Optimising quality of care for patients with COPD in government hospitals in Saudi Arabia

Mohammed E Alsubaiei

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School of Medicine

Flinders University

Adelaide, South Australia

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Principal Supervisor: Dr Tanja Effing

Joint Associate Supervisor: Prof Peter Frith

Adjunct Supervisors: Prof Doug McEvoy, Mr. Paul Cafarella

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Summary

Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality worldwide. The prevalence rate of COPD is estimated to be 4.2% among the general Saudi population, and 14.2% among smokers. In contrast to most other countries, smoking rates are steadily increasing among Saudis. This will most likely increase the future burden of COPD. Insufficient information is available about the quality of COPD care in Saudi Arabia. Thus, the primary aim of this thesis was to evaluate the current quality of care for patients with COPD in government hospitals in the Eastern Province of Saudi Arabia and to explore directions for future improvements.

We first assessed the current care services for patients with COPD provided by Saudi government hospitals (n = 22) using a cross-sectional design. Questionnaire results indicated limited availability of hospital facilities for patients with COPD such as no respiratory departments, limited spirometry (22.7% of the hospitals) and intensive care units (36.3% of the hospitals), and no pulmonary rehabilitation programs.

We then assessed the knowledge of physicians in 5 of the 22 government hospitals (44 physicians) using questionnaires. Physicians had suboptimal knowledge regarding COPD guidelines (mean ± standard deviation (29.5 ± 4.2 of 45 points; 65.5%)) and COPD management did not meet the guideline recommendations. Many physicians (n = 27 of 44; 61.3%) appeared to be unaware of any COPD guidelines and most physicians (n = 28 of 44; 63.6%) said they did not adhere to guidelines in their practice.

Subsequently, we performed a cluster randomised controlled trial to evaluate the effects of a comprehensive online education program for COPD guidelines (intervention group: two hospitals / 18 physicians; control group: three hospitals / 26 physicians). Results indicated that the training had significantly increased physicians' knowledge of the COPD guideline recommendations after a one-year follow-up (intervention group: baseline: 29.6 ± 3.3; 1-year follow-up: 41.5 ± 1.3; control group: baseline: 29.2 ± 4.8; 1-year follow-up: 30.1 ± 4.9). The self-rated readiness and level of confidence in implementing the guideline recommendations for COPD care also improved.

Our second cross-sectional study focused on barriers for setting up pulmonary rehabilitation in Saudi Arabia (hospitals n=22; health care providers n=123). The results revealed that the main barriers to establishing a pulmonary rehabilitation program in the Eastern Province of Saudi Arabia were a lack of (i) hospital capacity (75.6%), (ii) trained healthcare providers (72.4%), and (iii) funds (48.0%).

Finally, four focus groups provided us with recommendations of health care providers and patients to tailor an existing Australian pulmonary rehabilitation program for use in government hospitals in Saudi Arabia. The most important recommendations were: maximum length of eight weeks, exercise sessions that should be gender matched, and separate gyms for different genders. We concluded that a tailored pulmonary rehabilitation program that aligns with international pulmonary rehabilitation statements is feasible to be implemented in Saudi hospitals.

In conclusion, this thesis shows that COPD management in the Eastern Province of Saudi Arabia is sub-optimal. The study's original contribution to knowledge is that it identifies gaps in Saudi COPD management that currently exist, and provides directions to improve the quality of care for patients with COPD in government hospitals in the Eastern Province of Saudi Arabia.

Declaration

I certify that this thesis does not incorporate without my acknowledgment any material previously submitted for a degree in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Mohammed Alsubaiei

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List of publications arising from this thesis

1. **Alsubaiei M,** Cafarella P, Frith P, McEvoy D, Effing T. Current care services provided for patients with COPD in the Eastern province in Saudi Arabia: a descriptive study. International Journal of Chronic Obstructive Pulmonary Disease. 2015;10(1):2379-91.

2. **Alsubaiei ME,** Cafarella PA, Frith PA, McEvoy RD, Effing TW. Barriers for setting up a pulmonary rehabilitation program in the Eastern Province of Saudi Arabia. Annals of Thoracic Medicine. 2016;11(2):121-7.

3. **Alsubaiei ME**, Frith PA, Cafarella PA, Quinn S, Moamary MS Al, R McEvoy RD, Effing TW. COPD care in Saudi Arabia: physicians' awareness and knowledge of guidelines and barriers to their implementation. The International Journal of Tuberculosis and Lung Disease. 2017 (accepted, in press).

List of abstracts and posters

1- **Alsubaiei M**, Cafarella P, Frith P, McEvoy D, Effing T. Barriers for Setting up a Pulmonary Rehabilitation Program in the Eastern Province of Saudi Arabia. Thoracic Society of Australia and New Zealand Annual Scientific Meeting 2014 April 8th

2- **Alsubaiei M**, Frith P, Cafarella P, Quinn S, Al Moamary MS, McEvoy D, Effing T. COPD care in Saudi Arabia: physicians' awareness and knowledge of COPD guidelines. European Respiratory Society International Congress - London 2016 September 3rd.

3- **Alsubaiei M**, Frith P, Cafarella P, Quinn S, Al Moamary MS, McEvoy D, Effing T. Effects of COPD guideline training on physicians' awareness, knowledge and readiness to implement guidelines: a cluster randomized controlled trial. Thoracic Society of Australia and New Zealand Annual Scientific Meeting 2017 March 24th (submitted).

Chapter 1:

General introduction

This hybrid thesis describes the results of a series of studies that were performed to evaluate and optimise the quality of care for patients with chronic obstructive pulmonary disease (COPD) in Saudi Arabia. The primary aim of this thesis was to evaluate the current quality of care for patients with COPD in government hospitals in the Eastern Province of Saudi Arabia, and to explore possible directions for further improvements. In this introduction, I briefly define the term COPD, summarise the epidemiology of COPD, give an overview of the prevalence of COPD in Saudi Arabia, and establish the rationale and an outline of the research studies that were undertaken.

Epidemiology of COPD

COPD is a common chronic inflammatory disease of the lungs that is progressive and characterised by airflow limitation that is not fully reversible (1). COPD is defined by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) as:

> a common preventable and treatable disease characterised by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. Exacerbations and comorbidities contribute to the overall severity in individual patients (1).

In 1990, COPD was the fourth leading cause of death globally. Currently, it is the third leading cause of death (2). A recent meta-analysis showed a global COPD prevalence rate of 11.7% (8.4%-15.0%) (3). COPD is associated with a reduced quality of life for patients, as well as high healthcare costs (3-5).

Prevalence of COPD in Saudi Arabia

Saudi Arabia is a high-income country (6) with a population of approximately 30 million people (7) that has many people with respiratory diseases such as COPD (8, 9, 10). The few studies that have investigated the prevalence of COPD in Saudi Arabia have all reported a comparable prevalence of the disease to developed countries (10-18). A recent study showed that the current prevalence of COPD is 4.2%, confirmed by spirometry, among the adult Saudi population (17, 18), while a study of 501 smokers over 40 years of age attending primary healthcare clinics in the largest three

cities of Saudi Arabia reported that 71 patients (14.2%) had COPD confirmed by spirometry (9, 13). The Saudi COPD prevalence rate among smokers is comparable with prevalence rates in other parts of the world (such as Turkey18%) (9). The reported COPD prevalence rate of 4.2% among the general Saudi population is low (17) compared to the worldwide prevalence range (8.4% to 15.0%) (2, 12-15). However, this low level of COPD prevalence rate among the general Saudi population in this particular study may be explained by the fact that participants were included only from the capital city of Saudi Arabia (Riyadh) and this study included people who smoke cigarette and did not consider other types of smoking (e.g. waterpipe) (17).

Previous studies have shown that smoking is one of main risk factors for developing COPD (1,4,2). In Saudi Arabia, the prevalence of smoking is estimated at 20% (male = 28.8%; female =2.4%), compared with 16.2% (male =18.4%; female =13.9%) in Canada and 12.1% in Qatar (male =20.2%; female =3.1%). Smoking rates are still low in women; however, these rates are raising (19) Moreover, the prevalence of smoking among Saudi adolescents is steadily increasing (19-22). In addition, exposure to non-smoking factors that can cause COPD such as biomass fuel, dusts, gases, outdoor air pollution, a history of tuberculosis (TB) (the rate of TB is 15.6 per 100,000 in Saudi Arabia) (23), chronic asthma and respiratory-tract infections during childhood (1, 24), is also relatively high in Saudi Arabia (12, 14, 24). Although TB rate in Saudi Arabia is low compared to the global rates (142 per 100,000) (23), it remains a public problem and should be considered as a factor that can influence the prevalence of COPD (1, 23, 24). It is therefore likely that the prevalence of COPD in Saudi Arabia will further increase in the future and place an even higher burden on healthcare costs and demand in Saudi Arabia (17).

Healthcare services in Saudi Arabia

In Saudi Arabia, healthcare services are provided by three sectors: (i) the Ministry of Health (MOH) sector including, primary care centres (n = 2,281) and hospitals (public and tertiary, n = 270); (ii) other government sectors, such as universities and the military, including hospitals (n = 42); and (iii) private sectors, including hospitals (n = 141) (25). The number of hospitals in all sectors increased from 415 in 2010 to 453 in 2014, which provides more services to meet the needs of the rapidly growing

population (25). In Saudi Arabia, primary care centres provide primary services to all Saudi citizens (26). Patients who require moderate care are referred to public hospitals, while tertiary hospitals supply services to patients who need more complex care (26). The average number of beds per 10,000 people in Saudi Arabia is 22.1 (25), which is low compared to other countries, such as the United States (46 beds per 10,000 people) and Australia (38 beds per 10,000 people) (27). However, access to healthcare services seems not to be a barrier for Saudi people (28). According to the MOH, around 45% of the population visit hospitals sponsored by the MOH, while 38% visit hospitals in the private sector, and less than 17% visit hospitals sponsored by other government sectors (25).

In the Saudi healthcare system, most patients with respiratory diseases are initially seen by general practitioners at primary healthcare centres. If patients require more care, they are referred to government hospitals (25, 29). However, primary care services do not always have the knowledge to address respiratory needs correctly (29), and frequently refer patients to government hospitals for respiratory care (29). As a result, the majority of people with respiratory diseases are seen in government hospitals (25, 29). According to the MOH, the total number of patients who have visited emergency departments and chest diseases clinics in government hospitals, and the number of people who have died due to respiratory diseases, has increased noticeably over the last four years (25). This may be a result of increasing prevalence, or other factors such as increasing prevalence of comorbidities (30). Continuing lack of optimal management may under these circumstances increase mortality rate even further in patients with COPD in Saudi Arabia (30, 31). Alongside the increase in absolute numbers of patients with COPD, the high number of emergency visits and deaths may also be a result of suboptimal respiratory management (8, 31).

The rationale and an outline of the research studies

To date, there are several national and international clinical COPD management guidelines implemented, such as the Saudi Initiative for Chronic Airway Disease (SICAD) guidelines (8) and the GOLD strategy document (1). Guidelines and strategy documents have been developed to provide standard management for patients with COPD (1, 8). The main aims of GOLD are: (i) to increase awareness of COPD among health professionals, health authorities and the general public; (ii) to improve the

diagnosis, management and prevention of COPD; and (iii) to decrease morbidity and mortality associated with COPD (1). The GOLD statement includes six COPD management components (diagnosis, assessment, therapeutic options, manage stable COPD, manage exacerbations and manage comorbidities) and provides the main recommendations for each component, as well as evidence for these recommendations (1). The SICAD was established in 2014 and includes a customised and simplified version of the GOLD recommendations that have been tailored for the Saudi setting (8). As a result, there are significant differences between the GOLD and SICAD guidelines. For example, in terms of assessment, the SICAD guidelines based its algorithm on the COPD Assessment Test (CAT) and history of exacerbations/hospitalisations, while the GOLD statements are based on disease severity by spirometry, CAT or Modified British Medical Research Council (mMRC) guidelines, and history of exacerbations/hospitalisations (1, 8). COPD management and care should meet these recommendations (diagnosis, assessment, therapeutic options, provide PR programs, manage stable COPD, manage exacerbations and manage comorbidities) in order to provide optimal care for patients with COPD.

In 2010, MOH developed a plan to place more focus on chronic diseases (32). Whereas the available information suggested that the quality of Saudi COPD care was limited and knowledge about the general management of COPD was suboptimal, COPD was not included in the MOH plan (32-35). To gain a better understanding of the current COPD management in Saudi Arabia, I first searched the literature to identify the factors influencing the management of respiratory diseases particularly COPD in Saudi Arabia. This is addressed in **Chapter 2**. Health economic factors such as lack of funds, lack of healthcare providers, religion, culture, attitude, lifestyle, and lack of adherence to evidence-based practice guidelines may have affected the healthcare system and management of chronic diseases (including respiratory diseases) in the past and may be still influencing it adversely today (26, 31).

To the best of my knowledge, there have been no previous studies that have evaluated the quality of services for patients with COPD in Saudi Arabian government hospitals. Thus, there was a clear need to evaluate this and to explore to what extent the current care services meet the COPD guideline recommendations (1, 8). **Chapter 3** evaluates the current care services provided by government hospitals for patients

with COPD in Saudi Arabia. Based on personal observations and international literature, we hypothesised that the current care provided would be suboptimal and would not meet the COPD guidelines recommendations'

In general, and in Saudi Arabia in particular, many physicians and pulmonologists seem to be unaware or have a poor understanding of and adherence to guideline recommendations for the management of COPD (8, 31). Studies have shown that lack of awareness and knowledge of guideline recommendations, as well as time constraints, are important barriers that prevent physicians from adhering to these recommendations in their practice (36-39). Other studies have also shown that providing an education program on evidence-based medicine guidelines to physicians and healthcare providers improves physicians' knowledge, skills and performance in practice and may lead to improved patient outcomes (40-44). There are many methods to provide an efficient education program to healthcare providers (45, 46). Education programs can be delivered as conference presentations, workshops, or online course activities (41,45). The provision of online CME activities is a suitable and cost-effective alternative to traditional CME activities in light of previous studies showing that lack of time and workload were the main barriers to attend traditional CME activities in Saudi Arabia and in Australia (47,48). In addition, internet and web based learning methods can be efficient and effective, and are well accepted by healthcare providers (44, 45). For the above reasons, we developed an online education training intervention based on the GOLD recommendations (1) . For that reason, we developed a comprehensive online education intervention to increase physicians' awareness, knowledge and consideration of implementing COPD guideline recommendations in Saudi Arabia. We evaluated the effects on physicians' awareness and knowledge in a cluster randomised controlled trial. **Chapter 4** presents the baseline results of this trial. The effects of the online education intervention are subsequently presented in **Chapter 5**. We hypothesised for Chapter 4 that physicians would have a lack of awareness and knowledge regarding COPD guidelines. Similar to observations in other countries and jurisdictionsor for Chapter 5, we hypothesized that a short comprehensive education intervention would improve physician's knowledge and awareness of these guidelines.

In the COPD guidelines, COPD therapeutic management is divided into pharmacological therapy (such as bronchodilators, corticosteroids and antibiotics) and non-pharmacological therapy that includes pulmonary rehabilitation (PR) programs (1, 8). The guidelines recommend PR programs as an effective treatment option for patients with a respiratory disease such as COPD (1, 49). PR is defined as:

> a comprehensive intervention based on a thorough patient assessment followed by patient tailored therapies that include, but are not limited to, exercise training, education, and behaviour change, designed to improve the physical and psychological condition of people with chronic respiratory disease and to promote the long-term adherence to health-enhancing behaviours (49).

Evidence proves that PR reduces dyspnoea, anxiety, depression and hospital admission rates, and improves exercise capacity, level of physical activity and quality of life, at least in the short term (5, 50).

While there are large numbers of patients with COPD in the Middle East and Saudi Arabia, thus far, the effects of only one PR program in a tertiary hospital in Saudi Arabia have been reported using a cohort study (35, 51, 52). Overall in the Middle East, there have been a few more reports from Turkish studies (53-55). The results of the PR studies published in the Middle East and Saudi Arabia aligned with studies from Europe, America and Canada, and concluded that PR in patients with respiratory diseases such as COPD leads to improved quality of life, reduced dyspnoea and increased exercise capacity (35, 51,52).

While accessibility to PR is already low in developed countries, it is significantly lower in Middle Eastern countries and Saudi Arabia (34). Currently in Saudi Arabia, we are only aware of one tertiary hospital (the King Abdulaziz Medical City in Riyadh) that offers a PR program in Saudi Arabia (51). The number of patients with COPD who can access PR in Saudi Arabia is thus extremely low (51). Establishing PR programs that meet international criteria and suit the Saudi population and healthcare system may increase accessibility to PR in Saudi Arabia (35, 49, 51, 52).

There are many models of PR (including outpatients, inpatients and communities) that hospitals in Saudi Arabia could adopt (31, 49, 50). However, implementing an

unadjusted 'Western' PR program in a Saudi hospital may lead to difficulties driven by differences in culture, attitudes, beliefs, lifestyle and language (33). For example, physiotherapy departments in all hospitals in Saudi Arabia are divided into male and female sections, and female patients should be seen only by female physiotherapists. In addition, frequently used assessment tools-such as the Medical Research Council (MRC) dyspnoea scale and Saint George's Respiratory Questionnaire-are available, valid and reliable in the English language, but are not available in the Arabic language (33, 56). Thus far, only two questionnaires-the Chronic Respiratory Disease Questionnaire (CRQ) and CAT-have been validated and classified as reliable to use in the Arabic language, and can be used in the assessment of patients with respiratory diseases (33).

In order to implement and establish PR programs in Saudi Arabia, we first evaluated barriers to establishing PR in Saudi Arabia. The results of this evaluation are reported in **Chapter 6**. **In Chapter 7**, we subsequently report the results of four focus groups that were undertaken (two with healthcare providers and two with patients with COPD and asthma) to help tailor PR programs in Saudi Arabia that would consider the likely difficulties identified in Chapter 6, and provide suggestions for PR programs that would be sensitive to the needs of Saudi patients and their culture.

Finally, in **Chapter 8**, I discuss the major results of these five studies and provide recommendations for clinical and public health practice for future research.

I have answered the following research questions in this thesis:

Chapter 2:

What are factors that may have led to the suboptimal management of chronic diseases in general and respiratory diseases such as COPD in particular, in Saudi Arabia?

Chapter 3:

What are the current care services provided by government hospitals for patients with COPD in Saudi Arabia and do these services meet the COPD guideline recommendations?

Chapter 4:

What is the level of physicians' awareness and knowledge of COPD guideline recommendations in Saudi Arabia?

What is the level of physicians' readiness to implement the GOLD guideline recommendations in their practice?

What are the main barriers that prevent physicians to implement the GOLD guideline recommendations in their COPD management?

Chapter 5:

Does the online The Global Initiative for Chronic Obstructive Lung Disease (GOLD) statement education program improve physicians' awareness and knowledge about COPD guideline recommendations in Saudi Arabia?

Does the online The Global Initiative for Chronic Obstructive Lung Disease (GOLD) statement education program improve physicians' readiness to implement the GOLD guideline recommendations in their practice?

Does the online The Global Initiative for Chronic Obstructive Lung Disease (GOLD) statement education program improve physicians' adherence to GOLD guideline recommendations in their practice?

Chapter 6:

What are the main barriers for setting up PR programs in Saudi Arabia?

Chapter 7:

Can tailoring an existing Australian PR program meet the specific needs of Saudi health care providers and patients in Saudi secondary government hospitals?

The published chapters (3, 4, and 6) have been formatted according to the requirements of the journals.

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Chapter 2:

Commentary article

Factors influencing management of chronic respiratory diseases in general and Chronic Obstructive Pulmonary Disease in particular in Saudi Arabia: an overview

Mohammed E. Alsubaiei

Paul A. Cafarella

Peter A. Frith

R. Doug McEvoy

Tanja W. Effing

According to the World Health Organization (WHO), chronic obstructive pulmonary disease (COPD) and asthma are among the most common respiratory diseases affecting people worldwide (1). Respiratory diseases are associated with a reduced quality of life for patients, as well as high healthcare costs (1-3). Annually, more than four million people die because of respiratory diseases (1). In 2014, respiratory diseases combined represented the fifth leading cause of death in Saudi Arabia, according to the Ministry of Health MOH (4). Approximately 3,388 people with respiratory diseases died in 2014, compared to 1,892 in 2010 (4, 5). In addition, in 2014, more than five million people visited emergency departments and more than 456,295 people visited chest disease clinics in public hospitals in Saudi Arabia due to respiratory diseases (4), whereas only 285,000 people visited emergency departments for the treatment of respiratory diseases in the United States in 2015 (6).

The WHO estimated that more than 65 million people have moderate to severe COPD worldwide (7), with COPD affecting 8% of individuals older than 40 years around the world (8, 9). COPD is defined by the GOLD as:

> A common preventable and treatable disease characterised by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. Exacerbations and comorbidities contribute to the overall severity in individual patients (9).

In 1990, COPD was the fourth leading cause of death globally. Currently, it is the third leading cause of death (10), (8, 9). According to the WHO, in 2012, more than three million people worldwide died of COPD, accounting for 6% of total deaths (7). The burden of COPD is increasing in Middle Eastern countries and Saudi Arabia in particular (11, 12). Factors such as increasing smoking rates, climate, and wars (chemical weapons) may contribute to this increase (13-15).

Saudi Arabia has a population of approximately 30 million (16), with many people suffering from COPD (3, 17-19). The few studies that have investigated the prevalence of COPD in Saudi Arabia have reported a comparable prevalence to other developed countries (12, 17, 20-23), particularly among smokers (14.2% among smokers) (17, 21). The prevalence is reported to range between 2.4% and 4.2% in the

general adult Saudi population (17, 18, 20). However, it is expected that the prevalence of COPD in Saudi Arabia will further increase in the future due to the relatively high number of people in Saudi Arabia who smoke (27.9% of the Saudi population aged > 40 years) (24). In addition, the population is exposed to non-smoking factors, such as biomass fuel, dusts, gases and outdoor air pollution (14, 17, 20). Many people also have a history of tuberculosis, chronic asthma and respiratory-tract infections during childhood, which are considered risk factors for COPD (14, 17, 20).

Despite Saudi Arabia being a high-income country, COPD is still not receiving sufficient attention from physicians and the government in Saudi Arabia (3, 17, 25). COPD is underdiagnosed, COPD care is suboptimal, and knowledge about the optimal general management of COPD (particularly specific treatment approaches, such as pulmonary rehabilitation, is low (3, 26-28)). In this opinion paper, we have provided an overview of the factors that may have led to the suboptimal management of chronic diseases in general, and respiratory diseases such as COPD in particular, in Saudi Arabia. In addition, we have provided recommendations for improvement.

Factors influencing management of chronic diseases in general and respiratory diseases in particular in Saudi Arabia

Healthcare system in Saudi Arabia

Saudi Arabia is a positive exception in healthcare system in the Middle Eastern region with its government focusing on improving its healthcare system (26, 29). According to the WHO, Saudi Arabia is ranked 26 of 190 countries in terms of the quality of the healthcare system (New Zealand is ranked 41, Australia is ranked 32, Canada is ranked 30, Kuwait is ranked 45 and Qatar is ranked 44) (26, 29, 30). Health services are free for all Saudi citizens (26, 31). However, according to the MOH, the total number of patients who visited emergency departments and chest diseases clinics in public hospitals, and the number of people who died due to respiratory diseases, increased noticeably over the last four years (4). This may be explained by suboptimal management provided by government hospitals, and increasing numbers of people with respiratory diseases (3, 33). Health economic factors (such as lack of funds), lack of healthcare providers, religion, culture, attitude, lifestyle, and lack of adherence to

evidence-based practice guidelines may have affected the healthcare system and management of chronic diseases (including respiratory diseases) in the past and may be still influencing it today (3, 26, 34, 35).

1. Health economic factors

Lack of funds is a serious challenge in Saudi Arabia because health services are free for the Saudi population (26). In 2014, the Saudi Arabian government spent around 12% of the gross domestic product (GDP) on the health sector (36), compared to 16% of GDP in the United States (37). While higher spending does not by definition mean better quality of healthcare, it is one factor leading to improved healthcare systems (26, 38). However, although the MOH spends high amounts of money to improve infrastructure for the healthcare system, it may need to become more efficient in allocating funds for education and training programs for healthcare providers to study evidence-based practice guidelines (26).

Previous studies have recommended that Saudi Arabia should reform the model of health financing and consider healthcare insurance for both foreign workers and citizens to decrease financial stress on the government (26, 39). Privatisation of public hospitals with control and subversion by the MOH may be another solution to the health economic factors (26, 40). These solutions may increase income to the MOH and help improve the healthcare system and research activities in Saudi Arabia (12, 26, 40), with improved management of respiratory diseases as a result.

Every year, the Saudi healthcare system experiences additional stress (on finances, healthcare providers and health services) during Hajj, which is the pilgrimage to Mecca city in Saudi Arabia (32, 41). This is a unique situation for Saudi Arabia because it has the two holiest cities in the Islamic world—Mecca and Medina. During Hajj (annually in the last month of the Islamic calendar), Saudi Arabia provides many free services to more than two million pilgrims from around the world, including free healthcare, which may influence the health economics issues in Saudi Arabia (26, 42).

2. Lack of healthcare providers

According to the MOH, the rate of physicians and nurses per 10,000 people in Saudi Arabia is estimated to be 12.5 physicians and 29.8 nurses (4). This number is very low compared to other countries such as Bahrain (30 and 58 per 10,000), France (37 and 81 per 10 000) and the United States (27 and 98 per 10,000) (4, 26). Further, the total number of chest physicians working in all sectors of Saudi Arabia is around 600, which represents 0.73% of the total number of physicians (MOH sectors, n = 257; other government sectors, n = 137; private sectors, n = 206) (4). In contrast, countries in Europe have a higher reported percentage of chest physicians for example, Poland's percentage of chest physicians is 2.93% (43).

Currently, there are more than 23 universities providing medical, nursing and applied health science degrees to Saudi students (4). The government in Saudi Arabia could engage people to study medicine, nursing and applied health science by opening more schools of medicine and nursing locally, or by sending students to study medicine in developed countries in order to increase the number of healthcare providers (4).

3. Language

Arabic is the official language in Saudi Arabia. However, because of the lack of healthcare providers in Saudi Arabia (44), the government has hired a large number of healthcare providers from non-Arabic-speaking countries. Saudi and non-Saudi healthcare providers communicate in English; however, this is not the first language for many of them (44), which is likely to affect the quality of knowledge transfer (44).

Communication between patients and healthcare providers is also affected because there is only limited number of healthcare providers who speak the Arabic language fluently. This may lead to miscommunication and decreased quality of care (44, 45). The Saudi government could implement Arabic language requirements for non-Saudi healthcare providers, and provide regular Arabic courses for non-Arabic healthcare providers (44).

4. Religion, culture, attitude and lifestyle

Islam has a long history in Saudi Arabia (46, 47); therefore, Islam should contribute to the health and wellbeing of the people who adhere to it, by encouraging people to be healthy and strong (46, 48). In some communities, there are extreme religion believers who do not wish to obtain treatment from standard medical care systems and treat themselves with traditional herbal medicine (46, 47). This may affect their health and increase the burden of disease in their community (46, 48). Another belief is that diseases such as chronic or life-threatening conditions are a test from God, and represent a way to atone for sins. While Islam encourages people to be patient and seek good treatment based on recent medical recommendations, some people still stay home and wait for death (46, 47).

Family support is very important for people in Middle Eastern Arabic countries, such as Saudi Arabia (46, 47), and Islam encourages people to help and look after their family. Many elderly people prefer therefore to stay at home, rather than at a hospital, which may negatively affect their health conditions (46, 47). As a result, family members play an important role in caring for elderly people (46, 47). A previous study suggested that increasing family members' knowledge and awareness of their patient's chronic disease and providing them with essential care may help improve the quality of care and health situation of patients with chronic diseases in general and respiratory diseases in particular (49).

Smoking is the cause of many chronic diseases such as COPD and cancer and a very important lifestyle factor that affects healthcare and managing respiratory diseases in Saudi Arabia (50). In Saudi Arabia, the prevalence of smoking is estimated at 20% (male = 28.8%; female =2.4%), compared with 16.2% (male =18.4%; female =13.9%) in Canada and 12.1% in Qatar (male =20.2%; female =3.1%). (15, 51-54). Smoking rates are still low in women; however, these rates are rising (15). Around 83% of Saudi smokers began smoking at the age of 15 years (55) and the prevalence of smoking among Saudi adolescents is steadily increasing (15, 24, 56, 57). The prevalence of smoking among children aged between 11 and 19 in Saudi Arabia is 19.3% (24% male; 11.2% female) (57). These young smokers will cause an alarming and serious health problem for the coming generation (15, 57).

The Saudi Arabian government has invested increased effort towards smoking cessation among Saudis during the last four years (58, 59). The Tobacco Control Program was established by the MOH in Saudi Arabia to provide smoking cessation clinics and education programs for smokers, free of charge (59). There are more than 70 smoking cessation clinics in Saudi Arabia and smoking is now banned in government sectors, universities and public institutions (59). In addition, the Saudi government has banned smoking advertisements in the Saudi media (59). However, despite all these efforts, the percentage of smokers remains alarmingly high and is increasing among Saudis (15, 57, 58, 60). Therefore, more work is needed to develop effective smoking cessation programs that will consider Saudi-specific barriers.

Many studies have now shown that physical inactivity is also associated with the epidemic of chronic diseases and respiratory diseases (61-63). Patients with COPD tend to be physically inactive in daily life (62, 63), and a relationship exists between a decreased level of physical activity and poor quality of life, which may increase healthcare use and reduce survival (62). The level of physical inactivity in Saudi Arabia is high among both males and females because of a lack of facilities and limited time to exercise (64). According to the Centres for Disease Control and Prevention and American College of Sports Medicine, adults should accumulate 30 minutes or more of moderate-intensity physical activity on most days of the week (61). The lack of physical activity in Saudi Arabia is evidenced by the fact that 96.1% of Saudi males and 98.5% of Saudi females do not meet these recommended physical activity levels, compared to 64% of males and 60% of females in Australia (61, 65). This low level of physical activity of patients with COPD in Saudi Arabia is likely to contribute further to the mortality and healthcare burden associated with COPD in this country (62).Saudi Arabia could invest in interventions that improve many outcomes in COPD, such as pulmonary rehabilitation programs and behavioural change interventions for Saudi patients with COPD to try to improve their physical activity levels, health status, and health care utilisation (63). While there is no convincing evidence of the direct effect of PR on physical activity levels among patients with COPD, implementing PR is an important first step to improving exercise capacity and muscle strength in Saudi patients with COPD (66, 67).

The culture in Saudi Arabia negatively affects women's access to healthcare (47, 68). Women are only accepted in a government hospital when accompanied by a male guardian, women are not allowed to sign the consent form for medical procedures, and most males do not permit male physicians or other male healthcare providers to treat the women for whom the men are responsible. In addition, access to healthcare is affected by women being prohibited to drive cars (47, 68). Possible solutions to this could include providing Saudi patients with public transportation or arranging private transport that is fully paid by the government (47, 68).

While respiratory diseases affect people regardless of their nationality, gender, religion and beliefs, the above factors can affect the response towards disease management. To improve any healthcare system, health professionals must consider and understand how chronic diseases are viewed in different cultures (68). Thus, the health economic factors, lack of healthcare providers, culture, religion, community and family factors described above must be considered when seeking to improve and optimise healthcare.

Specific factors influencing the management of respiratory diseases, particularly COPD, in Saudi Arabia

Lack of awareness of evidence-based practice guidelines to manage respiratory diseases (particularly COPD)

To date, several national and international clinical COPD management guidelines have been developed, including the Saudi Initiative for Chronic Airway Disease (SICAD) guidelines (3) and the frequently updated Global Initiative for Chronic Obstructive Lung Disease (GOLD) strategy document (9). These guidelines were developed to provide standard management for patients with COPD, and COPD care should meet these evidence-based recommendations (3, 9). Table 1 presents a summary of the differences between GOLD and SICAD for the management of patients with COPD.

In general, many physicians and pulmonologists are unaware of or have poor understanding of and adherence to the GOLD and SICAD recommendations for the management of COPD (33, 69, 70). Studies have shown that adherence to COPD guidelines in clinical practice in most countries is unsatisfactory (33, 69, 71-73). This

may be caused by lack of awareness and knowledge of its recommendations by physicians and pulmonologists, time constraints on physicians, or pulmonologists disagreeing with the recommendations (69-71, 74, 75). It is also evident that a good understanding of COPD guidelines by physicians is important for good patient care (69). For example, a study investigating the quality of care in primary care centres in Saudi Arabia showed that the quality of care provided to patients with chronic diseases and respiratory diseases is suboptimal due to lack of adherence to evidence-based guidelines (27). Lack of awareness and familiarity with COPD guidelines is likely to lead to non-adherence and subsequent suboptimal management of patients with COPD (74, 76, 77). As a result, morbidity and mortality rates may increase (9).

In Saudi Arabia, there has been no previous study assessing physicians' knowledge of COPD guidelines and adherence to their recommendations for COPD management in public hospitals (secondary hospitals) (12). A study that assessed family physicians' knowledge of the Saudi Initiative for Asthma guidelines in Saudi Arabia showed that most physicians had poor knowledge of the guidelines (78). Therefore, in order to optimise the quality of care for patients with respiratory diseases, particularly COPD, we recommend investigating and evaluating the levels of physicians' knowledge of COPD guidelines in Saudi Arabia. Increasing awareness and knowledge of the importance of COPD guidelines, such as GOLD and SICAD, is recommended to increase physicians' knowledge of and adherence to COPD guidelines for COPD management, and thereby improve COPD care (69, 76, 77, 79). In addition, we recommend evaluating interventions, such as education programs, to improve physicians' knowledge and adherence to COPD guidelines.

Evidence shows that, as a non-pharmacological therapy, pulmonary rehabilitation has positive effects among patients with respiratory diseases, such as COPD, asthma, and interstitial lung disease (28, 66, 80, 81). Thus, the use of pulmonary rehabilitation is included in COPD and asthma guidelines (3, 9, 81). Many studies have shown that pulmonary rehabilitation improves patients' outcomes and quality of life (8, 66, 67, 82). While accessibility to pulmonary rehabilitation is already low in developed countries (34.8% in European countries) (83), it is significantly lower in Middle Eastern countries and Saudi Arabia (82). Currently in Saudi Arabia, we are aware of only one tertiary hospital (the King Abdulaziz Medical City in Riyadh) that offers

pulmonary rehabilitation program in Saudi Arabia (84). Thus, the number of patients with COPD who can access pulmonary rehabilitation in Saudi Arabia is extremely low (84). Therefore, we highly recommend establishing more PR programs that meet international criteria and are suited to the Saudi population and healthcare system (84-87). Further, we recommend evaluating barriers to establishing PR in Saudi Arabia. By knowing these barriers, it should be possible to stimulate further implementation and establishment of PR programs.

In summary, the prevalence of COPD in Saudi Arabia is 4.2% among the general population and 14.2% among smokers. Factors such as climate, social issues and health lifestyle choices (such as smoking and physical inactivity) may affect the prevalence of respiratory diseases in Saudi Aribia. Suboptimal management of respiratory diseases and COPD in Saudi Arabia is influenced by several issues, such as health economic factors, lack of healthcare providers, culture, attitude, lifestyle and lack of adherence to the evidence-based practice guidelines. These factors should be taken into account while seeking to improve and optimise quality of care for patients with respiratory diseases in Saudi Arabia.

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Table 1: Summary of differences between GOLD and SICAD for management of patients with COPD

GOLD recommendations	SICAD recommendations
Diagnosis: a) Clinical diagnosis of COPD should be considered for any patient who has dyspnoea, chronic cough or sputum production, and a history of exposure to risk factors for the disease. b) Spirometry is required to diagnose COPD. c) The presence of a post-bronchodilator FEV1/FVC < 0.70 confirms the presence of COPD.	**Diagnosis:** Similar recommendations to GOLD.
Assessments: COPD assessment must consider the following aspects of the disease separately: **a)** Current level of patient's symptoms (mMRC*, CAT* and CCQ*). **b)** Severity of the spirometric abnormality (GOLD 1 [Mild], GOLD 2 [Moderate], GOLD 3 [Severe], GOLD 4 [Very severe]). **c)** Exacerbation risk: 0–1 per year versus ≥ 2 per year. **d)** Presence of comorbidities. **e)** Others (such as Oximetry and Arterial Blood Gas Measurement, Alpha-1 Antitrypsin Deficiency Screening and Exercise Testing).	**Assessments:** COPD assessment must consider the following aspects of the disease separately: a) Current level of patient's symptoms (CAT*) b) Exacerbation risk: 0–1 per year versus ≥ 2 per year. c) Presence of comorbidities. d) Other (such as Oximetry and Arterial Blood Gas Measurement, Alpha-1 Antitrypsin Deficiency Screening and Exercise Testing).
Classification using combined assessments: Symptoms AND spirometry AND assessment of risk of exacerbations **a)** Patients group A: Fewer symptoms (mMRC 0-1, CAT < 10), low risk (GOLD 1, 2 and exacerbation ≤ 1). **b)** Patients group B: More symptoms (mMRC > 2, CAT > 10), low risk (GOLD 1, 2 and exacerbation ≤ 1). **c)** Patients group C: Fewer symptoms (mMRC 0-1, CAT < 10), high risk (GOLD 3, 4 and exacerbation > 2). **d)** Patients group D: More symptoms (mMRC > 2, CAT > 10), high risk (GOLD 3, 4 and exacerbation > 2).	**Classification using combined assessments:** Symptoms AND assessment of risk of exacerbations a) Class I—Fewer symptoms (CAT ≤ 10), at low risk of exacerbation ≤ 1. b) Class II—More symptoms (CAT ≥10), at low risk of exacerbation ≤ 1. c) Class III—At high risk of exacerbation ≥ 2 (CAT any score).
Manage stable COPD: (First-line pharmacologic therapy) **a)** Patients group A: Short-acting anticholinergic (SAMA) or short-acting bronchodilator (SABA). **b)** Patients group B: Long-acting anticholinergic (LAMA) or long-acting beta2-agonist (LABA). **c)** Patients group C: Inhaled corticosteroid (ICS) + long-acting beta2-agonist or long-acting anticholinergic. **d)** Patients group D: Inhaled corticosteroid + long-acting beta2-agonist and/or long-acting anticholinergic.	**Manage stable COPD:** (First-line pharmacologic therapy) a) Class A: SABA or SAMA. b) Class B: LAMA or LABA (LABA is not available as monotherapy; however, ultra-LABA will soon be available. c) LAMA or combination of ICS and LABA.
Manage stable COPD: (non-pharmacologic therapy) Patients group A: Smoking cessation, physical activity, flu vaccination and pneumococcal vaccination.	**Manage stable COPD:** (non-pharmacologic therapy) Similar recommendations to GOLD; however, they do not recommend physical activity for patients in group A (SICAD:

Patients groups B–D: Smoking cessation, PR, physical activity, flu vaccination and pneumococcal vaccination.	Class I).
Manage exacerbations: **a)** Short-acting inhaled beta2-agonists with or without short-acting anticholinergic. **b)** Systemic corticosteroids and antibiotics. **c)** Oxygen therapy. **d)** Non-invasive mechanical ventilation. **e)** Invasive mechanical ventilation is needed when patients unable to tolerate. **f)** Immediate admission to an intensive care unit when needed.	**Manage exacerbations:** Similar recommendations to GOLD.
Manage comorbidities: Presence of comorbidities—such as cardiovascular disease, osteoporosis, lung cancer and metabolic syndrome—should not alter COPD treatment. Comorbidities should be treated as if the patient does not have COPD.	**Manage comorbidities:** Similar recommendations to GOLD.

Abbreviations: GOLD, global initiative for chronic obstructive lung disease; COPD, chronic obstructive pulmonary disease

*Breathlessness measurement using the mMRC questionnaire.

*COPD Assessment Test (CAT): An eight-item measure of health status impairment in COPD.

*Clinical COPD Questionnaire (CCQ): Self-administered questionnaire developed to measure clinical control in patients with COPD.

Chapter 3:

Current care services provided for patients with COPD in the Eastern province in Saudi Arabia: a descriptive study

Mohammed E. Alsubaiei

Paul A. Cafarella

Peter A. Frith

R. Doug McEvoy

Tanja W. Effing

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Abstract

Background: COPD is a leading cause of morbidity and mortality worldwide. The prevalence rate of COPD in the general Saudi population is estimated to be 2.4% and 14.2% among smokers. Not much is known about current health care services for patients with COPD in Saudi Arabia. The objective of this study was to determine the current care services for patients with COPD provided by government hospitals in the Eastern province of Saudi Arabia.

Methods: A cross-sectional study was conducted in the Eastern province of Saudi Arabia. Directors of the Department of Internal Medicine from all 22 general government hospitals that are under the responsibility of the Ministry of Health or the Ministry of Higher Education in this region were asked to participate. Data were collected using a questionnaire.

Results: The study results indicated that there are limited hospital facilities for patients with COPD: no respiratory departments in any of the included hospitals, no spirometry in 77.3% of the hospitals, no intensive care units in 63.7% of the hospitals, and no pulmonary rehabilitation program in any of the hospitals. Among the included 22 hospitals, 24 respiratory physicians, 29 respiratory therapists, and three physiotherapists were involved in COPD care.

Conclusion: In conclusion, current care services provided by government hospitals in the Eastern province of Saudi Arabia for patients with COPD do not meet international recommendations for COPD management. Increased awareness, knowledge, and implementation of COPD guidelines by health care providers will most probably improve COPD management in Saudi Arabia. In addition, the government could improve dissemination of information about COPD management through national programs and by offering specific education regarding respiratory diseases.

Keywords: health services, pulmonary disease, chronic obstructive, Saudi Arabia, hospitals, general

Introduction

COPD affects 65 million people worldwide and is characterized by inflammation, airway obstruction, and worsening in lung function that is not fully reversible (1–4). The long-term management of patients with COPD adds substantially to health care costs, economic burden, and poor quality of life of patients (5,6). Although COPD is a serious respiratory disease with an already high and still increasing morbidity and mortality, it is underdiagnosed and underrecognized in Middle Eastern countries, including Saudi Arabia (7).

A recent study estimated the prevalence rate of COPD in Saudi Arabia at 2.4%, similar to the prevalence rate in the entire Middle East (3.6%) (8). A Saudi study among smokers older than 40 years of age reported that 14.2% had COPD (9,10). This prevalence rate is comparable to rates in smoking populations in Turkey (9,10). According to the Saudi Ministry of Health (MOH), chest diseases were the fourth leading cause of death in Saudi Arabia in 2010 (11).

Smoking is the main risk factor for the development and progression of COPD (9). Evidence suggests that the smoking rate is steadily increasing among Saudis (9) and is currently 27.9% (12). COPD prevalence rates in Saudi Arabia are therefore expected to rise even further (9). Other risk factors for developing COPD in Saudi Arabia are outdoor air pollution, desert dust, wars (eg, chemical weapons), and childhood respiratory infections (13).

Saudi Arabia has a population of ~30 million people who live in 13 provinces, of which the Eastern province is the largest (with > 4 million inhabitants and 34 government hospitals) (14). The Eastern, Central, and Makkah provinces have the highest population and the highest number of training centers that provide specialized programs for physicians in Saudi Arabia (11). Their health services therefore differ positively from the other ten provinces, for example, more hospitals, beds, health care providers, and funds (11).

The number of physicians and nurses per 10,000 people in Saudi Arabia is estimated to be 11.6 and 28, respectively (15), substantially lower than in some other Middle East countries (e.g. Kuwait: 18 and 37 per 10,000 and Bahrain: 30 and 58 per 10,000) and in most developed countries (e.g. US: 27 and 98 per 10,000) (15). This lack of

health care providers may compromise health care in Saudi Arabia (15).

To date, there are several national and international clinical COPD management guidelines such as the recently published Saudi Initiative for Chronic Airway Disease (SICAD) guidelines and the internationally recognized and frequently updated Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines (7,16). The SICAD guidelines panel has customized and simplified the GOLD guidelines based on the Saudi setting (7,16). Whereas COPD guidelines are widely accessible, many physicians and pulmonologists are not aware of their existence or do not fully understand them (17). Indeed, adherence to COPD guidelines in clinical practice in most countries is not satisfactory (17–21). This has been attributed to lack of awareness and time constraints of physicians and pulmonologists, as well as disagreement with the recommendations (17,18,22,23).

The GOLD Strategy recommends that hospitals should have specialized care such as respiratory departments and respiratory wards, qualified respiratory health care providers, and pulmonary rehabilitation programs in order to provide optimal care for patients with COPD (16). In the present study, we have evaluated current care services for COPD provided by government hospitals in the Eastern province in Saudi Arabia. Gaining knowledge regarding the current COPD care provided allows the identification of existing service limitations in Saudi Arabia and in the Middle East and Northern Africa countries. This is necessary before strategies can be developed that are aimed at further optimizing the quality of COPD care in the Middle East and Northern Africa countries such as Saudi Arabia.

Methods

A cross-sectional study was conducted from April to August 2013 in the Eastern province in Saudi Arabia. Figure 1 shows the main areas in the Eastern province in Saudi Arabia in which 22 government hospitals were included. The government hospitals included had to meet the following criteria: 1) general hospitals sponsored by the MOH and Ministry of Higher Education and 2) situated in the Eastern province of Saudi Arabia. Hospitals were excluded if they were 1) specialist hospitals (eg, psychiatric, convalescent, and maternity and children's hospitals sponsored by the MOH) or 2) referral hospitals sponsored by the MOH.

One health care professional (Director of one of the Departments of Respiratory Medicine, Internal Medicine, Physiotherapy, Psychiatry, Nutrition, or Nursing) at each hospital was asked to complete our self-developed questionnaire evaluating hospital health care (Figure S1) within a week.

The research protocol was approved by the Southern Adelaide Clinical Research Ethics Committee (Flinders Medical Centre), the Institutional Review Board at MOH in Saudi Arabia, and the Institutional Review Board at King Fahd Hospital University in Saudi Arabia. All included participants signed a written informed consent.

The questionnaire (Figure S1) was written in English, the official language in Saudi hospitals, and was based on an organizational survey created by the COPD Audit Steering Board (24). The original questionnaire has been used in Europe and is valid for use worldwide (24); it has been modified to make it suitable for hospitals in Saudi Arabia. The adjusted questionnaire includes 34 open-ended and closed questions to evaluate care within hospital services in terms of their size, equipment status, staffing, treatment, and care provided for patients with COPD. The items can be categorized into two parts: 1) general hospital information (n=9) and 2) the (respiratory) department and COPD care (n=25) (24).

Statistical analysis

All data from the questionnaires were entered into the Statistical Package for Social Sciences (SPSS) Version 19 (IBM Corporation, Armonk, NY, USA). The analyses were descriptive. Continuous variables were summarized by calculating the mean and standard deviation. Nominal data were given as proportions.

Results

Of the 34 government hospitals in the Eastern province in Saudi Arabia, 22 met the predefined criteria and were included, whereas 12 were excluded because they were specialist hospitals (psychiatric, Women's and Children's; Figure 2). All 22 included participants were Directors of the Department of Internal Medicine (for characteristics see Table S1), the majority was male (n=19), non-Saudi (n=15), and Internal Medicine specialists (n=12). Based on our data, ~4,387,000 people have access to the included government hospitals (Eastern area [n=2,774,000], Al-Ahsa area

[n=1,180,000], and Hafar Al-Batin area [n=433,000]).

Table 1 provides a summary of the current care services provided by each hospital in the Eastern province in Saudi Arabia in 2013. The total number of beds available was 3,161. Five hospitals had 300 or more beds, whereas 13 had 50 or fewer beds. None of the hospitals had a respiratory department, but all had an internal medicine department and ward in which patients with COPD could be admitted. Five hospitals (C, G, H, Q, and U) did not admit any patients with COPD in 2012. Only three hospitals (A, K, and O) had a specific respiratory outpatient clinic available, whereas in the other 19 hospitals, patients with COPD were referred to the outpatient clinic for internal medicine. Two of these hospitals (C and H) referred patients with COPD to the nearest hospital (L) due to a lack of facilities to treat patients with COPD. Only five hospitals had spirometry available, but in one hospital (T), it was not used frequently because of insufficient time to do so. Respiratory physicians (n=1), technicians (n=13), and therapists (n=11) performed spirometry. There were eight hospitals with intensive care units (ICUs), 12 that offered invasive mechanical ventilation for acidotic respiratory failure, and seven that offered noninvasive ventilation. None of the included hospitals offered pulmonary rehabilitation programs or supported discharge programs for patients with COPD (Table 1).

Only five hospitals had qualified respiratory physicians (total: n=24) and 23 of these physicians worked in the Eastern area (n=16) and Al-Ahsa area (n=7), whereas only one was based in the Hafar Al-Batin area. In 19 hospitals, patients with COPD were seen by internal medicine physicians. Besides physicians, there were 29 respiratory therapists and three physiotherapists involved in COPD care. There were no respiratory nurses, nurse practitioners (only general nurses), mental health specialists, occupational therapists, or dieticians involved in COPD care (Table S2).

Table 2 compares GOLD guideline recommendations with the current care provided in the Eastern province. The hospitals did not meet the GOLD recommendations in terms of having specialized care for patients with COPD such as respiratory departments and respiratory wards, qualified respiratory health care providers, and pulmonary rehabilitation programs. Only five hospitals had some services for COPD management (eg, respiratory physicians, spirometry, and ICUs).

Discussion

This study is the first to describe the current care services provided by government hospitals to patients with COPD in the Eastern province of Saudi Arabia. Results show that there is a lack of hospital capacity for patients with COPD and that there are limited numbers of specialized health care providers involved in COPD care.

In the Eastern province, the overall number of beds available in government hospitals is relatively low compared to the total population that has access to these hospitals (one bed per 1,387 people). According to the MOH of Saudi Arabia, the average ratio for the whole of Saudi Arabia is one bed for 1,219 people (11), much lower than in most other countries (Switzerland [one bed for 55 people] and Australia [one bed for 126 people]) (25). In order to increase the number of beds in Saudi Arabia, the MOH has recently decided to establish more hospitals in the Eastern province (n=6), which will add ~1,500 beds by the end of 2015 (26).

The GOLD guidelines recommend specialized care for respiratory diseases such as COPD in order to ensure optimal care (16). Respiratory specialists provide better care for respiratory patients than nonrespiratory medical specialists (27,28). Whereas in Europe, most hospitals have respiratory outpatient clinics and patients with COPD are seen by respiratory physicians (24), our data show a lack of respiratory inpatient and outpatient clinics and of respiratory physicians. The latter may lead to suboptimal management and provision of care for patients with chronic diseases, especially respiratory diseases (29). Although the number of respiratory physicians has increased slightly over the last 2 years in the Eastern province (11), the total number of Saudi respiratory physicians is still low (11). This small number of Saudi physicians is a serious challenge for the MOH. Non-Saudi physicians are likely to have less capacity and ongoing commitment to enhancing the quality of care and systems of management for (respiratory) patients because of their limited stay in Saudi Arabia (15). In order to reduce shortages of Saudi physicians, the government could provide more training incentives for local people to study medicine and then to specialize in respiratory medicine. Offering high-quality education in Saudi Arabia and sending students to developed countries for additional education may be useful ways to stimulate this change.

Existing national and international COPD guidelines recommend that spirometry should be used to confirm the diagnosis of COPD (6,7,16,30). Our data show that only 22.7% of hospitals had spirometry available in contrast to almost all hospitals in Europe (24). According to the GOLD guidelines, spirometry should not only be used for diagnosis but also to determine the disease severity, to differentiate between asthma and COPD, and to help monitor disease progression (16). Studies have shown that misdiagnoses between asthma and COPD frequently exist in Saudi Arabia, which may lead to incorrect treatment and unnecessary deterioration (31,32). Increasing awareness of the importance of spirometry use and training in the conduct and interpretation of spirometry have proven to drive uptake of spirometry (33).

Our data reveal that a lack of ICUs, invasive mechanical ventilation, and noninvasive ventilation for acidotic respiratory failure is another challenge for the MOH in Saudi Arabia. The presence of ICUs is important in order to provide optimal rescue care for patients with COPD, suffering from acute respiratory failure during exacerbations and requiring ventilation support (16,31) A cohort study conducted in Saudi Arabia reported that 33% of the patients with COPD admitted to ICU were mechanically ventilated (31). Patients who are admitted to ICU or to the care of a well-staffed respiratory ward and receive early noninvasive ventilation have an increased chance of surviving (16,31,34–36). This has become a standard of care in American and European hospitals (24) but is not yet available in the Eastern province.

Pulmonary rehabilitation has proven to be effective treatment in patients with COPD (16,37). Our data show that pulmonary rehabilitation programs were not available in the included hospitals, and to our best knowledge, only one military hospital is currently offering pulmonary rehabilitation in Saudi Arabia (Central province) (7,38). The number of patients with COPD who can access pulmonary rehabilitation in Saudi Arabia is therefore extremely low, especially compared to countries such as the United Kingdom in which 88% of hospitals offer pulmonary rehabilitation programs (24). Barriers for setting up pulmonary rehabilitation programs in the Eastern province should be investigated, so that implementation of these programs can be facilitated.

Our results show that only limited disciplines were involved in COPD care, whereas there is strong evidence that management of patients with COPD is better if a

multidisciplinary team is involved (6,16,37,39). This lack of specialized health care providers can be explained by low awareness levels of physicians regarding management of respiratory patients in general and/or lack of knowledge regarding the multidisciplinary approach. Our data also suggest that referrals to other disciplines are extremely scarce. Short courses regarding COPD management, COPD seminars, and in-service education could increase awareness of the benefits of multidisciplinary involvement and increase referral rates (40).

Results show that most nurses involved in COPD care had general roles, and there was a lack of respiratory nurses. It is rare in Saudi Arabia for the level of education of nurses to extend to bachelor level (41,42). Increasing the education of nurses to bachelor level (41,43) and specific training in respiratory diseases is therefore recommended.

The Eastern, Central, and Makkah provinces have higher number of hospitals, beds, health care providers, and funds compared to the other ten provinces in Saudi Arabia (11). The fact that the health care services for patients with COPD in the Eastern province, a global hub for chemical industries and most of the oil production (14), are far from optimal supports the view that COPD care in government hospitals in the rest of Saudi Arabia and perhaps in nearby countries in the region may also be suboptimal or even worse (21).

Based on a study performed by the MOH in 2013, it was decided to give extra attention to chronic diseases that have high prevalence rates among Saudis (eg, obesity, hypertension, diabetes, and high cholesterol) (44). Regrettably, respiratory diseases, the fourth leading cause of death in Saudi Arabia (11,44), were not considered a priority (11,44). Unfortunately, although most people with respiratory diseases are first seen by general practitioners, studies show that primary care services do not address the respiratory needs of community ambulatory patients, including spirometry. The majority of people with respiratory diseases therefore are seen in government hospitals (45). Given that our study results reveal that services and treatments for patients with COPD are suboptimal, there are grounds for expecting the MOH to provide higher priority for care and management of respiratory diseases, and thereby avoid extra health problems.

In this study, we have not included all hospitals in the Eastern Province, only the hospitals that are under the responsibility of the MOH and Ministry of Higher Education and that all Saudi citizens have thus free access to (11). A small percentage of the population (<17%) visit other specialized government hospitals that are not under the responsibility of the MOH or the Ministry of Higher Education such (eg, military) and ~38% of the Saudi population visit private hospitals (11). We are not aware of the existence of respiratory hospitals in the Eastern province in Saudi Arabia. In our study, we could have chosen to use a structured interview method to obtain more detailed data. However, this would likely have led to the inclusion of fewer directors because of a time constraint. We therefore chose to use established questionnaires. We did not include military, private, or specialized hospitals, which may have more specialized care for patients with COPD, but only targeted government hospitals because every person has access to them. Finally, we have provided results per hospital, and by doing this we have given equal importance to hospitals regardless of their size. This may have influenced the precision of some of the data.

Conclusion and recommendations

Current services for patients with COPD provided by government hospitals in the Eastern province of Saudi Arabia fall short of GOLD Strategy recommendations because of a lack of hospital capacity, respiratory-specific services, and specialized health care providers involved in COPD care. Increasing the awareness and knowledge regarding optimal COPD management by health care providers may improve the quality of COPD management. Direct support for Saudi people to study medicine and nursing both within their own country and in developed countries would also assist. Finally, models of health financing that enable funding of essential services such as pulmonary rehabilitation and ICUs are urgently needed.

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Disclosure

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Table 1 : Summary of the current care provided by each hospital in the Eastern province

Area	Eastern area: n= 14															Al-Ahsa area: n=5						Hafar Al-Batin area: n=3				
Hospitals	Total (N)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	Total (N)	O	P	Q	R	S	Total (N)	T	U	V	Total (N;%)
Number of beds	2,029	600	50	30	60	26	200	50	30	30	30	425	368	100	30	752	502	30	50	50	120	380	300	30	50	3,161
Emergency admissions for patients with COPD in 2012	902	200	50	0	10	10	10	0	0	100	2	200	100	200	20	210	50	50	0	50	60	92	52	0	40	1,204
Hospitals with respiratory department	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hospitals with a specific respiratory outpatient clinic	2	1	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	3; 13.6%
Hospitals providing spirometry	3	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	0	0	0	1	1	0	0	5;22.7%
Hospitals with ICU	5	1	0	0	0	0	1	0	0	0	0	1	1	1	0	2	1	0	0	0	1	1	1	0	0	8;36.3%
Hospitals offering invasive mechanical ventilation	9	1	1	0	1	0	1	0	0	1	0	1	1	1	1	2	1	0	0	0	1	1	1	0	0	12;54.5%
Hospitals offering non-invasive ventilation	6	1	0	0	0	0	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	1	0	0	7;31.8%
Hospitals having pulmonary rehabilitation program and early or/support discharge program	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Note: A to V refers to a different specific hospital.
Abbreviation: ICU, intensive care unit.

Table 2 : Comparison between GOLD guideline recommendations and services available in hospitals in the Eastern province in Saudi Arabia

GOLD recommendations	Hospitals in the Eastern province (n=22)
1. Specialized care for respiratory diseases.	1. No respiratory departments and only 13.6% of hospitals (n=3) have a specific respiratory outpatient clinic
2. Spirometry is required to make the diagnosis of COPD	2. Five hospitals (22.7%) have spirometry available
3. COPD assessment must consider the following aspects of the disease separately: current level of patient's symptoms, severity of the spirometric abnormality, exacerbation risk and presence of comorbidities	3. No information available
4. Pulmonary rehabilitation (PR) program and physical activity is recommended for all patients with COPD.	4. No PR program and physical activity are offered to patients with COPD
5. Oxygen therapy is recommended for patients with chronic respiratory failure	5. Eight hospitals (36.6%) offer long-term oxygen therapy for patients with COPD
6. Non-invasive ventilation (NIV) has been shown to improve acute respiratory acidosis	6. Seven hospitals (31.8%) offer non-invasive ventilation
7. Invasive Mechanical Ventilation is need when patients unable to tolerate non-invasive Mechanical ventilation (severe exacerbations)	7. Twelve hospitals (54.5%) offer invasive mechanical ventilation
8. Immediate admission to (ICU) when is needed	8. Eight hospitals (36.6%) have an ICU
9. Smoking cessation is the key intervention for all patients with COPD who continue to smoke	9. No information available
10. Pharmacologic therapy such as short-acting anticholinergic, short-acting bronchodilator, long-acting anticholinergic, long-acting beta2-agonist and inhaled corticosteroid is recommended for patients with COPD	10. No information available

Abbreviations: GOLD, Global Initiative for Chronic Obstructive Lung Disease; ICU, intensive care unit.

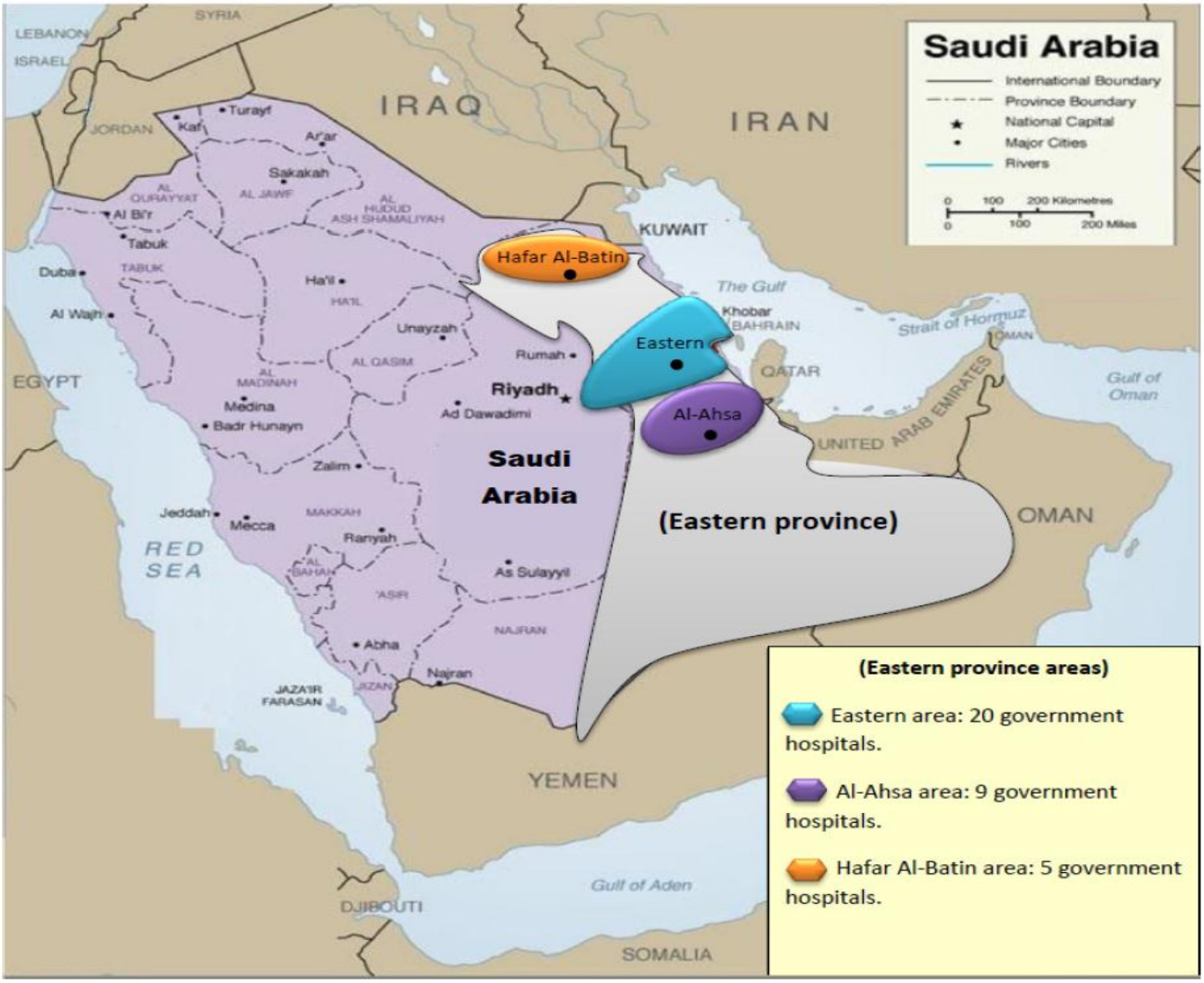

Figure 1 The main areas in the Eastern province in Saudi Arabia.
Notes: Eastern province is divided in to three main areas: 1) Eastern area (Blue area), 2) Al-Ahsa area (Purple area), 3) Hafar Al-Batin area (Orange area).

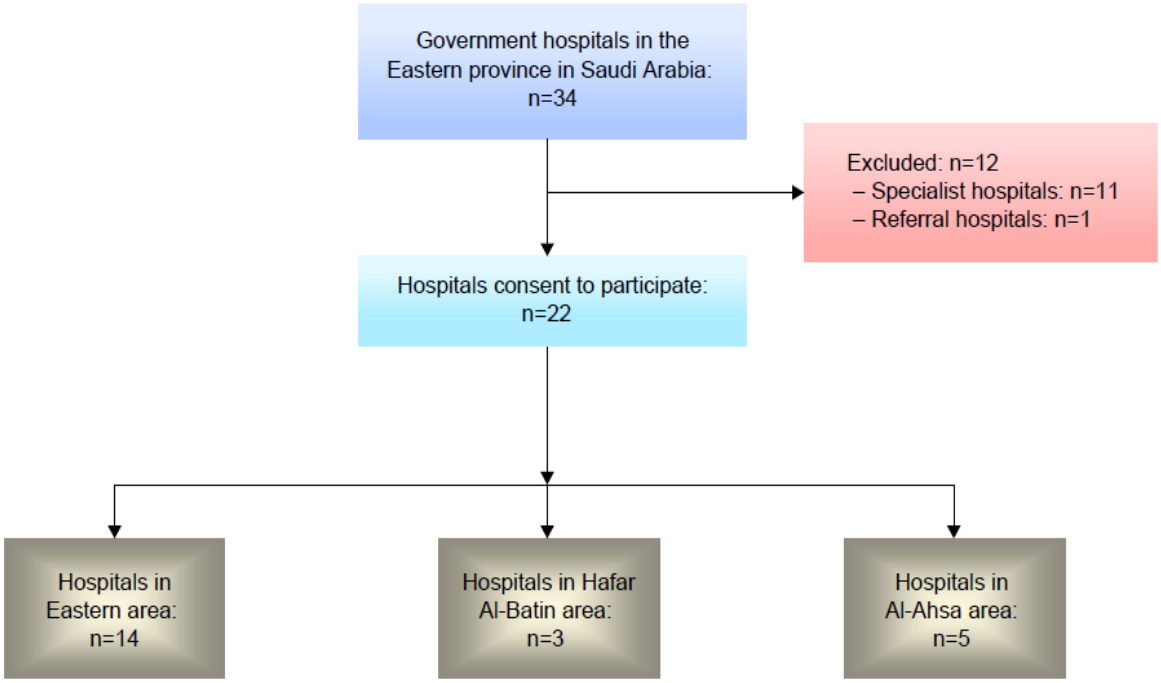

Figure 2 Flow diagram of government hospital's progress through the study.

Chapter 4:

COPD care in Saudi Arabia: Physicians' awareness and knowledge of guidelines, and barriers to guideline implementation

Mohammed E. Alsubaiei

Peter A. Frith

Paul A. Cafarella

Stephen Quinn

Mohammed S. Al Moamary

R. Doug McEvoy

Tanja W. Effing

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Abstract

Background: Implementation of COPD guidelines increases quality of COPD care.

Aim: To assess physicians' awareness and knowledge of COPD guideline recommendations in Saudi Arabia.

Methods: A cross-sectional study conducted in the Eastern Province of Saudi Arabia, recruiting physicians involved in COPD care in five hospitals. Data were collected using questionnaires.

Results: Forty-four physicians were included (respiratory consultants n = 7; internal medicine specialists n = 12; internal medicine residents n = 25). The mean ± sd knowledge score was 29.5 ± 4.2 out of 45 points (65.5%). No significant differences were found between physician groups. Many physicians (n = 27; 61.3%) appeared to be unaware of any COPD guidelines and most (n = 28; 63.6%) said they did not adhere to guidelines in their practice. The barriers to adherence to COPD guidelines considered as most important by physicians were "Lack of educational material/support" and "Lack of awareness", reported by 72.7% and 70.5% of the physicians respectively. The mean confidence score in implementing GOLD recommendations was 5.6 ± 2.6 on a 10-point scale. No significant differences between physician groups were found.

Conclusion: Saudi physicians had fair knowledge scores regarding GOLD guidelines. Increasing awareness about COPD related guidelines, and implementing an education intervention to improve physicians' knowledge of COPD management are therefore highly recommended.

Key words: Chronic obstructive; physicians; awareness; knowledge; barriers; Saudi Arabia

Introduction

Around 65 million people worldwide have chronic obstructive pulmonary disease (COPD) (1,2). COPD is characterised by airway obstruction and worsening of lung function that is not fully reversible (1). COPD is a serious respiratory disease with an already high and still increasing morbidity and mortality (1). COPD is currently the third leading cause of death (3).

Saudi Arabia has a population of approximately 30 million (4) and has many patients with COPD (5). The prevalence of COPD among the general population in Saudi Arabia is 4.2%, which is similar to the prevalence rate in the entire Middle East (3.6%). Smoking is the main risk factor for the development and progression of COPD (5), with the current prevalence among smokers being 14% in Saudi Arabia (6-8). Due to the steady increase of smoking rates among young Saudis, it is expected that the prevalence of COPD in Saudi Arabia will further increase (5, 7).

Unfortunately, COPD is still under-diagnosed and has not received sufficient attention by physicians and governments in Middle Eastern countries and Saudi Arabia in particular (7,9). Whereas the Ministry of Health (MOH) developed a plan to provide more services and care for chronic disorders such as diabetes, hyperlipidemia, and hypertension, COPD was not addressed in this plan (10).

There are several clinical guidelines regarding COPD management. The recommendations from the GOLD expert panel (Global strategy for the Diagnosis, Management, and Prevention of chronic obstructive pulmonary disease) first appeared in 2001. These recommendations sought to provide standard strategies for the diagnosis, assessment and management of COPD, and the GOLD document is frequently updated (1). The recently published Saudi Initiative for Chronic Airway Disease (SICAD) is based on the GOLD recommendations and customised and simplified for the Saudi healthcare setting (1,9). While COPD care should meet these evidence-based recommendations (1,9), many physicians and pulmonologists are not aware of COPD guideline recommendations (11). Indeed, diagnosis and management of COPD is still not satisfactory in many countries, including Saudi Arabia (7, 9, 11-13).

A recent study outlining the respiratory care services available in the Eastern Province

of Saudi Arabia found that only a small percentage of hospitals had a specific respiratory outpatient clinic (13.6%) and access to spirometry (22.7%) (14).

Previous studies have shown that a better understanding of COPD guidelines by physicians is important for optimal patient care (11). In this study we assessed physicians' knowledge of the GOLD recommendations in terms of the diagnosis, assessment and management of patients with COPD using a cross-sectional design. We also evaluated physicians' awareness and adherence to any of the COPD guidelines, barriers for physicians to implement GOLD recommendations, and physicians' readiness and confidence to implement the guidelines

Method

Data collection for this cross-sectional study was conducted from January to February 2015 in the Eastern Province of Saudi Arabia. All participants in this study were part of a randomised controlled trial that evaluated the effects of an online GOLD statement training module for physicians in the Eastern Province of Saudi Arabia (the Australian & New Zealand Clinical Trial Registry [ANZCTR]12614000741684).

We selected five out of 22 hospitals that were included in a previous study (14). These five hospitals were selected because the majority of patients with COPD in the Eastern Province were referred to these five sites for specialised care (14).

To be eligible for inclusion, physicians had to meet the following criteria: 1) work at the Department of Internal Medicine; and 2) evaluate, treat and provide care for patients with COPD with a minimum of 10 cases per year.

After inclusion, the physicians were asked to complete questionnaires assessing: 1) their knowledge of the GOLD recommendations, 2) their awareness of and adherence to any of the COPD recommendations/guidelines, 3) barriers to them implementing these recommendations in COPD management, and 4) their readiness and level of confidence to implement GOLD recommendations in practice (questionnaires are included as an online repository; Appendix 1 and 2).

Physicians were asked to answer the questions regarding their awareness of and adherence to any of the COPD recommendations before they were provided with

extra information to answer questions regarding their readiness to implement specific COPD recommendations in practice.

This study was approved by the Southern Adelaide Clinical Human Research Ethics Committee (328.14 - HREC/14/SAC/328) and Institutional Review Board at the MOH in Saudi Arabia. All included physicians signed a written informed consent.

Physicians' knowledge of the GOLD recommendations

Forty-five questions (multiple choice and true/false) were used to assess the physicians' knowledge of the basic content of the GOLD recommendations. Thirty-seven questions were selected from a questionnaire used in another study that also assessed physicians' knowledge of the GOLD recommendations (11). Another eight questions regarding the use of the GOLD combined assessment, pulmonary rehabilitation, and spirometry were added to make the questionnaire more comprehensive and to cover the updated information in the GOLD 2014 strategy document (1). The additional eight questions were reviewed and approved by three respiratory consultants (two from Australia (PAF and RDM) and one from Saudi Arabia (MAM).

The 45 questions were divided into six sections: 1) definition and overview; 2) diagnosis and assessment; 3) principles of therapy; 4) pharmacotherapy; 5) non-pharmacotherapy; and 6) prevention of deterioration. Each correct answer was counted as one point (total of 45 points) (see online repository, Appendix 1, question 2-46)). Based on previous studies that assessed physicians' knowledge (15-17), the level of physicians' knowledge of physicians was considered as: satisfactory if the mean score was greater than 80%, fair if in the range 50%-80%, and poor if less than 50% of total score.

Awareness of and adherence to any of the COPD guidelines

The physicians were asked two closed questions regarding their awareness of and adherence to any of the COPD guidelines (see online repository, Appendix 1, section 7).

Barriers for implementation COPD guideline recommendations

The physicians were asked which barriers they considered to be important regarding their adherence to COPD guidelines (multiple responses were allowed). The pre-defined list of barriers was compiled from questionnaires used in other studies that evaluated barriers for non-adherence to COPD guidelines such as GOLD (see online repository, Appendix 1, section 8) (11,18).

Readiness to implement GOLD-recommendations in practice and level of confidence questionnaire

The study's questionnaire was based on Prochaska and DiClemente's Transtheoretical Model (19). The questionnaire included three sections (diagnosis and assessment, therapeutic options, and prevention of deterioration) in order to assess the physicians' readiness to implement the GOLD recommendations in practice. The physicians were provided with general COPD recommendations based on the GOLD statement before each specific section (diagnosis and assessment, therapeutic options [pharmacologic and non-pharmacologic therapy] and prevention of deterioration). Subsequently, they were asked which statement they agreed with most: "I am not familiar with these GOLD recommendations" (pre-contemplation stage); "I am intending to use these GOLD recommendations but I am not confident about using them" (contemplation stage); "I am intending to use these GOLD recommendations in the next month" (preparation stage); "I just recently used these GOLD recommendations" (action stage); or "I have been using these GOLD recommendations for the past six months and intend to keep using them" (maintenance stage). For each section, the physicians were also asked to rate their current levels of confidence regarding the implementation of the specific GOLD recommendations by using a scale of 1 to 10 (with 1 'not being confident at all' and 10 'being as confident as possible') (see online repository Appendix 2).

Statistical analysis

All data from the questionnaires were entered into the Statistical Package for Social Sciences (SPSS) version 22 (IBM Corporation, Armonk, NY, USA).

Continuous variables were summarised by calculating the mean and standard

deviation (SD), or median and interquartile range (IQR) as appropriate. Nominal data were given as proportions with percentages.

Associations were assessed using general linear models, clustering over hospital to account for correlated readings among physicians within a hospital because it was assumed that physicians who work within a hospital have similar knowledge levels and adhere to similar management. Tukey's honestly significance difference test was used to compare the physicians' mean scores on COPD and level of confidence. A p-value less than 0.05 (two tailed) was considered statistically significant.

Pearson or Spearman's rank correlations were used to assess correlation between stages of change and level of confidence and the physicians' mean scores on COPD knowledge. A p value less than 0.05 was considered as significant.

Results

Of the 50 eligible physicians, 44 could be included in this study. Six physicians refused to participate due to a lack of time. Table 1 shows the characteristics of the 44 included physicians. The majority were internal medicine residents, Saudi and male.

The mean scores for COPD knowledge by level of physicians' specialty (Table 2) show that the overall mean ± sd scores were 29.5 ± 4.2, out of 45 points (65.5%). There was no significant difference in the total mean scores between the physician groups after correction for correlation between physicians in the same hospital (p = 0.07).

Awareness of, and adherence to COPD guidelines (Table 3) showed that most physicians were not aware of (n = 27 of 44; 61.3%) and did not adhere (n = 28; 63.6%) to any COPD guidelines in their practice. Most of the physicians who indicated they adhered to a COPD guideline mentioned the GOLD statements (1).

Self-rated readiness to implement GOLD recommendations in practice by physicians (Figure 1) showed that the readiness was highest in the subcategory 'pharmacologic therapy' with 61.4% of physicians being in the maintenance stage. Readiness to implement was lowest in the subcategories of 'non-pharmacologic therapy', with 50% of physicians being in the pre-contemplation stage.

Physicians' levels of confidence to implement GOLD recommendations in their practice (Table 4) showed an overall mean ± sd score of 5.6 ± 2.6 on a 10-point scale (where 0 = 'not confident at all' and 10 = 'as confident as possible'), with no significant difference between physician groups. However, there were significant differences in the level of confidence to implement the subcategory (prevention) of the GOLD recommendations between respiratory consultants and internal medicine specialists ($p = 0.021$) and the respiratory consultants and internal medicine residents ($p = 0.002$) (Table 4).

Sub-analyses were performed to assess correlations between the physicians' confidence, readiness, and knowledge scores. The level of confidence was positively and highly correlated with the stage of readiness ($r = 0.747$, $p < 0.001$). Higher confidence was associated with the maintenance and action stages whereas lower confidence was linked to the pre-contemplation and contemplation stages. No correlation was found between physicians' readiness and knowledge score ($r = 0.256$, $p = 0.32$).

The barriers considered important by physicians in regard to their adherence to COPD guidelines included a "Lack of educational material/support" (72.7% of physicians), followed by "Lack of awareness" (70.5%) (Table 5).

There were no obvious differences between the barriers reported in the group of physicians who claimed to be aware of COPD guidelines (n = 17) and the physicians who were not aware of any COPD guidelines (n = 27).

Discussion

This study is the first to assess physicians'knowledge of the GOLD recommendations for COPD care amongst physicians in Saudi Arabia. Our results indicated that the physicians had only fair knowledge (65.5%) of the GOLD guidelines, which aligns with previous studies (11, 20-22). The knowledge score for the respiratory consultants the subgroup with the highest level of knowledge (73.7%) was low compared to the scores found among respiratory consultants in Nigeria (average score of 97.3%) (11). This Nigerian study also reported that the internal medicine residents had the lowest level of knowledge regarding GOLD recommendations (11). The low level of knowledge among all physicians in our study can most likely be explained by the fact

that more than half of the included physicians were not aware of any existing COPD guidelines. This contrasts with approximately 85% in a large international study (23). Lack of awareness of and familiarity with COPD guidelines is likely to lead to non-adherence to guidelines and therefore suboptimal management of patients with COPD (18, 24, 25). Increasing awareness and knowledge of the importance of COPD guidelines is recommended to increase physicians' knowledge of and to adherence the COPD guidelines in COPD management (11, 18, 20, 24) and thus improve care. Improvements in adherence may be achieved with short courses, (e.g. online education), seminars, and professional development education programs regarding the management of COPD (21, 26, 27).

Similar to previous studies (18, 24), our data demonstrated that the physicians had low levels of confidence to implement the GOLD recommendations in their practice, a factor that usually leads to low adherence (18, 24, 25), and ultimately may reduce quality of COPD management. Our data showed that the respiratory consultants and internal medicine specialists had a higher level of confidence than the internal medicine residents. The lower confidence scores in this medical sub-group may be explained by their lack of experience in COPD management, although their stage of learning might be expected to encompass most recent knowledge. Whereas higher levels of confidence do not by definition lead to higher adherence, it is one of the key enablers of adherence to guideline recommendations (18, 28). Previous studies have suggested that providing interventions that aim to increase the level of confidence may increase adherence to guidelines in COPD management (18, 24, 29). One strategy proven to change physicians' behaviour, and increase their level of confidence in and adherence to the management standards is the use of flowsheets and algorithms that include recommendations from COPD guidelines such as GOLD (30-33).

The Saudi physicians considered the lack of educational material/support, and lack of awareness, as the main barriers to implementing the guideline recommendations. These variables have also been indicated as barriers to physicians' adherence in previous studies (11,12 ,18 ,24, 25). Therefore, it is strongly recommended that interventions be developed with a careful consideration of strategies to overcome these barriers in order to increase physicians' adherence to COPD guidelines and

subsequently provide optimal care for patients with COPD (24, 25).

According to the Saudi Commission for Health Specialties, there are 40 recognised training hospitals in Saudi Arabia providing training for physicians who want to specialise in internal medicine from Saudi Arabia and the Middle East and North African countries (34). Most of these hospitals are based in the Makkah Province (n = 16; 40%), the Eastern Province (n = 8; 20%), and the Central Province (n = 7; 17.5%). In each of the other 10 provinces of Saudi Arabia there were approximately one or two recognised training hospitals (34). In our study, we included the five government hospitals with the highest numbers of physicians, beds and services for the management of COPD (14); it is therefore reasonable to assume that physicians in other hospitals in the Eastern Province, other Saudi provinces, the Middle East and North African countries may have similar or worse results to our findings (11, 13, 14, 35).

Our study had several limitations. The fact that more than 60% of the included physicians were not aware of any COPD guidelines prior to this study indicates that more work is needed to promote the existence of these guidelines. This gap in awareness may have influenced the data regarding the barriers to adherence to COPD guidelines. However, there were no obvious differences in the barriers reported by the groups who were and were not aware of COPD guidelines at the time of the study. In this study, we first asked questions regarding awareness of and adherence to any of the COPD recommendations and then questions regarding readiness to implement specific COPD recommendations in practice. Physicians were provided with specific information about guideline sections before scoring their readiness. As a result, some physicians stated that they were not aware of any COPD guidelines but scored themselves in the maintenance stage for their readiness to implement specific COPD guideline recommendations. Also, although physicians said that they were ready to implement or actually already implementing sections of the COPD guidelines, this did not always match better knowledge scores (no significant correlation between readiness and physicians' knowledge score). Whereas a trend could be observed between better knowledge and higher confidence in the respiratory consultant group, the differences were not significant. This may however have been a result of lack of power.

Conclusion and recommendations

This study has identified that physicians working with patients with COPD in the Eastern Province of Saudi Arabia have a fair knowledge of the COPD guideline recommendations. Increasing the awareness and knowledge regarding COPD guidelines by physicians and adherence to recommendations in these documents should improve the quality of COPD management. Our results highlight the urgent need to develop education and other interventions such as system support aiming to improve physicians' knowledge of COPD to enhance self-learning among physicians and increase their level of confidence to apply the guidelines.

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Table 1: Characteristics of the physicians (n=44)	
Age (median (IQR [25-75]); years)	31 (28-42.2)
Number of years of COPD patient related experience (median; IQR [25-75]; years)	4 (2-10)
Male (N; %)	37 (84.1)
Nationality (N; %)	
Saudi	29 (65.9)
Non Saudi	15 (34.1)
Position (N; %)	
Respiratory consultant	7 (15.9)
Internal medicine specialist	12 (27.3)
Internal medicine resident	25 (56.8)

Abbreviations: IQR, Interquartile range; COPD, chronic obstructive pulmonary disease.

Table 2: Physicians' scores on COPD knowledge test by level of physicians' specialty

Basic content of the GOLD statements	Maximum total score	Total mean score (mean ± SD; [%*])	Respiratory consultants (mean ± SD; [%*])	Internal medicine specialists (mean ± SD; [%*])	Internal medicine residents (mean ± SD; [%*])	ŦP values
Definition and overview	8	5.0 ± 1.3 (62.5)	5.4 ± 1.2 (67.5)	5.08 ± 1.4 (63.5)	4.8 ± 1.3 (60.0)	**0.68**
Diagnosis and assessment	10	5.6 ± 2.1(56.0)	6.8 ± 3.0 (68.0)	5.8 ± 2.1 (48.3)	5.1 ± 1.8 (51.0)	**0.39**
Principles of therapy	5	2.8 ± 0.8 (56.0)	3.1 ± 1.2 (62.0)	2.8 ± 1.0 (56.0)	2.7 ± 0.7 (54.0)	**0.67**
Pharmacotherapy	9	6.9 ± 1.1(76.6)	7.4 ± 0.9 (82.2)	7.0 ± 1.3 (77.7)	6.7 ± 1.1 (74.4)	**0.62**
Non-pharmacotherapy	10	6.8 ± 1.4 (68.0)	7.7 ± 1.1 (77.0)	6.5 ± 0.9 (65.0)	6.7 ± 1.6 (67.0)	**0.16**
Prevention of deterioration	3	2.2 ± 0.55 (73.3)	2.7 ± 0.4 (90.0)	2.5 ± 0.5 (83.0)	2.0 ± 0.4 (66.6)	**0.77**
Total	**45**	**29.5 ± 4.2 (65.5)**	**33.2 ± 5.7 (73.7)**	**29.8 ± 3.6 (66.2)**	**28.3±3.5 (62.8)**	**0.07**

Abbreviations: COPD, chronic obstructive pulmonary disease; GOLD: global initiative for chronic obstructive lung disease.
***** percentage of the maximum total score.
Ŧ p values show the difference between the three groups of physicians.

Table 3: physicians' awareness of and adherence to COPD guidelines (n = 44).

COPD guidelines	Awareness of COPD guidelines				Adherence to COPD guidelines			
	Total	**Respiratory consultants**	**Internal medicine specialists**	**Internal medicine residents**	**Total**	**Respiratory consultants**	**Internal medicine specialists**	**Internal medicine residents**
a) GOLD	**9**	3	2	4	**10**	4	2	4
b) SICAD	**0**	0	0	0	**1**	0	1	0
c) NICE	**4**	1	1	2	**3**	0	1	2
d) GOLD/SICAD	**1**	1	0	0	**0**	0	0	0
e) SICAD/NICE	**1**	0	1	0	**0**	0	0	0
f) Yes but not mentioned	**2**	0	1	1	**2**	0	1	1
g) No	**27**	2	7	18	**28**	3	7	18
Total	**44**	7	12	25	**44**	7	12	25

Abbreviations: COPD: chronic obstructive pulmonary disease; GOLD: global initiative for chronic obstructive lung disease; SICAD: Saudi guidelines for the diagnosis and management of COPD; NICE: national institute for health and care excellence management of COPD in adults in primary and secondary care

Table 4: physicians' level of confidence to implement the GOLD recommendations (scale 1-10)

Physicians' confidence to re-implement GOLD recommendations in terms of:	Total	Respiratory consultants	Internal medicine specialists	Internal medicine residents	*p values
a) Diagnosis and assessment (mean ± SD)	**5.6 ± 2.8**	8.0 ± 1.2	7.0 ± 2.3	4.3 ± 2.6	**0.98**
b) Pharmacologic therapy (mean ± SD)	**6.3 ± 2.9**	9.0 ± 0.8	7.2 ± 2.4	5.2 ± 3.0	**0.33**
c) Non-pharmacologic therapy (mean ± SD)	**4.4 ± 3.1**	7.7 ± 2.3	5.3 ± 3.3	3.1 ± 2.4	**0.46**
d) Offering annual influenza vaccinations or pneumococcal vaccinations, and discussing an action plan (mean ± SD)	**5.8 ± 3.3**	9.5 ± 0.7	5.6 ± 3.7	4.9 ± 2.8	**[Ŧ]0.041**
Total	**5.6±2.6**	**8.5±1.1**	**6.3±2.5**	**4.5±2.2**	**0.17**

Abbreviations: GOLD, global initiative for chronic obstructive lung disease.

*p values show the difference between the 3 groups of physicians.

[Ŧ] Respiratory consultants versus internal medicine specialists (p = 0.021); respiratory consultants versus internal medicine residents (p = 0.002)

Table 5: Barriers to adherence to COPD guidelines

	Physicians (number of 'yes' responses; %)
1. **Lack of educational material/support**	32 (72.7)
2. **Lack of awareness**	31 (70.5)
3. **Lack of equipment and resources (spirometry, cessation experts)**	23 (52.3)
4. **Lack of familiarity of its recommendations**	16 (36.4)
5. **Lack of motivation and poor dissemination by physician to colleagues**	13 (29.5)
6. **Lack of time**	12 (27.3)
7. **Believed patients cannot adhere to guideline recommendations**	9 (20.5)
8. **Lengthy and difficult to remember**	8 (18.2)
9. **Disagree with the recommendations of guideline**	1 (2.3)
10. **Believed guidelines will not improve the outcome of COPD**	0 (0)
11. **Others**	0 (0)

Abbreviations: COPD, chronic obstructive pulmonary disease.

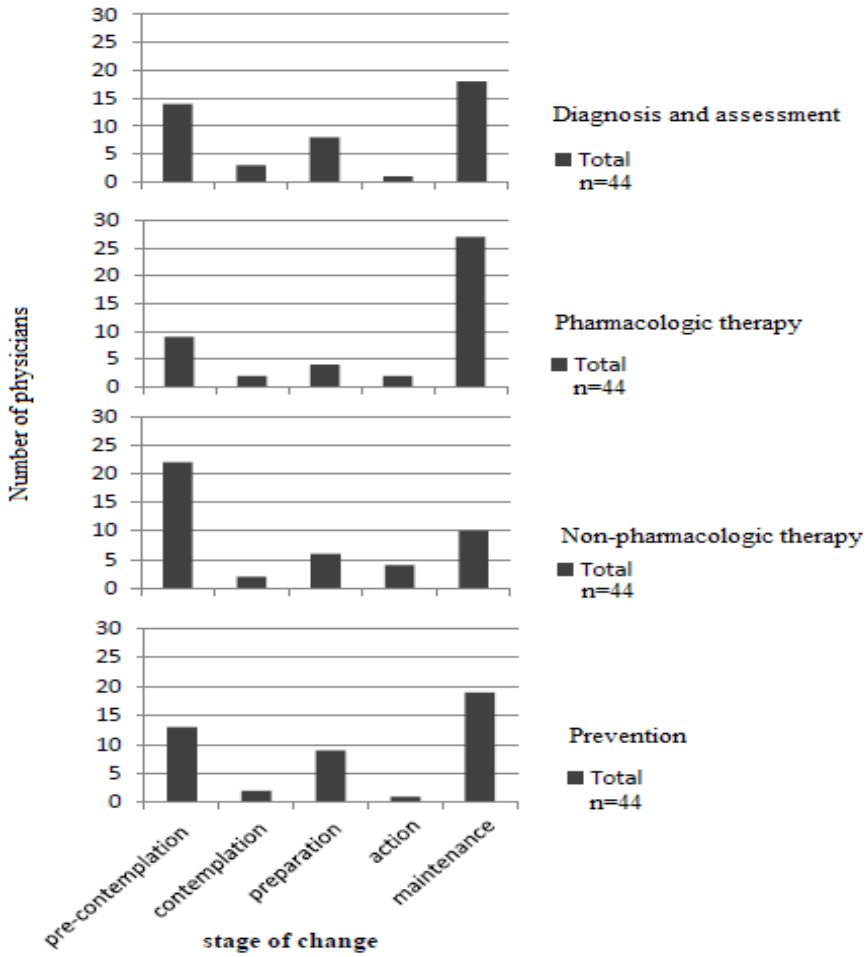

Figure 1: Physicians' readiness (indicated by stage of change) to implement GOLD recommendations in practice

Chapter 5:

Effects of COPD guideline training on physicians' awareness, knowledge, and readiness to implement guidelines: a cluster randomised controlled trial.

Mohammed E. Alsubaiei

Peter A. Frith

Paul A. Cafarella

Stephen Quinn

MS Al Moamary

R. Doug McEvoy

Tanja W. Effing

Abstract

Background: In Saudi Arabia, the level of physicians' awareness and knowledge regarding Chronic Obstructive Pulmonary Disease (COPD) guideline recommendations is suboptimal.

Aim: To evaluate the effect of the online Global Initiative for Chronic Obstructive Lung Disease (GOLD) statement education program on physicians' awareness and knowledge about COPD guideline recommendations in Saudi Arabia.

Methods: An online GOLD statement education program (five modules) was designed and subsequently evaluated among respiratory and internal medicine physicians using a cluster randomised controlled study in the Eastern Province in Saudi Arabia. Data were collected using questionnaires pre intervention, directly post (two weeks), and one year after the intervention.

Results: Forty-four physicians were included (intervention group: hospitals n = 2 / physicians n = 18; control group: hospitals n = 3 / physicians, n = 26). A significant between-group difference in the mean physician score of more than 12 points on COPD knowledge (maximum score of 45 points) was found after a one-year follow-up ($p = < 0.001$). Whereas the mean knowledge score in the intervention group increased significantly (baseline: 29.9 ± 3.3; one year follow-up: 41.5 ± 1.3), the control group score did not change (baseline: 29.2 ± 4.8; one year follow-up: 30.1 ± 4.9). There was a significant between-group difference in the level of physicians' confidence to implement the GOLD recommendations after one-year follow-up ($p=0.001$). The overall mean level of confidence increased by 3.6 points after the one year in the intervention group (9.4 ± 0.6) on a 10-point scale, while the level of confidence did not change in the control group (5.0 ± 2.8). In the intervention group the number of physicians who reported to be adhering to the GOLD and the Saudi Initiative for Chronic Airway Disease guidelines in their practice changed dramatically from 27% at baseline to 94.4% after the one year follow-up.

Conclusion: The online GOLD statement education program was effective in increasing physicians' knowledge. Thus, online education is recommended to increase the awareness of COPD guidelines in Saudi Arabia.

Introduction

Chronic Obstructive Pulmonary Disease (COPD), is characterised by airway obstruction that is not fully reversible, and is associated with high and still increasing morbidity and mortality worldwide (1). More than 65 million people worldwide have COPD (1, 2), and the prevalence of COPD is increasing due to exposure to the major risk factor smoking, as well as other factors such as dust and air pollutions (1). Currently, COPD is the third leading cause of death (1, 3). COPD is associated with a reduced quality of life for patients, premature death, and high healthcare costs (1, 3).

Many people in Saudi Arabia have COPD (4-7). Current estimates state that the prevalence of COPD among smokers over 40 years of age is 14.2%, and in the general adult Saudi population is 4.2% (6, 7). These prevalence rates are comparable to those in Middle Eastern countries (3.6% among general population) and other nations such as Turkey (18 % among smokers) and Australia (7.5% among the general population) (6, 8-10). COPD prevalence rates in Saudi Arabia are expected to further increase due to the steady increase in smoking rates among the young Saudi population and other risk factors such as heavy dust storms and the use of biomass fuel (4, 5, 11).

COPD clinical guidelines such as the Saudi Initiative for Chronic Airway Disease (SICAD) and The Global Initiative for Chronic Obstructive Lung Disease (GOLD) statement document have been developed to provide standard recommendations for the diagnosis, assessment and management of COPD (1, 4). The GOLD statement is recognised and well known internationally whereas the SICAD panel has customised and simplified the GOLD recommendations based on local Saudi resources (1, 4). COPD management should meet clinical guideline recommendations to provide optimal care and thus decrease the burden associated with COPD (1, 4). However, COPD management in many countries, including Saudi Arabia, does not comply with these recommendations (4, 5, 12-19). This may be caused by a lack of awareness and knowledge among physicians and pulmonologists of these recommendations, time constraints on physicians, and/or disagreement with the recommendations (12, 13, 16, 18, 20).

Understanding of, and adherence to, COPD guideline recommendations for managing

COPD is low in Saudi Arabia (4, 18). In our previous study, conducted in 22 government hospitals in the Eastern Province in Saudi Arabia, we found that only three hospitals had a specific respiratory outpatient clinic, that five hospitals had spirometry implemented, and that pulmonary rehabilitation programs were not available in the included hospitals (18).

It has been recommended that a better understanding and increasing awareness of COPD guidelines among physicians should increase adherence to guidelines and ultimately improve care for patients with COPD (12, 18, 21, 22). Better adherence to guideline recommendations (e.g. to use the recommended medications in the management of patients with COPD and implement pulmonary rehabilitation programs) could reduce hospitalisations and days spent in hospital, reduce the perceived intensity of breathlessness, reduce anxiety and depression associated with COPD, and improve exercise capacity as well as survival in patients with COPD (23, 24).

Previous studies demonstrated that providing an education program regarding evidence based medicine guidelines to physicians and healthcare providers improved their knowledge, skills and performance in their practice and led to improved patient outcomes (25-29). Education programs can be delivered as conference presentations, workshops, or online course activities (25,26). Studies reported that the provision of online CME activities is a suitable and cost-effective alternative to traditional CME activities in light of previous studies showing that lack of time and workload were the main barriers to attend traditional CME activities in Saudi Arabia and in Australia (30,31). In addition, Internet and web based learning methods can be efficient and effective, and are well accepted by healthcare providers (32, 33). For the above reasons, we developed an online education training intervention based on the GOLD recommendations. The primary aim of the current study was to evaluate the effectiveness of this online GOLD statement training provided to respiratory and internal medicine physicians in Saudi Arabia.

Methods

We conducted a cluster randomised controlled study from January 2015 to February 2016 in the Eastern Province of Saudi Arabia. We selected five government hospitals

out of 22 previously selected hospitals in the Eastern Province that have more specialised COPD care (17).

All eligible physicians in the selected hospitals were asked to participate. To be eligible, physicians had to meet the following criteria: 1) work at the Department of Internal Medicine; and 2) evaluate, treat, and provide care for patients with COPD with a minimum of 10 cases per year.

After baseline assessments, the hospitals were randomly assigned by an independent person blinded to the hospital's name using pre-packed envelopes to intervention and control groups based on the hospital size (number of beds). Prior to randomisation, hospitals were classified as big (n=3) and small (n=2). This was indicated on the envelopes. One big and one small hospital were assigned to each study group. The third big hospital was then randomly assigned to one of the study groups (using again blinded envelopes). All participants in this study were part of previous research (Chapter 4).

The research protocol was approved by the Southern Adelaide Clinical Human Research Ethics Committee (328.14 - HREC/14/SAC/328) and the Institutional Review Board at the Ministry of Health in Saudi Arabia. All included physicians and patients signed a written informed consent. This study was registered in the Australian New Zealand Clinical Trial Registry (ANZCTR12614000741684).

Intervention

Physicians of the 'intervention hospitals' who agreed to participate in the study were provided a link to the GOLD statement training modules via the Virtual Medical Academy website (34) and asked to complete all five modules within a two week period. A maximum of three emails and two phone calls were used as reminders to complete the modules. In the control group, the physicians were asked to continue with their usual care of COPD management.

The primary aim of the education intervention was to increase physicians' awareness and knowledge of COPD guideline recommendations (i.e. GOLD and SICAD). The online GOLD statement training was presented over five modules: 1) introduction to the GOLD training modules 2) specific recommendations regarding COPD

management; 3) spirometry; 4) pulmonary rehabilitation; and 5) training in the use of a flowsheet that included the main GOLD and SICAD recommendations during consultations with patients with COPD.

The five modules included one to six short presentations (approximately five to 20 minutes each) completed by three of the investigators (MA, PF, and PC) and senior respiratory scientists. The information contained in the GOLD Statement 2014 (1) was adapted by the investigators (MA and PF). Recordings of the presentations were composed at Flinders University. The PowerPoint slides and a hardcopy of the GOLD statement (2014) were also provided in the online training modules (1). The physicians were allowed to download the intervention materials, so they had access to it throughout the entire study period. Physicians were encouraged to use a flowsheet in their practice. An optional two hour live interactive general discussion lecture was provided (by PF) via Virtual Medical Academy (34) two weeks after completion of the initial training.

Measurements

All physicians in this study were asked to complete four questionnaires at baseline, directly after the intervention, and 12 months after the intervention. These four questionnaires assessed: 1) physicians' knowledge and 2) awareness of the guideline recommendations; 3) the barriers for implementation of the guidelines in COPD management and 4) the physicians' readiness and level of confidence to implement the guideline recommendations in practice. In all questionnaires, we avoided mentioning 'GOLD' in order to avoid influencing the physicians in the control group. The measurements regarding physicians' knowledge of the GOLD recommendations, awareness of and adherence to any of the COPD guidelines, barriers for implementing GOLD statement recommendations, and readiness to implement GOLD recommendations in practice together with a level of confidence questionnaire are described in detail in another article (35). In addition, the status of physicians' consideration to implement different components of any COPD guideline recommendations (e.g. GOLD and SICAD) was assessed at baseline and 12 months by extracting patients' medical record data and including these in a specifically designed flowsheet (see online repository, Appendix 1).

1) Physicians' knowledge of the GOLD recommendations

This was assessed by a questionnaire including 45 questions (multiple choice and true/false). Each correct answer was awarded one point (total of 45 points) (see Chapter 4 online repository, Appendix, question 2-46). Level of physician knowledge was considered as: satisfactory if the mean score was > 80%, fair if it ranged between 50% - 80%, and poor if correct answers were < 50% of total score. These percentages were based on previous studies that assessed physicians' knowledge (36-38).

2) Awareness of and adherence to any of the COPD guidelines

Two closed questions were provided to physicians "Are you aware of any COPD protocol or guideline?" and "Do you adhere to a COPD protocol or guideline?" (see Chapter 4 online repository, Appendix 1, section 7). The physicians who reported that they were aware of and adhered to any COPD guidelines were asked to specify these guidelines.

3) Barriers for implementation GOLD guideline recommendations

A list of barriers that might prevent physicians from adhering to COPD guidelines in COPD management was provided to physicians to which multiple responses were allowed, (see Chapter 4, online repository Appendix 1, section 8). This list of barriers was compiled from questionnaires used in other studies that evaluated barriers for non-adherence to COPD guidelines such as GOLD (see online repository section 8) (12, 39, 40).

4) Readiness to implement GOLD guidelines in practice and level of confidence questionnaire

The physicians' readiness to implement the GOLD guidelines in their practice was assessed by using Prochaska's trans-theoretical models (41). The physicians were asked to select from one of five statements (each statement represented one stage of change: pre-contemplation, contemplation, preparation, action and maintenance). In addition, the physicians were asked to rate their current level of confidence regarding the implementation of the specific GOLD recommendations by using a scale of 1 to 10 (with 1 'not being confident at all' and 10 'being as confident as possible') (see

Chapter 4 online repository, Appendix 2).

Current status of consideration to implement COPD guidelines recommendations by physicians in COPD management

In each of the five hospitals, ten patients who were seen for COPD management in the last 12 month were randomly selected using hospital database software (total of 50 patients). The selection of patients was not linked to included physicians. At the 12 month follow up, ten patients with COPD were again randomly selected from each of the five hospitals (total of 50 patients) and matched with the baseline patients based on age, the number of previous respiratory related hospitalisations, and the number of exacerbations in the last 12 months.

Information from the 37 components of the GOLD recommendations was categorised into four sections in a flowsheet (see online repository Appendix 1) as follows: 1) past history (n = 6); 2) diagnosis and assessment (n = 8); 3) therapeutic options (pharmacologic therapy and non-pharmacologic therapy) (n = 20); and 4) prevention of deterioration (n = 3). An independent physician blinded to hospital sites and participants' names transferred all the required and available information documented by any physician in the included hospitals from the medical record audit to the flowsheet at baseline, and 12 months follow up (patient information was de-identified). Each flow sheet was subsequently scored by an investigator (PF) who was blinded to hospital sites, patients' and physicians' names.

Sample size calculations

A power analysis was performed to calculate the required sample size. The primary outcome variable in this study was the difference in the mean score of the physicians' knowledge between the groups post-test (12 months). Using 80% power, a 5% alpha level, and assuming an intra-cluster correlation (ICC) of 0.005 (42-43) and a standard deviation of 8.4, a sample size of six physicians per hospital was needed to detect a clinically significant difference of ten points in the physicians' knowledge score between the intervention and control group.

Statistical analysis

All data from the questionnaires were entered into the Statistical Package for Social Sciences (SPSS) version 22 (IBM Corporation, Armonk, NY, USA). Continuous variables were summarised by calculating the mean, standard deviation, and percentages where appropriate. Nominal data were given as proportions.

Between-group differences were assessed using general linear models, clustering over hospitals to account for correlated readings among physicians within a hospital in continuous variables after the 12 month follow up. For primary analysis, I have performed general linear models, clustering over hospitals because of the time difference between baseline assessment and post intervention assessment. I expected that the time difference between the baseline and first follow-up measurement (2 weeks) was negligible compared to the 12 month follow-up and thus assumed that physicians' level of knowledge and management would not change over such a short time period. A sensitivity analysis was performed using mixed model analysis (group × time), clustering over hospital to assess between-group differences throughout the study duration. Chi‑square two-way tables and Mann-Whitney U tests were performed to determine associations and significance between categorical variables. P values less than 0.05 (two tailed) were considered as significant.

Results

Of the 50 eligible physicians, 44 physicians could be included for this study. Six physicians refused to participate due to a lack of time (Figure 1). After baseline assessments, 18 physicians were assigned to the intervention group (n = 2 hospitals) and 26 physicians were assigned to the control group (n = 3 hospitals). The baseline characteristics of the 44 physicians are presented in Table 1. There was a significant difference between both study groups in age of the participants (p = 0.036). In the intervention group, the majority of the physicians were internal medicine residents and Saudi whereas in the control group the majority were internal medicine specialists and internal medicine residents.

Table 2 shows the mean ± sd physician scores on knowledge of COPD guideline recommendations for both study groups at baseline, post intervention and one year after the intervention. The intervention group had a baseline score of 29.9 ± 3.3

(66.4%) and a post-intervention score of 42.0 ± 2.0 (93.3%) out of 45 points and this improvement remained stable until the end of the one-year follow-up period 41.5 ± 1.3 (92.2%). In the control group, the overall mean ± sd score at baseline was 29.2±4.8 (64.8%) which did not change over the one-year follow-up 30.1 ± 4.9 (66.8%). A significant between-group difference in the mean ± sd physician scores of more than 12 points on the total mean COPD knowledge was found after one-year follow-up ($p < 0.001$) (Table 2).

Sensitivity sub analysis showed a significant between-group difference in the total mean ± sd score when adjusting for age and position of physicians (consultants, specialists and residents) ($p < 0.005$).

Table 3 presents details of the physicians' awareness of, and adherence to, COPD guidelines. Most physicians (n = 17 of 18; 94.4%) in the intervention group reported to be adherent to the GOLD and SICAD guidelines in their practice after the one-year follow-up compared to 27% of physicians at baseline. This contrasted with the physicians in the control group (baseline: n = 6 out of 26 adherent (23.0%); one-year follow-up: n=8 out of 26 adherent (30.7%)). There was a significant between-group difference in physician awareness of, and adherence to, the COPD guidelines after one-year follow-up ($p < 0.001$) (Table 3).

The results of the self-rated readiness to implement GOLD recommendations in practice by physicians in both study groups are presented in Figure 2. At baseline readiness to implement was highest in the subcategory 'pharmacologic therapy' with the majority of physicians being in the maintenance stage, whereas readiness to implement was lowest in the subcategories 'non-pharmacologic therapy'. There was a significant between-group difference in stages of change after the one-year follow-up ($p < 0.005$). Most physicians in the intervention group were in the maintenance stage after one-year follow-up in all the subcategories of the GOLD recommendations. The stages did not change in the control group (after the one year follow-up).

Table 4 shows a significant between-group difference in the level of physicians' confidence to implement the GOLD recommendations in their practice after the one-year follow-up ($p = 0.001$). The overall mean ± sd level of confidence had increased by 3.6 points after one year in the intervention group on a 10-point scale (1: 'not

confident at all' – 10: 'as confident as possible') compared to no change in the control group.

Figure 3 presents the barriers considered important by the physicians in regard to their adherence to COPD guidelines at baseline, post intervention and after the one-year follow-up. There were no obvious differences between the reported barriers at baseline in both study groups as the most reported barrier was "Lack of awareness", followed by "Lack of educational material/support". Changes in the reported barriers were only observed in the intervention group. After one year, the most reported barrier in the intervention group was "Lack of time" followed by "Lack of motivation and poor dissemination by physician to colleagues" whereas in the control group the reported barriers did not change compared to the baseline.

Table 5 presents the demographics of the two samples of 50 patients at baseline and 50 patients after the one-year follow-up whose medical records were evaluated to assess the physicians' level of consideration of COPD guidelines recommendations. These comprised patients from the intervention group: hospitals n = 2 / patients n = 20; and the control group: hospitals n = 3 / patients, n = 30; 10 patients per hospital. There were no significant differences in the variables. Table 6 presents the medical record information from these patients regarding the level of physicians' consideration to implement COPD guidelines recommendations for COPD management at baseline and after the one-year follow-up. Based on information available in the patients' medical records significantly more COPD guideline recommendations were considered by physicians in the intervention group patients for implementation compared to the physicians of control group patients.

Discussion

COPD care in Saudi Arabia often does not match the COPD guideline recommendations (17, 18, 44) and physicians' knowledge of COPD guidelines is low (12, 18). This study is the first to assess the effect of online COPD guideline training in the Middle East. Our results indicated that the online GOLD statement training modules were effective. Physicians in the intervention hospitals had an increased awareness and satisfactory knowledge (92.2%) of the GOLD recommendations, which persisted to the one year follow-up assessment. Self-rated readiness and level

of confidence to implement guideline recommendations in COPD care also improved among the intervention physicians.

Previous studies have shown that physicians' awareness and knowledge of COPD guidelines is limited in Saudi Arabia and Middle Eastern countries (12, 17, 18). Our baseline results showed that the intervention physicians had only fair knowledge (66.4%) of the GOLD recommendations and that 55.5% of them were not aware of or did not adhere to any COPD guidelines in their practice. These results differ from those of a large international study completed in 12 countries in which more than 85% of the physicians were aware of COPD guidelines such as GOLD and local guidelines (45). Due to the relatively low baseline scores in our study, there was large room for improvement in the knowledge scores. Thus, the significant improvement in physicians' knowledge after completing the education program was therefore not completely unexpected.

Similar to our data, previous studies have reported that a good understanding and awareness of COPD guidelines can lead to better physician adherence to guideline recommendations in the short and long term (25, 27, 46-48). In a Chinese study, where a short education program regarding COPD Chinese Guideline recommendations was provided, a significantly improved physician knowledge score persisted after a four year follow-up (47, 48). A study completed in the United States also showed that physicians retained an increased knowledge level of COPD diagnosis and management nine months after completing an education intervention (49). Therefore, providing education interventions seems to be an effective way to improve physicians' knowledge and subsequently COPD patient care.

Improving the awareness of already existing COPD education programs is likely to lead to further improvement in physicians' knowledge of COPD guideline recommendations. The internet and smartphones are used frequently by many physicians and healthcare providers worldwide (36, 38, 50). The content of our online education program is based on the GOLD recommendations, and can also easily be found on the internet (1), but many physicians seem not to be aware of the availability of any COPD guideline materials. GOLD established a 'GOLD COPD strategy' application (GOLD App) in 2012 as an interactive tool to help healthcare providers navigate the recommendations and use the combined assessment processes (51).

Physicians can use the recommended assessment tools by entering the required information, from which the application automatically generates the treatment group into which the patient fits and shows the recommended treatments (50, 52). One of the aims of our education program was to make physicians more aware of existing guidelines and tools.

Physicians' confidence is a key factor in adherence to COPD guideline recommendations that improves physicians' performance in COPD care (39, 53). Similar to previous studies (26, 53, 54), our data showed improvement in physicians' self-rated levels of confidence and readiness to implement the guideline recommendations in practice. In line with other studies (48, 55-57), our data also revealed improvements in the physicians' consideration to use COPD guideline recommendations in their patients' usual care. The implementation of guideline recommendations in patient care may be a consequence of the improvement in physicians' level of confidence in using the guidelines. The provision of a flowsheet that included the main GOLD and SICAD recommendations for use in clinical practice may also have affected the guideline consideration (1, 4). Providing a flowsheet and training physicians to use this strategy improved physicians' adherence to guideline recommendations in previous studies (55, 57-59). However, in this study we did not aim to evaluate the effects of consideration of COPD guideline recommendations on patients' outcomes. Thus, we recommend undertaking further studies to determine this.

Our finding that a 'lack of time' is an important barrier for implementation of guidelines by physicians is consistent with the literature (12, 16, 60). Once there is awareness of the guidelines, smartphone medical applications such as the (GOLD App) may help physicians to increase their knowledge and seek information more efficiently, even during a consult (52, 61). Increasing the awareness of web based education and smartphone application tools is recommended for healthcare providers.

Our study had several limitations. There may have been a difference between physicians who were prepared to volunteer for this trial and those who were not which may have affected the generalisability of our results. However, most physicians agreed to participate in this trial as our response rate was 88%, and we therefore argue that our study population is a good reflection of the source population. We did not test

the physicians' knowledge in a private examination environment due to the physicians' lack of time. However, using direct interviews may have led to the inclusion of fewer physicians. The approach we used may have resulted in an overestimation of the physicians' knowledge scores because the intervention physicians had access to information sources that could have helped them complete the knowledge questionnaires. Our results however were in line with previous studies (25, 27, 46-48). The imbalance in the number of physician positions (consultants, specialists and residents) in each group may have influenced the quality of the data due to significant differences in the ages and experience of COPD management amongst participants. Our results however showed that there were no differences in physicians' mean knowledge scores between study groups at baseline. Unfortunately we could not properly further assess these differences between physician groups because our study was not sufficiently powered to assess this, as it was not defined as a primary study aim. Finally, to evaluate levels of consideration to implement COPD guideline recommendations by physicians we have only included a small number of patients' medical records from each hospital (n = 10), and this may limit the generalisability of our findings. Moreover, the information collected from the patients' medical records was limited by our methods, as some physicians may not have documented all their actions in the medical records, and this may have led to an underestimation of the actual level of consideration of COPD guideline recommendations in each hospital. However, the level of consideration to implement guideline recommendations in our study was similar to previous studies (12, 46, 55), and we did find highly significant improvements in the intervention group.

Conclusion

This study revealed that active involvement in using online GOLD-statement training modules improved the awareness and knowledge of COPD guidelines, self-rated readiness and level of confidence among physicians working with patients with COPD in the Eastern Province of Saudi Arabia. Therefore, we strongly recommend that physicians in Saudi Arabia and Middle Eastern countries should be proactively encouraged to use online COPD guideline materials to increase awareness of COPD guidelines and hence improve adherence to their recommendations.

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Table 1: Physicians' baseline characteristics (n = 44)

variables	Intervention group, n = 18	Control group, n = 26
Age (mean [SD]; years)	31.6 (8.5)	37.7 (9.6)*
Number of years of COPD patient related experience (mean [SD]; years)	4.6 (5.0)	8.3 (6.9)
Male (N; %)	14 (77.7)	23 (88.4)
Nationality (N; %)		
Saudi	16 (88.8)	13 (50)**
Non Saudi	2 (11.1)	13 (50)**
Position (N; %)		
Respiratory consultants	2 (11.1)	5 (19.2)
Internal medicine specialists	1 (5.5)	11 (42.3)
Internal medicine residents	15 (83.3)	10 (38.4)

Abbreviations: IQR: Interquartile range; COPD: chronic obstructive pulmonary disease.
*p value shows significant difference between intervention group and control group (p = 0.036)
**p value shows significant difference between intervention group and control group (p = 0.007)

Table 2: Mean difference in physicians' scores for COPD knowledge at baseline, post-intervention and 12-month follow-up

		Intervention group n = 18			Control group n = 26					
Basic content of the GOLD guidelines	Maximum total score	Baseline (mean ± SD)	Post intervention (mean ± SD)	12 month follow up (mean ± SD;)	Baseline (mean ± SD)	Post intervention (mean ± SD)	12 month follow up (mean ± SD)	Between group differences group from baseline and after one year follow up with confidence interval (95% CI)	ŦP values	Between group differences including baseline, post intervention, and after one year follow up with confidence interval (95% CI)	**P values
Definition and overview	8	5.5 ± 0.8	7.8 ± 0.4	7.7 ± 0.4	4.6 ± 1.4	4.7 ± 1.5	4.7 ± 1.5	2.3 (1.2-3.4)	0.004	0.3 (-1.0-1.7)	<0.001
Diagnosis and assessment	10	5.9 ± 1.6	9.3 ± 0.8	9.2 ± 0.9	5.3 ± 2.4	5.5 ± 2.3	5.8 ± 2.1	2.9 (2.3-3.6)	<0.001	-0.01 (-0.6-0.5)	<0.001
Principles of therapy	5	2.6 ± 0.6	4.5 ± 0.6	4.3 ± 0.7	2.9 ± 1.0	3.4 ± 1.0	3.4 ± 1.0	1.0 (0.3-1.7)	0.013	-0.08 (-0.6-0.4)	0.008
Pharmacotherapy	9	7.0 ± 0.9	8.6 ± 0.5	8.6 ± 0.6	6.8 ± 1.3	6.8 ± 1.2	6.8 ± 1.2	1.6 (1.1-2.2)	0.001	-0.04 (-0.3-0.2)	<0.001
Non-pharmacotherapy	10	6.7 ± 1.4	9.0 ± 0.8	8.8 ± 0.8	6.9 ± 1.4	6.7 ± 1.5	6.8 ± 1.6	2.1 (1.1-3.1)	0.004	0.7 (-0.7-2.2)	0.027
Prevention of deterioration	3	1.9 ± 0.4	2.6 ± 0.6	2.6 ± 0.6	2.5 ± 0.5	2.4 ± 0.5	2.5 ± 0.5	0.5 (0.1-0.9)	0.018	0.02 (-0.2-0.2)	0.005
Total COPD knowledge	**45**	**29.9±3.3**	**42.0±2.0**	**41.5±1.3**	**29.2±4.8**	**29.8±5.0**	**30.1±4.9**	**10.7 (8.3- 13.1)**	**<0.001**	**3.1 (-4.3-10.6)**	**0.005**

Abbreviations: COPD: chronic obstructive pulmonary disease; GOLD: global initiative for chronic obstructive lung disease.
*percentage of the maximum total score.
Ŧ Primary analysis shows p values of the differences between intervention and control groups after the one year follow up tested with general linear model, clustering over hospital.
** Sensitivity analyses using mixed model analyses (group × time), clustering over hospital.

Table 3: Physicians' awareness of and adherence to COPD guidelines at baseline, post-intervention and 12-month follow-up

	Physicians aware of COPD guidelines (n)						**Physicians adherent to COPD guidelines (n)**					
	Intervention group n = 18			Control group n = 26			Intervention group n = 18			Control group n = 26		
COPD guidelines	Baseline	*Post intervention	*12 month follow up	Baseline	*Post intervention	*12 month follow up	Baseline	*Post intervention	12 month follow up	Baseline	*Post intervention	*12 month follow up
GOLD	4	0	0	5	7	8	5	3	3	5	7	7
SICAD	0	0	0	0	0	0	0	6	4	1	1	1
NICE	2	0	0	2	1	1	2	0	0	1	0	1
GOLD/SICAD	1	16	16	0	0	0	0	8	10	0	0	0
SICAD/NICE	0	0	0	1	1	1	0	0	0	0	0	0
GOLD/SICAD/NICE	0	2	2	0	0	0	0	1	1	0	0	0
Yes but not specified	1	0	**0**	1	0	0	1	0	**0**	1	0	0
No aware/adherent to any guidelines	**10**	**0**	**0**	**17**	**17**	**16**	**10**	**0**	**0**	**18**	**18**	**17**

Abbreviations: COPD: chronic obstructive pulmonary disease; GOLD: global initiative for chronic obstructive lung disease; SICAD: Saudi guidelines for the diagnosis and management of COPD; NICE: national institute for health and care excellence management of COPD in adults in primary and secondary care.

* Chi-square (2x2) test showed a significant difference in physicians' awareness of, and adherence to, COPD guidelines between intervention group and control group ($p = <0.001$).

Table 4: Mean difference in physicians' level of confidence (scale 1–10) to implement GOLD recommendations at baseline, post-intervention and 12-month follow-up

	Intervention group n = 18			Control group n = 26			
Physicians' confidence to re-implement GOLD recommendations in terms of:	Baseline	Post intervention	12 months follow up	Baseline	Post intervention	12 month follow up	[T] p values
a) Diagnosis and assessment (mean ± SD)	5.6 ± 2.5	9.1 ± 1.0	9.5 ± 0.9	5.6 ± 3.0	5.6 ± 3.1	5.4 ± 3.2	0.003
b) Pharmacologic therapy (mean ± SD)	6.6 ± 2.7	9.0 ± 1.1	9.5 ± 0.6	6.1 ± 3.1	6.0 ± 3.2	5.7 ± 3.1	0.005
c) Non-pharmacologic therapy (mean ± SD)	4.6 ± 2.9	8.2 ± 1.5	9.1 ± 1.1	4.3 ± 3.2	4.0 ± 3.3	4.0 ± 3.1	<0.001
d) Offering annual influenza vaccinations or pneumococcal vaccinations, and discussing an action plan (mean ± SD)	6.6 ± 2.8	9.2 ± 0.8	9.7 ± 0.5	5.3 ± 3.5	5.1± 3.6	4.9 ± 3.7	0.001
Total (mean ± SD)	**5.8 ± 2.3**	**8.9 ± 0.9**	**9.4 ± 0.6**	**5.4 ± 2.8**	**5.2 ± 2.9**	**5.0 ± 2.8**	**0.001**

Abbreviations: GOLD: global initiative for chronic obstructive lung disease.
[T] p values of the differences between intervention and control groups after one year follow up tested with general linear model, clustering over hospital.

Table 5: Characteristics of 100 patients whose medical records were assessed to evaluate physicians' compliance with GOLD guideline recommendations				
Variables	Baseline Intervention group (n = 20)	After 12 month Intervention group (n = 20)	Baseline Control group (n = 30)	After 12 month Control group (n = 30)
Age (mean ± SD; years)	62.9 ± 7.8	63.0 ± 7.8	64.0 ± 10.4	64.1 ± 9.4
Weight (mean ± SD; kg)	77.5 ± 16.9	79.4 ± 19.3	82.1 ± 18.1	82.8 ± 14.0
Previous respiratory related hospitalisations (mean ± SD)	1.4 ± 0.8	1.3 ± 0.5	1.6 ± 0.7	1.6 ± 0.6
Number of exacerbations in the last 12 months (mean ± SD)	1.1 ± 0.4	1.1 ± 0.3	1.4 ± 0.5	1.4 ± 0.5
Male (%)	55	75	80	60

Table 6. Physicians' practice of and adherence to GOLD guideline according to 100 medical records of patients with COPD*

GOLD recommendations	**Number of patients' medical records that showed that patients were considered to be examined and treated according to GOLD recommendations N; (%)**						
	Baseline	**After 12 month**		**Baseline**	**After 12 month**		
	Intervention group n = 20	Intervention group n = 20	** p values	Control group n = 30	Control group n = 30	ŧ p values	¥ p values between study groups after one year follow up
Past history							
Smoking history	7 (35)	18 (90)	< 0.001	14 (46.6)	15 (50)	-	0.003
Medical history	15 (75)	19 (95)	-	22 (73.3)	21 (70)	-	0.030
Previous respiratory related hospitalisations	20 (100)	20 (100)	-	30 (100)	30 (100)	-	-
Presence of comorbidities	20 (100)	17 (85)	-	25 (83.3)	21 (70)	-	-
Diagnosis and assessment							
Respiratory related symptoms	100	100	-	30 (100)	30 (100)	-	-
Spirometry for severity monitoring and spirometry diagnosis	7 (35)	14 (70)	0.025	10 (33.3)	12 (40)	-	0.038
Health status impairment test (CAT)	0 (0)	13 (65)	< 0.001	0 (0)	0 (0)	-	< 0.001
History of exacerbations in the last 12 months	20 (100)	20 (100)	-	30 (100)	30 (100)	-	-
Exercise capacity (six-minute walk test)	0(0)	13 (65)	< 0.001	0 (0)	1 (3.3)	-	< 0.001
Artery blood gas	11 (55)	13 (65)	-	15 (50)	14 (46.6)	-	-
Combined assessments *GOLD (A,B,C,D) or *SICAD (I, II, III)	1 (5)	13 (65)	< 0.001	0 (0)	0 (0)	-	< 0.001
Therapeutic options (pharmacotherapy)							
Smoking cessation	1 (5)	14 (70)	< 0.001	3 (10)	2 (6.6)	-	< 0.001
Prescribed bronchodilators for stable COPD	13 (65)	20 (100)	0.004	29 (96)	29 (96)	-	-
Prescribed systemic corticosteroids, phosphodiesterase-4 inhibitors, and antibiotics for exacerbation of COPD	7 (35)	20 (100)	< 0.001	9 (30)	27 (90)	<0.001	-
Therapeutic options (non-pharmacotherapy)							
Considered pulmonary rehabilitation	0 (0)	0 (0)	-	0 (0)	0(0)	-	-
Recommended and encouraged physical activity at home	0 (0)	13 (65)	< 0.001	0 (0)	0(0)	-	< 0.001
Provided education advises	0 (0)	11 (55)	< 0.001	0 (0)	0(0)	-	< 0.001
Referred to physiotherapy for exercise training	0 (0)	13 (65)	< 0.001	0 (0)	0(0)	-	< 0.001

Referred for nutrition counselling	0 (0)	13 (65)	< 0.001	0 (0)	0(0)	-	< 0.001
Referral for psychological support	0 (0)	0(0)	-	0 (0)	0(0)	-	-
Considered oxygen therapy	3 (15)	11 (55)	0.008	7 (23.3)	9 (30)	-	-
Prevention							
Offered influenza vaccination	1 (5)	13 (65)	< 0.001	1 (3.3)	3 (10)	-	< 0.001
Discuss self-management and action plan	0(0)	13 (65)	< 0.001	0	0	-	< 0.001

Abbreviations: GOLD, global initiative for chronic obstructive lung disease; COPD, chronic obstructive pulmonary disease; CAT, COPD assessment test.
*SICAD AND GOLD classification of COPD (1, 3):
Based on the symptoms and risk of future exacerbations, patients with COPD are recommended to be classified into the following clinical classes
Class I: Fewer symptoms (CAT < 10) and 0-1 exacerbations in the past year and no hospitalisation. This is equivalent to GOLD group A.
Class II: More symptoms (CAT ≥ 10) and 0-1 exacerbations in the past year and no hospitalisation. This is equivalent to GOLD group B.
Class III: At risk of exacerbations as manifested by ≥ 2 exacerbations in the past year and/or hospitalisation regardless of symptoms. This is equivalent to GOLD groups C and D
** p values of the differences between intervention group at baseline and after one year follow up tested with Chi-square (2 x 2)
Ŧ p values of the differences between control group at baseline and after one year follow up tested with Chi-square (2 x 2)
¥ p values of the differences between intervention group and control group after one year follow up tested with Chi-square (2 x 2).

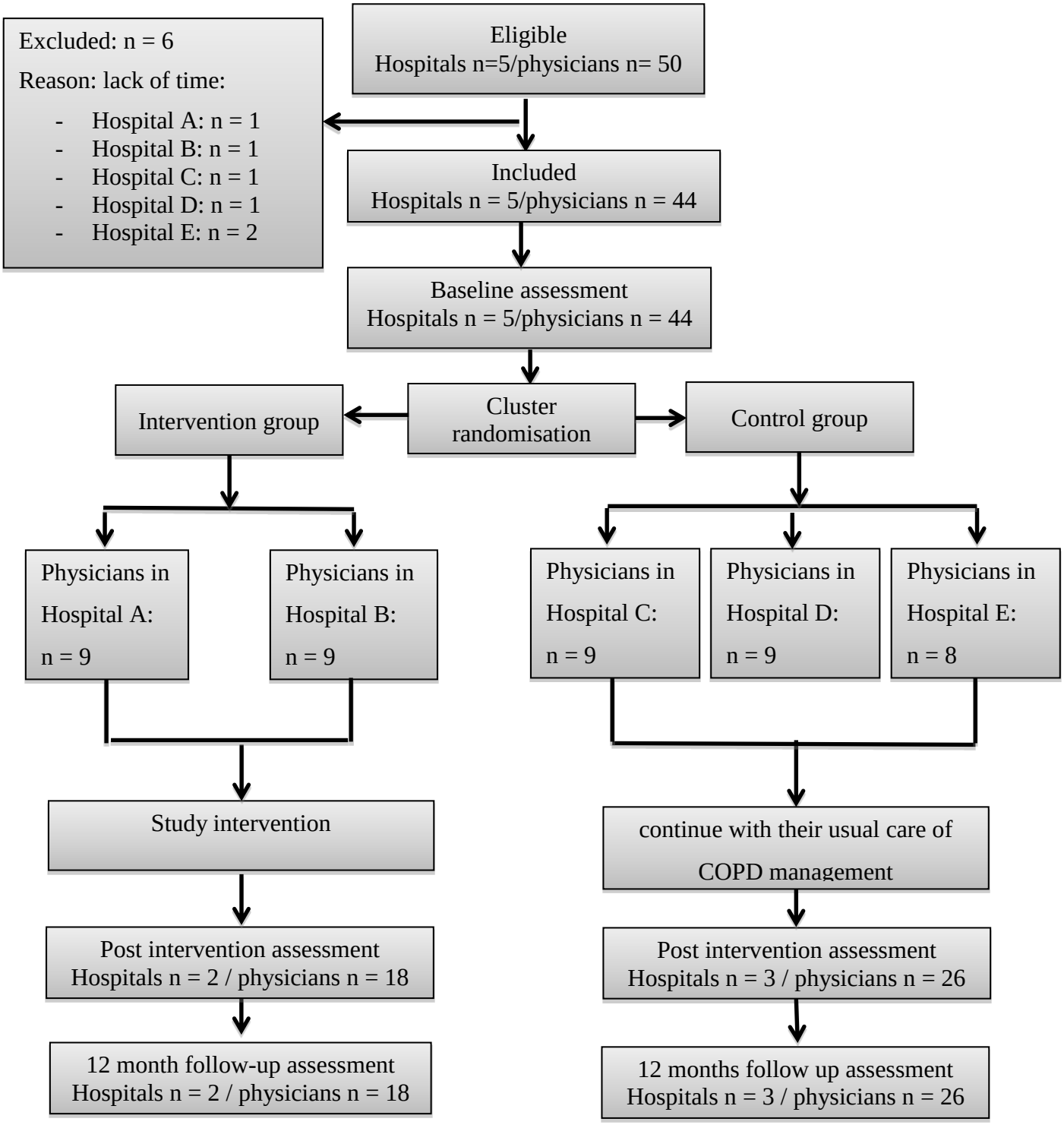

Figure 1: Flow diagram summary of study stages

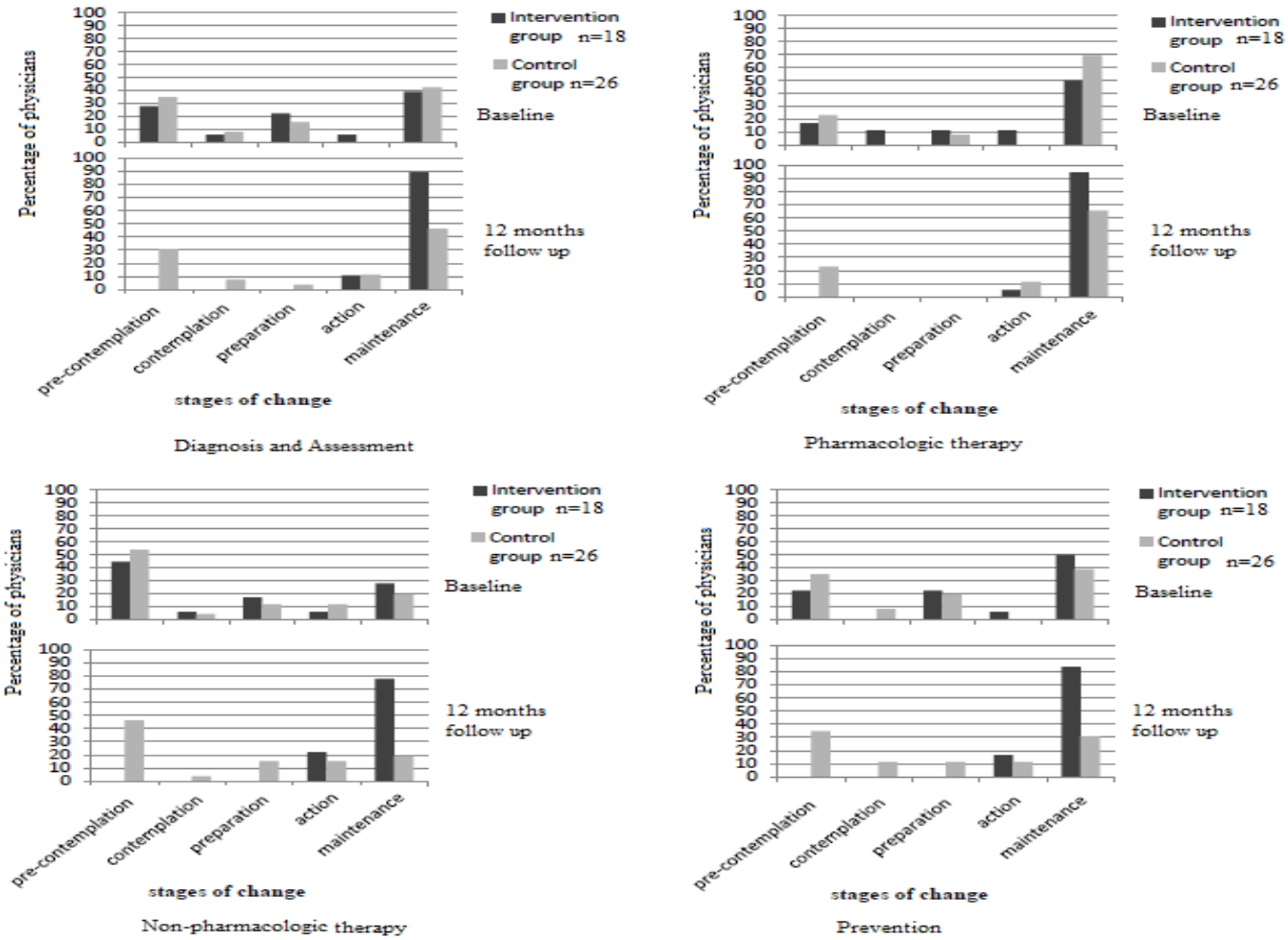

Figure 2: Physicians' readiness (indicated by stage of change) in intervention and control group to implement GOLD guidelines in practice

*p-values of the significant difference between intervention and control groups after one-year follow-up, tested with Mann-Whitney U ($p < 0.005$).

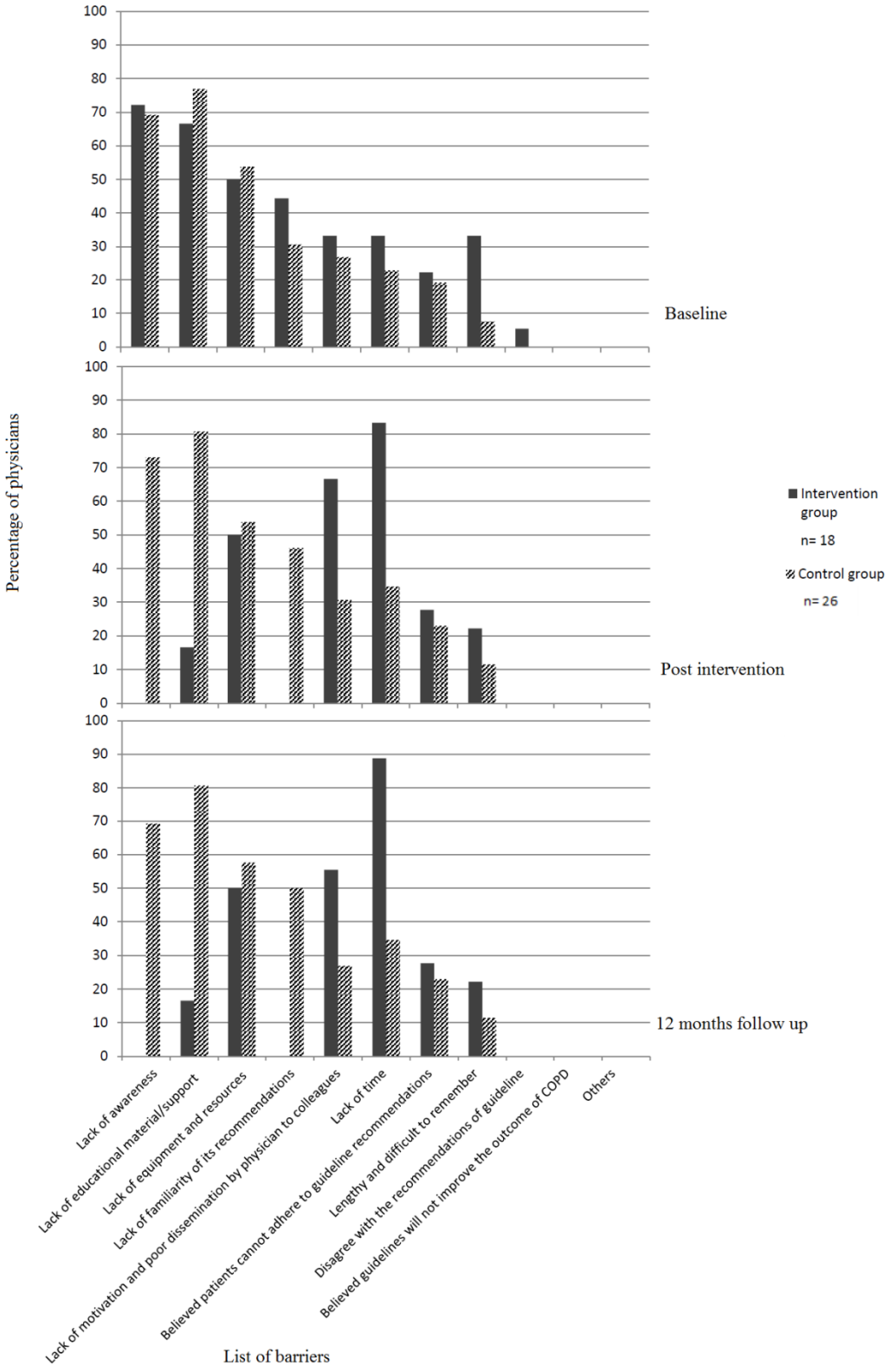

Figure 3: Barriers to adherence to COPD guidelines in both study groups at baseline, post-intervention and one-year follow-up.

Chapter 6:

Barriers for setting up a pulmonary rehabilitation program in the Eastern Province of Saudi Arabia

Mohammed E. Alsubaiei

Paul A. Cafarella

Peter A. Frith

R. Doug McEvoy

Tanja W. Effing

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Abstract

BACKGROUND: Pulmonary rehabilitation (PR) programs have proven to be one of the most effective treatment options for respiratory diseases; yet, they are not well‐established in hospitals in Saudi Arabia.

AIM: To determine the main barriers for setting up PR programs in Saudi Arabia.

METHODS: A cross‐sectional study was conducted in the Eastern Province of Saudi Arabia. Health care providers involved in treatment of chronic obstructive pulmonary disease (COPD) patients were recruited from 22 general government hospitals. Data were collected using questionnaires: full version if they had heard about PR before the study, and a short version if they had not heard about PR before.

RESULTS: A total of 123 health care providers were recruited (physicians [*n* = 44], nurses [*n* = 49], and respiratory therapists/technicians [*n* = 30]). Only 3.2% of the recruited health care providers had heard about PR programs before. According to the health care providers, the main barriers for setting up PR programs were a lack of (1) hospital capacity (75.6%), (2) trained health care providers (72.4%), and (3) funds (48.0%). There were significant differences in barriers reported by the health care providers. Compared to physicians, nurses were more likely to nominate the PR costs as a barrier (18.0% vs. 38.8%; $P < 0.05$).

CONCLUSION: There is a worrisome lack of knowledge regarding content and benefits of PR programs among Saudi health care providers treating patients with COPDCOPD patients. These findings imply that improving awareness and increasing education of the health care providers regarding PR will be required before PR can be more widely implemented as an integral treatment modality for patients with COPD in Saudi Arabia.

Key words:

Barriers, chronic obstructive, general, hospitals, pulmonary disease, rehabilitation, Saudi Arabia

Introduction

Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality worldwide (1). In 2012, more than 3 million people worldwide died of COPD, accounting for 6% of total deaths (2). The global burden of disease study estimates that by 2020 COPD will become the third leading cause of death worldwide (1).

In Saudi Arabia, the prevalence of COPD is 2.4% among the general population and 14.2% among smokers over 40 years of age (3-5). These prevalence rates are comparable to rates in the Middle East countries (3.6% among the general population) and in Turkey (18.1% among smoking population) (3, 5). In 2014, the fifth leading cause of death in Saudi Arabia was chest diseases (6). Evidence shows that smoking is the main risk factor for the development and progression of COPD (3). At present, the smoking rate in Saudi Arabia is estimated at 27.9% (7), and there is evidence that the rate of smoking is steadily increasing among Saudis (7). The prevalence and the burden of COPD are therefore expected to rise further in Saudi Arabia, not only because of exposure to smoking, but also outdoor air pollution, desert dust, wars (e.g., chemical weapons), childhood respiratory infections, and lack of physical activity (8, 9).

Studies have shown that patients with COPD tend to be physically inactive in daily life (9). A relationship exists between decreasing level of physical activity and poor quality of life, increased health care utilization and reduced survival (9). The prevalence of physical inactivity in Saudi Arabia is high (10). This is illustrated by the fact that 96.1% of the Saudi males and 98.5% of the Saudi females do not meet the recommended physical activity levels compared to 64% of the males and 60% of the females in Australia (10, 11). This low level of physical activity of patients with COPD in Saudi Arabia is likely to contribute further to the mortality and health care burden associated with COPD in this country (9).

Many studies and guidelines have recommended pulmonary rehabilitation (PR) programs as an integral and essential management option for respiratory diseases such as COPD (11, 12, 13). PR is defined as “a comprehensive intervention based on a thorough patient assessment followed by patient‐tailored therapies that include but

are not limited to exercise training, education, and behavior change, designed to improve the physical and psychological condition of people with the chronic respiratory disease and to promote the long-term adherence to health-enhancing behaviors."(12). High-level evidence shows that PR decreases dyspnea, anxiety levels, depression levels, and hospitalization rates and that it increases exercise capacity, physical activity, and quality of life (12, 14). Currently, there are no PR programs in hospitals in the Eastern Province of Saudi Arabia (15) and to the best of our knowledge, there is only one tertiary hospital (The King Abdulaziz Medical City in Riyadh, Central Province) that offers a program in Saudi Arabia (16). Therefore, the number of patients with COPD that can access PR in Saudi Arabia is extremely low (16). Implementation of more PR programs that meet international criteria throughout Saudi Arabia is therefore highly recommended (13, 16-18).

In this study, we explored the reasons why PR is not a part of usual COPD management in Saudi Arabia. Barriers for setting up PR programs were identified by health care professionals who treat and provide care for patients with COPD in Saudi Arabia. Moreover, we ascertained the opinions of these health care providers in relation to reasons that would prevent patients with COPD from participating in PR programs if they were to be offered.

Method

A cross-sectional study was conducted from April to August 2013 in the Eastern Province of Saudi Arabia. Health care providers were selected from 22 general government hospitals (Eastern area: n=14, Al-Ahsa area: n=5, and Hafar Al-Batin area: n=3) (15). To be eligible, health care providers needed to (a) have access to evaluate, treat, and provide care for patients with COPD and (b) have experience with patients with COPD with a minimum of 10 cases/year.

The research protocol was approved by the Southern Adelaide Clinical Human Research Ethics Committee, Flinders Medical Centre Ethics Committee, Institutional Review Board at Ministry of Health (MOH) in Saudi Arabia, and Institutional Review Board at King Fahd Hospital University in Saudi Arabia. All participants signed an informed consent form.

The researcher (MA) first contacted the directors of the Departments of Internal Medicine Physiotherapy, Respiratory Care, Psychiatry, Nutrition, and Nursing in order to obtain permission to conduct interviews with the health care providers who had access to evaluate, treat, and provide care for patients with COPD.

All eligible health care providers were asked in a face to face interview "Have you heard of a pulmonary rehabilitation program?" Health care providers who answered "yes" were asked to complete a full version of our PR questionnaire in order to evaluate the barriers for setting up PR. If the health care providers and the directors answered "no," the researcher provided standardized information about PR in order to familiarize them with PR [Box 1] and they were asked to complete a short version of our PR questionnaire. Health care providers were asked to complete the questionnaires within a week.

Questionnaires

The PR questionnaire was in the English language because this is the official language in Saudi hospitals. Barriers were predefined and based mostly on a systematic review (19) that described factors associated with uptake and completion of PR for people with COPD.

The full version of the questionnaire, provided to the health care providers who were familiar with PR, was divided into two parts. The first part (questions 1–4) evaluated their knowledge about PR programs. Another 13 questions were directed toward (1) the structure of the offered PR program, (2) perceived barriers for setting up a PR program, and (3) perceived preventers of participation in a PR program by patients with COPDA short version of the PR questionnaire was provided to the health care providers who were not familiar with PR. It included standardized information about PR, four questions evaluating the perceived barriers associated with setting up a PR program and preventers of PR program participation by patients with COPD.

After analyzing the questionnaires, we felt that health care providers could not distinguish between two barriers listed, namely "lack of hospital capacity" and "lack of hospital rooms." These barriers were therefore retrospectively combined in one barrier "lack of hospital capacity."

Statistical analysis

All data were entered into the Statistical Package for Social Sciences version 19 (IBM Corporation, Armonk, NY, USA). Analyses were mostly descriptive. Continuous variables were summarized by calculating the mean and the standard deviation. Nominal data were given as proportions.

One way ANOVA was used to assess continuous variables across three groups. Chi-square tests were performed to determine associations and significance between variables. Statistical significance was reported when $P < 0.05$.

Results

Of the 158 health care providers, 123 could be included (physicians n = 44 from 22 hospitals, nurses n = 49 from 8 hospitals, and respiratory therapists/technicians n = 30 from 3 hospitals). Six physicians, 15 nurses, and five respiratory therapists refused to participate because of lack of time. Six general physicians and three physiotherapists were excluded because they did not meet the study criteria (Figure 1). Characteristics of the included health care providers are presented in (Table 1). The majority of the health care providers were non-Saudis (n = 78; 63.4%).

Health care providers were categorized into three disciplines based on their specialties (physicians, nurses, and respiratory therapists/technicians). (Table 2) presents the characteristics of each discipline. There is a significant difference between health care providers' disciplines in terms of number per region, age, gender, and years of experience. Physicians were enrolled from 21 hospitals, nurses were enrolled from eight hospitals, while respiratory therapists/technicians were enrolled from three hospitals. Only four participants (all physicians) had heard of PR and therefore completed a full version of the PR questionnaire, while 119 health care providers were not familiar with PR and completed the short version of PR questionnaire instead (Figure 1) and (Table 2).

Table 3 shows the perceived barriers for setting up PR program in hospitals in the Eastern Province of Saudi Arabia according to the health care providers. The most reported barrier was “The capacity of the hospital does not allow us to set up a pulmonary rehabilitation program” (reported by 75.6% of health care providers). “We

do not have qualified health care providers that can run a pulmonary rehabilitation program" was also reported frequently (72.4%), followed by "We do not have funds from the hospital to run a pulmonary rehabilitation program" (48%).

Perceived barriers to setting up a PR program organized in accordance with the health care providers' disciplines are presented in (Table 4). There were significant differences between the views of physicians, respiratory therapists/technicians, and nurses in terms of reporting barriers. For example, whereas almost all physicians (93%) saw the lack of trained health care providers as a barrier, well over half of the nurses (61%) and respiratory therapists/technicians (60%) considered this as a barrier. Most of the health care providers (91%) thought that patients with COPD would be willing to participate in a PR program if they were offered a place.

Table 5 displays health care providers' perceptions of barriers that may prevent patients with COPD from participating in a PR program. The main barriers reported by the health care providers included smoking status (76.2%), interruption to patient's routine (59.8%), lack of transportation (59%), patients will not complete the PR program (55.7%), patients will get bored (45.9%), lack of social/family support (41.8%), lack of perceived benefit (38.5%), and patients do not like group activities (30.3%).

Discussion

This study is the first to assess the barriers to setting up a PR program in Saudi Arabia (15, 17, 20). The study results show that only a very small percentage of the Saudi health care providers know what PR is. Hospitals capacity, trained health care providers, and funds were seen by the health care providers as the main barriers to setting up a PR program. Reported barriers differed significantly between disciplines.

Lack of hospital capacity was reported as a barrier by more than half of the health care providers. However, PR can be provided within existing infrastructure and using incumbent health professionals in the hospitals (21). Furthermore, it has been demonstrated that an outpatient PR program conducted in a small hospital was as effective as programs in a large hospital in patients with COPD (22). Studies have also suggested that PR can be effectively provided in an inpatient, community-based

or home setting (14, 21,23-26). Hospitals in the Eastern Province of Saudi Arabia could therefore adopt any PR model that suits their resources (14).

Lack of trained health care providers was defined as another major barrier for setting up a PR program. Studies show that Saudi Arabia, in general, suffers from a lack of health care providers, and limited disciplines are involved in COPD management in particular (6, 15, 27). Moreover, the total number of chest physicians in Saudi Arabia is very low (6) and the number of specialized nurses (e.g., respiratory nurse practitioners) in Saudi Arabia is even lower (6, 15, 28). This lack of health care providers may affect the quality of COPD care in Saudi Arabia (15). The government could provide training incentives and facilitations encouraging upskilling of current health care providers and stimulating people to study medicine or health sciences and to specialize in respiratory diseases. The latter can be stimulated by offering high-quality education in Saudi universities or by sending students to overseas universities.

Similar to our data, lack of funds was also defined as an important barrier for setting up PR program and in keeping programs running in Australia (29). Funding of health care services is a serious challenge for the MOH in Saudi Arabia because government-based health services are free for the population (27). Whereas, spending more does not per definition mean a better quality of health care, the availability of funds is, however, one factor that influences the quality of health care systems (30). It is important for the Saudi government to consider and fund PR program as a part of usual COPD management because it is seen as a core component of COPD care.

Our data show that barriers reported by health care providers differed significantly between disciplines. The fact that physicians had more years of experience in specifically managing patients with COPD than nurses and respiratory therapists/technicians may have contributed to this difference. Another potential explanation is that all of the nurses participating in our study were general nurses and not specialized respiratory nurses (15, 28). It is therefore likely that nurses may have had limited knowledge about management of respiratory diseases. Increasing the nurse's level of education to the bachelor level is recommended in order to improve the quality of nursing care for patients in Saudi Arabia (15, 28, 31, 32). In addition, worryingly, between 10% and 20% of respondents considered PR would not be useful. This indicates that there is a need to improve the spread of understanding of

the role and outcomes of PR among health care workers as well as administrators and government agencies in Saudi Arabia.

Previous studies in other countries and Saudi Arabia have reported that lack of knowledge and awareness of PR by primary care and specialist physicians were seen as one of the main barriers for setting up and referring to PR program (15, 29, 33). Our data strongly support the view that there is a significant lack of knowledge by health care providers regarding PR programs and management of COPD in Saudi Arabia. This is exemplified by the fact that only four physicians in our sample had even heard of PR prior this study. In addition, only three disciplines were identified as being directly involved in COPD care in this study. This suggests that physicians may not be completely aware of optimal management of respiratory patients in general and the multidisciplinary approach in COPD management in particular. COPD guidelines recommend the involvement of other health care providers such as physiotherapists, mental health specialists (i.e., psychiatrist and psychologists), occupational therapists, respiratory nurses, and dieticians in COPD management (1, 13, 21, 34, 35). Increasing awareness and improving information regarding PR is therefore recommended in order to implement PR programs and then to improve the referral rate (15, 33), which can be achieved by offering physicians and other health care providers short courses regarding PR program and management of COPD, seminars, education, and so forth (15, 33).

There is only one tertiary care hospital offering a PR program in the entire Saudi Arabia (15, 17, 20). It is, however, possible that some private hospitals run PR programs, but they are often not well known by health care providers. It is very likely that barriers found in our study also apply to the rest of the Saudi Provinces because the Eastern Province is the largest and has a higher number of beds, funds, and health care providers (6).

Instead of a cross-sectional design, we could also have chosen to use a structured interview method with health care providers to obtain more detailed data in this study. However, because of time constraints, the use of such a structured interview would most probably have led to the inclusion of fewer health care providers. Another study limitation was the limited participation of nurses in this study (only nurses from eight hospitals participated). Many nurses refused to participate due to a perceived lack of

time. The small number of participating respiratory therapists/technicians (three hospitals) is not surprising because only five of the included government hospitals had employed respiratory therapists/technicians involved in COPD care (15). Another limitation is that barriers that may prevent patients with COPD from participating in a PR program were obtained from health care providers and not the patients themselves, and we cannot be sure that these are the actual barriers. Our data are however in line with barriers mentioned in other studies that have assessed barrier for PR in patients with COPD (19, 36). Finally, barriers reported in this study may have been different if the health care providers had more knowledge regarding PR (and experience with PR) at the start of the study.

Conclusion and Recommendation

. Knowledge regarding PR, however, is very limited among health care providers who are involved in COPD care in Saudi Arabia. Several barriers were identified by health care providers. These barriers should be further explored and if necessary targeted in the near future to increase awareness and knowledge regarding PR by health care providers as a crucial first step to facilitate implementation of PR programs in Saudi hospitals.

Acknowledgment

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Conflicts of interest

There are no conflicts of interest.

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Table 1: Characteristics of the health care providers (n=123)	
Variable	
Age (mean ± SD; years)	36.9 ± 9.5
Number of years of COPD patient related experience (mean ± SD; years)	9.1 ± 6.4
Male (N ;%)	62 (50.4)
Nationality (N; %)	
Saudi	45 (36.6)
Non Saudi	78 (63.4)
Region (number of health care providers by each area) (N ;%).	
Eastern Province area	90 (73.2)
Al-Ahsa area	30 (24.4)
Hafar Al-Batin area	3 (2.4)
Position (N ;%)	
Internal medicine consultants	9 (7.3)
Internal medicine Specialists	23(18.7)
Internal medicine residents	2 (1.6)
Respiratory physician consultants	6 (4.9)
Respiratory physician specialists	4 (3.3)
General nurses	49 (39.8)
Respiratory therapists	15 (12.2)
Respiratory technicians	15 (12.2)
Abbreviations: COPD: chronic obstructive pulmonary disease.	

Table 2: Characteristics of the health care providers' disciplines (n=123)

	Physicians	Nurses	Respiratory therapists / technicians
Number	44	49	30
Region (N; %)*			
Eastern area	27 (61)	35 (71)	28 (93.3)
Al-Ahsa area	14 (31.8)	14 (28.5)	2 (6.6)
Hafar Al-Batin area	3 (6.8)	0 (0.0)	0 (0.0)
Age (mean ± SD; years)*	43.3 ± 9.5	31.2 ± 5.5	36.7 ± 8.8
Number of years of COPD patient* related experience (mean ± SD; years)	13.3 ± 6.8	5.3 ± 3.7	8.9 ± 5.7
Male (N; %)*	39 (88.6)	4 (8.1)	19 (63.3)
Nationality (N; %)			
Saudi	12 (27.2)	21 (42.9)	12 (40)
Non Saudi	32 (72.8)	28 (57.1)	18 (60)
Have you ever heard of pulmonary rehabilitation? (N; %)*			
Yes	4 (9.1)	0 (0.0)	0 (0.0)
No	40 (90.9)	49 (100)	30 (100)

Abbreviations: COPD: chronic obstructive pulmonary disease.
* One way ANOVA was used to assess continuous variables across three groups(p-value is < 0.05)

Table 3: Barriers for setting up pulmonary rehabilitation program

	Health care providers (Number of positive responses; %)
1. The capacity of the hospital does not allow us to set up a pulmonary rehabilitation program	93 (75.6)
2. We do not have qualified health care providers that can run a pulmonary rehabilitation program	89 (72.4)
3. We do not have funds from the hospital to run a pulmonary rehabilitation program	59 (48)
4. Pulmonary rehabilitation program is more expensive than standard management	32 (26)
5. We do not have many patients with COPD	23 (18.7)
6. Standard management for patients with COPD is better than a pulmonary rehabilitation program	21 (17.1)
7. Pulmonary rehabilitation program does not interest me	14 (11.4)
8. I do not believe a pulmonary rehabilitation program will be a valuable addition to the management of patients with COPD	14 (11.4)
9. Others	3 (2.4)

Abbreviations: COPD: chronic obstructive pulmonary disease.

Table 4: Barriers for setting up pulmonary rehabilitation program according to health care providers groups *

Number	**Physicians n= 44 (%)	**Nurses n= 49 (%)	**Respiratory therapists / technicians n= 30 (%)	P value (<0.05)
1. The capacity of the hospital does not allow us to set up a pulmonary rehabilitation program	28 (63.6)	36 (73.5)	29 (96.7)	0.005
2. We do not have qualified health care providers that can run a pulmonary rehabilitation program	41 (93)	30 (61)	18 (60)	0.001
3. We do not have funds from the hospital to run a pulmonary rehabilitation program	19 (43.2)	25 (51)	15 (50)	0.727
4. Pulmonary rehabilitation program is more expensive than standard management	8 (18.2)	19 (38.8)	5 (16.7)	0.032
5. We do not have many patients with COPD	5 (11.4)	16 (32.7)	2 (6.7)	0.005
6. Standard management for patients with COPD is better than a pulmonary rehabilitation program	2 (4.5)	18 (36.7)	1 (3.3)	0.0001
7. Pulmonary rehabilitation program does not interest me	1 (2.3)	13 (26.5)	0 (0)	0.0001
8. I do not believe a pulmonary rehabilitation program will be a valuable addition to the management of patients with COPD	1 (2.3)	12 (24.5)	1 (3.3)	0.001
9. Others	1 (2.3)	1 (2.0)	1 (3.3)	0.933

Abbreviations: COPD: chronic obstructive pulmonary disease.
* The result presents number of health care providers who has responded (Yes) for each barrier.
**The total number of health care providers is 123: Physicians (n=44); Nurses (n=49); Respiratory therapists/technicians (n=30).

Table 5: Barriers that might prevent patients with COPD from participating in a pulmonary rehabilitation program

	Health care providers (Number of response yes; %)
1. Patients will not quit smoking	93 (76.2)
2. Patients do not want to lose time out of their holiday to attend a program	73 (59.8)
3. Problems with transport to the pulmonary rehabilitation program	72 (59)
4. Patients will not complete the pulmonary rehabilitation program	68 (55.7)
5. Patients will get bored	56 (45.9)
6. Patients will not be motivated from their family members to attend and participate	51 (41.8)
7. Patients would think that they will not perceive any benefit from attending pulmonary rehabilitation program.	47 (38.5)
8. Patients do not like group activities	37 (30.3)
9. Patients will find difficult to get the accessibility of car parking	30 (24.6)
10. Patients will not be motivated by health care providers to attend and participate	28 (23.0)
11. Others	3 (2.5)

Abbreviations: COPD: chronic obstructive pulmonary disease.

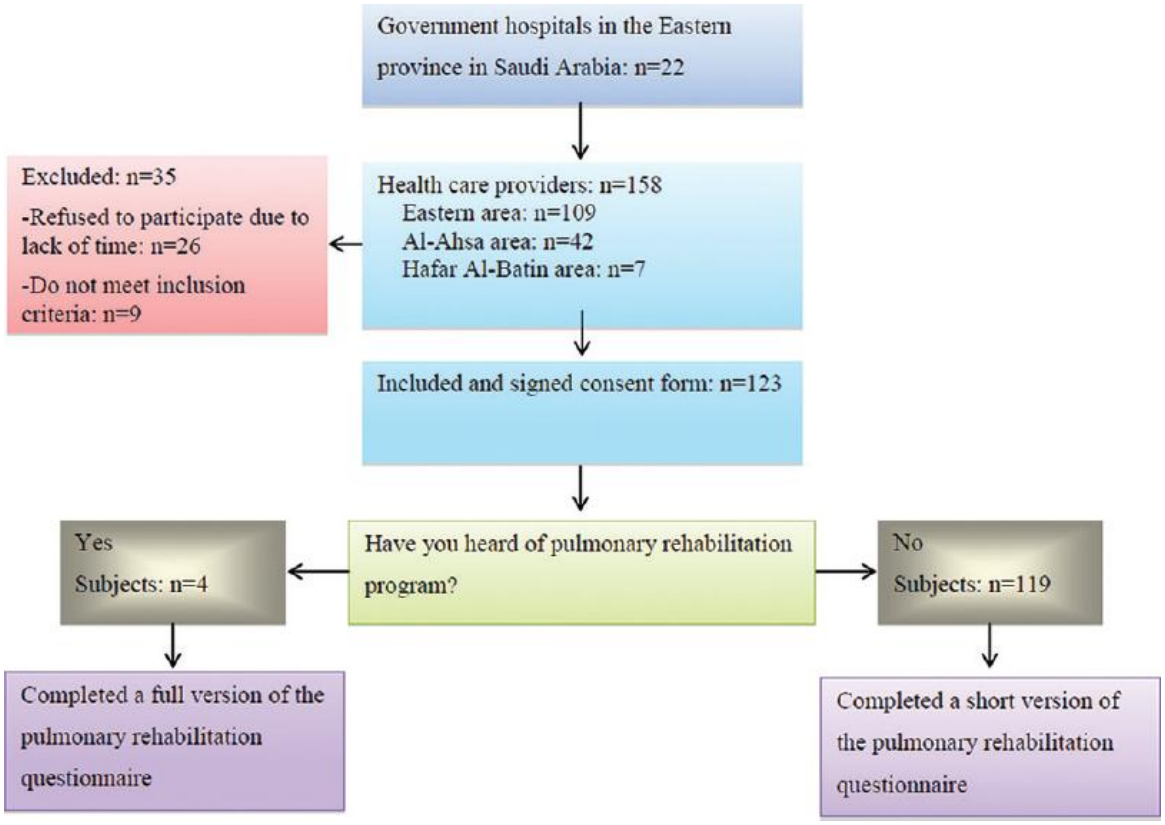

Figure 1: Flow diagram of health care provider's progress through the study

Box 1: Information about pulmonary rehabilitation program.

Pulmonary Rehabilitation is a program that includes exercise and education/self-management classes to teach patients with respiratory diseases such as COPD and asthma about their lungs, how to exercise and do activities with less shortness of breath, and how to "live" better with their lung condition. It will be provided by a multidisciplinary team and health care providers such as physicians, nurses and physiotherapists.

When patients attend education/self-management classes, they will learn many things about their disease. For example, the following topics will be discussed: what is wrong with their lungs, what their medicines do, when to call their health care provider, and how to avoid hospitalizations. During group meetings, patients will meet others with breathing problems. This gives them time share concerns and approaches to living with breathing problems. Patients need to attend an hour per week at hospitals for eight weeks or twelve weeks.

The main aim of self- management strategies is to change the patients' disease behaviour by increasing their knowledge, confronting them with consequences of specific behaviour, and supplying them with tools to deal with different components of their disease.

The exercise classes will help patients be more active with less shortness of breath. Usually, patients will be exercising both their upper and lower extremities. Pulmonary rehabilitation is proven to be effective in patients with respiratory diseases. The exercise classes will help patients feel better and become stronger by helping them get into better shape.

Studies show that pulmonary rehabilitation including exercise training and self-management decreased dyspnea, increased exercise capacity, increase a level of physical activity, reduced anxiety and depression, lower hospitalisation rates and higher quality of life.

In addition, inclusion of self-management strategies and thus change of disease behaviour may prevent this loose of benefits

Guidelines recommend that patients attend two times per week at the hospitals for eight or twelve weeks.

(Nici et al., 2006)

(Pulmonary rehabilitation toolkit 2012)

Chapter: 7

Tailoring pulmonary rehabilitation for government hospitals in Saudi Arabia: a focus group study

Mohammed E. Alsubaiei

Paul A. Cafarella

Peter A. Frith

R. Doug McEvoy

Tanja W. Effing

Abstract

Background: Pulmonary rehabilitation (PR) programs are not well established in secondary government hospitals in Saudi Arabia.

Aim: To tailor an existing Australian PR program to meet the specific needs of Saudi health care providers and patients in Saudi secondary government hospitals.

Methods: Two focus groups were conducted with healthcare providers followed by two focus groups with patients with respiratory diseases to identify recommendations for tailoring an existing PR program for use in Saudi secondary government hospitals. All focus groups were audio-taped and transcribed verbatim. The focus group transcripts were analysed using thematic analysis methods.

Results: Healthcare providers (n = 10) and patients with respiratory diseases (n = 10) participated in this study. The main topics gleaned from the two healthcare providers focus groups included: 1) a preference to increase health care providers' and patients' awareness and knowledge of PR program; 2) a maximum program length of eight weeks; 3) a frequency of three times per week for exercise; 4) gym sessions should be gender matched and separate gyms are needed for different genders; and 5) replacing the respiratory nurse by a respiratory therapists. The patients agreed with the adjustments as recommended by the healthcare providers and considered them as effective and valuable. However, patients felt that negative communication from the healthcare providers and lack of transportation could prevent patients from attending, adhering to and completing a PR program.

Conclusion: With the recommendations from Saudi healthcare providers and patients, we were able to tailor an existing Australian PR program for use in Saudi secondary government hospitals.

Introduction

Chronic obstructive pulmonary disease (COPD) affects many people worldwide (1). COPD is characterised by infection, airway obstruction and worsening in lung function that is not fully reversible (1). It is a serious respiratory disease with high and increasing morbidity and mortality (1). Saudi Arabia has a prevalence of COPD of 4.2% in the general population and 14.2% among smokers (3, 4). These prevalence rates of COPD in Saudi Arabia are comparable to the rates of other developed countries (4, 5). However, the alarming and growing evidence of smoking rates among Saudis (currently 20%) will add to an expected further rise of COPD prevalence rates in Saudi Arabia (6, 7).

COPD therapeutic management is divided into pharmacological therapy (such as bronchodilators, corticosteroids and antibiotics) and non-pharmacological therapy (such as pulmonary rehabilitation [PR] programs) (1, 8). PR programs are recommended as an effective treatment option for patients with a respiratory disease such as COPD or asthma (1, 9-11). Currently, we are aware of only one military tertiary hospital (the King Abdulaziz Medical City in Riyadh) that offers a PR program in Saudi Arabia (12). Therefore, the number of patients with COPD who can access PR in Saudi Arabia is extremely low (12).

Whereas the only existing Saudi PR program (12) is mostly in line with international PR statements , the education component is not provided by a multidisciplinary team but by two sole physiotherapists (10, 12, 13). This military tertiary hospital has access to more local resources (e.g. medical equipment, staff, and facilities) than most secondary Saudi government hospitals to which more patients with COPD and asthma are referred to (14-16). There are many models of PR that hospitals in the Eastern Province in Saudi Arabia could adopt (10, 17). Implementing an unadjusted Western PR program in a Saudi hospital could however lead to some difficulties driven by differences in culture, attitude, beliefs, lifestyle, and language (17, 18). For example, physiotherapy departments in all Saudi hospitals divided into male and female sections. Consequently, female patients are seen only by female physiotherapists, as per hospital policy in Saudi Arabian hospitals. In addition, frequently used assessment tools such as the Medical Research Council (MRC) dyspnoea scale and Saint George's Respiratory Questionnaire are available, valid, and reliable in the English

language but are not yet available in the Arabic language (2, 17). So far, two questionnaires, the Chronic Respiratory Disease Questionnaire (CRQ) and the COPD Assessment Test (CAT), have been validated and classified as reliable to use in the Arabic language, and they can be used in the assessment of patients with respiratory diseases (17).

A study published by our group showed that the main barriers to establishing PR programs in the Eastern Province of Saudi Arabia were lack of awareness and knowledge regarding PR, trained health care providers, hospital capacity, and funds (15). We recommend implementing a PR program that overcomes these barriers and is in line with international guidelines. In this study, we aimed to tailor an existing Australian PR program to meet the specific needs of Saudi health care providers and patients and to be suitable for use in Saudi secondary government hospitals. We therefore conducted focus groups with Saudi physicians, allied healthcare providers, and nurses that were involved in respiratory care in one large secondary government hospital.

Methods

Four focus groups were conducted during February and March 2016 in a government hospital within the Eastern Province of Saudi Arabia: two focus groups for healthcare providers, followed by two focus groups for patients with respiratory diseases.

All eligible healthcare providers from a secondary government hospital in Dammam city were asked to participate by the researcher during a personal meeting. To be eligible, healthcare providers had to meet the following criteria:1) be a physician, physiotherapist, psychologist, psychiatrist, nurse or dietician; 2) have access to evaluate, treat, and provide care for patients with respiratory diseases, such as COPD and asthma; 3) have experience with patients with respiratory diseases.

The patients were recruited from the internal medicine outpatient clinic at the government hospital in Dammam city. The participants had to meet the following criteria: 1) be an adult of 18 years of age and above; 2) have a chronic respiratory disease (e.g. COPD or asthma) diagnosed by physician; 3) be able to speak and read the Arabic language.

The participants attended one of four focus groups: 1) physicians; 2) nursing and allied healthcare providers; 3) male patients with respiratory diseases; and 4) female patients with respiratory diseases.

The researcher contacted the Directors of the following departments; Internal Medicine, Physiotherapy, Respiratory Care, Psychiatry, Nutrition and Nursing by letter to ask permission and to provide a list of physicians (n=10) and allied health care providers (n=10 [two healthcare providers from each departments]) who are providing care for patients with respiratory diseases such as COPD and asthma. For the physicians' focus group, the first seven physicians (Internal Medicine and respiratory physicians) of this list were asked to participate. The same was done for the allied health care providers' focus group. The researcher invited the first seven allied health care providers on the list, which included at least one healthcare provider of each of the following disciplines: Physiotherapy, Respiratory Care, Psychiatry, Nutrition, and Nursing. For the patients' focus groups, the researcher contacted the Director of the Medical Records department requesting a list of patients with respiratory diseases (e.g. COPD the diagnosis was confirmed with spirometry or asthma) (n=12). Convenience sampling was used to recruit patients with respiratory diseases. The researcher invited all 12 patients (n=6 male; n=6 female) from the list with respiratory diseases (e.g. COPD or asthma.

We decided to separate the focus groups for healthcare providers (Group 1: physicians; Group 2: nurses and allied healthcare providers) to avoid any potential influence of the difference in hierarchy between physicians and nursing and allied healthcare providers. The aim was to minimise the influence of physicians on the opinions and recommendations of nursing and allied healthcare providers. In addition, we decided to separate the focus groups for male and female patients with respiratory diseases to create a more 'safe' and 'private' environment especially for the female patients to provide their opinions and recommendations. This gender separation was not applied to the healthcare providers because males and females are accustomed to and familiar with sharing opinions and recommendations in hospital departments in Saudi Arabia.

The research protocol was approved by the Southern Adelaide Clinical Human Research Ethics Committee (500.15 - HREC/15/SAC/493) and Institutional Review

Board at MOH in Saudi Arabia. All included participants signed a written informed consent.

All four focus groups were led by investigator MA. A structured schedule was used in the two focus groups to guide the discussions and ensure consistency between groups (healthcare providers: see Box 1; patients: see Box 2). The focus groups were audio-taped and transcribed verbatim.

Healthcare provider focus groups

Prior to the healthcare provider focus groups, all healthcare providers were provided with a link to a video recorded PowerPoint presentation via the Virtual Medical Academy website in order to update their knowledge regarding PR programs (19). The series of presentations explained what PR is, the main benefits of PR, necessary assessments prior to PR, components of PR programs, healthcare providers involved, specific characteristics of PR programs (e.g. duration, frequency), and the minimum requirements to facilitate the establishment of PR programs with limited resources. Finally, the structure and the process of the existing Australian selected outpatients PR program, which is consistent with international guidelines, was discussed (see Box 3) (10). The presentations took around two hours to complete. The healthcare providers were asked to watch these presentations within a one-week period.

The health care providers were asked to provide their opinions and recommendations regarding the adjustment of the existing Australian PR program to make it suitable for the Saudi population. Five topics were discussed: 1) referral process; 2) assessments; 3) exercise training; 4) education topics, and 5) home exercises (Box 1). Each focus group lasted approximately one hour. The two healthcare provider focus groups were conducted in the English language, the official language in Saudi hospitals. At the end of these focus groups, a summary document with the participants' recommendations was analysed and sent to all health care providers by email for their feedback and comments. Based on the health care providers' focus group data, two study investigators (MA and PC) formulated the recommended adjustments to the existing Australian PR program and provided these adjustments to the patient focus groups.

Patient focus groups

One week prior to the patient focus groups, investigator MA sent the patients two Arabic letters that included general information regarding PR and a summary of the recommended adjustments to the existing Australian PR program from the healthcare providers' focus groups (these documents were translated from the English by an official translator ; see Box 4 and 5). These Arabic documents were reviewed by two independent Saudi respiratory physicians to ensure that the translation was satisfactory and covered the main points.

During the 45-minute focus group, the patients were asked five open-ended questions regarding the acceptability of this adjusted PR program and barriers that might prevent them from participating in this program (Box 2). A summary of the patient focus group meetings was sent to all patients by mail for their feedback and comments. The final transcript was translated into the English language by an independent official hospital translator. This English version was translated back into Arabic by another independent official hospital translator. The back-translation was compared to the original version by the first investigator MA.

Data analysis

Each focus group transcript was analysed separately by two study investigators (MA and PC) using thematic analysis methods (see Box 6) (20).

Results

All health care providers completed the online education package before the focus group.

Table 1 shows the characteristics of the participants in each focus group.

Quotes exemplifying the major themes and concepts stipulated in physician and other healthcare provider focus groups are presented in Table 2. There was agreement in the majority of the general themes in both healthcare provider focus groups. "Respiratory nurses can be replaced by respiratory therapists locally" was the main difference, as this was only reported in the allied health care provider and nursing focus group. Table 3 presents the healthcare providers' recommendations to tailor the existing PR

program for use in secondary government hospitals in Saudi Arabia.

Table 4 lists quotations that exemplify the major themes drawn from both patient focus groups. The patients were mostly happy with the content of the PR program presented to them. However, some group differences in the themes emerged. The male patients reported the following themes: "individualised and private education was preferred in addition to standardised group education", "feeling that they would get more psychological benefits of home exercise compared with the exercise in hospitals", and "negative communication regarding PR from the health care providers should be avoided". Three different themes emerging from the female patient focus group were: "male and female mix of patients and presenters is acceptable for the education component", "valued presence of family members", and "privacy concerns about the use of technology for home exercise".

Discussion

This study is the first to provide the opportunity for Saudi healthcare providers and respiratory patients to present their opinions and suggestions regarding tailoring a PR program to be suitable for use in secondary government hospitals in Saudi Arabia. These suggested adjustments should be considered before implementing PR programs in Saudi Arabia. The major themes gleaned from the healthcare providers focus groups included 1:) a preference to increase health care providers' and patients' awareness and knowledge of PR program; 2) a maximum program length of eight weeks; 3) a frequency of three times per week for exercise; 4) gym sessions should be gender matched and separate gyms are needed for different genders; and 5) replacing the respiratory nurse by a respiratory therapists. In general, based on the patients' focus groups, the patients showed acceptance of the healthcare providers' recommendations and the presented PR program. The patients also considered the suggested Saudi PR program to be effective and valuable. However, the patients felt that negative communication from the healthcare providers and lack of transportation could prevent patients from attending, adhering to and completing a PR program.

In one of our previous studies, lack of awareness and knowledge about PR, trained healthcare providers, hospital capacity, and funds were identified as the main barriers for setting up PR in Saudi Arabia (15). Lack of awareness was also reported by the

physicians in a previous study as one of the main barriers to referring patients to a PR program in an Australian study (21) but was not mentioned in this focus group as a barrier. Similar to previous studies, our study participants recommended providing education of PR program for both healthcare providers and patients as a necessity to increase awareness and knowledge of PR and to optimise the uptake of and referral to PR program (21, 22). Evidence shows that a better understanding and awareness of PR can lead to better adherence of PR in COPD care (21-24). Therefore, education programs should be provided to close the gap in knowledge and overcome these barriers. Lack of hospital capacity and funds were not identified as barriers in this study, whereas they were identified in one of our previous studies (15). This may be explained by the fact that the proposed PR can be provided using existing local hospital infrastructure services (e.g. physiotherapy gym and auditorium) and already employed healthcare professionals (25). Most large secondary government hospitals in the Eastern Province have the capability to establish a PR program because they have these services available (14). With all the available evidence for PR, it should therefore be possible to convince large secondary hospitals to establish PR programs.

The structure and content of the proposed Saudi PR program is compatible with international PR statements (10). An important recommendation from both healthcare provider focus groups was a maximum PR program length of eight weeks. Evidence has shown that an eight week PR program can be effective for patients with respiratory diseases (10, 12, 27). Although there is no optimal duration for PR programs, current evidence suggest that it is more likely that longer PR programs may lead to greater improvement in patient outcomes (10, 17, 25). In Saudi Arabia, it is however reasonable to begin the program with eight weeks as our suggested by our participants, because an eight week program is more feasible and easier to fund than a longer program. Previous studies have also recommended that an effective PR program should include at least three supervised exercise training visits, or two supervised visits and one unsupervised visit per week, with a minimum of 30 minutes duration (10, 17). The focus group recommendation of three times per week supervised exercise training is therefore in line with the guideline recommendations. Our participants recommended that the assessment process and the education component of the PR should be performed by multidisciplinary staff in line with the existing Australian PR program and international PR statement (10, 25). Our

participants in the allied health care provider and nursing focus group preferred however to include respiratory therapists, instead of nurses, in the PR programs because they believed that respiratory therapists are more qualified to care for patients with respiratory disease than nurses in the Saudi Arabian context (28). Our previous study also showed that there are currently no respiratory nurses involved in COPD care in the Eastern Province of Saudi Arabia because there is a limited number of nurses with a training specific to respiratory disease (14). Choosing a respiratory therapist instead of a nurse would therefore likely to be the best choice.

In Saudi Arabia, there are many cultural factors that need to be considered when it comes to tailoring PR programs to the Saudi community (10, 14, 20). The final PR program should be culturally appropriate in order to ensure maximum uptake, adherence and benefits for the target group (10, 18, 29). For example, evidence shows that tailoring and establishing a PR program for a specific culture group such as Indigenous Australians with COPD in Australia (e.g. eight week duration with two supervised exercise sessions and one hour of education) can led to significantly improved patient outcomes (29). Our participants addressed a very important cultural issue that exercise sessions should be gender matched and in separate gyms, so that patients can exercise with full respect for their privacy and cultural norms. The majority of women in Saudi Arabia wear a burka to cover their faces while in front of foreign men even healthcare providers which would limit their exercises in the physiotherapy gym. Thus, having separate gym facilities for female patients would enable a better exercise environment for female patients (10, 12, 14, 20). In addition, the female patients in our study did not wish to use video recordings for the two-weekly home based exercise sessions, as suggested by the healthcare providers and male patients.

Similar to our patients' comments, previous studies have reported that perceived negative communication regarding PR from healthcare providers and lack of transportation would prevent patients from attending, adhering to and completing PR (30-33). Previous studies have shown that negative communication with patients leads to lower patient adherence to the treatment, which may lead to poor patient outcomes (30, 32, 34, 35). Training physicians to have positive communication skills with patients will improve patients' adherence to the recommended treatment and thus

improve patients' outcomes (35). In addition, a home-based PR program may be a solution for patients who have transportation difficulties (36-38). Evidence has shown that home-based PR programs can be effective as an outpatient PR programs with patients with respiratory diseases such as COPD (36-38). In countries such as Saudi Arabia, where home-based PR is currently unavailable, providing public transportation to hospitals can be option for patients facing transportation difficulty. Providing public transportations or arrange private transpirations (e.g. taxi) that is fully paid by the government to patients in Saudi Arabia in general and female patients in particular, is highly recommended (39).

A possible limitation of this study is that we included only one healthcare provider for each allied health care provider specialty (i.e. physiotherapist, psychologist, respiratory therapist, nurse and dietician). This may have limited the generalisability of our results. However, the recommended adjustments in our study were in line with those in previous studies (10, 12, 27). Another limitation is that two female physicians did not attend the focus group because they were too busy; as a result, we had only one female (a nurse) who participated as a healthcare provider. The lack of female input may have influenced the quality of data, particularly because of the cultural driven differences between men and women in Saudi Arabia. The input of the female health care provider during the focus group was however in line male health care providers' recommendations. I could not conduct more focus groups to collect additional information due to lack of time. However, the sample size was in line with the literature (40) and the recommended adjustments in this study were consistent with previous studies (10, 12, 27). I assume that more participants would not add more information to our results because I feel that data saturation were determined. The later might be explained by the fact that there was not verity of the participants' opinions in each section and most of the participants were agree with each other and no argument points were reported.

Conclusion

This study has provided information that is necessary for the cultural adjustments required to tailor a PR program for use in secondary government hospitals in Saudi Arabia. The proposed tailored PR program is in line with international PR statements and can feasibly be implemented in Saudi secondary government hospitals. After

implementation, ongoing review is necessary to evaluate the outcomes, uptake, drop-out and attendance rates from this program, which may lead to further program adjustment and improvement.

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Table 1: Characteristics of focus group participants

Variable	Physicians (n = 5)	* Allied health care (n = 5)	Ŧ Male patients (n = 5)	** Female patients (n = 5)
Age (mean ± SD)	31.6 ± 5.6	29.6 ± 2.3	51.4 ± 10.8	49.0 ± 9.5
Gender (male), n (%)	5 (100)	4 (80)	5 (100)	0 (0)

* One representative was included for each allied health care provider specialty (four male [physiotherapist, psychologist, respiratory therapist, and dietician], and one female nurse).
Ŧ Four patients with COPD and one asthma patient were included.
** Three patients with COPD and two patients with asthma were included.

Table 2: Major themes and concepts arising from physicians' and health care providers' focus groups	
Major themes and concepts	**Example of participants quotations**
What procedures can be put in place to optimize the uptake of pulmonary rehabilitation program in this hospital?	
Increase awareness and knowledge of PR program	• 'We have to increase the awareness among the public in general and specifically among patients has or who has can be selected for the program … Increase the awareness even among the physicians because there was responsible for referral' (Physician 5). • 'I agree with my colleagues that we should provide education program for both patients and healthcare providers to increase the uptake' (Healthcare provider 3). • 'I think the need to start with educating the people from the disease' (Healthcare provider 1).
Create local policy and guidelines to include PR rehabilitation program	• 'We need to establish clear guidelines or policy and knowing the specific criteria for referring the patients' (Physician 3). • 'Referral pathway I think should be by specified who is referral. Should specified by policy or guidelines before referral to this centre' (Physician 2). • 'We need to do a new policy and procedure regarding that' (Healthcare provider 4).
Referrals can only be made by physicians due to Saudi Arabian policy	• 'Primary healthcare or family physician. They have eligibility to refer the patients to this program … qualified physicians to do this' (Physician 4). • 'Also internal medicine, internal medicine or pulmonologists, referral to this program' (Physician 2). • 'The program is not known and not been in the Saudi Arabia—that's why … the only physicians is I meant the physicians the only one who can make this order to be referral' (Healthcare provider 1). • 'We only received referral from physicians' (Healthcare provider 5).
Eight-week length of the PR program	• 'I think it is enough eight weeks' (Physician 5). • 'My suggestions is I think within the program if we say eight weeks I … my suggestion is one hour per week' (Physician 4). • 'It is enough I think eight weeks for at the beginning' (Healthcare provider 2). • 'He long duration just half hour for eight weeks' (Healthcare provider 4).
Eight to 15 patients per program in the PR program	• 'So, as this as they can. Eight to 10 patients' (Physician 3). • 'We can start as for example in the program in Australia 15, but after that we should evaluate after each cycle is this enough for needs and demands or not' (Physician 4). • 'Four to five patient per cycle I think it is enough at the beginning and we can increase it later' (Healthcare provider 2). • 'Five male will be in the male gym and five female will be in the female gym' (Healthcare provider 5).
What do you think about the assessment process for eligible patients and what are your recommendations to make it suitable in your hospital?	
Involve a multidisciplinary team in the assessment	• 'The first points we have respiratory physicians maybe I agree that the respiratory physicians in the beginning of the program who is the one who should assess the patients in the early stage in the program, but later on we increase we want to increase the number of the patients I think we should we have to include all physicians. After training with the pyhci assess to assess the patients. In addition to respiratory nursing in the Kingdom, we have respiratory therapist maybe maybe the the same maybe different name but the same function. So we already we have per .. person specialised in the respiratory therapy who is the one who is assess the this this action we have psychologist to assess the patients also we have number of dieticians. Also its important to assess these patients or the physiotherapy I think to provide specific section in the physiotherapy department for this program to let to let them is more time with this patients' (Physician 5). • 'Form my think, the process should be by stages. For example, started with the physicians then should go through the nurse, the therapist. So not including one person—it's including more many persons in the same time. Should be process with many stages' (Physician 1). • 'We could include some assessment process used in in the Australian program like psychologist, physicians, dietician and physiotherapy, and we suggest to replace respiratory nursing assessment by respiratory therapist because they have more qualified' (Healthcare provider 3). • 'Should be physicians, physiotherapist, respiratory therapist, dietician' (Healthcare provider 1).
Respiratory nurse can be replaced by respiratory therapists locally	• 'But I think the respiratory nurse will be replaced by respiratory therapist because we do not have respiratory nurse here and they not available in Saudi Arabia' (Healthcare provider 1). • 'In some hospitals, the nurse role is with the physicians in the assessment of the patients and but I think if the respiratory therapist did the assessment' (Healthcare provider 5). • 'And we suggest to replace respiratory nursing assessment by respiratory therapist because they have more qualified' (Healthcare provider 3).
Pulmonary function test, six minute walk test, and cardiopulmonary exercise test were nominated as appropriate local Pre	• 'We need pulmonary function test, like spirometry—very important to do it for each patients within each program' (Physician 4). • 'I think if we apply the maximum cardiopulmonary exercise and the submaximal six-minute walk they will be more better for our assessment' (Physician 1). • 'Usually in our hospital, physicians will do first the pulmonary function test' (Healthcare provider 5). • 'For exercise capacity assessment, we can use the maximal cardiopulmonary exercise test and six-minutes walk test' (Healthcare provider 3).

pulmonary rehabilitation assessment test	
The Arabic version of Chronic Respiratory Questionnaire, Hospital Anxiety and Depression Scale and modified Medical Research Council Dyspnoea scale were nominated as appropriate for PR program	• 'We motioned that before the questionnaire who has the Arabic version we have the priority to use it' (Physician 5). • 'We have many scales measure the other the others parameters, like we have hospital anxiety and depression scale we can use it for the mental. Even for the dyspnoea we can use the modified Medical Research Council Dyspnoea scale and also there is many scales other than that for the quality of life we can use for our available Arabic version the Chronic Respiratory Questionnaire. So we can make the whole assessment through these scales' (Physician 1). • 'We can use Arabic version of chronic respiratory questionnaire and, for dyspnoea, we can use Arabic version of modified Borg dyspnoea scale and, for the mental health assessment, we can use hospital anxiety and depression scale in Arabic version' (Healthcare provider 3). • 'Also we can use the Borg for dyspnoea because it is available in Arabic for the dyspnoea' (Healthcare provider 2).
How would you provide the exercise training?	
Three times per week for exercise sessions	• 'I think we can increase the frequency—could be three per week instead of two weeks in our culture. We see our patients who they … who are the doing physiotherapy, some time when they make a book for twice per week, they considered as very low number, so I recommend to make it three per week' (Physician 1). • 'I agree that exercise training should be three times per week' (Healthcare provider 3). • 'I think three times is enough per week the duration' (Healthcare provider 4).
Exercise sessions should be gender matched and separated gyms are needed for different genders	• 'We should to consider our culture about the women and men. We have a separate gym for women separate gym for men also' (Physician 4). • 'Should be compatible with our clutter. Should be separated male and female' (Physician 5). • 'Five male will be in the male gym and five female will be in the female gym' (Healthcare provider 5). • 'The exercise should be supervision by physiotherapist. I mean for female patients should be supervision by female physiotherapist and male patients should be supervision by male physiotherapist' (Healthcare provider 3). • 'So we can provide the exercise for the male and female separated in two gyms' (Healthcare provider 2).
How would you make the education part appropriate for the Saudis culture?	
Involve a multi-disciplinary team in the education sessions	• 'My suggestions is I think within the program if we say eight weeks I … my suggestion is one hour per week and we can give the patients lectures by the team. That team is contained doctors and also general physicians and also respiratory therapist and physiotherapist' (Physician 4). • 'I agree that all disciplines, as it has mentioned—respiratory physician, psychiatry, physiotherapy. All of these should be involved in the education' (Physician 5). • 'The education program we can use the same staff in the Australian program' (Healthcare provider 3).
Two hours per week for education	• 'We can divide these two hours or make it one hour, as my colleague said. Either divide the two hour among three sessions and, depend on the schedule, if the discipline or the speciality has to present or to educate patients during the course, or make it only one hour per week' (Physician 5). • 'For me … I still going with two hours per week, but my suggestion that is to be in the same day, so it will be more easier for the patients to come at the same day to take these two hours in one session' (Physician 1). • 'I agree with my friend that we should make it like twice per week, one hour' (Healthcare provider 1). • 'I agree that education should be separate in … in one hour per day for two days' (Healthcare provider 3).
Recommend from eight to 15 patients for the education sessions	• 'The number it's very good that's from eight to 15. It will be easier for the presenter and more easier for the patients to understand and discuss about the topics' (Physician 4). • 'from eight to 15' (Physician 1). • '15 even more—it is depend on the place that will do the education' (Healthcare provider 5). • 'It can be like … it can jump from eight … to 12 to 15 patients' (Healthcare provider 1). • 'I think 15 it is okay… but I think the less number of patients that's better because they make sure that they understand the program' (Healthcare provider 2).
Family and carers should be invited to attend the education session	• 'The last thing for education I recommend that for the family to be included in the lectures. So they will make support because maybe they will be older patients and they need taking care for their family. So if we include their family in the cycle, it will be more beneficial' (Physician 1). • 'We should encourage the caregiver to come to this session' (Healthcare provider 1). • 'Also we can share the family or patients. The multidisciplinary meeting' (Healthcare provider 4).

What do you recommend to make the home exercise training component suitable for patients from your hospital?	
To use technology for home exercises	• 'In addition, what we have mentioned before—videos and technology for example. I mean SMS message, phone calls or maybe in the future the applications via smart phone, including it contain videos each week, exercises. It will be more beneficial' (Physician 3). • 'Also in addition to the home exercise, we can add to the applications every week. We can add for the physicians or for the physiotherapist for the assessor what is the patients is doing at home. So if he is practising his exercise by record the exercise, so he can revise it through the applications and see my patients if he improve or not' (Physician 2). • 'We can contact with the patients through social media and we can available with patients also at the beginning handout, brochures to try to encourage the patients continue in this program' (Healthcare provider 4). • 'Also we can put it the lectures regarding pulmonary rehabilitation in the website' (Healthcare provider 2).
Family and carers should be educated about exercise to assist patients with their home exercises	• 'I agree with my colleague said—in addition to that, most of the patients are elderly, I think we need to involve family in this home exercise' (Physician 1). • 'To encourage the relative of the patients to come and teach them how to educate, how to exercise with the patients' (Healthcare provider 2). • 'They will encourage patients' (Healthcare provider 5).

Table 3: Adjustments recommended by healthcare providers to tailor an existing PR program for use in government hospitals in Saudi Arabia		
Items	**Australian pulmonary rehabilitation program**	**Suggested Saudi pulmonary rehabilitation program**
Program type	Outpatient program and it includes exercise, education, and psychosocial support	Outpatient program and it includes exercise, education, and psychosocial support
Type of patients	Any patients with respiratory diseases such as asthma and COPD	Any patients with respiratory diseases such as asthma and COPD
Program duration	12 weeks	eight weeks
Number of patients in each PR cycle	15 per cycle (12 weeks)	eight to 15 per cycle (8 weeks)
Referrals to the program	Referrals can be made by any health professional	Referrals can only be made by physicians
Staff involved in the PR	Multi-disciplinary staff will be involved in the PR program*	Multi-disciplinary staff will be involved in the PR program*
Pre and post program patient assessment	Pulmonary function tests, multidisciplinary assessments (physician, respiratory nursing, psychologist, dietician and physiotherapist) and questionnaires	Pulmonary function tests, multidisciplinary assessments (physician, respiratory therapist, psychologist, dietician and physiotherapist) and questionnaires in the Arabic language
Number of supervised exercise sessions	Two times per week	Three times per week
Duration of exercise sessions	One hour	30 minutes to one hour
Place of exercise sessions	Physiotherapy gym	Separated gyms are needed for different genders (e.g. female gym for female patients and male gym for male patients)
Frequency and duration of education lecture sessions	Two hours per week	Two hours per week
Home exercise training	Two times per week	Two times per week
***** Multidisciplinary staff recommended : physicians, physiotherapists, respiratory therapists, nurses, psychologists, pharmacists, dieticians, occupational therapists, and social workers.		

Table 4: Major themes and concepts arising from patient's focus groups	
Major themes and concepts	**Example of participants quotations**
What do you think about the assessments prior to PR (e.g. medical, physiological, physiotherapy, and nutrition)?	
Perceived effectiveness and value encourages patients acceptance of PR assessments	• 'It is better because it makes me feel that I am worthwhile person, there people who are provide more care for me as a patient' (Male 3). • 'Because it is advantage for the patient' (Male 4). • 'It is very nice assessments and very pleasant and interesting. It reveals me early … part of the diseases that I have. It is excellent to see … my psychological and physical and intellectual level' (Female 2). • 'Patients know the disease that they have. It helps to treat these diseases … it helps the diseases that they have' (Female 4).
What do you think about the component of the exercise training, (length of the exercise training) and (number of sessions)	
Perceived value and acceptance of exercise component	• 'A good program, the duration is good' (Male 4). • 'I mean half an hour of exercise every day is beneficial and three days per week is enough' (Male 2). • 'We are satisfied, I mean the exercises is treadmill and bike, it would be enough' (Male 2). • 'The patients, yes, three days per week is nice. I mean it helps the patients to get fit' (Female 3). • 'It is useful and I get benefit' (Female 1).
Length of program (3 days) is acceptable	• 'Three days per week is very good. I mean it is suitable and the time is suitable' (Male 3). • 'It is very reasonable that three hours, three days per week is very reasonable and from half an hour to one hour for the exercise is suitable' (Male 1). • 'Three days per week is enough for the patient' (Female 5). • 'It is useful and I get benefit. The time is excellent. Three days is excellent' (Female 1).
Duration of the program (30 to 60 minutes) is acceptable	• 'Three hours is enough and suitable for the patients' (Male 5). • 'It is very reasonable that three hours' (Male 1). • 'The time is suitable, especially 30 minutes or one hour—they are both suitable' (Female 4). • 'The time is excellent and organised' (Female 5).
What do you think about the education topics, (length of the lectures), (place), and (number of participants in the same room)?	
Perceived value and acceptance education component	• 'also suitable, which will give the patients more chance to understand his disease' (Male 3). • 'Excellent and I means it is comprehensive I means and it does not need adding anything' (Male 1). • 'There will be a benefit for all patients. It will benefit them and educate them about the information that they do not know about. It will add information on the top of the information that patients know' (Female 4). • 'The education program is very interesting and nice and varied. It leads to increase primary care and health education' (Female 2).
Time of education program is acceptable	• 'The time is suitable and the number is also suitable which will give the patients more chance to understand his disease' (Male 3). • 'The time is suitable and nice' (Female 1). • 'The time is sufficient and the duration is enough for the patient. It is suitable' (Female 5).
Acceptance of group size of education component	• 'It is very suitable if the number do not increase above 10' (Male 2). • 'The number is suitable' (Female 1). • 'The number is very, very nice because if there are less people, it will be more focus on the patients' (Female 4).
Individualised and privet education in addition to standardised group education	• 'I see that the time is suitable, but one hour or half hour should be added in order to allow patients to have an individual discussion with healthcare providers' (Male 1). • 'As my brother said, the doctor can add extra time for patients if they have private questions' (Male 2). • 'It is suitable and half an hour addition for private questions between doctors and patients … I agree. Patient always loves the privacy and confidentiality of the situation, if he has private thing it is the best for him' (Male 5).
Male and female mix of patients and presenters is acceptable for the education component	• "There is no problem from mix the women and men in this medical filed as long as the benefit will be for the all" (Female 2) • "It is excellent point that those women in one site and men in one site, and I mean it is excellent for both. The time is suitable and there is no difference between men and women" (Female 3) • "There is no problem" (Female 1)

Valued presence of family members	• 'The idea of bringing a family member with the patient is beautiful and this idea is very, very excellent idea' (Female 4). • 'It is useful because their presence … it is beautiful with them' (Female 3). • 'It is beautiful the presence of family members' (Female 1).
What do you think about the component of the home exercise training?	
Perceived benefit of using technology to monitor home exercise	• 'I see that the video record technology is a great because doctors can follow up the patient's condition and he can see if the patient does the exercises incorrectly and he can correct them for the patient' (Male1). • 'I agree with the electronic application … for the devices. Now there is contact between the healthcare providers and the patients via message on this application' (Male 5). • 'Home exercises is excellent and it is so wonderful to continue health education for the patient and maintain his health' (Female 2). • 'It is up to date, advantage of phone' (Female 5).
Psychological benefit of exercise in home compared with the hospitals	• 'It is better for the patients to do home exercise via the application instead of going to the hospital. It is good for the patient psychologically' (Male 1). • 'It helps the patient psychologically' (Male 2). • 'It might be at home 60% or 80% instead of going to the hospital because it might not be a good time, such as the morning or afternoon, in addition to the transportation' (Male 5).
Privacy concerns about the use of technology for home exercise	• 'All cultures are very excellent, except for the idea of video recording the home exercises program at home. It is kind of privacy' (Female 2). • 'It is very difficult because it is our privacies as women that do not video record ourselves in the mobile phone' (Female 5). • 'Yes, exercises for exercises, but not video record' (Female 3).
What would prevent you from attendance, adherence and completing PR program?	
Transportation	• 'It is not far away due to lack of transportation' (Male 4). • 'I do not want to say that transportations do not have a big role' (Male 5). • 'The prevention is lack of transportation to go to this program' (Female 2). • 'Transportation, some women find it difficult to go with a stranger person or a driver' (Female 4). • 'It could be transportation. She cannot continue' (Female 3).
Perceived negative communication from the health care providers	• 'I see that the first obstacle is the government hospital, the staff in the government hospital. They always complain from the patients' attendance, our society here' (Male 5). • 'Some of them do not care about time or the doctor himself meets the patient with smile and the doctor doesn't expel the patient' (Male 3). • 'According to the government hospitals, there is always pressure on them and this situation put obstacle to the healthcare providers and the patients. For the patients, they always complain' (Male 2). • 'It is always that nurses and healthcare providers complain from the patients who come frequently to the hospitals' (Male 5).
Providing transportations such as buses would make attendance more likely	• 'Provide a transportation options to take patients from their home to the hospitals and take them back' (Male 3). • 'Providing the transportations in order to attract patients and continue the program' (Male 4). • 'Providing special buses from the hospital to the patients' (Female 5). • 'The same thing if there is bus, so it can be easy for them, close to their home' (Female 3).

Box 1: Focus group schedule

Introduction

Thank you for attending this meeting today. You have been invited to this meeting because you are currently involved in the care of patients with respiratory diseases such as COPD and asthma. We hope that you will be able to help us design a pulmonary rehabilitation program that can be used for patients with respiratory disease in government hospitals in Saudi Arabia.

Before we begin, I have some information regarding this meeting that I would like to share with you.

This focus group will take around two hours, so feel free to move around if you need to refresh yourself.

We ask that you turn off your phones or pagers. If you cannot and if you must respond to a call, please do so as quietly as possible and re-join us as quickly as you can.

We will audio- tape this session because we don't want to miss any of your comments. However, data will be de-identified in all documentation of this study. Data will be handled with the highest confidentiality.

We have asked you to watch the PowerPoint presentation regarding PR and we hope that this information will help facilitate the discussions today.

There are no right or wrong answers and we are interested in everyone's point of view equally. Please feel free to share your opinion even if it differs from what others have said. Keep in mind that we're just as interested in negative comments as positive comments.

Our discussion will be divided into the following five sections: selection of patients and referral process to PR program, assessments pre and post PR program, exercise training, education topics, and home exercises program.

Our questions will focus on your opinions and recommendations regarding the applicability of and necessary changes to an existing Australian PR program when implemented in this hospital. This existing PR program has been presented in the video recorded PowerPoint presentation. The aim is to modify this PR program to make it suitable for patients with respiratory diseases in government hospitals in Saudi Arabia. In front of you there is a summary of this PR program and its structure to help you to provide us with your opinions and recommendations.

My role as moderator will be to guide the discussion, ask questions, take note of your opinions and your recommendations, and provide a final summary of this focus group.

My role is also to lead you through the questions so that we finish on time. Please do bear with me if we have to move to the next section.

The role of the assistant is to help me to tape record this focus group and to take note of your opinions and your recommendations.

Please let us get started.

Overall comment:

We would like to modify this PR program to make it suitable for patients with respiratory diseases such as asthma and COPD in your hospital and in other government hospitals in Saudi Arabia. We therefore would like to hear your recommendations in each of the following sections.

Section 1 (selection of patients and referral process to PR program):

Question 1:

What procedures can be put in place to optimise the uptake of PR program in this hospital?

- Selection of patients.
- Referral pathway.

Question 2:

Who will be able to refer patients to the PR program in this hospital?

Question 3:

How many patients should we strive for in one PR cycle?

- Throughput

Section 2 (assessments pre and post PR program):

Question 4:

What do you think about the assessment process for eligible patients and what are your recommendations to make it suitable in your hospital?

- What health care providers should be involved in the assessments process?

Question 5:

You have watched the video that describes which assessment tools are recommended in the PR program. Of these, which particular assessment tools would you recommend to use to assess: exercise capacity, quality of life, shortness of breath, and mental health?

Section 3 (exercise training):

Question 6:

How would you provide the exercise training in this hospital?

- How would you make it appropriate for the Saudis culture?
- Culture consideration: (Gender), Practical consideration: (e.g. group size, throughput, program length, and health care providers involvement in the exercise training)

Section 4 (education topics):

Question 7:

How would you make the education part appropriate for the Saudis culture?

- Culture consideration: (Gender), Practical consideration: (e.g. group size, throughput, program length, and health care providers involvement in the education part)
- Which topic do you recommend and suggest to add or to change in the education part to make it suitable for your hospital?

Section 5 (home exercise training):

Question 8:

What do you recommend to make the home exercise training component suitable for patients from your hospital?

Box 2: Focus group schedule for patients with respiratory diseases:

Introduction

Thank you for attending this meeting today. You have been invited to this meeting because you have been diagnosed with asthma or COPD by your physicians. We hope that you will be able to help us design a pulmonary rehabilitation program that can be used with patients with respiratory disease in government hospitals in Saudi Arabia.

Before we begin, I have some information regarding this meeting that I would like to share with you.

This focus group will take around one hour, so feel free to move around if you needed to refresh yourself.

We ask that you turn off your phones or pagers. If you cannot and if you must respond to a call, please do so as quietly as possible and re-join us as quickly as you can.

We will audio tape this session because we don't want to miss any of your comments. However, data will be de-identified in all documentation of this study. Data will be handled with the highest confidentiality.

We have asked you to read the letter regarding PR and we hope that this information will help facilitate the discussions today.

There are no right or wrong answers and we are interested in everyone's point of view equally. Please feel free to share your opinion even if it differs from what others have said. Keep in mind that we're just as interested in negative comments as positive comments.

Our discussion will be divided into five questions

Our question will focus on your opinions and recommendations regarding the applicability and necessary changes of an existing Australian PR program when implemented in this hospital. This existing PR program has been presented in the video recorded PowerPoint presentation. The aim is to modify this PR program to make it suitable for patients with respiratory diseases in government hospitals in Saudi Arabia. In front of you there is a summary of this PR program and its structure to help you to provide us with your opinions and recommendations.

My role as moderator will be to guide the discussion, asking questions, take note of your opinions and your recommendations, and provide a final summary of this focus group.

My role also is to lead you through the questions so that we finish on time. Please do bear with me if we have to move to the next section.

The role of the assistant is to help me to tape record this focus group and to take note of your opinions and your recommendations.

Before we get stated, I would like to ask you - what is your opinion of PR as a treatment for your lung condition?

Please let us get started

Question 1:

What do you think about the assessments prior to PR (e.g. medical, physiological, physiotherapy, and nutrition)?

- How acceptable would these assessments be to you?

Question 2:

What do you think about the component of the exercise training, (length of the exercise training) and (number of sessions)?

- How acceptable would these exercise sessions be to you?

Question 3:

What do you think about the education topics, (length of the lectures), (place), and (number of participants in the same room)?

- What topics would you add or change?

Question 4:

What do you think about the component of the home exercise training?

- How acceptable would this be to you?

Question 5:

If this program exists in your hospital and you have chance to participate, what would prevent you from attendance, adherence and completing this program?

Box 3: Pulmonary rehabilitation program of the Repatriation General Hospital

This existing PR program used in this study is a 12 week outpatient program comprising of two hours of education and two supervised one-hour exercise sessions (2). This PR program takes groups of up to 15 patients per cycle (12 weeks) and has an annual throughput of approximately 120 patients. Participants' health status is thoroughly assessed by multi-disciplinary staff (respiratory physician, respiratory nurse, psychologist, dietician, and physiotherapist) prior to the start of the program. This comprehensive assessment includes lung function tests, medical and nursing review, nutritional status, physiotherapy and psychological assessment and questionnaires. Interactive education sessions are conducted by a multi-disciplinary respiratory team and include the following topics (how the lungs work, treatments, device techniques, smoking cessation, psychosocial and carer issues, exercise and breathing techniques, energy conservation, palliative issues and nutrition issues). All education sessions are conducted in small groups up to 15 people. Individually tailored exercise sessions are supervised by physiotherapists in a hospital gym and can include arm and leg strengthening and endurance exercises, as well as bike-riding and treadmill-walking (2). Participants are also required to complete a tailored home exercise session weekly. A maintenance program exists and includes weekly, supervised (physiotherapist) exercise sessions.

Box 4: General information about pulmonary rehabilitation program

Pulmonary Rehabilitation is a program that includes exercise and education classes to increase your exercise capacity and strength and to teach you about your respiratory diseases such as COPD and asthma and to teach you about your lungs, how to exercise and do activities with less shortness of breath, and how to "live" better with your lung condition. The classes will be provided by a multidisciplinary team including healthcare providers such as physicians, nurses and physiotherapists.

The exercise classes will help you to be more active with less shortness of breath. Usually, you will be exercising both your upper and lower extremities. The exercise classes will help you feel better and become stronger by helping you get into better shape.

When you attend education/self-management classes, you will learn many things about your disease. For example: what is wrong with your lungs, how your medication works and how to use it, and when to call your healthcare provider for assistance so chances to be hospitalise reduce.

One of the aims of the education sessions is to improve your self- management strategies and supply you with tools to deal with different components of your disease.

You will need to attend two group exercise and education sessions twice a week. In total the time investment will probably be around two half a days per week for a period of 8-12 weeks. During the group meetings, you will meet others with breathing problems. This will also give you time to share concerns and approaches to living with breathing problems.

Box 5: Suggested design for the Saudi PR program based on healthcare providers' and physicians' opinions and recommendations

Program type: The PR program is an outpatient program and it includes exercise, education, and psychosocial support.

Type of patients: Any patients with respiratory diseases such as asthma and COPD

Program duration: eight weeks

Number of patient in each PR cycle: 10 up to 15 patients per cycle

Referrals: Due to Saudi Arabian policy, referrals can only be made by physicians

Staff involved in the PR: Multidisciplinary staff will be involved in the PR program: physicians, physiotherapists, respiratory therapists, nurses, psychologists, pharmacists, dieticians, occupational therapists, and social workers.

Pre and post patient assessment:

You will be asked to perform the following assessments

1) Pulmonary Tests which are a group of tests that measure how well the lungs take in and release air and how well they move gases such as oxygen from the atmosphere into the body's circulation. During the tests it is measured how much air you exhale, and how quickly.

The cardiopulmonary exercise test (CPET) is a test to measure how your lungs, heart and muscles react together when you exercise. While you walk on a treadmill, the health care provider will measure how much air you breathe, how much oxygen you need, and how fast and efficiently your heart beats when you exercise.

The six minute walk test is to evaluate your exercise capacity. You will be asked to walk as far as possible for six minutes and you will walk back and forth in a 50 meters hallway. You are permitted to slow down, to stop, and to rest as necessary.

2) ***Multidisciplinary assessments***: you will be seen by multi-disciplinary team that includes physician with nurse, physiotherapist, dietician, psychologist, and respiratory therapist. Each health care provider will evaluate you in his/her clinic.

3) ***Questionnaires involved in the PR program for patients assessment:*** you will be asked to complete a verity of questionnaires in the Arabic version to assess your quality of life, dyspnoea (your breathlessness), and your mental health

For your quality of life assessment, you will be asked to complete Chronic Respiratory Questionnaire which covers the domains of your dyspnoea emotion, fatigue and mastery. You are asked to grade your function in each item using a seven-point Likert scale.

For your dyspnea assessment during exercises session you will be asked to complete Modified Borg Dyspnoea Scale. You will be asked about how much difficulty your breathing causing you at the moment. It starts at number 0 where your breathing is causing you no difficulty at all and progresses through to number 10 where your breathing difficulty is maximal.

Also you will be asked to complete Hospital Anxiety and Depression Scale (HADS-) in order to assess your anxiety and depression. HADS is used to determine the levels of anxiety and depression that you are experiencing. The HADS is a fourteen item scale that generates ordinal data. Seven of the items relate to anxiety and seven relate to depression.

Exercise program in the PR program with consideration of the Saudi culture:

Number of exercise sessions: you will be asked to attend to the physiotherapy gym three times per week (supervised by the physiotherapist at hospital).

Duration of exercise sessions: The duration of the exercise sessions can be started from 30 minutes. Then, it can be increased gradually up to one hour.

Place of exercise sessions: Separated gyms is needed for different genders (e.g. female gym for female patients and male gym for male patients)

Staff involve in the exercise sessions: Exercise sessions should be gender matched (e.g. female physiotherapists for female patients and male physiotherapists for male patients

***Ratio of staff to patient during exercises session*:** the ratio is one physiotherapist to three-five patients.

Education topics in the PR program with consideration of the Saudi culture:

Frequently and duration of education lectures sessions: you will be asked to attend the education session at hospital two times per week for one hour for eight weeks.

Patients in the education sessions: Up to 15 patients for the education sessions. Male patients and female patients can be in the same room during the education session.

Staff involve and topics in the education sessions:

Multidisciplinary staff involved in the education sessions and the suggested health care providers and topics for the education sessions for the PR program will be as following:

physicians: (e.g. Respiratory system – how it works, what goes wrong with it and what to do about it; exacerbations and action plans; physiotherapist: e.g. Breathing techniques, exercise, clearance; psychologist: e.g. Adjustment, anxiety, depression; respiratory therapist: Inhaled medications, techniques, O2, nebulisers; pharmacist: Medications; dietician: Nutrition; occupational therapist: (Energy conservation, activities of daily living and work simplification); social worker: Community resources, advanced care directives.

The educational topics will be presented by both male and female speakers.

Language of the education topics: language in the education sessions needs to be in Arabic.

Family support during the education session:

Your family members and carer will be invited to attend the education session

Home exercise training:

Training at home will be encouraged. You are encouraged to use specific information provided on social media and a website for your home exercises. In addition, you will be provided with printed copies of the home exercises that will assist you with their home exercises. In order to monitoring your home exercises, you will be contact by phone (one call per week), and text messaging. In addition, your family and carers will be educated about exercises to assist you with your home exercises.

Box 6: Thematic **analyses step, analyses performed by two investigators (MA and PC)**

1) Reading of final version of each transcript carefully several times, line by line.
2) Identifying relevant words, phrases and sentences.
3) Giving codes to the relevant words, phrases, sentences or sections.
4) Creating themes by grouping several codes.
5) Selecting main themes if they were reported by three or more of the participants in each focus group.
6) Phrasing the final themes, taking into account all main themes created from the previous steps.

Chapter: 8

General discussion

General discussion

This thesis has described the results of a series of studies that were performed in the Eastern Province of Saudi Arabia to evaluate and optimise the quality of care for patients with chronic obstructive pulmonary disease (COPD) in Saudi Arabia. The results of this thesis highlighted two main problem areas: 1) identification of current existing challenges and gaps in Saudi COPD management leading to suboptimal management of COPD; and 2) improving and optimising the quality of Saudi COPD care by providing online COPD guideline education program to increase physicians' awareness and knowledge of COPD guideline recommendations. In this final chapter, I discuss the results of my thesis in a broader context, highlight some methodological issues, and clarify the effect of these results on COPD care and future research in Saudi Arabia.

Identified challenges and gaps in Saudi COPD care

Inadequate hospital services

Due to inadequate respiratory services in the primary care centres in Saudi Arabia, most patients with respiratory diseases are referred to government hospitals for respiratory-specific care (1, 2). We observed that only five of 22 hospitals in the Eastern Province of Saudi Arabia have reasonable services in terms of COPD management, yet these services were still considered suboptimal when compared to national and international COPD guideline recommendations (see Chapters 3 and 6) (3, 4). In addition, our data revealed that no pulmonary rehabilitation programs had been implemented in the government hospitals in the Eastern Province (see Chapter 3). A very recent study, published in 2016, confirmed that Saudi hospitals generally lack services, medical equipment and healthcare providers (5). It is likely that these deficits negatively influence the quality of care for respiratory diseases such as COPD in Saudi Arabia (5) and may lead to reduced quality of life for patients with COPD and higher healthcare costs (4, 6, 7).

Recently, the Saudi government has established a vision to improve the health sector in general by 2030 (8). Based on the information made available by the government, the main aims of this 2030 vision for the health sector are: (i) improving and enhancing the capacity of the hospitals and health services; (ii) promoting preventive care; (iii) providing private medical insurance for general population; and (iv) optimising medical services in primary care centres. The Saudi government is now working step by step to improve the infrastructure in the health sector by establishing new hospitals in both rural and metropolitan areas to achieve the 2030 vision. In the past few years, changes have already been observed. The number of hospitals increased from 288 in 2010 to 312 in 2014 (an increase of 7,023 beds) (1). The government has established more medical, nursing and applied health science colleges in Saudi Arabia to increase the number of healthcare providers (1). More than 23 universities now provide medical, nursing and applied health science degrees for Saudi students, compared to five universities in 2000 (7). As a result, the percentage of Saudi citizen healthcare providers working in Saudi Arabia increased from 66.3% in 2010 to 72.6% in 2014 (1) and led to a decreased percentage of hired non-Saudi healthcare providers (1). In order to improve respiratory care, the special needs and requirements of respiratory patients should be considered in these future health infrastructure plans. It seems therefore advisable that the Saudi government gives higher priority to improving inadequate respiratory services currently available in hospitals such as spirometry, intensive care units, pulmonary rehabilitation programs, smoking cessation interventions, and specialised healthcare providers to match the evidence-based recommendations of expert societies for care of each of the range of respiratory diseases. The Saudi government should consider services that are more cost effective to implement in government hospitals. For example, they could provide smoking cessation clinics and PR programs in most government hospitals by using local recourses that are already available (e.g. physiotherapy gym and health care providers). To achieve this, it would be helpful if the Saudi government provided private medical insurance to improve access to medical services for the majority of

patients with COPD and encouraged private sectors to contribute to the improvement of health services for patients with COPD. The latter may decrease the financial stress and burden on the Saudi government.

Lack of awareness and knowledge of COPD guidelines

Studies have previously reported that lack of understanding and awareness of COPD guidelines by healthcare providers may decrease adherence to guidelines which may contribute to suboptimal COPD management (9-12) and increase the COPD burden, morbidity and mortality among patients together with higher healthcare costs (3, 4). Chapters 3, 4 and 6 of this thesis highlight that lack of awareness and knowledge of COPD guideline recommendations is a serious limitation. These results are in line with findings from many developed countries such as the United States of America, Switzerland, and Australia (9, 13, 14), but are in contrast with the results from a large international study conducted in 12 countries (15), which showed that more than 85% of the physicians were aware of COPD guidelines such as GOLD and local guidelines (15). The high level of awareness among physicians in this particular study may be explained by the fact that 34.6% of the included physicians were specialised in respiratory medicine and the majority of the included (primary care) physicians had received specific COPD education programs previously (15).

Previous studies in Saudi Arabia have reported that medical education in both undergraduate and postgraduate medical training levels is not optimal, which may explain some of the deficits in awareness and knowledge among healthcare providers in Saudi Arabia (16, 17). We recommend reforming the medical curricula and increasing healthcare providers' awareness and knowledge of the existing COPD guideline recommendations such as SICAD and GOLD in both undergraduate and postgraduate medical training programs to optimise the quality of COPD care. In addition, the Saudi Continuing Medical Education (CME) activities, aiming to increase healthcare providers' knowledge, clinical skills and update their medical information after completion of medical professional degrees (18-20), do not address

COPD guideline recommendations very well. For example, there were only four short (half-day) CME activities available regarding COPD management in the Eastern Province from January 2012 to October 2016 (2012, n = 2; 2013, n = 1; 2014, n = 1) and most respiratory CME activities were about asthma management (19, 21). I strongly recommend increasing the number of CME activities regarding COPD management in the Eastern Province. However, sometimes the 'knowledge is out there', but education sources have not been used efficiently among respiratory healthcare professionals in Saudi Arabia. This is illustrated by the fact that the Saudi Initiative for Asthma guidelines were established in 2009 (22, 23), yet Saudi physicians still had poor knowledge of asthma management recommendations in 2015 (24). Low levels of self-education and motivation among healthcare providers may be another possible explanation for healthcare providers' lack of knowledge because online evidence based medicine education programs are easily accessible and affordable to the majority of healthcare professionals worldwide (25-27). Therefore, it is strongly advisable to develop behavioural interventions aimed toward improving healthcare providers' self-education.

Other challenges and gaps in Saudi COPD care

Smoking cessation

COPD guidelines recommend that smoking cessation should be discussed with those patients who are currently active smokers as a part of their COPD management (3, 4, 28). Previous studies reported that decreasing the exposure to smoking is the key to stopping the development and progress of COPD and slowing the rate of deterioration of the remaining lung function (3, 29, 30). Several studies have reported that the prevalence of COPD (currently 14.2% among smokers) in Saudi Arabia will further increase due to the high exposure to smoking among adults and among young people (31-33). In addition, smoking cessation may be a factor that will help patients to complete the pulmonary rehabilitation program (3, 29, 30). Our results revealed however that physicians often did not discuss smoking cessation methods with their

patients with COPD (Chapter 5). For all the reasons mentioned above, smoking cessation and prevention programs are a main issue that the Saudi government should prioritise and invest more effort in the near future.

The Saudi government has already taken several actions to decrease the prevalence of smoking rates among the Saudi population. For instance, it has established the Tobacco Control Program to provide smoking cessation clinics and education programs for smokers free of charge (34). Smoking is now banned in the government sectors, universities and public institutions (34). In addition, the Saudi government has banned advertisements on smoking in the Saudi media (34). The Tobacco Control Program should however not be a stand-alone program; there is an urgent need to provide further education programs about the negative impact of smoking among young people. Studies have proven that smoking prevention programs provided at schools have short and long term positive effects on smoking reduction among young students (35, 36). For example, as a result of a school based smoking prevention program in Saudi Arabia, students had a higher level of confidence to remain a non-smoker in the future (36). Smoking prevention programs should therefore be widely implemented at all levels of schools in Saudi Arabia to prevent developing chronic diseases, including COPD among the Saudi population and thus decrease the healthcare costs. In this way, we may prevent young people from developing COPD in the future because GOLD statement reported that COPD is a preventative disease (3, 4, 28). In addition, it seems therefore advisable that an education program about Tobacco Control Program should be provided among healthcare providers to improve discussion about smoking cessation among patients with COPD.

Patient adherence

It is recognised globally that poor adherence of patients to the COPD treatment regimens as prescribed by their physician adds to suboptimal care (37-39). In Saudi Arabia, poor patient adherence to treatment regimens has been observed in patients with chronic diseases such as diabetes and hypertension (39, 40). Patients with COPD

may therefore have poor adherence as well. In this thesis, I have not investigated 'patient adherence'. To cover this area, further studies are strongly recommended. The results of the first two studies (Chapter 3 and 6) have given us a clear indication that inadequate awareness and knowledge of and adherence to COPD guideline recommendations among healthcare providers is currently negatively impacting on quality of care (Chapter 3) (9). I feel that we first need to focus on implementation of correct treatment regimens, before patient adherence can be optimised.

Possible improvement in COPD care and solutions to optimise the quality of COPD care

Improving physicians' and healthcare providers' awareness and knowledge of COPD guideline recommendations

Previous studies showed that providing an education program regarding evidence based medicine guidelines to physicians and healthcare providers improved their knowledge, skills and performance in their practice and led to improved patient outcomes (41-45). Education programs such as CME activities can be provided for healthcare professionals (18). These can be delivered as conference presentations, workshops, or online course activities (18, 46). In this thesis, I have used the online GOLD statement education program developed by our research group to improve physician awareness and knowledge of COPD guideline recommendations (see Chapter 5). The results in Chapter 5 revealed that our study intervention was effective and supported the notion that the internet and web based learning methods can be efficient and effective, and are overall well accepted by healthcare providers (Chapter 5) (25, 47). In addition, similar to our data, studies have previously reported that a good understanding and awareness of COPD guidelines can lead to better physician adherence to guideline recommendations in the short and long term (41, 43, 48-50). In this thesis, I however did not aim to evaluate the effects of implementation of COPD guideline recommendations on patients' outcomes. To cover this area, further studies are recommended.

The provision of online CME activities is a suitable and cost-effective alternative to traditional CME activities in light of previous studies showing that lack of time and workload were the main barriers to attend traditional CME activities in Saudi Arabia and in Australia (51, 52). Unfortunately in Saudi Arabia, the Commission for Health Specialties do not regard the online CME activities as effective as the traditional CME activities (18, 53). For example, healthcare providers need to earn a minimum of 15-30 CME hours annually to renew, keep their practitioners' practice licence, and keep their medical information up-to-date (18, 53). Based on the Saudi Commission for Health Specialties, online CME activities should not exceed 33% of the mandated CME hours required (18). I strongly recommend allowing an increased percentage of the mandated CME hours to be conducted online to encourage healthcare providers to participate in more online courses. In addition, I recommend that access to COPD online courses (e.g. our education program and the European Respiratory Society CME online) should be provided to the healthcare providers in Saudi Arabia to optimise the quality of care for patients with COPD.

Tailoring pulmonary rehabilitation programs

Many studies have shown that providing pulmonary rehabilitation programs improve patients' outcomes and quality of life (54-57). In this thesis, I focused on overcoming barriers for setting up pulmonary rehabilitation identified in Chapter 6 and tailoring a pulmonary rehabilitation program based on healthcare providers' and patients' opinions for use in the Saudi healthcare system in Chapter 7. Our data revealed that the proposed tailored pulmonary rehabilitation program is in line with international PR statements and is feasible to implement in Saudi secondary government hospitals (56). In this thesis I did not implement a pulmonary rehabilitation program to evaluate the uptake, drop-out and attendance rates. Further studies are recommended as a next step to cover these areas in particular. In order to optimise COPD care in general, we should provide COPD guideline education program to other healthcare providers (e.g. physiotherapists, mental health specialists, nurses and dieticians) to improve their

awareness and knowledge of COPD guideline recommendations. This will most likely also facilitate implementation of pulmonary rehabilitation programs in Saudi hospitals.

Strengths and limitations

With regard to the generalisability of our data, I feel that outcomes would be comparable or slightly worse in most of the other provinces of Saudi Arabia. This thesis was conducted in the Eastern Province of Saudi Arabia which has a high quantity of healthcare facilities (e.g. greater number of hospitals, beds, healthcare providers, and funds) compared to the other 12 provinces in Saudi Arabia (1). In addition, the Eastern Province is one of three that have recognised training hospitals in Saudi Arabia for physicians who want to specialise in internal medicine from Saudi Arabia, Middle East and Northern African countries (58). The recommendations as defined in this thesis may therefore be applied to the whole of Saudi Arabia and perhaps some other Middle East countries with similar cultural and healthcare approaches in order to improve COPD care. However our results might not be generalizable to all Middle Eastern counties such as Yemen and Syria because their healthcare systems are currently distorted by wars. In this thesis, I have used a combination of qualitative and quantitative designs (e.g. cross sectional, clustered RCT, and focus groups). I have chosen designs that fitted in my opinion best with the research questions(s). Whereas most likely other designs could have been used as well, the combination of quantitative and qualitative data should be seen as a strength which enabled us to identify gaps and suggestions for possible improvements in Saudi COPD care and to evaluate the study intervention. In addition, in this thesis the response rate of the participants was high in my studies and this strengthens the quality of the data and increases the internal validity.

A possible limitation of this thesis is that we used questionnaires to collect data. Whereas the use of other methods as, e.g. structured interviews, could have led to the collection of more detailed data, it would have increased the time burden for

participants and could therefore have led to the inclusion of fewer participants.

In this thesis, one of the inclusion criteria for the majority of the studies was that healthcare providers needed to have access to evaluate, treat, and provide care for patients with COPD with a minimum of ten cases per year to make sure they had a minimum level of experience. Only a limited number of disciplines were involved in COPD care and therefore the majority of the participants in this thesis were physicians, nurses and respiratory therapists. This may have limited the generalisability of some of our results.

We have only provided the online COPD guideline education program for physicians and not healthcare providers because in Saudi Arabia, physicians have the power and influence to change and improve the quality of care in Saudi Arabia. Physicians also are the medical "gate-keepers" who direct most decisions regarding the management of patients with COPD (e.g. diagnosis, assessment and develop the management plan for patients with COPD, as well as determining who should be referred to other healthcare providers such as physiotherapists, mental health specialists and dieticians). Providing our online COPD guideline education program to other healthcare providers would be a next step to optimise the quality of COPD care.

Conclusion and recommendations

In conclusion, this thesis shows that COPD management in the Eastern Province of Saudi Arabia is sub-optimal. My original contribution to knowledge is: 1) identification of challenges and the gaps in Saudi COPD management that currently exist; and 2) provision of directions for improving the quality of care for patients with COPD in government hospitals in the Eastern Province of Saudi Arabia.

Recommendations

- It is a priority to optimise the quality of care for patients with COPD in government hospitals in Saudi Arabia by implementing more respiratory

specific services (e.g. smoking cessation programs, spirometry, intensive care units, and pulmonary rehabilitation programs for patients with COPD).

- I recommend providing our online COPD guideline education program, including the flowsheet with COPD guideline recommendations, to physicians and other healthcare providers in secondary hospitals to improve awareness and knowledge of COPD guideline recommendations and facilitate implementation of pulmonary rehabilitation programs in Saudi hospitals.

- I recommend stimulating healthcare providers to use online education programs beside the traditional CME activities regarding COPD guideline recommendations to improve their knowledge and adhere to the COPD guideline recommendations.

- Further studies to assess the level of adherence to COPD recommendations by physicians are recommended in Saudi Arabia to ensure that physicians transfer the COPD recommendations to the COPD care correctly.

- Evaluation of the effect of the implementation of guidelines (e.g. considering spirometry, bronchodilators, corticosteroids, antibiotics, pulmonary rehabilitation program, physical activity, and vaccinations and discussing an action plan) on patient outcomes is recommended in Saudi Arabia.

- Providing access to the COPD online education program for primary care physicians is recommended to optimise quality of COPD care in primary care

- Establishing and implementing more pulmonary rehabilitation programs is urgently needed in the Eastern Provinces. Our proposed Saudi pulmonary rehabilitation program may guide this implementation.

- After implementation of pulmonary rehabilitation program, further studies are recommended to audit these programs to evaluate the uptake, drop-out, attendance rate and the effect.

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Online repositories

Table S1 Characteristics of the Directors of Department of Internal Medicine (n=22)

Age (mean ± SD; years)	45.40±9.31
Male (N; %)	19 (86.4)
Nationality (N; %)	
Saudi	7 (31.8)
Non-Saudi	15 (68.2)
Position (N; %)	
Internal medicine consultant	7 (31.8)
Internal medicine specialist	12 (54.5)
Respiratory physician consultant	3 (13.6)

Table S2 Summary of the current health care providers involved in COPD care in hospital in the Eastern province

Area	Eastern area: n=14															Al-Ahsa area: n=5						Hafar Al-Batin area: n=3				Total (N)
Hospitals	Total (N)	A	B	C*	D	E	F	G	H	I	J	K	L	M	N	Total (N)	O	P	Q	R	S	Total (N)	T	U	V	
Respiratory physicians																										
Consultants	8	3	0	0	0	0	0	0	0	0	0	4	0	1	0	2	2	0	0	0	0	0	0	0	0	10
Specialists	7	1	0	0	0	0	0	0	0	0	0	5	0	1	0	3	3	0	0	0	0	1	1	0	0	11
Residents	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	2	0	0	0	0	0	0	0	0	3
Respiratory therapists	28	6	0	0	0	0	0	0	0	0	0	10	10	2	0	1	0	0	0	0	1	0	0	0	0	29
Physiotherapists	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	1	0	0	0	0	3
Others (mental health specialists, respiratory nurses, and dieticians)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Percentage of COPD patients seen by internal medicine physicians (%)	–	100	100	0	100	100	100	100	100	100	100	0	100	100	100	–	0	90**	90**	90**	40**	–	100	100	100	–

Notes: A to V refers to a different specific hospital. *Patients with COPD were referred to the nearest hospital (hospital L). **The remaining patients were seen by general physicians.

Organizational survey

Hospital name:
Department:
Name:
Position:
Gender: **Male** ☐ **Female** ☐
Nationality:

1. **What is the total number of beds in your hospital?**
   ☐
2. **How many people have access to your hospital?**
   ☐
3. **Does your hospital have a respiratory department?**
   ☐ Yes If yes, please go to question 5
   ☐ No
4. **Does your hospital have an internal medicine department that admits respiratory patients such as chronic obstructive pulmonary disease (COPD) and asthma?**
   ☐ Yes
   ☐ No
   If no, please tell us which department admits respiratory patients such as (COPD) and asthma:
   .....
   Please, go to question 9.
5. **Does your hospital have a specific respiratory outpatient clinic available?**
   ☐ Yes If yes, please go to question 7
   ☐ No
6. **Does your hospital have an internal medicine outpatient clinic that admits respiratory patients such as COPD and asthma?**
   ☐ Yes
   ☐ No
7. **Does your hospital have a respiratory ward?**
   ☐ Yes If yes, please go to question 9
   ☐ No
8. **Does your hospital have an internal medicine ward that admits respiratory patients such as COPD and asthma?**
   ☐ Yes
   ☐ No
9. **Does your hospital have a respiratory team?**
   ☐ Yes
   ☐ No
10. **Is there a qualified respiratory physician on call every day of the year?**
    ☐ Yes
    ☐ No
11. **Does your hospital have spirometry available?**
    ☐ Yes
    ☐ No

Figure S1 *(Continued)*

12. How many emergency admissions for patients with COPD did your hospital take in 2012?

☐

13. How many qualified respiratory physicians are there in your hospital?

☐ Consultants
☐ Specialists
☐ Residents

14. How many nurses specialising in respiratory diseases are there in your hospital?

☐ Respiratory nurses
☐ Respiratory nurses practitioners

15. How many physiotherapists/respiratory therapists are involved in COPD care in your hospital?

☐ Physiotherapists
☐ Respiratory therapists

16. How many pulmonary function technicians are there in your hospital?

☐

17. How many respiratory therapists are involved in pulmonary function testing are there in your hospital?

☐

18. In your hospital what percentage of pulmonary function testing is performed by:

%	Technicians
%	Respiratory therapists
%	Others (Please specify them)

19. Does your hospital operate a system of specialty triage for COPD?

☐ Yes
☐ No

If yes, please explain: ……
……
……
……
……

20. What percentage of COPD outpatients in your hospital are seen by each of the following health care providers?

%	Respiratory physicians (ie, consultants, specialists and residents)
%	General physicians
%	Internal medicine physicians
%	Physiotherapist
%	Respiratory therapists
%	Respiratory nurses
%	Respiratory nurses practitioners
%	Mental health specialists (ie, psychiatrist, psychologists and mental health nurses)
%	Dieticians
%	Occupational therapists
%	Others: please mention them: …… ……

Figure S1 *(Continued)*

21. What percentage of COPD patients are seen by each of the following health care providers during an admission in your hospital?

%	Respiratory physicians (ie, consultants, specialists and residents)
%	General physicians
%	Internal medicine physicians
%	Physiotherapist
%	Respiratory therapists
%	Respiratory nurses
%	Respiratory nurses practitioners
%	Mental health specialists (ie, psychiatrist, psychologists and mental health nurses)
%	Dieticians
%	Occupational therapists
%	Others: please mention them: …… ……

22. Does your hospital have an Intensive Care Unit (ICU)?

☐ Yes
☐ No

23. Does your hospital offer non-invasive ventilation for acidotic respiratory failure patients?

☐ Yes
☐ No

24. Does your hospital offer invasive mechanical ventilation for acidotic respiratory failure patients?

☐ Yes
☐ No

25. Does your hospital have access to a pulmonary rehabilitation program for patients with COPD?

☐ Yes
☐ No If no, please go to question 31

26. What type of pulmonary rehabilitation program do you carry out? (Please tick all of the boxes that apply).

☐ Outpatient
☐ Inpatient
☐ Exercise only
☐ Education only
☐ Exercise and education
☐ Others pleases mention them: ……
……
……
……
……

27. How many weeks is the program?

☐

28. How many COPD patients are included in each pulmonary rehabilitation program?

☐

29. How many sessions are included in the pulmonary rehabilitation program?

☐

Figure S1 *(Continued)*

30. What health care providers are involved in the pulmonary rehabilitation program? (Please tick all of the boxes that apply).

Respiratory physicians (ie, consultants, specialists and residents)
General physicians
Internal medicine physicians
Physiotherapist
Respiratory therapists
Respiratory nurses
Respiratory nurses practitioners
Mental health specialists (ie, psychiatrist, psychologists and mental health nurses)
Dieticians
Occupational therapists
Others: please mention them: …….. ……

31. Does your hospital operate an early/supported discharge program for COPD admissions?

☐ Yes
☐ No

If yes, please explain: ……
……
……
……
……

32. To what percentage of COPD admitted to your hospital is this early/supported discharge program offered?

☐ %

33. Does your hospital take care of long-term oxygen patients?

☐ Yes
☐ No

If yes, how many patients per year: ☐

34. Does your hospital take care of home ventilated patients?

☐ Yes
☐ No

If yes, how many patients per year: ☐

Date:…….. **Signature:……**

Figure S1 Organizational questionnaire used to evaluate care within hospital services for patients with respiratory diseases such as COPD.
Notes: This material has not been reviewed by European Respiratory Society prior to release; therefore the European Respiratory Society may not be responsible for any errors, omissions or inaccuracies, or for any consequences arising there from, in the content. Adapted and reproduced with permission of the European Respiratory Society: An International Comparison of COPD Care in COPD Care in Europe. Results of the First European COPD Audit. Published by European Respiratory Society ©. First Edition 2012.

Appendix 1

Guidelines for Chronic Obstructive pulmonary Disease (COPD) survey

Hospital name:

Department:

Name (optional):

Position:

Gender: **Male** ☐ **Female** ☐

Nationality:

1. Number of years of COPD patient related experience?

☐

Section 1: Definition and overview of COPD. Please answer the following questions:

2. COPD is a chronic inflammatory disease due to noxious particles or gases and is characterized by progressive airflow limitation that fully is reversible.

☐ True

☐ False

3. Smokers are the only people who may develop chronic airflow limitations.

☐ True

☐ False

4. COPD, is a common preventable and treatable disease.

☐ True

☐ False

5. If optimal care is provided, lung function does not decline over time.

☐ True

☐ False

6. COPD is not reversible either spontaneously or with treatment.

☐ True

☐ False

7. COPD exacerbations are always commonly caused by klebsiella and pseudomonas infection.

☐ True

☐ False

1

8. The following pathologies are present in COPD except:

- ☐ Alveolar wall destruction
- ☐ Increase inflammatory cell: eosinophilic and mast cell
- ☐ Airway remodelling
- ☐ Pulmonary hypertension

9. What is not a risk factor for COPD? (Please tick all of the boxes that apply)

- ☐ Passive Tobacco smoke
- ☐ Occupational dusts, organic and inorganic
- ☐ Indoor air pollution from heating and cooking with biomass in poorly ventilated dwellings
- ☐ Outdoor air pollution
- ☐ Gender and Age
- ☐ Rhinitis
- ☐ Low Socioeconomic status and poor nutrition
- ☐ Asthma

Section 2: Diagnosis and Assessment of COPD. Please answer the following questions:

10. A clinical diagnosis of COPD should be considered in any patient who has dyspnea, chronic cough or sputum production, and a history of exposure to risk factors for the disease.

- ☐ True
- ☐ False

11. Chronic cough or sputum production is always diagnostic of COPD.

- ☐ True
- ☐ False

12. Spirometry is required to confirm the diagnosis of COPD.

- ☐ True
- ☐ False

13. Physical signs like hyperinflation and abnormal chest radiograph can help to confirm the diagnosis of a COPD.

- ☐ True
- ☐ False

14. Arterial blood gas measurements are routinely required in COPD diagnosis.

- ☐ True
- ☐ False

2

15. Measurement of lung volume is recommended during an exacerbation to determine the severity of illness.

☐ True

☐ False

16. Which of the following data sets is most diagnostic of COPD as a primary diagnosis? (Each value FEV1 and FCV is a % predicted)

	FEV1	FCV	post-bronchodilator FEV/FCV
☐	80	85	78
☐	65	80	64
☐	69	67	80
☐	50	80	75

17. A 70 year old farmer has been coughing regularly for 3 years. The cough has been associated with sputum expectoration. He has a smoking history of 23 pack years. During the last year, he has been prescribed antibiotics for 'colds' twice. The FEV1/FVC ratio was <70% and FEV1 was 30 %. The COPD Assessment Test (CAT) score was 12 and Breathlessness Measurement using the Modified British Medical Research Council (mMRC) Questionnaire grade was 3. Which group of COPD would you classify this patient?

☐ Group A

☐ Group B

☐ Group C

☐ Group D

18. A 65 year old lorry driver has been coughing more frequently over the last 3 years and this has been associated with sputum expectoration. He has of 25 pack years of cigarette smoking. The FEV1/FVC ratio was <70% and FEV1 was 55%. Which grade of COPD would you classify this patient?

☐ (Grade 1: Mild)

☐ (Grade 2: Moderate)

☐ (Grade 3: Severe)

☐ (Grade 4: Very Severe)

19. In an adult below 45 years of age, the screening for one of the following is helpful in the diagnosis of COPD?

☐ Alpha anti-trypsin deficiency.

☐ Cigarette smoke

☐ Carbon monoxide diffusing capacity DLCO

☐ Rheumatoid factor

3

Section 3: Principles of therapy of stable COPD. Please answer the following questions:

20. The management of stable COPD requires stepwise treatment like asthma.

- ☐ True
- ☐ False

21. Dry powder inhalers (DPI) requires higher inspiratory flow rates than metered dose inhalers (MDI).

- ☐ True
- ☐ False

22. The use of a spacer (holding chamber) improves drug delivery, increases lung deposition, and may reduce local and systemic side effects.

- ☐ True
- ☐ False

23. In patients with COPD who smoke, smoking cessation is essential.

- ☐ True
- ☐ False

24. Which of the following is not a goal of COPD treatment?

- ☐ Relieve symptoms
- ☐ Prevent disease progression
- ☐ Improve exercise tolerance
- ☐ Control or cure the disease
- ☐ Prevent and treat complications and exacerbation

Section 4: Pharmacotherapy of stable COPD and acute exacerbation. Please answer the following questions:

25. Inhaled long-acting inhaled B2-agonists are more effective and convenient than short acting B2-agonists in stable COPD.

- ☐ True
- ☐ False

26. Long-acting inhaled B2-agonists should be used as monotherapy in COPD as these medications appear to influence the airway inflammation.

- ☐ True
- ☐ False

27. Low dose theophylline is weak and they are less effective than a low dose of inhaled glucocorticosteroide in decreasing the long term decline in lung function.

- ☐ True
- ☐ False

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28. As add-on therapy to anti-cholinergics, theophylline is more effective than using long-acting inhaled B2-agonists alone in stable COPD.

- ☐ True
- ☐ False

29. Inhaled short-acting B2-agonists is the preferred bronchodilator of choice for acute exacerbation of COPD.

- ☐ True
- ☐ False

30. Oral or IV glucocorticosteroide is recommended for acute exacerbation of COPD.

- ☐ True
- ☐ False

31. Antibiotics are not routinely required unless there are signs of pneumonia, purulent and increased sputum production if the patient is on a mechanical ventilator.

- ☐ True
- ☐ False

32. Which of the following medications is recommended for stable COPD?

- ☐ Mucolytics
- ☐ Cough syrups
- ☐ Antibiotics
- ☐ Vitamins E and C
- ☐ None of the above

33. Prolonged inhaled glucocorticosteroids in COPD is recommended for patients in which grade?

- ☐ (Grade 1: Mild)
- ☐ (Grade 2: Moderate)
- ☐ (Grade 3: Severe)
- ☐ (Grade 4: Very Severe)
- ☐ (Grade 1: Mild) and (Grade 2: Moderate)
- ☐ (Grade 3: Severe) and (Grade 4: Very Severe)

Section 5: Non-pharmacotherapy of stable COPD and acute exacerbation. Please answer the following questions:

34. It is recommended to give vaccinations to all COPD patients.

- ☐ True
- ☐ False

5

35. Pulmonary rehabilitation is indicated only in patients with COPD in Grade 3: Severe and Grade 4: Very Severe.

- ☐ True
- ☐ False

36. Pulmonary rehabilitation is a recommended treatment option in COPD.

- ☐ True
- ☐ False

37. Surgery is often beneficial in COPD patients.

- ☐ True
- ☐ False

38. 100% O2 (7-10L/min) is required for hypoxia in acute exacerbation of COPD.

- ☐ True
- ☐ False

39. A Venturi mask is not more effective than a nasal prong/canula in delivering controlled oxygen in COPD.

- ☐ True
- ☐ False

40. Long term O2 therapy is indicated in COPD except:

- ☐ SaO2 <88 or PaO2 <55 mmhg ± hypercapina
- ☐ SaO2 <88 or PaO2 <55 mmhg ± pulmonary hypertension, PCV> 55%
- ☐ Peripheral oedema and RVF
- ☐ FEV1 is 70% of predicted

41. What is the optimal length of a pulmonary rehabilitation program?

- ☐ 6 weeks
- ☐ 8-12 weeks
- ☐ Less than 6 weeks

42. An optimal pulmonary rehabilitation program should include:

- ☐ Exercise only
- ☐ Education only
- ☐ Exercise and Education
- ☐ None of the above

6

43. It is recommended that Pulmonary rehabilitation should include the following health care providers (Please tick all of the boxes that apply):

- ☐ Internal medicine and Respiratory physicians
- ☐ Physiotherapists
- ☐ Mental health specialists
- ☐ Dieticians
- ☐ Respiratory nurses
- ☐ General physicians

Section 6: Prevention of COPD and comorbidity. Please answer the following questions:

44. Avoiding or controlling the risk factors after the development of COPD is not necessary.

- ☐ True
- ☐ False

45. Tobacco cessation therapy does not have a significant role in the management of COPD once the lung is damaged.

- ☐ True
- ☐ False

46. In general, presence of comorbidities should not alter COPD treatment and comorbidities should be treated as if the patient did not have COPD.

- ☐ True
- ☐ False

Section 7: Adherence to guideline. Please answer the following questions:

47. Are you aware of any a COPD protocol or guideline(s)?

- ☐ Yes If yes, please specify:.....
- ☐ No

48. Do you adhere to a COPD protocol or guideline(s)?

- ☐ Yes If yes, please specify:.....
- ☐ No

7

Section 8: barriers to Adherence to guideline. Please answer the following questions:

49. Which one of the following barriers are main causes of preventing you to adhere to the COPD protocol or guideline? (Please tick all of the boxes that apply).

- ☐ Disagree with the recommendations of guideline
- ☐ Lack of awareness
- ☐ Lack of familiarity of its recommendations
- ☐ Lack of educational material/support
- ☐ Lack of time
- ☐ Lengthy and difficult to remember
- ☐ Lack of equipment and resources (spirometry, cessation expert)
- ☐ Believed patients cannot adhere to guideline recommendations
- ☐ Believed guidelines will not improve the outcome of COPD
- ☐ Lack of motivation and poor dissemination by physician to colleagues
- ☐ Others: please mention them.....

.....

8

Appendix 2

Hospital name: **Department:** **Gender: Male ☐ Female ☐**

Age: **Nationality:**

Number of years of COPD patient related experience?

☐

Section1: Diagnosis and assessment:

1. **Which statement regarding guidelines recommendations for the use of diagnosis and the assessment of COPD do you agree with most?**

☐ I am not familiar with these recommendations.
☐ I am intending to use these recommendations but I am not confident about using them.
☐ I am intending to use these recommendations in the next month.
☐ I just recently used these recommendations.
☐ I have been using these recommendations for the past six months and intend to keep using them.

2. **My confidence re implementing diagnosis and assessment according to guidelines recommendations at the moment is: (please circle the number)**

1 2 3 4 5 6 7 8 9 10

Not being confident at all **As confident as possible**

Section 2: Therapeutic options (pharmacologic therapy and non-pharmacologic therapy):

A. pharmacologic therapy:

3. **Which statement regarding guidelines recommendations for the use of medications such as bronchodilators, beta2-agonists, anticholinergics, methylxanthines, inhaled/oral corticosteroids and antibiotics for patients with COPD do you agree with most?**

☐ I am not familiar with these recommendations.
☐ I am intending to use these recommendations but I am not confident about using them.
☐ I am intending to use these recommendations in the next month.
☐ I just recently used these recommendations.
☐ I have been using these recommendations for the past six months and intend to keep using them.

4. **My confidence re implementing pharmacologic therapy according to guidelines recommendations at the moment is: (please circle the number)**

1 2 3 4 5 6 7 8 9 10

Not being confident at all **As confident as possible**

1

B. Non-pharmacologic therapy:

5. Which statement regarding guidelines recommendations for the use of non-pharmacological therapy such as referral to a pulmonary rehabilitation program, recommending physical activity and offering oxygen therapy for patients with COPD do you agree with most?

- ☐ I am not familiar with these recommendations.
- ☐ I am intending to use these recommendations but I am not confident about using them.
- ☐ I am intending to use these recommendations in the next month.
- ☐ I just recently used these recommendations.
- ☐ I have been using these recommendations for the past six months and intend to keep using them.

6. My confidence re implementing non-pharmacologic therapy according to guidelines recommendations at the moment is: (please circle the number)

1 2 3 4 5 6 7 8 9 10

Not being confident at all **As confident as possible**

Section 3: Prevent deterioration:

7. Which statement regarding guidelines recommendations in terms of offering annual influenza vaccinations or pneumococcal vaccinations to patients with COPD and discussing an action plan with them in order to prevent deterioration do you agree with most?

- ☐ I am not familiar with these recommendations.
- ☐ I am intending to use these recommendations but I am not confident about using them.
- ☐ I am intending to use these recommendations in the next month.
- ☐ I just recently used these recommendations.
- ☐ I have been using these recommendations for the past six months and intend to keep using them.

8. My confidence re implementing guidelines recommendations in terms of offering annual influenza vaccinations or pneumococcal vaccinations to patients with COPD and discussing an action plan with them in order to prevent deterioration at the moment is: (please circle the number)

1 2 3 4 5 6 7 8 9 10

Not being confident at all **As confident as possible**

2

Appendix 1

Evaluation sheet for patients with COPD checklist

Hospital name: **Patient's file number:** **Patient's age:**

Patient's weight: **Gender: Male** ☐ **Female** ☐

New patient ☐ **Follow up** ☐

	Date: __/__/___	
Section1: Past history **Have you assessed/discussed:**	**Yes / No / NA**	**Comments**
1. Exposure to current risk factors (e.g. occupational, environmental)		
2. Smoking history?		Total of years: Total of pack years:
3. Medical history (e.g. asthma, allergies, respiratory infections in childhood, other respiratory diseases)		
4. Previous respiratory related hospitalisation		No of hospitalisation in the last 12 month
5. Presence of comorbidities		
6. Family history of respiratory diseases		
Section2: Diagnosis and assessment **Have you assessed/discussed:**	**Yes / No / NA**	**Comments**
7. Respiratory related symptoms		
8. Spirometry for severity monitoring and spirometry diagnosis		**FEV1 % predicted:** **FVC (litres):** **FEV1/FVC ratio:** **GOLD grade: 1,2,3,4**
9. Health status impairment test (CAT))		Score:
10. History of exacerbations *		Exacerbations/year:
11. Exercise capacity (6-minute walk test)		meters
12. Artery blood gas (ABG)		PaCO2: PaO2: PH: Saturation: Oxygen supply: L/min
13. x- ray		
14. Combined assessments GOLD (A,B,C,D) or SICAD (I),(II), (III) score:		

* Exacerbations is defined as worsening of patient's usual symptoms (more than 48 hours), which may require a change in usual medications

Section 3: Therapeutic options (pharmacologic therapy and non-pharmacologic therapy): **During this consult, have you**	**yes/ no/ NA**	**Comments**
15. Discussed smoking Cessation		
16. Prescribed short acting beta2-agonists?		Medication name:
17. Prescribed long acting beta2-agonists?		Medication name:
18. Prescribed short acting anticholinergic medication?		Medication name:
19. Prescribed long acting anticholinergic medication?		Medication name:
20. Prescribed a short-acting beta2-agonists and anticholinergic in one inhaler		Medication name:
21. Prescribed Methylxanthines (Theophylline)		Medication name:
22. Prescribed inhaled corticosteroids		Medication name:
23. Prescribed a long-acting beta2-agonists and corticosteroids in one inhaler		Medication name:
24. Prescribed systemic corticosteroids		□ exacerbation □ long term Medication name:
25. Prescribed phosphodiesterase-4 inhibitors		□ exacerbation □ long term Medication name:
26. Prescribed Antibiotics		□ exacerbation □ long term Medication name:
27. Considered pulmonary rehabilitation		
28. Recommended and encouraged physical activity at home		
29. Provided education advises (e.g. booklet, individual counselling or internet materials)		
30. Referred to physiotherapy for exercise training		
31. Referred for nutrition counselling		
32. Referral for psychological support		
33. Considered oxygen therapy		
34. Offered ventilatory support		
Section 4: Prevent deterioration **During this consult, have you:**	**Yes / No / NA**	Comments
35. Offered annual influenza vaccination		
36. Offered pneumococcal vaccination		
37. Offered and discuss self-management and action plan		

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