Abstract of thesis entitled

“An Evidence-Based Walking Exercise Program for Older Adults with COPD in Improving Quality of Life”

Submitted by

Chan Hoi Yan

for the degree of Master of Nursing

at The University of Hong Kong

in July 2014

The number of older adults suffering from chronic obstructive pulmonary disease (COPD) is increasing in Hong Kong due to the aging population. Their quality of life (QoL) would be reduced gradually after each episode of acute exacerbation. Many research studies have proved that walking exercise helps to increase functional capacity and QoL of COPD patients. The purpose of this dissertation is to develop an evidence-based walking exercise guideline in improving QoL of COPD patients.

Eight eligible studies were extracted from searching the existing databases for literature review. The tools developed by Scottish Intercollegiate Guideline Network were used for critical appraisal. Data from the studies were then summarized and synthesized.

Furthermore, the transferability and feasibility were assessed for the cost-effectiveness and its implementation potential in Hospital A. Therefore, a
walking exercise program was established. Patients are recommended to walk on a daily basis for 3 months at a certain duration and intensity.

Eventually, a plan for implementation and evaluation would be initiated by the research committee to try out the guideline and to assess the program effectiveness. After communicated with the program stakeholders, eligible patients would be recruited to pilot test. Outcomes including health related quality of life, functional capacity, patient compliance, nurse satisfaction and cost expenditure were evaluated after the program completed. Lastly, a set of basis was compromised by the research team as the criteria to consider the program effectiveness.

It can be concluded that a 3-months walking exercise program is effective in improving QoL of COPD patients than usual medical care. Their functional capacity and exercise compliance can also be improved after the program.
An Evidence-Based Walking Exercise Program for Older Adults with
Chronic Obstructive Pulmonary Disease in Improving Quality of Life

by

Chan Hoi Yan

RN; B.Nurs

A thesis submitted in partial fulfilment of the requirements for
the degree of Master of Nursing
at The University of Hong Kong.

July 2014
Declaration

I declare that this thesis represents my own work, expect where due acknowledgement is made, and that it has not been previously included in a thesis, dissertation or report submitted to this University or to any other institution for a degree, diploma or other qualifications.

Signed...............................................................................

Chan Hoi Yan
Acknowledgements

I would like to take this opportunity to express my greatest gratitude to my supervisors, Ms Rebecca Poon and Dr. Angela Leung, for their guidance, enlightenment and support in the accomplishment of my dissertation. I would also like to express my sincere appreciation to the lecturers for their education and tutorial sessions during the course of Master of Nursing.

May I also show my gratitude to my dissertation partner Miss Lai Tsz Ning and Miss Kwan Leung Ying for their support and tackling every obstacle we encountered together during these two years.

Last but not the least, I would like to offer my blessings and regards to my dearest family members, my ward manager and colleagues, and friends for their comments, encouragement and love throughout my study in the Master of Nursing.
Contents

Declaration......................................................................................................................... i
Acknowledgement........................................................................................................ ii
Table of Contents........................................................................................................ iii
List of Appendices.......................................................................................................... ix
Abbreviations................................................................................................................. xi

CHAPTER ONE: INTRODUCTION.................................................................................. 1

1.1 BACKGROUND ................................................................................................. 1
   1.1.1 COPD in Global Context........................................................................ 1
   1.1.2 COPD in Hong Kong ........................................................................... 2
   1.1.3 Management of COPD ........................................................................ 2

1.2 AFFIRMING NEEDS ...................................................................................... 2
   1.2.1 Pulmonary Rehabilitation Program .................................................. 2
   1.2.2 Generalizability of Pulmonary Rehabilitation Program.................. 3
   1.2.3 Importance of Patient’s Quality of Life .......................................... 4
   1.2.4 Negative Impact on Quality of life .................................................. 4
   1.2.5 Innovation of a Walking Exercise Training Program ..................... 4

1.3 SIGNIFICANCE .............................................................................................. 5
   1.3.1 Potential Benefits of Walking Exercise Program............................. 5

1.4 RESEARCH QUESTION .................................................................................. 6

1.5 OBJECTIVES .................................................................................................... 6

CHAPTER TWO: CRITICAL APPRAISAL................................................................. 7

2.1 SEARCH AND APPRAISAL STRATEGIES.................................................... 7
2.1.1 Identification of Study ......................................................... 7
2.1.2 Inclusion Criteria ................................................................. 8
2.1.3 Exclusion Criteria ................................................................. 8
2.1.4 Appraisal Strategies ............................................................. 8
2.2 RESULTS ................................................................................ 9
2.2.1 Search History ................................................................. 9
2.2.2 Extraction of Data .............................................................. 9
2.2.3 Critical Appraisal of Internal Validity ............................... 10
  2.2.3.1 Research Titles and Questions .................................... 10
  2.2.3.2 Study Design .............................................................. 10
  2.2.3.3 Randomization Method and Allocation Concealment 10
  2.2.3.4 Blinding ................................................................. 11
  2.2.3.5 Baseline Similarity .................................................. 11
  2.2.3.6 Measurement Tools ................................................ 12
  2.2.3.7 Attrition and Intention-to-treat Analysis .................... 12
  2.2.3.8 Overall Quality ........................................................ 13
2.2.4 Level of Evidence .......................................................... 13
2.3 SUMMARY AND SYNTHESIS ................................................. 14
2.3.1 Summary of Findings ....................................................... 14
  2.3.1.1 Participant Characteristics ....................................... 14
  2.3.1.2 Intervention, Duration and Frequency .................... 14
  2.3.1.3 Length of Follow-up ............................................. 15
  2.3.1.4 Outcomes and Measurement Tools ......................... 15
  2.3.1.5 Study Results ........................................................ 15
2.3.2 Synthesis of Findings ......................................................... 16
  2.3.2.1 Target Population .................................................. 16
2.3.2.2 Ground-based Walking Exercise.......................... 16
2.3.2.3 Extremity Endurance Training............................. 17
2.3.2.4 Education Sessions........................................... 18
2.3.2.5 Walking Intensity............................................... 19
2.3.2.6 Duration and Frequency...................................... 19
2.3.2.7 Follow-up Visits.................................................. 20
2.3.2.8 Measurement of Health-Related Quality of Life........ 20
2.3.2.9 Treatment Effect with Length of Program............... 21
2.3.2.10 Exercise Performance....................................... 21

2.3.3 Conclusion........................................................................... 22

CHAPTER THREE: TRANSLATION AND APPLICATION............... 24

3.1 IMPLEMENTATION POTENTIAL........................................... 24
3.1.1 Target Setting and Target Audience............................. 24
3.1.2 Transferability of the Findings...................................... 24
3.1.2.1 Proposed Setting................................................ 24
3.1.2.2 Proposed Audience............................................ 25
3.1.2.3 Philosophy of Care............................................. 25
3.1.2.4 Time for Implementation and Evaluation.............. 26
3.1.3 Feasibility....................................................................... 26
3.1.3.1 Freedom of Nurses to Carry Out or to Terminate the
            Innovation.......................................................... 26
3.1.3.2 Interference with Current Staff Functions............... 26
3.1.3.3 Administration Support and Organizational Climate
            to Research Utilization......................................... 27
3.1.3.4 Consensus.......................................................... 27
3.1.3.5 Nursing Staff Training and Skills............................. 28
3.1.3.6 Equipment and Facilities................................. 28
3.1.3.7 Measurement Tools for Evaluation....................... 28
3.1.4 Cost-Benefit Ratio of the Innovation................................. 29
  3.1.4.1 Potential Risks................................................. 29
  3.1.4.2 Potential Benefits............................................ 30
  3.1.4.3 Cost-Benefit Ratio............................................. 30

3.2 EVIDENCE-BASED PRACTICE GUIDELINE............................. 31
  3.2.1 Title of the EBP Guideline........................................ 31
  3.2.2 Objectives of EBP Guideline.................................... 31
  3.2.3 Target Users.......................................................... 32
  3.2.4 Target Population.................................................. 32
  3.2.5 Rating Scheme for Grades of Recommendation............... 32
  3.2.6 Recommendations.................................................. 32
   3.2.6.1 Recommendation 1.0: Walking Exercise Sessions32
   3.2.6.2 Recommendation 2.0: Duration and Frequency.... 34
   3.2.6.3 Recommendation 3.0: Evaluation of the Training
           Program.................................................................. 35

CHAPTER FOUR: IMPLEMENTATION PLAN................................. 37
  4.1 COMMUNICATION PLAN.................................................. 37
    4.1.1 Identification of Stakeholders............................... 37
    4.1.2 Process of Communication...................................... 37
      4.1.2.1 Initiation of Communication............................ 37
      4.1.2.2 Empowerment and Facilitation........................ 38
      4.1.2.3 Monitoring and Sustaining.............................. 39
### 4.2 PILOT TESTING PLAN

- **4.2.1** Objectives of Pilot Test
- **4.2.2** Target Setting and Population of Pilot Test
- **4.2.3** Study Design
- **4.2.4** Program Intervention
- **4.2.5** Outcome Measurement
- **4.2.6** Evaluation of Pilot Testing

### CHAPTER FIVE: EVALUATION PLAN

- **5.1** Identification of Outcomes
- **5.1.1** Patient Outcomes
- **5.1.2** Healthcare Provider Outcome
- **5.1.3** System Outcome
- **5.2** NATURE OF CLIENTS INVOLVED IN THE PROGRAM
- **5.3** DETERMINATION OF NUMBER OF CLIENTS
- **5.3.1** Sampling Method
- **5.3.2** Major Outcome
- **5.3.3** Sample Size Calculation
- **5.4** DATA COLLECTION AND DATA ANALYSIS
- **5.4.1** Design
- **5.4.2** Outcome Measurements and Evaluation Objectives
  - **5.4.2.1** Patient Outcomes
  - **5.4.2.2** Healthcare Provider Outcome
  - **5.4.2.3** System Outcome
  - **5.4.2.4** Time for Outcome Measurement
- **5.4.3** Method of Analysis
5.5 BASIS FOR THE EFFECTIVENESS OF THE PROGRAM.............. 47

CHAPTER SIX: CONCLUSIONS AND IMPLICATIONS.................. 49

Appendices............................................................................................................ 50

References............................................................................................................. 89
List of Appendices

Appendix I
SIGN Methodology Checklists................................................................. 50

Appendix II
SIGN Grading System 1999-2012: Levels of Evidence............................. 66

Appendix III
Summary of search history..................................................................... 67

Appendix IV
Table of Evidence.................................................................................. 68

Appendix V
Levels of evidence of the review studies................................................. 76

Appendix VI
Table of Set-Up Cost and Operational Cost of WEP............................... 77

Appendix VII
SIGN Grading System 1999-2012: Grades of Recommendations............... 78

Appendix VIII
Content of Written Proposal of WEP...................................................... 79

Appendix IX
Timeframe for Implementation and Evaluation Plan............................... 80

Appendix X
Operational Flow of WEP Program....................................................... 83

Appendix XI
Sample Size Calculation Process........................................................... 84
Appendix XII

Chinese Chronic Respiratory Disease Questionnaire (CCRQ)....................... 85

Appendix XIII

Walking Exercise Training Record............................................................... 86

Appendix XIV

Staff Questionnaire on WEP......................................................................... 88
Abbreviations

6MWD  Distance in 6-Minute Walking Test (m)
6MWT  6-Minute Walking Test
95% CI  95% Confidence Interval
BDI  Mahler’s Basal Dyspnoea Index (12)
BI  Barthel Index (20)
BMI  Body mass index (kg/m2)
CCHRQ  Chinese Chronic Respiratory Disease Questionnaire
CDC  Centers for Disease Control and Prevention
CHP  Centre for Health Promotion
COPD  Chronic Obstructive Pulmonary Disease
COS  Chief of Service
CRDQ  Chronic Respiratory Disease Questionnaire
CRDQD  Chronic Respiratory Disease Questionnaire Dyspnoea
   Domain (score)
CRDQEF  Chronic Respiratory Disease Questionnaire Emotional
   Function Domain (score)
CRDQF  Chronic Respiratory Disease Questionnaire Fatigue Domain
   (score)
CRDQM  Chronic Respiratory Disease Questionnaire Mastery
   Domain (score)
CRDQT  Total Score of Chronic Respiratory Disease Questionnaire
   (score)
DOM  Department Operation Manager
EBP  Evidence-based practice
ECT  Endurance Cycle Test (s)
ESWT  Endurance Shuttle Walk Test (s)
FEV1  Forced expiratory volume in 1 second (% predicted)
FVC  Forced vital capacity (% predicted)
GOLD  Global Initiative for Chronic Obstructive Lung Disease
HRQL  Health-Related Quality of Life
IADL  Instrumental Activities of Daily Living Index (12)
ICT  Incremental cycle test (W)
ISWT  Incremental shuttle walk test (m)
ITT  Intention-to-treat
MCID  Minimum Clinically Important Difference
CHAPTER ONE
INTRODUCTION

This chapter starts with introducing the background of chronic obstructive pulmonary disease (COPD) in the global and local context. The affirming needs and significance for proposing a new intervention of walking exercise program to improve patient’s quality of life (QoL) are addressed. Then the research question and the objectives of this dissertation are identified.

1.1 BACKGROUND
1.1.1 COPD in Global Context

The Global Initiative for Chronic Obstructive Lung Disease (GOLD) defines COPD as a persistent limitation of airflow and it is associated with chronic inflammatory responses within the airways and the lung towards noxious gases and particles (GOLD, 2013). COPD morbidity can also be affected by other existing co-morbidities such as cardiovascular diseases and diabetes mellitus. According to World Health Organization (WHO), there are 65 million people having COPD in the world (WHO, 2013). The number is even more when disregarding the under-recognized and under-diagnosed (van den Boom et al., 1998). For COPD mortality in year 2005, there were 3 million people died of COPD, which was corresponded to 5% of the global deaths (WHO, 2013). However, it was estimated that it would be considerably increased to 8.3 million people each year by 2030. Besides, COPD will become the third leading cause of death by 2020 (GOLD, 2013). This implies that the disease will impose a heavy social and economic burden since a large amount of people are suffering from COPD.
1.1.2 COPD in Hong Kong

Back to our Hong Kong situation, a local study indicated that 9% of aged 70 or above were COPD victims (Ko et al., 2006). The statistics from the Centre for Health Promotion (CHP) showed that, in 2011, there were 1980 people died of chronic pulmonary diseases which were accounted for 4.5% of the total death (CHP, 2012). In Hong Kong, the problem of aging population causes the increase in number of patients with chronic diseases including pulmonary disease. It is also a risk factor that contributes to the deteriorating respiratory function. Visits towards clinics or even rates of emergency admission will also be increased (Chau et al., 2012). It is roughly estimated that nearly half of patients admitted to respiratory medical ward for chest rehabilitation are due to COPD exacerbation.

1.1.3 Management of COPD

Management of COPD can be divided into pharmacological and non-pharmacological treatment. Pharmacological intervention is mainly for controlling the symptoms and decreasing the chance of exacerbation. For non-pharmacological intervention, pulmonary rehabilitation is the main focus for long term benefits of COPD patients. Rehabilitation improves patient’s exercise capacities and reduces the intensity of dyspnoea which are associated with anxiety and depression (GOLD, 2013).

1.2 AFFIRMING NEEDS

1.2.1 Pulmonary Rehabilitation Program

Pulmonary Rehabilitation Program (PRP) has been implemented in Hong Kong hospital since year 1998 as a multidisciplinary and non-pharmacological
intervention for COPD (Mok & Lee, 2003). It has been established as a golden standard care for COPD patients. Eligible patients will be recruited to a 4 to 8 weeks multidisciplinary program which provides with disease education, breathing techniques retraining, exercise training, training for activities of daily living and chest physiotherapy. It aims at relieving symptoms and improving their functional capacities, disease related knowledge, self-care management and QoL. A significant improvement in QoL after PRP has been evidenced by a number of studies (Boxall, Barclay, Sayers and Caplan, 2005; Griffiths et al., 2000; Güell et al., 2008; & Oh, 2008).

1.2.2 Generalizability of Pulmonary Rehabilitation Program

Patients admit to the hospital due to acute exacerbation are provided with treatment like corticosteroid, antibiotics, bronchodilators and active chest physiotherapy. They are discharged soon after the symptoms subsided or their conditions have been stabilized. The current practice of the Respiratory Medicine Department (RMD) in hospitals under Hospital Authority is to offer PRP to a limited quota of COPD patients upon their discharge date since it is an out-patient program and needs extra manpower to organize and hold the sessions. Besides, organizing PRP is very expensive since it involves a multidisciplinary team of health care professionals including physicians, nurses, physiotherapists, occupational therapists, dietitians, medical social workers and some other allied health care workers. On the other hand, patients are required to transport to hospitals or clinics for every sessions while limiting the chance of rehabilitation for home-bound patients. Therefore, only very few eligible patients are recruited to PRP each time.
1.2.3 Importance of Patient’s Quality of Life

Health Related Quality of Life (HRQL) measures one’s well being and QoL with regards to his/her physical and psychological health. It is usually self-reporting. According to Centers for Disease Control and Prevention (CDC), HRQL includes how a person perceives about his/her health risks, functional capacity and socioeconomic status and supports which affecting his/her QoL (CDC, 2011a). It also measures the impact of health and conditions on QoL and assesses the positive aspects of life satisfaction and emotion.

1.2.4 Negative Impact on Quality of life

A study showed that COPD causes a decline in patient’s functional capacity and HRQL (Effing, Zielhuis, Kerstjens, van der Valk & van der Palen, 2011). Due to the inflammation and narrowing of the airways resulting in decreased forced expiratory flow volume in one second (FEV₁) and impaired gaseous exchange, patients may experience productive cough with sputum and shortness of breath (Hong Kong Lung Foundation, 2013). Sometimes, patients may find it difficult to walk at their own pace on the level ground. As the disease progresses, their daily activities would become more and more difficult. Moreover, acute exacerbation of COPD results in further decrease in pulmonary function, exercise tolerance, QoL and lengthening the periods of stay in hospital and recovery (Clini et al., 2009). Eventually, reduced exercise capacities and abilities to perform activities of daily living would be resulted and this imposes a negative impact on their QoL. Gradually, QoL decreases with increasing disease severity.

1.2.5 Innovation of a Walking Exercise Training Program

Exercise prescription in PRP focuses on upper extremity endurance training
for improving arm strength and function using ergometry or unsupported arm exercise by lifting free weights and stretching elastic bands. For lower extremity endurance training, it includes cycling exercise and treadmill walking. Although ground-based walking is a simple and easy physical exercise, this exercise is provided by physiotherapists with doctor’s prescription. As evidenced by Behnke et al. (2000) and Boxall, Barclay, Sayers and Caplan (2005) that walking exercise can help to improve HRQL of COPD patients. Yet, no evidence-based guideline of walking exercises exists within the current health care system. Therefore, a walking exercise program is necessary to improve HRQL for patients with COPD.

1.3 SIGNIFICANCE

1.3.1 Potential Benefits of Walking Exercise Program

As reported by CDC (2011b), regular physical exercise is essential to keep people away from health problems especially towards the elderly. The CDC regarded walking as a type of physical exercise which can bring about health benefits and it is suitable for older adults (2011b). With implementation of this evidence-based walking exercise program, it is believed that all COPD patients would get benefit from it in reducing chances of exacerbation, enhancing self-motivation to exercise, decreasing admission rate due to exacerbation and increasing QoL. Medical health-care cost can also be reduced for the benefits of the health-care providing organization. Besides, evidence-based guideline ensures the support for better quality of care in the field of nursing profession.
1.4 RESEARCH QUESTION

For older adults with COPD, is walking exercise program more effective in improving their QoL when compared to usual medical care?

1.5 OBJECTIVES

(1) To search for available evidence of walking exercise for COPD patients based on the research question.

(2) To review and critically appraise the research evidence of walking exercise intervention in improving HRQL of patients with COPD.

(3) To summarize and synthesize the existing evidence related to the topic.

(4) To assess the implementation potential including transferability, feasibility and cost effectiveness of the evidence-based innovation.

(5) To develop an evidence-based guideline of walking exercise program for COPD patients.

(6) To develop plans to implement the innovation and evaluate the outcomes of the desired protocol.
CHAPTER TWO
CRITICAL APPRAISAL

In this chapter, the details of searching and appraisal strategies were described. The data of the reviewed studies were extracted into a Table of Evidence (TOE). The study characteristics and methodologies were summarized and discussed. Quality appraisal was performed using the Scottish Intercollegiate Guidelines Network (SIGN) Checklists. Results of the studies were then summarized and synthesized.

2.1 SEARCH AND APPRAISAL STRATEGIES

2.1.1 Identification of Study

The databases used for searching research articles include Cochrane Library, EBSCOhost (Academic Search Premier; CINAHL Plus, MEDLINE), ProQuest (British Nursing Index, PsycINFO), PubMed (MEDLINE) and ScienceDirect. The search terms for population include “COPD”, “chronic obstructive pulmonary disease”, “chronic obstructive pulmonary diseases”, “stable COPD”, “stable chronic obstructive pulmonary disease”, “COAD”, “chronic obstructive airway disease”, “chronic obstructive airway diseases”, “chronic obstructive lung disease”, “chronic obstructive lung diseases”, “chronic airflow obstruction”, “chronic airflow obstructions”, “airflow obstruction chronic”, “chronic airway obstruction”, “chronic airway obstructions” and “airway obstruction chronic”; those for intervention include “walk”, “walking”, “walking exercise”, “walking exercises”, “walking exercise program”, “walking exercise programs”, “walking training”, “walking program”, “walking programs”, “ambulation”, “early ambulation” and “treadmill”; and those for outcome include “quality of life” and
“health related quality of life or life quality”.

2.1.2 Inclusion Criteria

(i) Study population is older adults of both sexes aged 60 years or above diagnosed with COPD.

(ii) The primary intervention of the study is a walking exercise program while the control group receives usual medical or nursing care or non-walking exercise training.

(iii) The study outcome measures QoL of patients using disease specific questionnaire or generic questionnaire.

(iv) The study year is from 2000 to 2013.

(v) The study design is a randomized controlled trial (RCT).

(vi) The study is a primary source.

(vii) Full text is available to retrieve.

(viii) The study is written in English.

2.1.3 Exclusion Criteria

(i) The study intervention is based on a self-management program or involved specific pharmacological intervention.

(ii) The study subjects are having acute exacerbation or unstable diseases.

(iii) The study is a secondary analysis.

2.1.4 Appraisal Strategies

The eligible studies would be criticized of their quality using the methodological checklist for randomized controlled trials designed by SIGN (SIGN, 2012) which was developed for the National Health Service in Scotland.
The levels of evidence of each study will be graded using the SIGN Grading System 2009-2012 (SIGN, 2011) (Appendix II).

2.2 RESULTS

2.2.1 Search History

A systematic searching process was performed on 27 May, 2013. The 3 sets of search terms were entered into the databases separated with Boolean “OR” and the search results were combined with Boolean “AND”. No restriction was set during searching to prevent unintentionally rejecting the eligible articles. A summary table of search history was attached in Appendix III. A total of 11245 studies were resulted when searching by the keywords. After screening the titles and citations, there were 268 potential studies left for further screening for full text according to the inclusion and exclusion criteria. Thereafter, 0 in Cochrane Library, 1 in EBSCOhost, 1 in ProQuest, 8 in PubMed (2 duplicated) and 2 in ScienceDirect (2 duplicated), a total of 8 eligible studies, were selected for review and critical appraisal and they were Behnke et al. (2000), Boxall, Barclay, Sayers and Caplan (2005), Hernandez et al. (2000), Leung, Alison, McKeough and Paters (2010), Nakamura et al. (2008), Oh (2008), Singh, Khandelwal, Khandelwal and Abusaria (2003) and Troosters, Gosselink and Decramer (2000).

2.2.2 Extraction of Data

A TOE summarizing the content of individual study was shown in Appendix IV. Data extraction including bibliographic citation, country of study, study type with levels of evidence, patient characteristics, intervention, comparison, length of follow-up, outcome measures with measurement tools and study results or effect
sizes. The critical appraisal of internal validity of the reviewed studies would be discussed in the section below. Critical appraisal checklists of each reviewed study were shown in Appendix I.

2.2.3 Critical Appraisal of Internal Validity

2.2.3.1 Research Titles and Questions

Among the 8 articles, the research problems and purposes were clearly stated in the introductory paragraph of each study and the research title was easily understood. The titles were specific and relevant to nursing profession. The study objectives were clearly mentioned by Boxall, Barclay, Sayers and Caplan (2005) while Leung, Alison, McKeough and Paters (2010) clearly list out research questions in their study.

2.2.3.2 Study Design

All the eight studies were RCTs with components of intervention and control groups specified in details. They were conducted in various countries including Germany, Australia, Spain, Japan, Korea, India and Belgium. Participants in intervention group received walking exercise, and participants in control group received usual medical care or non-walking exercise. Outcome measures were also clearly stated by the authors.

2.2.3.3 Randomization Method and Allocation Concealment

Random assignment of participants into intervention or control group was achieved. The methods of randomization among the studies including computer-generated random numbers, computerized phone dial-up system and in order of referral to minimize selection bias while the other 5 studies did not
mentioned about the methods of randomization. Allocation concealment was achieved by using sealed envelopes in studies conducted by Boxall, Barclay, Sayers and Caplan (2005), Leung, Alison, McKeough and Paters (2010), and Troosters, Gosselink and Decramer (2000) to minimize bias towards treatment allocation and to protect randomization process whereas other 5 studies did not mentioned about the concealment method so that it was uncertain if the person knew what was the next treatment allocation during randomization.

2.2.3.4 Blinding

Blinding was only mentioned by Leung, Alison, McKeough and Paters (2010) because the control group received cycling training exercise. Patients could be blinded for group assignment. The remaining 7 studies could not perform blinding because walking exercise was an intervention that needed patients’ active participation. Thus, it was sometimes difficult to blind to patients during research studies and this might increase the bias of the study.

2.2.3.5 Baseline Similarity

The baseline characteristics of participants in intervention and control group were reported in all the 8 studies. No significant difference was found among the participants. p-values were reported in studies by Boxall, Barclay, Sayers and Caplan (2005), Nakamura et al. (2008) and Oh (2003) to show non-significance between the two groups while mean values were shown in the remaining 5 studies. The baseline mean of total score of Chronic Respiratory Disease Questionnaire (CRDQT) among the 6 studies were 80 to 90 out of 140 but there was 20 scores lower in Singh, Khandelwal, Khandelwal and Abusaria’s study (2003) indicating COPD stage IV patients with FEV\textsubscript{1} less than 30% usually exhibited more
dyspnoea and resulted in a lower QoL. The participants with similar baseline characteristics were then randomized into either intervention or control group.

2.2.3.6 Measurement Tools

Six of the reviewed studies used CRDQ while only Nakamura et al. (2008) used Short Form-36 (SF-36) and Boxall, Barclay, Sayers and Caplan (2005) used St George Respiratory Questionnaire (SGRQ) as their measurement tools for HRQL. Validity and reliability of interviewer and self-administered version of CRDQ and SGRQ were widely tested and they were available in many languages (Wijkstra et al., 1994). The instruments showed the consistency and accuracy in measuring the attributes. The test-retest reliability of the CRDQ with $r=0.62$ has been reported by Oh (2003). The Minimum Clinically Important Difference (MCID) of CRDQT indicating the smallest difference perceived as an important effect (Lacasse, et al., 1996; Jaeschke, Singer & Guyatt, 1989). It has been mentioned in 4 of the reviewed studies (Behnke et al., 2000; Hernandez et al., 2000; Leung, Alison, McKeough & Paters, 2010; Troosters, Gosselink & Decramer, 2000).

2.2.3.7 Attrition Rate and Intention-to-treat Analysis

Sample sizes of each study were ranged from 34 to 100. Singh, Khandelwal, Khandelwal and Abusaria’s study (2003) had no attrition so that intention-to-treat (ITT) was not carried out. Among the remaining 7 studies, the drop-out rate of the intervention group was within 5.6% to 34.8% while that of the control group was within 16.7% to 46.7%. ITT analysis was applied in study of Leung, Alison, McKeough and Paters (2010). Nakamura et al. (2008) used modified-ITT while other studies applied per-protocol analysis except Troosters, Gosselink and
Decramer (2000) who did not use ITT in data analysis. Failure to use ITT
analysis may increase attrition bias and lead to faulty conclusion about the
treatment efficacy.

2.2.3.8 Overall Quality

According to the checklist criteria, the study was graded as high quality (++)
when the majority of criteria met with no ‘NO’ in the checklist; graded as
acceptable (+) when most of the criteria can be achieved with no more than one
‘NO’; and graded as low quality (0) when most criteria not met with more than
one ‘NO’. Study of Leung, Alison, McKeough and Paters (2010) was graded as
high quality (+++) and the remaining 7 reviewed studies were graded as acceptable
(+) since they had one ‘NO’ in each checklist. The overall quality of the studies
was good and they were applicable for development of evidence-based guideline.

2.2.4 Levels of Evidence

Levels of evidence of each of the study were graded according to the SIGN
Grading System 1999-2012 (SIGN, 2011) and were formulated in Table 1
(Appendix V). Leung, Alison, McKeough and Paters (2010) was graded as ‘1++’
which means it was RCT with very low risk of bias. Boxall, Barclay, Sayers and
Caplan (2005) and Oh (2008) were graded as ‘1+’ indicating they were RCTs with
low risk of bias. The remaining 5 were graded as ‘1-’ indicating they were RCTs
with high risk of bias. The results were still used because they had high
applicability towards the research question and critical appraisal.
2.3 SUMMARY AND SYNTHESIS

2.3.1 Summary of Findings

2.3.1.1 Participant Characteristics

A total of 418 patients were recruited as participants in the eight studies. They were elderly aged 60 to 78 with male participants varied from 48% to 90% in different studies. They were diagnosed COPD using the guideline from European Respiratory Society, The Japanese Respiratory Society or by a respiratory specialist. According to GOLD classification system of FEV\textsubscript{1} (% predicted) at baseline measurement, participants were stage II to IV COPD patients. They were excluded if there was evidence of acute exacerbation within 1 to 4 weeks, unstable cardiac diseases such as ischemic heart disease or severe or uncontrolled hypertension, orthopedic inabilities or neuromuscular disorders and malignant diseases. Patients who were already attending a current out-patient PRP were also excluded.

2.3.1.2 Intervention, Duration and Frequency

All the eight studies were investigating the effect of walking exercise program towards the QoL of older adults with COPD. The components of the program contained ground-based walking. Patients were asked to walk at a prescribed training speed or distance for 30-60 minutes for 3-7 days a week (Behnke et al., 2000; Hernandez et al., 2000; Leung, Alison, McKeough & Paters, 2010). The second type of walking program combined with extremity endurance training exercise which asked patients to strengthen their limb muscles. Patients were required to train for 30-90 minutes each time for 3-7 days per week (Boxall, Barclay, Sayers & Caplan, 2005; Nakamura et al., 2008; Troosters, Gosselink &
Decramer, 2000). The third type of walking training combined with education sessions which were based on components of PRP including such as inhalation techniques, bronchopulmonary hygiene, work simplification and relaxation techniques. Each session lasted for 30 to 90 minutes on a daily basis (Boxall, Barclay, Sayers & Caplan, 2005; Oh, 2008; Singh, Khandelwal, Khandelwal & Abusaria, 2003).

2.3.1.3 Length of Follow-up

From the reviewed studies, the program length ranged from 4 to 24 weeks. Measurement of QoL was done at the baseline and the end of the program except for Behnke et al.’s 24-weeks program (2000), an extra measurement was done at week-12 while for Troosters, Gosselink and Decramer (2000), an additional measurement was done at week-72 of their 24-weeks program.

2.3.1.4 Outcomes and Measurement Tools

The primary outcome of this review was HRQL which was measured using CRDQ, SGRQ and SF-36. They were administered by a trained interviewer. Secondary outcomes including walking capacity using 6-minutes walk test (6MWT) measuring patient’s maximum walking distance and speed within 6 minutes; and pulmonary function displayed by FEV₁.

2.3.1.5 Study Results

All the 8 studies showed that the 3 types of walking exercise program improved QoL of patients with COPD. Most or all the four dimensions in CRDQ showed statistically significant improvement of HRQL. Total and Impact domain of SGRQ in Boxall, Barclay, Sayers and Caplan (2005) and 5 out of 8 dimensions
of SF-36 in Nakamura et al. (2008) also showed statistically significant results in QoL of patients.

2.3.2 Synthesis of Findings

2.3.2.1 Target Population

From the evidence above, patients who were functionally homebound elderly aged 60 or above and diagnosed with COPD stage II (Leung, Alison, McKeough & Paters, 2010; Nakamura et al., 2008), stage III (Behnke et al., 2000; Boxall, Barclay, Sayers & Caplan, 2005; Hernandez et al., 2000; Nakamura et al., 2008; Oh, 2008; Troosters, Gosselink & Decramer, 2000) and stage IV (Singh, Khandelwal, Khandelwal & Abusaria, 2003) according to GOLD classification were eligible to be recruited to the program. Patients with neuromuscular disorders were excluded from all the eight studies since the walking exercise required patient’s active participation using muscle strength and coordination. Patients who were having unstable cardiovascular diseases (Behnke et al., 2000; Hernandez et al., 2000; Leung, Alison, McKeough & Paters, 2010; Nakamura et al., 2008; Oh, 2008; Singh, Khandelwal, Khandelwal & Abusaria, 2003; Troosters, Gosselink & Decramer, 2000), and malignancy (Leung, Alison, McKeough & Paters, 2010; Troosters, Gosselink & Decramer, 2000) were also excluded from the program to prevent deteriorating their disease prognosis. Patients who were attending a current PRP were also excluded since PRP (Boxall, Barclay, Sayers & Caplan, 2005; Nakamura et al., 2008; Singh, Khandelwal, Khandelwal & Abusaria, 2003) also bring about similar effects as a walking program.

2.3.2.2 Ground-based Walking Exercise

Walking exercise is regarded as a simple and effective training regime for
COPD patients. Behnke et al. (2000), Hernandez et al. (2000) and Leung, Alison, McKeough and Paters (2010) were comparing the difference between walking exercise as the only intervention with no exercise or non-walking exercise in improving HRQL. In Behnke et al. (2000) study, patients had a 10-day hospital-based walking training before discharged. They continued home-based training with individually tailored walking intensity. For Hernandez et al. (2000), patients walked for 20m at home or a place near home while for Leung, Alison, McKeough and Paters (2010), patients walked on a 26m circular indoor track. CRDQT of Behnke et al. (2000) and Hernandez et al. (2000) were 37.4 and 17.3 increase respectively, they showed a statistically significant improvement in every domains of CRDQ with \( p<0.001 \) and \( p=0.001 \) respectively. For Leung, Alison, McKeough and Paters (2010), there was 14 scores increase of CRDQT for the intervention group although the control group of cycling training would have been improved in their HRQL. Walking training group has a greater improvement in HRQL indicating walking exercise was even more effective than equipment dependent training. All the 3 studies concluded the effectiveness of walking exercise alone to improve HRQL of elderly with COPD.

2.3.2.3 Extremity Endurance Training

In pulmonary rehabilitation, extremity endurance training is important for COPD patients in their daily activities. Training program of Boxall, Barclay, Sayers and Caplan (2005) combined walking with arm exercise. Within the four dimensions in SGRQ, the Impact domain decreased with 8.1 (\( p=0.024 \)) while the Total domain decreased with 5.8 (\( p=0.02 \)) which exceeded the MCID. In Nakamura et al. (2008), the program combined with strength training (ST) such as push-up and back extension using an elastic band or combined with recreational
activities (RA) such as rubber ball exercise to compare with no exercise program provided. Physical Functioning for ST group and Social Functioning and Mental Health for RA group showed statistically significant result with p<0.05. Baseline score of SF-36 was not shown in the study to compare the MCID for clinical significance. Troosters, Gosselink and Decramer (2000) combined walking with cycling, stair climbing and peripheral muscle training. The result was statistically significant with an increment of 14 in CRDQT (p=0.002). To conclude, extremity endurance training, especially for lower extremity training, could improve physical aspects whereas recreational activities helped to improve psychosocial contentment of an individual to some extent.

2.3.2.4 Education Sessions

Patient education regarding the management of the disease as well as psychosocial intervention enhances patient’s ability in self-control and stress management. In Boxall, Barclay, Sayers and Caplan (2005), Oh (2008) and Singh, Khandelwal, Khandelwal and Abusaria (2003), walking exercise training were PRP-based which contained education sessions. The components of education session covered topics of breathing and secretion removal techniques, energy conservation and work simplification strategies, respiratory and peripheral muscle training, side effects of medication and stress management. CRDQT of the latter 2 studies had an increment of 17.45 and 18.26 respectively. All domains in CRDQ of the studies showed statistically significant result in improvement except the Dyspnoea domain in study of Oh (2008). The 3 studies suggested walking exercise program with education was effective to improve HRQL of patients with COPD.
2.3.2.5 Walking Intensity

The walking intensity of the program was determined by results of 6MWT (Behnke et al., 2000; Boxall, Barclay, Sayers & Caplan, 2005; Oh, 2008; Singh, Khandelwal, Khandelwal & Abusaria, 2003; Troosters, Gosselink & Decramer, 2000) or shuttle walk test (SWT) (Hernandez et al., 2000; Leung, Alison, McKegough & Paters, 2010). Behnke et al. (2000) prescribed training distance at 75% of distance in 6MWT (6MWD) for in-hospital training and at 125% of 6MWD for home-based training. The initial training speed was started at 70%-75% of SWT or 60% of 6MWT. Patients were provided a cassette indicating the training speed by means of an audible sound (Hernandez et al., 2000; Leung, Alison, McKegough & Paters, 2010) or used treadmill to adjust the walking speed (Troosters, Gosselink & Decramer, 2000). Only Boxall, Barclay, Sayers and Caplan (2005) and Nakamura et al. (2008) prescribed training intensity by oxygen saturation and Borg score. Results of 6MWD from study results showed a significant improvement (Behnke et al., 2000; Boxall, Barclay, Sayers & Caplan, 2005; Oh, 2008; Singh, Khandelwal, Khandelwal & Abusaria, 2003; Troosters, Gosselink & Decramer, 2000). It concluded that 6MWT could be used for prescribing the initial walking speed of patients. The training intensity was tailor-made according to the ability of different individuals.

2.3.2.6 Duration and Frequency

The duration for each session was ranged from 30 to 90 minutes and within which, the time of walking was 20 to 60 minutes. The training frequency was ranged from 2 to 7 sessions a week. Five of the studies suggested walking exercise training on a daily basis (Behnke et al., 2000; Boxall, Barclay, Sayers & Caplan, 2005; Nakamura et al., 2008; Oh, 2008; & Singh, Khandelwal,
Khandelwal & Abusaria, 2003). However, Leung, Alison, McKeough and Paters (2010) suggested exercising 3 days per week. Therefore, regular frequent training could improve exercise performance.

2.3.2.7 Follow-up Visits

Among the reviewed studies, patient’s performance such as walking distance and time were recorded on a diary for monitor the progress during each follow-up visit (Behnke et al., 2000; Boxall, Barclay, Sayers & Caplan, 2005; & Nakamura et al., 2008). Follow-up were made by home visits once every one or two weeks (Behnke et al., 2000; Boxall, Barclay, Sayers & Caplan, 2005; & Singh, Khandelwal, Khandelwal & Abusaria, 2003). Patients also received telephone follow-up after first 3 months of home visits (Behnke et al., 2000) or was as frequent as twice weekly phone call visits (Oh, 2008). For Hernandez et al. (2000), patients had follow-ups in hospital fortnightly for supervision. Their treatment progress could be monitored by regular visits.

2.3.2.8 Measurement of Health-Related Quality of Life

CRDQ (Behnke et al., 2000; Hernandez et al., 2000; Leung, Alison, McKeough & Paters, 2010; Oh, 2008; Singh, Khandelwal, Khandelwal & Abusaria, 2003; Troosters, Gosselink & Decramer, 2000) and SGRQ (Boxall, Barclay, Sayers & Caplan, 2005) were the two commonly used disease specific questionnaires for COPD which were more likely to be responsive to change after PRP and they were sensitive towards respiratory diseases when compared to a more generic questionnaire SF-36 (Nakamura et al., 2008). 6 of the studies used CRDQ as their measurement tool. Both of them had Self-Administered Version. The authors did not mentioned in details about the reasons of choosing the desired
one. CRDQ had 20 items in 4 domains whereas SGRQ had 50 items.

2.3.2.9 Treatment Effect with Length of Program

The increase in CRDQT for measuring HRQL was the most prominent in Behnke et al.'s (2000) 6-months program (CRDQT=37.4) than Hernandez et al. (2000) (CRDQT=17.3) and Leung, Alison, McKeough and Paters (2010) (CRDQT=14) and their programs last for 3 months and 2 months respectively. Moreover, score difference in each domain of Behnke et al. (2000) showed more than a doubled increase than the other 2 studies. The result showed that the score of HRQL increased with length of program. One of the reasons was that hospital training before patient discharge may contribute to the treatment effect. Troosters, Gosselink and Decramer (2000) also designed a 24-weeks rehabilitation program. The authors reported a 14 increase in CRDQT at completion (p=0.002). The difference was increased to 17 (p<0.01) at 72-weeks follow-up showing that patient’s HRQL can be maintained and increased after the 24-weeks program. The results showed that HRQL could be increased and sustained over months after completion of the program because the patients had become regular walkers.

2.3.2.10 Exercise Performance

6MWT had been used in 6 of the studies while all showed statistically significant improvement in walking distance. They all proved that walking exercise program would increase walking distance of the COPD patients (Behnke et al., 2000; Boxall, Barclay, Sayers & Caplan, 2005; Nakamura et al., 2008; Oh, 2008; Singh, Khandelwal, Khandelwal & Abusaria, 2003; & Troosters, Gosselink & Decramer, 2000). In Behnke et al. (2000), the 6MWD was even increased by 75% during hospital-based training but the control group did not. This highlighted
the treatment effect instead of due to recovery. The 6MWD of the intervention group had increased to 67.93m when compared with that of the control groups which was 24.5m. That result exceeded the MCID of 25m (Holland, 2010) indicating it was an important clinical outcome. Regular exercise could lead to improvement in exercise performance as well as persistence reduction in exertional dyspnoea (Boxall, Barclay, Sayers & Caplan, 2005).

2.3.3 Conclusion

To concluded, 8 research studies were selected according to the searching process. The research design and quality were criticized using the SIGN methodology checklists. The results from the studies were summarized and synthesized. All 8 studies showed that walking exercise training significantly improved HRQL of COPD patients when compared with usual medical care. Results showed that ground-based walking was effective in improving HRQL of target patients (Behnke et al., 2000; Hernandez et al., 2000; Leung, Alison, McKeough & Paters, 2010; Oh, 2008). CRDQ was recommended as the measurement tools for assessing HRQL since it was a disease-specific questionnaire especially for COPD (Behnke et al., 2000; Hernandez et al., 2000; Leung, Alison, McKeough & Paters, 2010; Oh, 2008; Singh, Khandelwal, Khandelwal & Abusaria, 2003; Troosters, Gosselink & Decramer, 2000). CRDQ was easy to access for use since it was commonly use in my clinical setting.

Initial walking intensity of individual patient was prescribed at 60% of 6MWD as research results showed significant improvement in their walking distance (Behnke et al., 2000; Boxall, Barclay, Sayers & Caplan, 2005; Oh, 2008; Singh, Khandelwal, Khandelwal & Abusaria, 2003; Troosters, Gosselink &
Decramer, 2000). 6MWT was simple and convenient to perform and assess patient’s functional ability of walking. Therefore, it could be used for prescribing initial walking speed for patients in a walking program. Patient’s training including walking time and distance should be recorded on a training diary to monitor patient’s performance and compliance. Follow-up visits were made every week for supervision and problem solving.

For duration and frequency, training was suggested on a daily basis since regular training could bring about effective and positive outcomes (Behnke et al., 2000; Boxall, Barclay, Sayers & Caplan, 2005; Nakamura et al., 2008; Oh, 2008; & Singh, Khandelwal, Khandelwal & Abusaria, 2003) and a duration of 30-minutes training would be optimal for patients as evidenced by Boxall, Barclay, Sayers and Caplan (2005) and Leung, Alison, McKeough & Paters (2010) since 60 minutes training would be too much for them and they were at risk of adverse effect such as fatigue of lower extremities. For program length, a 3-months program is preferred since it is sufficient for improving patient’s HRQL (Boxall, Barclay, Sayers & Caplan, 2005; Hernandez et al., 2000; Nakamura et al., 2008).

An evidence-based walking exercise guideline can be established based on the above research evidence and can be implemented to patients who fulfill the criteria of the target population in the designated setting.
CHAPTER THREE
TRANSLATION AND APPLICATION

Chapter three will continue with assessing the transferability, feasibility and cost-benefit ratio for implementing the proposed innovation (Polit & Beck, 2008). An evidence-based clinical guideline was developed based on justified recommendations.

3.1 IMPLEMENTATION POTENTIAL

3.1.1 Target Setting and Target Audience

The target setting of the proposed walking exercise program is the 4 medical wards (120 total beds in maximum) in RMD of Hospital A. The proposed program will be commenced on an in-patient basis. The proposed location for walking exercise is at the Rehab Garden of the hospital. Patients who are suffering from respiratory diseases such as COPD exacerbation, bronchiectasis or asthma will be admitted for medical treatment and pulmonary rehabilitation management including physiotherapy. According to the admission rate from the department, there were approximately one-third of total patients who had COPD stages II to IV and the majority of them are elderly. They would be the target audience in this proposed program.

3.1.2 Transferability of the Findings

3.1.2.1 Proposed Setting

The programs of most of the reviewed studies were implemented on an out-patient or domiciliary basis. Only in study of Behnke et al. (2000), the authors started the program before patients were discharged and continued the program as
a home-based training. The proposed program would be commenced within the hospitalization period and continued as a home-based program when patients were discharged. It is transferrable to the designated hospital since there is suitable venue designed for walking exercise. Therefore, the innovation would definitely fit for carry out in the target setting.

3.1.2.2 Proposed Audience

From the research studies, the researchers included stages II to IV COPD patients who were older than 60 years to join their interventions. Meanwhile, they excluded those who had unstable cardiac diseases, orthopedic inabilities, neuromuscular disorders or malignant diseases from their programs. For patient characteristics, although the majority of reviewed studies were done on Caucasians, some studies were done on Asians like Korean and Japanese which also showed significant and positive outcomes. Since the proposed program is to investigate the effect of walking exercise towards HRQL of COPD elderly, patients with the same inclusion and exclusion criteria as the reviewed studies would be the proposed audience. It is believed that the proposed audience is transferable to the population in the target setting.

3.1.2.3 Philosophy of Care

The mission of the RMD is to serve and to provide quality and comprehensive respiratory care to COPD patients. We hope to provide them a better QoL since their disease is progressively deteriorating after each episode of exacerbation. In a holistic view, we practice for the benefits of patient. It correlates with the aims of the reviewed studies which were to improve patient’s QoL and functional capacity so that they can manage their disease better by
adopting a healthier lifestyle.

3.1.2.4 Time for Implementation and Evaluation

According to the reviewed studies in Chapter 2, the time for program implementation was ranged from 1 to 6 months. However, three of the studies adopted a 3-months program and the length is appropriate for a new innovation to be implemented in the target hospital. Besides, the time for outcome measurement is at the end of the program with referring to most of the previous studies. Therefore, the optimal time for implementation is set at 3 months.

3.1.3 Feasibility

3.1.3.1 Freedom of Nurses to Implement or to Terminate the Program

The program will be initiated and implemented independently by nurses. With the use of our knowledge and skills of nursing practice in the specialty of respiratory medicine, we will make our own clinical judgment and decision for patient’s benefits. The program in-charge nurses will assess for patient’s condition during every session and monitor their progresses. Also, we have the freedom to voice out or comment on the proposed guideline to the program coordinator and decide whether to continue or to terminate the innovation.

3.1.3.2 Interference with Current Staff Functions

There is always a change when implementing a newly developed guideline since we need the cooperation between staff of different roles. Staff deployment is needed to successfully run the program. The case nurses of each ward will be responsible for introducing and referring eligible COPD patients to the program
after their acute exacerbation stage has been stabilized. Besides, nursing staffs will be deployed to run the program so that the innovation would not interfere with the current department operation functions.

3.1.3.3 Administration Support and Organizational Climate to Research Utilization

The RMD maintains the quality of patient care by conducting various Continuous Quality Improvement projects and providing a platform for nursing staff in the department to conduct evidence-based practice. A proposal introducing a walking exercise program is necessary for the Chief of Service (COS), the Department Operation Manager (DOM) and Ward Managers (WM) to consider the cost-benefit ratio and budget planning of the program. They always welcome for new programs, thus, the proposed innovation would gain the support from the administrators.

3.1.3.4 Consensus

Consensus should be made among nursing staff of the department and among administrators to acknowledge the importance and benefits of establishing a walking exercise program for COPD patients. After gaining the approval from the administrators, the implementation of the new program will be announced to all nursing staff in RMD by corresponding WMs. Physiotherapists will be involved to give recommendations and comments to the proposal, thus, it is necessary to arrange for discussion with the physiotherapy department manager to seek for the assistance and consultation. Consensus from patients is also important as they are the users of the program. It is believed that they will participate in the program for the benefit of their disease and health.
3.1.3.5 Nursing Staff Training and Skills

Since all nursing staff in the department will participate in the program, they are required to attend a 2-hours training workshop for the introduction of the walking exercise program and its details in implementation. They also learn how to assess patient’s HRQL using CRDQ interviewer version and to perform 6MWT to assess their walking capacity. Physiotherapist would be present to assist in skills and techniques for performing 6MWT. It is feasible and acceptable for the department to arrange the workshops for staffs for the purposes.

3.1.3.6 Equipment and Facilities

Basically, 6MWT can be performed on any flat track such as the corridor, which is even more favorable. Equipment required is the timer only. The speed of individual patient is entered to a treadmill machine for prescribing his/her own speed in the walking program. The treadmill can be borrowed from the physiotherapy department. The venue for walking exercise sessions is at the existing 1500 square feet outdoor Rehab Garden in the 2nd floor of the hospital with built-in walking tracks and handrails specially designed for use. Moreover, oxygen supply and machines for blood pressure and oxygen saturation monitoring are ready for use in case patient change condition suddenly or having complaints during walking exercise. Therefore, no expensive and extra equipment is necessary to install for the program.

3.1.3.7 Measurement Tools for Evaluation

CRDQ is used to measure the primary outcome, patient’s HRQL, of the program. For practical consideration, although SGRQ is also disease specific, it is not chosen since it has got 50 items which is more time-consuming to administer
but CRDQ has only 20 items. Also, SGRQ can be used for both COPD and asthma while CRDQ is more specific for COPD. Therefore, CRDQ would be more favorable to measure HRQL of COPD patients. The secondary outcome is patient’s walking capacity measured by 6MWT. The distance walked in the test is used to compare with that from the baseline assessment.

### 3.1.4 Cost-Benefit Ratio of the Innovation

#### 3.1.4.1 Potential Risks

Previous studies have proved that it was very safe for patients undergoing this kind of walking training program since none of them encountered problems that needed medical care or reported with incidents (Boxall, Barclay, Sayers & Caplan, 2005; Hernandez et al., 2000; Leung, Alison, McKeough & Paters, 2010; Oh, 2008). However, it can be expected that patients may suffer from dyspnoea during the program since walking exercise training imposes exertions towards them (Behnke et al., 2000; Leung, Alison, McKeough & Paters, 2010). Moreover, they are also at risk of pain or discomfort over the back and lower extremities because of muscle fatigue after training. Therefore, resting time is emphasized between each cycle of walking to prevent excessive training of the muscles. On the other hand, patients may be unwilling to comply with the program contract because they may feel anxiety or depressed to complete the program. We make sure the intensity of training is based on individual’s speed in 6MWT and their present condition without forcing them to walk on a certain speed. On the other hand, the consequences for not implementing the program will increase the chance for patients visiting to the emergency department and prolong hospitalization stay because of poor management to their disease. It is worthwhile to implement the guideline since all the risks mentioned can be prevented.
3.1.4.2 Potential Benefits

The proposed program effectively improves the HRQL of COPD patients and enhances their walking capacity. It also helps to desensitize the sensation of dyspnoea (Behnke et al., 2000; Boxall, Barclay, Sayers & Caplan, 2005; Hernandez et al., 2000; Oh, 2008). Also, patients are capable to integrate regular walking into their daily life so that they would have a better QoL (Behnke et al., 2000). Furthermore, the total medical cost spent on COPD patients would be reduced in the long term prospect. Boxall, Barclay, Sayers & Caplan (2005) showed that the hospitalization stay for the next exacerbation of intervention group was 3.4 days less than the control group.

The potential benefits for staff would be the increase in autonomy and confidence to manage COPD cases. They also have higher job satisfaction because of patient’s positive outcomes. For organizational level, the reduced medical cost and total expenditure would be the major benefit and concern for them to support this proposed project.

3.1.4.3 Cost-Benefit Ratio

A table of set-up and operational cost of the program with detailed calculation of each item was shown in VI. The setup cost includes the 2-hours training workshop for 4 sessions by the program coordinator ($220 per hour per staff) to introduce the program details together with the physiotherapist consultation ($300 per hour) on the 6MWT assessment techniques and the use of treadmill machines. Other necessary equipment mentioned in the previous sections is already available and thus is free. The total set-up cost is $5,920.
The operational cost for walking training sessions includes 2-pages walking training diary and 2-pages assessment and evaluation forms to record the outcome measurement and each photo copy cost $0.3. A maximum of 40 patients can join the program and 4 staffs are needed in each session. The printing cost is $48 while the manpower cost for walking training is $10,560. The total operation cost is $10,608. The total cost per program is $16,528 while that of each of the participant is ($16,528÷40) = $413.2. Since one proposed program last for 4 months including preparation and evaluation time, the department can run 3 times in each year. The annual cost of the program would be ($5,920 x1 + $16,528x3) = $55,504.

For each day of hospital stay costing $4680, the program will save ($4680x3.4 days) = $15,912 per patient. The cost-benefit ratio would be ($413.2÷$15,912) = 0.026 which indicates a high potential cost-effectiveness of the program.

3.2 EVIDENCE-BASED PRACTICE GUIDELINE

3.2.1 Title of the EBP Guideline

An Evidence-Based Walking Exercise Program (WEP) for Older Adults with COPD in Improving Quality of Life.

3.2.2 Objectives of EBP Guideline

(1) To propose an evidence-based guideline of walking exercise to COPD patients.

(2) To provide structured and effective walking training before patient
discharge and continued as a home-based program.

(3) To improve patient’s QoL so that they can live well with their diseases.

3.2.3 Target Users

All nurses in RMD are the target users of this guideline.

3.2.4 Target Population

The target populations are RMD in-patients aged 60 years or above and are diagnosed with COPD stages II to IV. Patients who participate in the program should not have unstable cardiovascular diseases such as ischemic heart disease or uncontrolled angina since they must be haemodynamically stable. Independent limb movement is the prerequisite for walking exercise while they would be excluded from the program if they have orthopedic inabilities or neuromuscular disorders since. For those who have end-stage malignant diseases, they would not be recruited in the program since they may opt for comfort care. Patients who are already attending a current out-patient PRP are also excluded as it may have similar training as the proposed guideline.

3.2.5 Rating Scheme for Grades of Recommendation

Considering the levels of evidence of the reviewed studies (Appendix V), key recommendations of this guideline are graded using the SIGN Grading System: Levels of Evidences and Grades of Recommendations (Appendix II and VII) (SIGN, 2011).

3.2.6 Recommendations

3.2.6.1 Recommendation 1.0: Walking Exercise Sessions
Recommendation 1.1 A program containing walking exercise training is regarded as an important component for COPD patients for pulmonary rehabilitation.

Patients showed only minor improvement after hospitalization if they did not continued regular home-based exercise training (Behnke et al., 2000). Walking was a more task-specific and sensible method of neuromuscular coordination training of daily activities for COPD patients (Hernandez et al., 2000). The effect of walking training has no significant difference to cycling and it even showed better walking capacity (Leung, Alison, McKeough & Paters, 2010).

Recommendation 1.2 Walking exercise training is started after acute exacerbation stage has been stabilized.

Exercise after initial recovery from acute exacerbation within hospitalization can significantly improve functional capacity, dyspnoea and QoL. Then, a persistence improvement can be achieved during home-based training (Behnke et al., 2000).

Recommendation 1.3 Training intensity of walking exercise starts at 60% of peak speed in individual 6MWT and gradually increased to a maximum intensity at 75%.

6MWT or SWT is used to prescribe the walking intensity. It is recommended to start from a lower intensity at 60%-75% of peak walking speed in 6MWT or SWT (Behnke et al., 2000; Hernandez et al., 2000; Leung, Alison, McKeough & Paters, 2010; Troosters, Gosselink & Decramer, 2000). 6MWT is chosen for prescribing training speed of each patient since it is easier for both the patient and
the nurse and it is less time-consuming to perform than SWT. Training intensity should be based on patient’s ability and condition which can promote a greater benefit to them (Oh, 2008). There is a higher compliance if the program is well designed by considering individual patient’s limitations (Boxall, Barclay, Sayers & Caplan, 2005).

Recommendation 1.4 Duration of walking training requires 15 minutes for 2 sets.

Walking for 30 minutes is optimal for daily exercise demand for COPD patients. Resting time is allowed between each set of training to lower the risk of exacerbation and dyspnoea (Boxall, Barclay, Sayers & Caplan, 2005; Behnke et al., 2000).

Recommendation 1.5 A training diary is used for patients to record their walking activities.

Patients are suggested to honestly record their walking time and distance every day on a training diary for monitoring the progress (Behnke et al., 2000; Boxall, Barclay, Sayers & Caplan, 2005; Nakamura et al., 2008). The nurse could observe for patient’s problems and difficulties and then to help them modify the walking regime.

3.2.6.2 Recommendation 2.0: Duration and Frequency

Recommendation 2.1 A program of 3 months produces the highest benefits.

A 3-months walking training program improves significantly in HRQL.
Programs of 1 or 2 months may be too short to train up the elderly whereas a high drop-out rate is commented in 6-months programs or longer. (Boxall, Barclay, Sayers & Caplan, 2005; Hernandez et al., 2000; Nakamura et al., 2008)

**Recommendation 2.2 Training on a daily basis is recommended to maintain the clinical benefit for COPD patients.**

Exercise should be performed on a regular basis and is integrated into the daily life. The physiological effect would be a short term effect if exercise is not performed regularly (Behnke et al., 2000; Boxall, Barclay, Sayers & Caplan, 2005; Nakamura et al., 2008; Oh, 2008; Singh, Khandelwal, Khandelwal & Abusaria, 2003).

**Recommendation 2.3 Follow-up every week in hospital for supervision and protocol compliance monitoring.**

Weekly follow-up in the hospital is necessary for monitoring patient’s progress and compliance towards the walking program (Boxall, Barclay, Sayers & Caplan, 2005; Singh, Khandelwal, Khandelwal & Abusaria, 2003). Telephone follow-up would be provided if patient is not able to attend the follow-up session of the week (Behnke et al., 2000; Oh, 2008).

3.2.6.3 Recommendation 3.0: Evaluation of the Training Program

**Recommendation 3.1 Measurement of HRQL using CRDQ.**

CRDQ is a common tool for measuring HRQL (Behnke et al., 2000; Hernandez et al., 2000; Leung, Alison, McKeough & Paters, 2010; Oh, 2008; Singh, Khandelwal, Khandelwal & Abusaria, 2003; Troosters, Gosselink &
Decramer, 2000). It is disease-specific since the questions are sensitive to COPD.

**Recommendation 3.2 Using 6MWT to evaluate the effect of WEP towards walking capacity.**

6MWT is a basic and common assessment and evaluation for walking capacity. Pulmonary rehabilitation of training lower extremities helps to improve the distance walked which in turn enhance their capacity to perform daily activities (Behnke et al., 2000; Boxall, Barclay, Sayers & Caplan, 2005; Nakamura et al., 2008; Singh, Khandelwal, Khandelwal & Abusaria, 2003; Troosters, Gosselink & Decramer, 2000).
CHAPTER FOUR
IMPLEMENTATION PLAN

Chapter four focuses on planning for implementation of the proposed WEP for COPD patients in Hospital A. It starts with planning to communicate with stakeholders and then to try out the guideline with pilot test to convince people in the designated setting to implement my innovation.

4.1 COMMUNICATION PLAN

4.1.1 Identification of Stakeholders

According to Cluzeau et al. (2012), stakeholders are the persons who have legitimate interests towards and impact on a guideline. The stakeholders involved in this program are (1) the administrators including COS, DOM, WM in RMD for getting approval for implementation. Since the program runs within the department, once the COS has approved then the program can be started and it is not necessary to get approval from the General Manager in Nursing; (2) Nurses are the organizers and frontline users to carry out the guideline; (3) Medical Officers (MO) and physiotherapists who will give comments and recommendations to the program; (4) the consumers of the guideline are COPD patients who will actively engage and participate in the program.

4.1.2 Process of Communication

4.1.2.1 Initiation of Communication

Before the initiation of the communication, it is necessary to set up a WEP committee that serves for facilitating and organizing the pilot study of the program. An Advanced Practice Nurse is invited to join the committee since she
can always give constructive opinion and recommendations from both practical and managerial perspectives. A senior MO and physiotherapist would be invited together with the researcher to form the committee.

The first step of starting the communication plan is to approach the WM and introduce the objectives of the evidence-based program which aims to help improve patient’s QoL and reduce the chance of exacerbation (Boxall, Barclay, Sayers & Caplan, 2005; Nakamura et al., 2008; Singh, Khandelwal, Khandelwal & Abusaria, 2003; Troosters, Gosselink & Decramer, 2000). A written proposal would be prepared by the research committee listing in details of the WEP (Appendix VIII). Then, the WM would be responsible to inform the COS, DOM and the other 3 WMs about the proposal during the department meeting. Comments and questions from the administrators would be answered and discussed. Their suggestions and recommendations would be seriously considered and revisions would be made.

After getting approval from the COS, the committee will request the WM of each ward to announce and introduce the WEP to their staffs. Word file of the proposal will be uploaded to the department intranet website for staff to download while the program details will be discussed during training workshops. The case nurse will introduce and explain the content of the program to the eligible patients and invite them to join.

4.1.2.2 Empowerment and Facilitation

A 2-hours training workshop will be arranged by the committee to train the staffs to run the program. It is estimated that each workshop accommodates 30
staffs so that 4 identical sessions are needed for all staff in RMD. The workshop will focus on pre-assessment such as how to interview participants using CRDQ and how to monitor and control patient’s speed during walking training.

A full version of the proposed guideline is printed and delivered to each ward for reference. A flowchart for patient recruitment with selection criteria is printed out on the first page of each copy of the guideline folder for staff to follow easily. Contact numbers of the committee members are also attached for enquiry and troubleshooting.

4.1.2.3 Monitoring and Sustaining

Revision meetings would be held every 2 weeks by the WEP committee and all staffs are welcomed to join. Improvements are made during reviewing the implementation flow of the program. Minutes for the meetings are prepared and updated regularly on the department website to all staff for reference. Program progress will be reported to the administrators upon request and after completion of the program. The process of communication will be completed within 1 month.

4.2 PILOT TESTING PLAN

A pilot test is a preliminary experiment to try out the feasibility of the innovation and to decide whether to implement to a larger population in the target setting (Polit & Beck, 2008). After a thorough communication with different parties and eventually approval was seek for implementation, a WEP pilot test can be performed to test out the protocol.
4.2.1 Objectives of Pilot Test

(1) To test the feasibility and comprehensiveness of the WEP guideline.

(2) To examine the patient recruitment process.

(3) To evaluate about patient, healthcare provider and system outcomes of the program and their measurement.

(4) To identify unexpected problems elicited and to determine if revisions are needed before full implementation of the program.

4.2.2 Target Setting and Population of Pilot Test

The target setting of the pilot test is the 4 RMD wards in Hospital A. Inclusion criteria of participants are ambulant patients aged over 60 admitted to RMD and are diagnosed COPD staged II to VI or exacerbation. Considering the situation in the target setting, patients who have dyspnoeic exertion; unstable blood pressure; or visual or vestibular disturbance are also excluded from the study in addition to the exclusion criteria mentioned in section 3.2.4.

Since sample size calculation is not necessary in pilot test, the research committee has compromised a group of 15 participants for the pilot test with reference to the sample sizes of the reviewed studies (Nakamura et al., 2008; Oh, 2008). The time for patient recruitment is about 1 week. For ethical concerns, the program details will be explained to eligible patients and informed consent should be obtained before pre-assessment starts.

4.2.3 Study Design

Simple quasi-experimental pretest-posttest design would be used for this pilot study.
4.2.4 Program Intervention

The WEP required patients to walk in the Rehab Garden. Duration of the training is 15 minutes for 2 times with resting time of 1-2 minutes in between. The intensity of walking starts at 60% of peak speed in individual’s baseline 6MWT and gradually increased to no more than 75%. Education on maintaining the walking speed, breathing control, regime compliance and safety precaution would be given to patients during training. The operational flow of the WEP is attached in Appendix X. The length of program is set at 3-months as mentioned in section 3.1.2.4. The Gantt chart for implementation and evaluation plan is attached in Appendix XI.

4.2.5 Outcome Measurement

Outcomes of this pilot test include the feasibility of running the WEP including patient process, program intervention and outcome measurement. Patient outcomes are HRQL, walking capacity and patient compliance. Nurse satisfaction and cost expenditure would be the healthcare provider outcome and system outcome respectively.

4.2.6 Evaluation of Pilot Testing

On completion of the pilot test, the research committee will organize an evaluation meeting to discuss about the outcomes and the feasibility of the innovation. All nurses, doctors and physiotherapists are invited to join the evaluation meeting. Modification and improvement of the implementation process will be made to finalize the protocol before full implementation to a larger population.
The committee will evaluate whether our staffs are clear about how to interview patients using CRDQ. The questionnaires would be interviewed by the same case nurse if possible to maintain consistency. To perform 6MWT, patients are made sure they should be in a good physical state without any exertion. To increase patient’s compliance, walking training is held at 2-3pm in view of patients may undergo treatment in the morning doctor’s round. Furthermore, an emergency plan is needed when incident happened such as to prepare oxygen supply in case patients suffer from desaturation during walking training. Oxygen saturation monitoring may be necessary for the cases.
Chapter five focuses on planning for program evaluation. Firstly, the major outcomes are identified. Then, the time and frequency for outcome measurement would be decided. Furthermore, the nature and number of the eligible clients are determined. The method used for data analysis would be specified. Finally, the basis for considering the effectiveness of the proposed protocol is set.

5.1 IDENTIFICATION OF OUTCOMES

5.1.1 Patient Outcomes

Patient outcomes are defined to assess the clinical benefits of the innovation. To refer back to the objectives of the evidence-based guideline, the primary patient outcome in this innovation is HRQL of COPD patients measured using CRDQ as proposed in the recommended guideline.

Secondary outcomes include patient’s walking capacity and patient’s compliance. Walking capacity is the ability that the patient can walk within a certain period of time. It is measured by performing 6MWT. Patient’s compliance is to assess if they can complete the program as scheduled. It is worth for the administrators to support and encourage new innovation if it shows a low drop-out rate.

5.1.2 Healthcare Provider Outcome

Nurse satisfaction is the healthcare provider outcome in this program to assess their satisfaction level and compliance towards a newly developed
guideline since their workload will increase for performing various kinds of assessment. They are also assessed of how detailed they know about the program implementation and its objectives.

5.1.3 System Outcome

The system outcome in this evaluation is to measure from the hospital perspective on the cost expenditure. The actual cost expenditure for running the program is compared with the predicted budget from the proposal. All extra expenditure which is not planned would be list out for program evaluation.

5.2 NATURE OF CLIENTS INVOLVED IN THE PROGRAM

The nature of participants of the program is the same as that in the pilot test since no modification is needed from the pilot test evaluation. The evaluation would include data from all the participants recruited to the program.

5.3 DETERMINATION OF NUMBER OF CLIENTS

5.3.1 Sampling Method

Non-probability purposive sampling would be used as the sampling method. Patients were selected as the samples when they met the inclusion and exclusion criteria of the program.

5.3.2 Major Outcome

The primary outcome in this program is patient’s HRQL and it is used for sample size calculation.
5.3.3 Sample Size Calculation

Sample size is calculated using an online software G*Power. The design for this program is a hypothesis test using one-sample $t$-test. The statistical significance is set at 0.01 while the power is set at 0.95 for obtaining a more stringent statistical result. The calculated effect size is 0.767 indicating there is a strong effect of the intervention on the outcomes and the estimated sample size is $N=30$. The process of sample size calculation is formulated in Appendix XI.

The research committee will anticipate there is 23.5% attrition rate with reference to the average drop-out rate from the reviewed studies (Behnke et al., 2000; Boxall, Barclay, Sayers & Caplan, 2005; Hernandez et al., 2000; Leung, Alison, McKoeough & Paters, 2010; Nakamura et al., 2008; Oh, 2008; Troosters, Gosselink & Decramer, 2000). Thus, the actual sample size is 37 patients. Time adjustment for patient recruitment is not necessary since COPD in-patients occupy about 40 beds in RMD (1/3 of total beds) according to the admission rate record.

Since all nursing staff in RMD would involve in the program for evaluation, therefore, calculation for sample size of healthcare provider is not necessary.

5.4 DATA COLLECTION AND DATA ANALYSIS

5.4.1 Design

Data analysis is done to obtain useful information collected from the study and to explore the relationship between the variables (Polit & Beck, 2008). The procedure will be started after completion of the program. Intention-to-treat principle would be adopted so that data from all the participants of the
intervention will be collected for analysis.

5.4.2 Outcome Measurements and Evaluation Objectives

5.4.2.1 Patient Outcomes

HRQL is the primary outcome of this program. It is measured by using CRDQ to determine if the total score is increased. It consists of 20 items on a 7-point Likert scale from with higher score indicate better function. A Chinese version of CRDQ (Appendix XII) is tested with validity and reliability (Chan, Tam, Chan, Ng & So, 2006). An increase in 0.5 score of each item is regarded as the MCID of CRDQ indicating a positive and significant treatment effect (Redelmeier, Guyatt & Goldstein, 1996).

6MWT is a timed-walking test originally performed by physiotherapist to determine if patient’s walking distance has increased (ATS Committee, 2002). The patient is asked to walk on a flat track at a speed as fast as tolerated in 6 minutes. The total time and distance walked is recorded in patient’s training diary (Appendix XIII).

Lastly, patient’s compliance is to assess if they adhered to daily walking training. It can be evaluated by the completeness of their training record.

5.4.2.2 Healthcare Provider Outcome

Nurse satisfaction would be assessed to determine if their compliance and satisfaction level are improved. A self-administered Staff Questionnaire on WEP (Appendix XIV) which is constructed by the research team will be used. Staffs will rate on 12 statements using ‘Never’, ‘Seldom’, ‘Sometimes’, ‘Usually’ and
‘Always’ that best describe their practices.

5.4.2.3 System Outcome

Cost expenditure is to estimate whether the actual cost for running the program exceeds the predicted budget that mentioned in program implementation potential.

5.4.2.4 Time for Outcome Measurement

Except for patient compliance, assessments for patient outcomes are done before commencement (Week 0) and at the end of the program (Week 12) for data evaluation. For healthcare provider and system outcomes, data collection is done after completion of the program (Week 12).

5.4.3 Method of Analysis

Descriptive statistical analysis would be used to synthesize patient’s demographic data. Data for patient compliance and nurse satisfaction would be displayed in form of a contingency table. For the rest of patient outcomes, data are analyzed using one-tailed $t$-tests to test for treatment effects. Data analysis would be performed by a statistical package IBM SPSS Statistics version 22 on a Windows computer. The accepted level of statistical significance is $p \leq 0.05$.

5.5 BASIS FOR THE EFFECTIVENESS OF THE PROGRAM

The basis for judging whether the new innovation is effective is necessary for program adoption. As reviewed from previous studies and compromised by the
research committee, the followings are the criteria to consider the WEP as effective.

1. CRDQT is increased by 14 points, although an increase of 10 points in mean CRDQT shows a significant effect of the intervention based on MCID. (Behnke et al., 2000; Hernandez et al., 2000; Leung, Alison, McKeough & Paters, 2010; Oh, 2008; Troosters, Gosselink & Decramer, 2000).

2. An increase of 40m in 6MWT. (Boxall, Barclay, Sayers & Caplan, 2005; Nakamura et al., 2008; Oh, 2008; Singh, Khandelwal, Khandelwal & Abusaria, 2003; Troosters, Gosselink & Decramer, 2000).

3. Patients can complete at least 90% of their training for the whole program since the drop-out rate of the program is set at 23.5%.

4. For nurse satisfaction, at least 95% of staff rated ‘Usually’ and ‘Always’. Although the statistical significance of the program is set at 0.01, the research committee has compromised to achieve at a rate of 95% would be reasonably feasible and effective for a newly invented program.

5. Cost expenditure is (Actual Expenditure ÷ Predicted Budget) \( \leq 1 \).
CHAPTER SIX

CONCLUSIONS AND IMPLICATIONS

This translational nursing research paper investigates the positive effects of ground walking in improving HRQL of patients as evidenced by critical appraisal of the previous studies. It is simple with no complicated equipment or specific training needed to implement. A WEP guideline is developed to improve HRQL of COPD patients in the local setting with specified inclusion and exclusion criteria. The major component of the program is walking exercise training. It can also improve the walking capacity and enhance motivation of the elderly to keep their exercise habit. Walking intensity is tailor-made according to individual’s ability and disease condition. The program is transferable and feasible to be implemented in the desired setting after all-round considerations and assessment. It can be concluded that WEP is more effective in improving HRQL of COPD patients than usual medical care. It is hoped that patients will continue to keep exercising as a habit to maintain their health for long-term benefits.

The proposed program is able to be implemented to other local hospitals since it is proved to be effective and feasible to run in the target hospital. Besides, it is suggested that further research studies concerning walking exercise program should be conducted in Hong Kong hospitals since there is a lack of local study in this field. There is also a lack of studies investigating the effect of walking exercise or rehabilitation program in reducing healthcare utilization which could be an important outcome towards the healthcare system.
Appendix I
SIGN Methodology Checklists

Methodology Checklist 2: Controlled Trials

Study identification

Guideline topic: Walking exercise program for older adults with COPD
Key Question No: N/A
Reviewer: Chan Hoi Yan

SECTION 1: INTERNAL VALIDITY

<table>
<thead>
<tr>
<th>In a well conducted RCT study…</th>
<th>Does this study do it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 The study addresses an appropriate and clearly focused question.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.2 The assignment of subjects to treatment groups is randomised.</td>
<td>Can't say</td>
</tr>
<tr>
<td>1.3 An adequate concealment method is used.</td>
<td>No</td>
</tr>
<tr>
<td>1.4 Subjects and investigators are kept ‘blind’ about treatment allocation.</td>
<td>Can't say</td>
</tr>
<tr>
<td>1.5 The treatment and control groups are similar at the start of the trial.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.6 The only difference between groups is the treatment under investigation.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.7 All relevant outcomes are measured in a standard, valid and reliable way.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.8 What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?</td>
<td>Intervention group: 34.8% (1 died, 1 had exacerbation, 4 lack of motivation, 2 due to unrelated diseases) Control group: 34.8% (1 died, 3 had exacerbation, 2 lack of motivation, 2 due to unrelated diseases)</td>
</tr>
</tbody>
</table>
1.9 All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis). | Yes
Per-protocol analysis

1.10 Where the study is carried out at more than one site, results are comparable for all sites. | Does not apply

**SECTION 2: OVERALL ASSESSMENT OF THE STUDY**

2.1 How well was the study done to minimise bias? | Acceptable (+)
*Code as follows:*

2.2 Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention? | Yes

2.3 Are the results of this study directly applicable to the patient group targeted by this guideline? | Yes

2.4 **Comments:**
A home-based walking training program showed both clinically and statistically significant result on the improvement of quality of life of COPD patients. For methodological assessment, concealment was not applied in the study while randomization method and blinding were not adequately described in the study.
Study identification

Guideline topic: Walking exercise program for older adults with COPD
Key Question No: N/A
Reviewer: Chan Hoi Yan

<table>
<thead>
<tr>
<th>SECTION 1: INTERNAL VALIDITY</th>
<th>Does this study do it?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In a well conducted RCT study…</strong></td>
<td><strong>Yes</strong></td>
</tr>
<tr>
<td>1.1 The study addresses an appropriate and clearly focused question.</td>
<td>Yes The PICO was addressed</td>
</tr>
<tr>
<td>1.2 The assignment of subjects to treatment groups is randomised.</td>
<td>Yes Computer-generated random numbers coded into opaque envelopes</td>
</tr>
<tr>
<td>1.3 An adequate concealment method is used.</td>
<td>Yes Retained in envelopes until initial assessment completed</td>
</tr>
<tr>
<td>1.4 Subjects and investigators are kept ‘blind’ about treatment allocation.</td>
<td>No The author stated that assessors and participants were not blinded</td>
</tr>
<tr>
<td>1.5 The treatment and control groups are similar at the start of the trial.</td>
<td>Yes Insignificant difference between two groups as presented with ( p )-values.</td>
</tr>
<tr>
<td>1.6 The only difference between groups is the treatment under investigation.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.7 All relevant outcomes are measured in a standard, valid and reliable way.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.8 What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?</td>
<td>Intervention group: 23.3% (1 fractured hip, 1 exacerbation of low back pain, 3 withdrew, 1 died, 1 diagnosed lung cancer) Control group: 23.3% (2 withdrew consent, 1 hospital admission, 1 respite care, 1 nursing home admission, 2 died)</td>
</tr>
<tr>
<td>1.9 All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).</td>
<td>Yes Per-protocol analysis</td>
</tr>
</tbody>
</table>
1.10 Where the study is carried out at more than one site, results are comparable for all sites. | Does not apply

**SECTION 2: OVERALL ASSESSMENT OF THE STUDY**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| **2.1** | How well was the study done to minimise bias?  
*Code as follows:* | Acceptable (+) |
| **2.2** | Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention? | Yes |
| **2.3** | Are the results of this study directly applicable to the patient group targeted by this guideline? | Yes |
| **2.4** | **Comments**  
Home-based PRP consisting walking and arm exercises can bring about improvement in functional capacity and QoL for patients with COPD. Patients who are housebound can be benefited from the program. For methodological assessment, the study is of good quality except blinding was not applied. |   |
### Methodology Checklist 2: Controlled Trials

**Guideline topic:** Walking exercise program for older adults with COPD  
**Key Question No:** N/A  
**Reviewer:** Chan Hoi Yan

#### SECTION 1: INTERNAL VALIDITY

<table>
<thead>
<tr>
<th></th>
<th><strong>In a well conducted RCT study...</strong></th>
<th><strong>Does this study do it?</strong></th>
</tr>
</thead>
</table>
| 1.1 | The study addresses an appropriate and clearly focused question. | Yes  
The PICO was addressed |
| 1.2 | The assignment of subjects to treatment groups is randomised. | Can't say  
Randomization method is not mentioned |
| 1.3 | An adequate concealment method is used. | No  
Concealment method was not mentioned |
| 1.4 | Subjects and investigators are kept 'blind' about treatment allocation. | Can't say  
Presence of blinding was not clear |
| 1.5 | The treatment and control groups are similar at the start of the trial. | Yes |
| 1.6 | The only difference between groups is the treatment under investigation. | Yes |
| 1.7 | All relevant outcomes are measured in a standard, valid and reliable way. | Yes |
| 1.8 | What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed? | Intervention group: 33.3%  
(6 lack cooperation, 4 had exacerbation of their underlying pathology)  
Control group: 43.3%  
(7 not cooperation with evaluation, 4 had acute exacerbation, 1 had CVA, 1 waiting for surgery) |
| 1.9 | All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis). | Yes  
Per-protocol analysis |
| 1.10 | Where the study is carried out at more than one site, results are comparable for all sites. | Does not apply |

---

**Study identification**

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>How well was the study done to minimise bias?</td>
<td>Acceptable (+)</td>
</tr>
<tr>
<td></td>
<td><em>Code as follows:</em></td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td>Taking into account clinical considerations, your evaluation of the</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>methodology used, and the statistical power of the study, are you</td>
<td></td>
</tr>
<tr>
<td></td>
<td>certain that the overall effect is due to the study intervention?</td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td>Are the results of this study directly applicable to the patient group</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>targeted by this guideline?</td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td><strong>Comments:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Home-based lower-extremity training improves quality of life of COPD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>patients with statistically significant ( p )-values indicated. For</td>
<td></td>
</tr>
<tr>
<td></td>
<td>methodological assessment, no concealment method is reported in the</td>
<td></td>
</tr>
<tr>
<td></td>
<td>study and randomization method is not described in detail.</td>
<td></td>
</tr>
</tbody>
</table>
**Methodology Checklist 2: Controlled Trials**

**Study identification**

<table>
<thead>
<tr>
<th>Guideline topic: Walking exercise program for older adults with COPD</th>
<th>Key Question No:</th>
<th>Reviewer:</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>Chan Hoi Yan</td>
<td></td>
</tr>
</tbody>
</table>

**SECTION 1: INTERNAL VALIDITY**

**In a well conducted RCT study…**

<table>
<thead>
<tr>
<th>Does this study do it?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.1</strong> The study addresses an appropriate and clearly focused question.</td>
</tr>
<tr>
<td><strong>1.2</strong> The assignment of subjects to treatment groups is randomised.</td>
</tr>
<tr>
<td><strong>1.3</strong> An adequate concealment method is used.</td>
</tr>
<tr>
<td><strong>1.4</strong> Subjects and investigators are kept ‘blind’ about treatment allocation.</td>
</tr>
<tr>
<td><strong>1.5</strong> The treatment and control groups are similar at the start of the trial.</td>
</tr>
<tr>
<td><strong>1.6</strong> The only difference between groups is the treatment under investigation.</td>
</tr>
<tr>
<td><strong>1.7</strong> All relevant outcomes are measured in a standard, valid and reliable way.</td>
</tr>
<tr>
<td><strong>1.8</strong> What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?</td>
</tr>
<tr>
<td><strong>1.9</strong> All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).</td>
</tr>
<tr>
<td><strong>1.10</strong> Where the study is carried out at more than one site, results are comparable for all sites.</td>
</tr>
</tbody>
</table>

**SECTION 2: OVERALL ASSESSMENT OF THE STUDY**

<table>
<thead>
<tr>
<th>Acceptable (+)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2.1</strong> How well was the study done to minimise bias?</td>
</tr>
<tr>
<td><em>Code as follows:</em></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>2.3</td>
</tr>
</tbody>
</table>
| 2.4 | **Comments:**  
Ground walk training has been proved to be an effective component in PRP to improve quality of life of COPD patients. The absolute effect of the desired intervention cannot be concluded because cycling training acted as an active control group in the study. The study assessor was blinded to group allocation who performed the outcome measures. Low attrition rate was seen in the study. Baseline characteristics of participants show no significant difference but the $p$-values were not reported in the study. |
Methodology Checklist 2: Controlled Trials

<table>
<thead>
<tr>
<th>Study identification</th>
<th>Guideline topic: Walking exercise program for older adults with COPD</th>
<th>Key Question No:</th>
<th>Reviewer:</th>
</tr>
</thead>
</table>

SECTION 1: INTERNAL VALIDITY

*In a well conducted RCT study…*  
*Does this study do it?*

<table>
<thead>
<tr>
<th>1.1 The study addresses an appropriate and clearly focused question.</th>
<th>Yes</th>
<th>The PICO was addressed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2 The assignment of subjects to treatment groups is randomised.</td>
<td>Can't say</td>
<td>Randomization presented but the method was not mentioned</td>
</tr>
<tr>
<td>1.3 An adequate concealment method is used.</td>
<td>No</td>
<td>Concealment method was not mentioned</td>
</tr>
<tr>
<td>1.4 Subjects and investigators are kept 'blind' about treatment allocation.</td>
<td>Can't say</td>
<td>Presence of blinding was not mentioned</td>
</tr>
<tr>
<td>1.5 The treatment and control groups are similar at the start of the trial.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>1.6 The only difference between groups is the treatment under investigation.</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>1.7 All relevant outcomes are measured in a standard, valid and reliable way.</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>
| 1.8 What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed? | AERO+ST: 28.6%  
AERO+RA: 7.1%  
Control group: 28.6%  
(Among the groups, 6 refused to participate, 3 met one or more exclusion criteria) |
| 1.9 All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis). | Yes | Modified intention-to-treat analysis was used |
| 1.10 Where the study is carried out at more than one site, results are comparable for all sites. | Does not apply |

58
<table>
<thead>
<tr>
<th>Section 2: Overall Assessment of the Study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2.1</strong> How well was the study done to minimize bias?</td>
</tr>
<tr>
<td><em>Code as follows:</em></td>
</tr>
<tr>
<td>Acceptable (+)</td>
</tr>
<tr>
<td><strong>2.2</strong> Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td><strong>2.3</strong> Are the results of this study directly applicable to the patient group targeted by this guideline?</td>
</tr>
<tr>
<td>Yes</td>
</tr>
<tr>
<td><strong>2.4</strong> Comments:</td>
</tr>
<tr>
<td>It is suggested to practice exercise to improve physical strength and to begin recreational activities to train different body muscles. The training program was effective in some domains of QoL. For methodological assessment, AERO+ST and control group had a high attrition rate but the author applied ITT to minimize the attrition bias to analyze the study results.</td>
</tr>
</tbody>
</table>
### Methodology Checklist 2: Controlled Trials

**Study identification**

**Guideline topic:** Walking exercise program for older adults with COPD  
**Key Question No:** N/A  
**Reviewer:** Chan Hoi Yan

#### SECTION 1: INTERNAL VALIDITY

**In a well conducted RCT study...**  
**Does this study do it?**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
</table>
| 1.1 | The study addresses an appropriate and clearly focused question. | Yes  
|   | The PICO was addressed | |
| 1.2 | The assignment of subjects to treatment groups is randomised. | Yes  
|   | Randomized in order of referral | |
| 1.3 | An adequate concealment method is used. | No  
|   | Concealment method was not mentioned | |
| 1.4 | Subjects and investigators are kept ‘blind’ about treatment allocation. | Can’t say  
|   | Presence of blinding was not clearly stated | |
| 1.5 | The treatment and control groups are similar at the start of the trial. | Yes | |
| 1.6 | The only difference between groups is the treatment under investigation. | Yes | |
| 1.7 | All relevant outcomes are measured in a standard, valid and reliable way. | Yes | |
| 1.8 | What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed? | Intervention group: 15.8%  
|   | (4 did not follow-up)  
|   | Control group: 46.7%  
|   | (4 did not follow-up, 2 lack of motivation to continue, 1 suffered from arthritis) | |
| 1.9 | All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis). | Yes  
|   | Per-protocol analysis | |
| 1.10 | Where the study is carried out at more than one site, results are comparable for all sites. | Does not apply | |

#### SECTION 2: OVERALL ASSESSMENT OF THE STUDY

2.1 How well was the study done to | Acceptable (+) |
|   | minimise bias?  
<table>
<thead>
<tr>
<th></th>
<th><em>Code as follows:</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2</td>
<td>Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention?</td>
</tr>
<tr>
<td>2.3</td>
<td>Are the results of this study directly applicable to the patient group targeted by this guideline?</td>
</tr>
</tbody>
</table>
| 2.4 | **Comments:**  
The study suggested a home-based PRP could improve patient’s exercise tolerance, dyspnoea on exertion and HRQL. For methodological assessment, concealment was not applied and blinding was not adequately described in the study. Attrition rate is relatively high in the control group which can lead to risk of bias and eventually |
Methodology Checklist 2: Controlled Trials

Guideline topic: Walking exercise program for older adults with COPD

Key Question No: N/A
Reviewer: Chan Hoi Yan

SECTION 1: INTERNAL VALIDITY

<table>
<thead>
<tr>
<th>In a well conducted RCT study...</th>
<th>Does this study do it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 The study addresses an appropriate and clearly focused question.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.2 The assignment of subjects to treatment groups is randomised.</td>
<td>Can't say</td>
</tr>
<tr>
<td>1.3 An adequate concealment method is used.</td>
<td>No</td>
</tr>
<tr>
<td>1.4 Subjects and investigators are kept ‘blind’ about treatment allocation.</td>
<td>Can't say</td>
</tr>
<tr>
<td>1.5 The treatment and control groups are similar at the start of the trial.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.6 The only difference between groups is the treatment under investigation.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.7 All relevant outcomes are measured in a standard, valid and reliable way.</td>
<td>Yes</td>
</tr>
<tr>
<td>1.8 What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?</td>
<td>Intervention group: 0%</td>
</tr>
<tr>
<td>1.9 All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).</td>
<td>Yes</td>
</tr>
<tr>
<td>1.10 Where the study is carried out at more than one site, results are comparable for all sites.</td>
<td>Does not apply</td>
</tr>
</tbody>
</table>

SECTION 2: OVERALL ASSESSMENT OF THE STUDY

| 2.1 How well was the study done to minimise bias? | Acceptable (+) |

---

<table>
<thead>
<tr>
<th>Code as follows:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2.2</strong> Taking into account clinical considerations, your evaluation of the</td>
<td></td>
</tr>
<tr>
<td>methodology used, and the statistical power of the study, are you certain that</td>
<td></td>
</tr>
<tr>
<td>the overall effect is due to the study intervention?</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>2.3</strong> Are the results of this study directly applicable to the patient group</td>
<td></td>
</tr>
<tr>
<td>targeted by this guideline?</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>2.4</strong> <strong>Comments</strong></td>
<td></td>
</tr>
<tr>
<td>A significant improvement has been found in 6MWT and QoL in home PRP. QoL</td>
<td></td>
</tr>
<tr>
<td>of control group did not changed much. Statistical significance between the</td>
<td></td>
</tr>
<tr>
<td>two groups was shown. Bias may be resulted since randomization and concealment</td>
<td></td>
</tr>
<tr>
<td>method were not mentioned and blinding was not clearly stated in the study.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Methodology Checklist 2: Controlled Trials</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Guideline topic</td>
<td>Walking exercise program for older adults with COPD</td>
</tr>
<tr>
<td>Key Question No</td>
<td>N/A</td>
</tr>
<tr>
<td>Reviewer</td>
<td>Chan Hoi Yan</td>
</tr>
<tr>
<td><strong>SECTION 1: INTERNAL VALIDITY</strong></td>
<td></td>
</tr>
<tr>
<td><strong>In a well conducted RCT study...</strong></td>
<td><strong>Does this study do it?</strong></td>
</tr>
<tr>
<td>1.1</td>
<td>The study addresses an appropriate and clearly focused question.</td>
</tr>
<tr>
<td>1.2</td>
<td>The assignment of subjects to treatment groups is randomised.</td>
</tr>
<tr>
<td></td>
<td>Randomization presented but the method was not mentioned</td>
</tr>
<tr>
<td>1.3</td>
<td>An adequate concealment method is used.</td>
</tr>
<tr>
<td></td>
<td>Using sealed envelopes</td>
</tr>
<tr>
<td>1.4</td>
<td>Subjects and investigators are kept 'blind' about treatment allocation.</td>
</tr>
<tr>
<td>1.5</td>
<td>The treatment and control groups are similar at the start of the trial.</td>
</tr>
<tr>
<td>1.6</td>
<td>The only difference between groups is the treatment under investigation.</td>
</tr>
<tr>
<td>1.7</td>
<td>All relevant outcomes are measured in a standard, valid and reliable way.</td>
</tr>
<tr>
<td>1.8</td>
<td>What percentage of the individuals or clusters recruited into each treatment arm of the study dropped out before the study was completed?</td>
</tr>
<tr>
<td></td>
<td>Intervention group: 32%</td>
</tr>
<tr>
<td></td>
<td>(1 refused initial testing, 12 refused to training, 1 lost to follow-up, 2 died)</td>
</tr>
<tr>
<td></td>
<td>Control group: 44%</td>
</tr>
<tr>
<td></td>
<td>(2 refused initial testing, 15 refused follow-up, 2 lost to follow-up, 3 died)</td>
</tr>
<tr>
<td>1.9</td>
<td>All the subjects are analysed in the groups to which they were randomly allocated (often referred to as intention to treat analysis).</td>
</tr>
<tr>
<td></td>
<td>Treatment effect may be over-estimated.</td>
</tr>
<tr>
<td>1.10</td>
<td>Where the study is carried out at more than one site, results are comparable for all sites.</td>
</tr>
</tbody>
</table>
### SECTION 2: OVERALL ASSESSMENT OF THE STUDY

|   | How well was the study done to minimise bias?  
<table>
<thead>
<tr>
<th></th>
<th><em>Code as follows:</em></th>
<th>Acceptable (+)</th>
</tr>
</thead>
</table>
| 2.1 | How well was the study done to minimise bias?  
|     | *Code as follows:* | Acceptable (+) |
| 2.2 | Taking into account clinical considerations, your evaluation of the methodology used, and the statistical power of the study, are you certain that the overall effect is due to the study intervention? | Yes |
| 2.3 | Are the results of this study directly applicable to the patient group targeted by this guideline? | Yes |
| 2.4 | **Comments:**  
|     | A home-based walking training program showed both clinically and statistically significant result on the improvement of quality of life of COPD patients. For methodological assessment, concealment method and blinding were not mentioned. Treatment effect may be over-estimated since intention-to-treat analysis was not applied in the study. |   |
## Levels of Evidence

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1++</strong></td>
<td>High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias</td>
</tr>
<tr>
<td><strong>1+</strong></td>
<td>Well-conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias</td>
</tr>
<tr>
<td><strong>1-</strong></td>
<td>Meta-analyses, systematic reviews, or RCTs with a high risk of bias</td>
</tr>
<tr>
<td><strong>2++</strong></td>
<td>High quality systematic reviews of case control or cohort or studies</td>
</tr>
<tr>
<td></td>
<td>High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal</td>
</tr>
<tr>
<td><strong>2+</strong></td>
<td>Well-conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal</td>
</tr>
<tr>
<td><strong>2-</strong></td>
<td>Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal</td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Non-analytic studies, e.g. case reports, case series</td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>Expert opinion</td>
</tr>
</tbody>
</table>
## Appendix III

### Summary of search history

<table>
<thead>
<tr>
<th>Keywords search</th>
<th>Databases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cochrane Library</td>
</tr>
<tr>
<td>(i) COPD or chronic obstructive pulmonary disease or chronic obstructive pulmonary diseases or stable COPD or stable chronic obstructive pulmonary disease or COAD or chronic obstructive airway disease or chronic obstructive airway diseases or chronic obstructive lung disease or chronic obstructive lung diseases or chronic airflow obstruction or chronic airflow obstructions or airflow obstruction chronic or chronic airway obstruction or chronic airway obstructions or airway obstruction chronic</td>
<td>7922</td>
</tr>
<tr>
<td>(ii) walk or walking or walking exercise or walking exercises or walking exercise program or walking exercise programs or walking training or walking program or walking programs or ambulation or early ambulation or treadmill</td>
<td>10052</td>
</tr>
<tr>
<td>(iii) quality of life or health related quality of life or life quality</td>
<td>20936</td>
</tr>
<tr>
<td>(i) AND (ii) AND (iii) (11245)</td>
<td>628</td>
</tr>
<tr>
<td>Screening titles or citations (268)</td>
<td>59</td>
</tr>
<tr>
<td>Screening full text (12)</td>
<td>0</td>
</tr>
<tr>
<td>Eligible studies</td>
<td></td>
</tr>
</tbody>
</table>
### Appendix IV (TOE)


<table>
<thead>
<tr>
<th>Bibliographic Citation; Study Type</th>
<th>Patient Characteristics</th>
<th>Intervention(s)</th>
<th>Comparison</th>
<th>Length of Follow-up</th>
<th>Outcome Measures (Measurement Tools)</th>
<th>Study Results/ Effect Sizes&lt;sup&gt;2&lt;/sup&gt; (*Significantly different from baseline)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behnke et al. (2000) RCT</td>
<td>♦ Severe COPD patients (European Respiratory Society) in Germany ♦ Age (years): 64 vs 68 ♦ Male (%): 80 vs 73 ♦ BMI: 24.6 vs 24.4 ♦ FVC: 72 vs 73.5 ♦ FEV&lt;sub&gt;1&lt;/sub&gt;: 34.1 vs 37.5 ♦ BDI: 3.9 vs 3.8 ♦ Borg: 2.4 vs 2.7 ♦ 6MWD: 265 vs 223 ♦ CRDQD: 13.2 vs 13.1 ♦ CRDQF: 17 vs 15.3 ♦ CRDQEF: 31.5 vs 33.7 ♦ CRDQM: 17.7 vs 17.9 ♦ <em>(CRDQT: 79.3 vs 79.5)</em></td>
<td>♦ N=23 ♦ <strong>Program</strong>: 10-day hospital-based then 6-month home-based walking training program ♦ <strong>Component</strong>: (i) 10-day hospital-based training: 6-min treadmill test and 5 self-controlled walking sessions with at least 75% 6MWD. Frequency: daily (ii) 6-month home-based training: 125% of best of treadmill 6MWD in 15 min. Frequency: 3 times per day ♦ Record on diary the walking distance and time with visit every 2 weeks by investigators in first 3 months then monthly by phone call.</td>
<td>♦ N=23 ♦ No structured training program except conventional therapy including pharmacological therapy and 30-min daily breathing exercise as identical as intervention group</td>
<td>♦ Day-11, 3 and 6 months ♦ For QoL, assessment was only done at 3&lt;sup&gt;rd&lt;/sup&gt; and 6&lt;sup&gt;th&lt;/sup&gt; month</td>
<td>(1) Lung function (Spirometry) (2) Dyspnoea score (BDI) (3) Quality of life (CRDQ) (4) Exercise performance (6MWD)</td>
<td>At Day 11: (1) FEV&lt;sub&gt;1&lt;/sub&gt;(L)= +0.21* vs +0.13 (p&lt;0.001) (2) BDI= +6.9* vs +3.1* (p&lt;0.001) (3) N/A (4) 6MWD= +225* vs +8 (p&lt;0.001) At 3&lt;sup&gt;rd&lt;/sup&gt; month: (1) FEV&lt;sub&gt;1&lt;/sub&gt;(L)= +0.17* vs +0.3 (p&lt;0.001) (2) BDI= +4.6* vs +0.3 (p&lt;0.001) (3) CRDQD= +8.9* vs +2.6 (p&lt;0.01) CRDQF= +3.7* vs +0.4 (p&lt;0.01) CRDQEF= +7.3* vs 0 CRDQM= +5.8* vs -1 (p&lt;0.01) <em>(CRDQT= +25.7</em> vs +2)* (4) 6MWD*(p&lt;0.001) At 6&lt;sup&gt;th&lt;/sup&gt; month: (1) FEV&lt;sub&gt;1&lt;/sub&gt;(L)= +0.23* vs +0.1 (p ≦ 0.05) (2) BDI= +4.4* vs -2.8 (p&lt;0.001) (3) CRDQD= +12.1<em>vs +0.8 (p&lt;0.001) CRDQF= +6.5</em> vs -0.8 (p&lt;0.001) CRDQEF= +10.6* vs -1.8 (p&lt;0.01) CRDQM= +8.2* vs -0.4 (p&lt;0.001) <em>(CRDQT= +37.4 vs -2.2)</em> (4) 6MWD* (p&lt;0.001)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bibliographic Citation; Study Type</th>
<th>Patient Characteristics</th>
<th>Intervention(s)</th>
<th>Comparison</th>
<th>Length of Follow-up</th>
<th>Outcome Measures (Measurement Tools)</th>
<th>Study Results/ Effect Sizes (<em>Significantly different from baseline</em>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boxall, Barclay, Sayers and Caplan (2005)</td>
<td>♦ Diagnosed COPD by local respiratory specialist in Australia ♦ Age(years): 77.6 vs 75.8 ♦ Male(%): 48 vs 65 ♦ Oxygen use (%): 52 vs 57 ♦ FEV₁: 40.5 vs 37.7; FEV₁/FVC: 74.4 vs 70.4 ♦ 6MWD: 164 vs 147.5 ♦ SGRQT: 56.5 vs 61 ♦ SGRQS: 61.7 vs 71.5 ♦ SGRQI: 50.7 vs 56.5 ♦ SGRQA: 63.6 vs 63.6 ♦ BI: 19.4 vs 18.8 ♦ Borg Score: 3.3 vs 3.9 ♦ IADL Score: 7.6 vs 7.1</td>
<td>♦ N=30 ♦ Program: Home-based pulmonary rehabilitation program ♦ Component: (i) Walking exercise: 15 min x2 plus 2 min resting time; (ii) Arm exercise: 3 sets of 6 repetitions; (iii) Education sessions ♦ Intensity: prescribed by oxygen saturation and Borg score ♦ Frequency: Once daily ♦ Duration: 3 months ♦ Recorded by exercise diary with weekly physiotherapy visits for first 6 weeks then fortnightly</td>
<td>♦ N=30 ♦ Usual medical care and had a 3-month delay before commencing the identical program</td>
<td>♦ 3 months</td>
<td>(1) Exercise tolerance (6MWD) ♦ (2) Quality of life (SGRQ) ♦ (3) Dyspnoea (Borg Score)</td>
<td>(1) 6MWD= +39.0 vs +4.2 (p=0.023) (2) SGRQT= -5.8 vs -1.4 (p=0.02) SGRQS= +2 vs -0.6 (p=0.21) SGRQI= -8.2 vs -2 (p=0.024) SGRQA= -5.9 vs -1 (p=0.241) (3) Borg score= -0.13 vs +0.22 (p=0.024)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bibliographic Citation; Study Type</th>
<th>Patient Characteristics</th>
<th>Intervention(s)</th>
<th>Comparison</th>
<th>Length of Follow-up</th>
<th>Outcome Measures (Measurement Tools)</th>
<th>Study Results/ Effect Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hernandez et al. (2000) RCT</td>
<td>♦ COPD patients (European Respiratory Society) in Spain</td>
<td>♦ N=30</td>
<td>♦ N=30</td>
<td>♦ 3 months</td>
<td>(1) Pulmonary function studies (Spirometry)</td>
<td>(1) NS</td>
</tr>
<tr>
<td></td>
<td>♦ Age (years): 64.3 vs 63.1</td>
<td>♦ Program: Home exercise training program</td>
<td>♦ Visit to hospital every 2 weeks for clinical checkup and treatment supervision</td>
<td></td>
<td>(2) Shuttle walking test (SWT)</td>
<td>(2) SWT= 0 vs -0.3</td>
</tr>
<tr>
<td></td>
<td>♦ FVC: 71.1 vs 74.7</td>
<td>♦ Component: Walking for 20m at home or a place near home</td>
<td></td>
<td></td>
<td>(3) Time(min)= +18.9 vs +2.4</td>
<td>(3) Time(min)= +18.9 vs +2.4 (p=0.01)</td>
</tr>
<tr>
<td></td>
<td>♦ FEV₁: 41.7 vs 40</td>
<td>♦ Intensity: 70% of SWT</td>
<td></td>
<td></td>
<td>Distance(m)= +1403 vs +188 (p=0.01)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>♦ FEV₁/FVC ratio : 47 vs 42.3</td>
<td>♦ Frequency: 1-hr per day (6 days a week)</td>
<td></td>
<td></td>
<td>(4) BDI= +1.6 vs -0.3 (p=0.03)</td>
<td>(4) BDI= +1.6 vs -0.3 (p=0.03)</td>
</tr>
<tr>
<td></td>
<td>♦ BDIA: 4.7 vs 5.4</td>
<td>♦ Duration: 3 months</td>
<td></td>
<td></td>
<td>(5) CRDQ= 5.4* vs 1.5</td>
<td>(5) CRDQ= 5.4* vs 1.5 (p&lt;0.01)</td>
</tr>
<tr>
<td></td>
<td>♦ CRDQ: 14.7 vs 16.1</td>
<td>♦ Follow up in hospital every 2 weeks for supervision</td>
<td></td>
<td></td>
<td>CRDQF= 3.7* vs 0.1</td>
<td>CRDQF= 3.7* vs 0.1 (p&lt;0.05)</td>
</tr>
<tr>
<td></td>
<td>♦ CRDQF: 17.4 vs 20.1</td>
<td></td>
<td></td>
<td></td>
<td>CRDQEF=5.7* vs 2</td>
<td>CRDQEF=5.7* vs 2 (p&lt;0.01)</td>
</tr>
<tr>
<td></td>
<td>♦ CRDQM: 19.4 vs 20.2</td>
<td></td>
<td></td>
<td></td>
<td>CRDQM= 2.5* vs -0.2</td>
<td>CRDQM= 2.5* vs -0.2 (p&lt;0.05)</td>
</tr>
<tr>
<td></td>
<td>♦ (CRDQT: 82.3 vs 90.6)</td>
<td></td>
<td></td>
<td></td>
<td>(CRDQT= +17.3 vs +3.4)</td>
<td></td>
</tr>
</tbody>
</table>

*Significantly different from baseline*

<table>
<thead>
<tr>
<th>Bibliographic Citation; Study Type</th>
<th>Patient Characteristics</th>
<th>Intervention(s)</th>
<th>Comparison</th>
<th>Length of Follow-up</th>
<th>Outcome Measures (Measurement Tools)</th>
<th>Study Results/ Effect Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leung, Alison, McKeough and Paters (2010)</td>
<td>♦ COPD stage I to IV patients (GOLD classification) in Australia ♦ Age (years): 71 vs 72 ♦ Male(%): 78 vs 61 ♦ BMI: 27 vs 26 ♦ FEV$_1$: 56 vs 53 ♦ FVC: 86 vs 84 ♦ FEV$_1$/FVC ratio: 50 vs 49 ♦ TLC: 99 vs 102 ♦ 6MWD(%): 72 vs 65 ♦ CRDQD: 17 vs 16 ♦ CRDQF: 18 vs 15 ♦ CRDQEF: 36 vs 33 ♦ CRDQM: 22 vs 18 ♦ CRDQT: 93 vs 82</td>
<td>♦ N=18 ♦ Program: Walking training program ♦ Component: Trained on a 26-m circular indoor track ♦ Intensity: Initial training speed at 75% of peak walking speed. Each lap to be completed in 5-min period. ♦ Frequency: 30-45 min per session at 3 sessions per week ♦ Duration: 2 months for 8 weeks.</td>
<td>♦ N=18 ♦ Program: Cycling training program ♦ Component: Trained on upright cycle ergometer with initial training intensity at 60% of participant’s peak work capacity ♦ Duration: 30-45 min per session. 3 sessions per week for 2 months.</td>
<td>♦ 2 months</td>
<td>Primary outcome: (1) Endurance walking capacity (ISWT) Secondary outcomes: (2) Peak walking capacity (ISWT) (3) Peak cycling capacity (ICT) (4) Endurance cycling capacity (ICT) (5) Health-related quality of life (CRDQ)</td>
<td>95% CI of mean difference between groups: (1) ISWT==+54 vs +45 (-15 to 34) (2) ESWT==+439 vs +160 (70 to 483) (3) ICT==+6 vs +13 (-17 to 2) (4) ECT==+140 vs +293 (-350 to 42) (5) CRDQD==+4 vs +4 (-2 to 3) CRDQF==+3 vs +2 (-0.4 to 3) CRDQEF==+5 vs +2 (-1 to 4) CRDQM==+2 vs +2 (-2 to 2) CRDQT==+14 vs +10 (-2 to 10)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bibliographic Citation; Study Type</th>
<th>Patient Characteristics¹</th>
<th>Intervention(s)</th>
<th>Comparison</th>
<th>Length of Follow-up</th>
<th>Outcome Measures (Measurement Tools)</th>
<th>Study Results/ Effect Sizes²</th>
</tr>
</thead>
</table>
| Nakamura et al. (2008) RCT        | ♦ COPD patients (Japanese Respiratory Society) in Japan                           | ♦ N=14 for both groups  
♦ Program: Exercise training program  
♦ Component: Group 1: Aerobic training + ST: 20 min walking + Stretching of extremities (3 sets of 10 repetitions and 30-s rest between sets)  
Group 2: Aerobic training + RA: 20 min walking + 60 min rubber ball exercise  
♦ Intensity: 3-5 on Borg score  
♦ Frequency: Once daily  
♦ Duration: 3 months  
♦ Patients documented their training in a diary | ♦ N=14  
♦ No exercise program | ♦ 3 months | (1) Exercise test (Medical Gas Analyzer)  
(2) 6-min walking distance testing (6MWD)  
(3) Muscular strength and endurance measurement  
(4) Quality of life (SF-36)  
(i) Physical functioning  
(ii) Role – physical  
(iii) Bodily pain  
(iv) General health  
(v) Vitality  
(vi) Social functioning  
(vii) Role – emotional  
(viii) Mental health | Group 1 vs Group 2 vs Control:  
(1) NS  
(2) 6MWD= +22.6 vs +51.6 vs -1.9 (p<0.05)  
(3) Grip strength+ Arm curl: NS  
Keeping a half-squat position: p=0.009  
(4) SF-36 (mean % change):  
(i) 7.9 vs 1.1 vs -14.8 (p=0.042)⁶  
(ii) -1.9 vs 0.0 vs -40.0 (p=0.154)  
(iii) 4.6 vs -5.6 vs 4.9 (p=0.616)  
(iv) 22.9 vs 21.2 vs -8.4 (p=0.063)  
(v) 15.4 vs 16.1 vs -8.0 (p=0.048)⁵  
(vi) 5.7 vs 9.4 vs -14.9 (p=0.012)⁵  
(vii) 33.3 vs 10.3 vs -25.0 (p=0.169)  
(viii) 11.3 vs 12.2 vs -5.0 (p=0.020)⁴ |

a. p<0.05 between Group 1 and control group.  
b. p>0.05 among three groups.  
c. p<0.05 between Group 2 and control group.  
d. p<0.05 between Group 2 and control group.

<table>
<thead>
<tr>
<th>Bibliographic Citation; Study Type</th>
<th>Patient Characteristics¹</th>
<th>Intervention(s)</th>
<th>Comparison</th>
<th>Length of Follow-up</th>
<th>Outcome Measures (Measurement Tools)</th>
<th>Study Results/ Effect Sizes²</th>
</tr>
</thead>
</table>
| Oh (2008) RCT                      | COPD patients (Diagnosed by respiratory physician) in Korea | ♦ N=19  
♦ Program: Comprehensive home-based pulmonary rehabilitation program | ♦ N=15  
♦ Only received educational advice | ♦ 2 months | (1) Lung function (Spirometry)  
(2) Dyspnoea on exertion (Modified Borg Scale)  
(3) Exercise tolerance (6MWD)  
(4) Health-related quality of life (CRDQ) | (1) FEV₁ = +6.79 vs +8.98 (p=0.93)  
FEV₁/FVC (%) = +0.99 vs +1.63 (p=0.88)  
(2) Modified Borg Scale = -1.79 vs +1.28 (p=0.04)  
(3) 6MWD = +40.61 vs -27.32 (p=0.00)  
(4) CRDQD = +3.66 vs +6.62 (p=0.62)  
CRDQF = +5.6 vs -0.13 (p=0.03)  
CRDQEF = +8.4 vs -1.87 (p=0.00)  
CRDQM = +3.86 vs -0.75 (p=0.002)  
CRDQT = +17.45 vs -2.55 (p=0.03) |

<table>
<thead>
<tr>
<th>Bibliographic Citation; Study Type</th>
<th>Patient Characteristics</th>
<th>Intervention(s)</th>
<th>Comparison</th>
<th>Length of Follow-up</th>
<th>Outcome Measures (Measurement Tools)</th>
<th>Study Results/ Effect Sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singh, Khandelwal, Khandelwal and Abusaria (2003) RCT</td>
<td>♦ Stable severe COPD patients in India  ♦ Age (years): 59.37± 6.4  ♦ Male (%): 80  ♦ FEV1; 28 vs 26  ♦ FEV1 /FVC ratio: 44 vs 48  ♦ 6MWD: 261 vs 247;7  ♦ CRDQD: 15.8 vs 17.5  ♦ CRDQF: 11.2 vs 11.92  ♦ CRDQEF: 21 vs 21  ♦ CRDQM: 11.56 vs 12.4  ♦ <em>(CRDQT: 59.56 vs 62.82)</em></td>
<td>♦ N=20  ♦ Program: Domiciliary pulmonary rehabilitation program  ♦ Component: (a) Removal of secretions; (b) Lower extremity exercises; (c) Breathing strategies and energy conservation; (d) Work simplification  ♦ Intensity: walk with submaximal speed  ♦ Frequency: 30 min twice daily  ♦ Duration: 1 month  ♦ Patients were supervised weekly for the rehabilitation schedule and regular treatment.</td>
<td>♦ N=20  ♦ Usual care</td>
<td>♦ 1 month</td>
<td>♦ (1) Lung function (Spirometry)  ♦ (2) 6MWT (6MWD)  ♦ (3) Quality of life (CRDQ)</td>
<td>♦ (1) FEV1=+1.1 vs +0.9 (NS)  ♦ (2) 6MWD= 54.2 vs 6.7 (p&lt;0.001)  ♦ (3) CRDQD= 4.8 vs 0.4 (p&lt;0.001)  ♦ CRDQF= 3.6 vs 0.24 (p&lt;0.001)  ♦ CRDQEF= 6.3 vs 1.05 (p&lt;0.001)  ♦ CRDQM= 3.56 vs 0.2 (p&lt;0.001)  ♦ <em>(CRDQT= 18.26 vs 1.89)</em></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bibliographic Citation; Study Type</th>
<th>Patient Characteristics1</th>
<th>Intervention(s)</th>
<th>Comparison</th>
<th>Length of Follow-up</th>
<th>Outcome Measures (Measurement Tools)</th>
<th>Study Results/ Effect Sizes2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Troosters, Gosselink and Decramer (2000)</td>
<td>Severe COPD patients with FEV1 &lt;65% in Belgium</td>
<td>N=50</td>
<td>N=50</td>
<td>6 months and 18 months (for QoL only)</td>
<td>(1) Pulmonary function test (Spirometry) (2) Functional exercise capacity (6MWD) (3) Maximal exercise capacity (maximal cycle ergometer) (4) Peripheral muscle strength (Dynamometer) (5) Respiratory muscle strength (Standard techniques) (6) Quality of life (CRDQ)</td>
<td></td>
</tr>
<tr>
<td>RCT</td>
<td>Age(years): 60 vs 63</td>
<td>Program: Out-patient based rehabilitation program (46 sessions)</td>
<td>Usual care</td>
<td>6 months</td>
<td>Difference between groups in change from baseline (95% CI): At 6th month: (1) FEV1(L)= 0.04 (-0.09-0.12) (p=0.89) (2) 6MWD= 52 (15-89) (p=0.01) (3) Maximal work load (watts)=12 (6-19) (p=0.003) Maximal oxygen uptake(L/min)=0.256 (0.07-0.45) (p=0.02) (4) Quadriceps force(Nm)= 18 (7-30) (p=0.004) (5) Maximal inspiratory pressure(cmH2O)=11 (3-20) (p=0.04) (6) CRDQT= 14 (6-21) (p=0.002) At 18th month: (6) CRDQT=17 (8-26) (p&lt;0.01)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male(%): 84 vs 91</td>
<td>Component: cycling, treadmill walking, stair climbing and peripheral muscle training, strength training</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BMI: 24 vs 25</td>
<td>Intensity: 60% of speed in 6MWT, increased to 80% in first 3 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FEV1: 41 vs 43</td>
<td>Frequency: 90 min each session. 3 sessions per week for first 3 months then 2 sessions per week for next 3 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>FVC: 81 vs 84</td>
<td>Duration: 6 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6MWD(%): 61 vs 60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CRDQT: 77 vs 84</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Remarks:

1. Patient characteristics are presented as mean values (Intervention group vs Control group).
2. Results are presented as difference from baseline (Intervention group vs Control group) with \( p \) value indicating between group significance unless specified.
Appendix V

Levels of Evidence of Reviewed Studies

<table>
<thead>
<tr>
<th>Reviewed studies</th>
<th>SIGN GRADING SYSTEM 1999 – 2012 Levels of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Behnke et al. (2000)</td>
<td>1-</td>
</tr>
<tr>
<td>2. Boxall, Barclay, Sayers and Caplan (2005)</td>
<td>1+</td>
</tr>
<tr>
<td>3. Hernandez et al. (2000)</td>
<td>1-</td>
</tr>
<tr>
<td>4. Leung, Alison, McKeough and Paters (2010)</td>
<td>1++</td>
</tr>
<tr>
<td>5. Nakamura et al. (2008)</td>
<td>1-</td>
</tr>
<tr>
<td>6. Oh (2008)</td>
<td>1+</td>
</tr>
<tr>
<td>7. Singh, Khandelwal, Khandelwal and Abusaria (2003)</td>
<td>1-</td>
</tr>
<tr>
<td>8. Troosters, Gosselink and Decramer (2000)</td>
<td>1-</td>
</tr>
</tbody>
</table>
## Appendix VI

### Table of Set-Up Cost and Operational Cost of WEP

<table>
<thead>
<tr>
<th>Set-Up Items</th>
<th>Cost ($)</th>
<th>Operational Items</th>
<th>Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Staff training workshop</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff training workshop</td>
<td>Free</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>(3-hr workshop)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teaching staff (1 RN) $220 x 3hrs</td>
<td>$660</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td>PT consultation $300 x 3hrs</td>
<td>$900</td>
<td>/</td>
<td>/</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>$1,560</td>
<td><strong>Subtotal</strong></td>
<td>$0</td>
</tr>
<tr>
<td><strong>Walking Exercise Sessions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Venue (Rehab Garden) Free</td>
<td></td>
<td>Rehab Garden maintenance fee Free</td>
<td></td>
</tr>
<tr>
<td>(16 sessions @ 1 hr)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulse oximeter Free</td>
<td></td>
<td>Pulmonary function machine Free</td>
<td></td>
</tr>
<tr>
<td>Pulmonary function machine Free</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treadmill (Loan from PT)</td>
<td></td>
<td>Patient training diary $0.3 x 2pgs x 40</td>
<td>$24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Assessment and evaluation form $0.3 x 5pgs x 40</td>
<td>$60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Training staff (4 RNs) $220 x 1hr x 16 x 4RNs</td>
<td>$14,080</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>$0</td>
<td><strong>Subtotal</strong></td>
<td>$14,164</td>
</tr>
<tr>
<td><strong>Education Sessions</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Venue (Activity Rooms) Free</td>
<td></td>
<td>Assessment and evaluation form $0.3 x 2pgs x 40</td>
<td>$24</td>
</tr>
<tr>
<td>(16 sessions @ 2 hrs)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computers and Computer software</td>
<td>Free</td>
<td>Education pamphlets $0.3 x 10pgs x 16 x 40</td>
<td>$1,920</td>
</tr>
<tr>
<td>Projection screen x1</td>
<td>$850</td>
<td>Training staff (4 RNs) $220 x 2hrs x 16 x 4RNs</td>
<td>$28,160</td>
</tr>
<tr>
<td>Projector x1</td>
<td>$1,280</td>
<td></td>
<td>/</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td>$2,130</td>
<td><strong>Subtotal</strong></td>
<td>$30,104</td>
</tr>
</tbody>
</table>

**Total set-up cost** $3,690 **Total operational cost** $44,268 **Total** $47,982

Remarks:
*All costs are calculated in the unit of HKD.

"It is estimated that the maximum number of participants per program is 40."
Appendix VII
SIGN Grading System 1999 – 2012 (SIGN, 2011)
Grades of Recommendations

A At least one meta-analysis, systematic review, or RCT rated as 1++, and directly applicable to the target population; or

A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results

B A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or

Extrapolated evidence from studies rated as 1++ or 1+

C A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or

Extrapolated evidence from studies rated as 2+

D Evidence level 3 or 4; or

Extrapolated evidence from studies rated as 2+
Appendix VIII

Contents of Written Proposal of WEP

(1) The problems of existing practice;
(2) Significance of the need to change;
(3) Objectives of the proposed guideline with supportive evidence from current literature;
(4) Transferability and feasibility of the guideline in our local setting;
(5) Potential benefits and risks of adopting the change;
(6) The cost-benefit ratio which they concerns the most;
(7) The procedure and timeframe for the program.
### Appendix IX

**Timeframe for Implementation and Evaluation Plan**

<p>| Weeks | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21-32 | 33 |
|-------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|-----|----|
| Activities | | | | | | | | | | | | | | | | | | | | | |
| 1. Set up WEP committee | ✓ | | | | | | | | | | | | | | | | | | | | |
| 2. Prepare the WEP proposal | ✓ | ✓ | | | | | | | | | | | | | | | | | | | |
| 3. Approach administrators for getting approval | ✓ | ✓ | | | | | | | | | | | | | | | | | | | |
| 4. Obtain the approval and make revisions to the proposal | ✓ | | | | | | | | | | | | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th>Establish a link for WEP on department intranet</th>
<th>✓</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6.</td>
<td>Organize train-the-trainer workshops; Promotion to patients</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Plan for pilot test</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Start the patient recruitment process</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Deploy staff to be the program runners</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Obtain patient baseline data from pre-program assessment</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Execute the pilot test</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>12.</strong> Collect pilot test results from post-program assessment</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. Analyze the data collected</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>14.</strong> Organize meeting for pilot test outcomes evaluation and the guideline refinement; report results to administrators</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>15.</strong> Full implementation of the program</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>16.</strong> Collect and analyze program data; evaluate and report results</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix X

Operational Flow of WEP Program
(WEP Program Schedule)

Patient recruitment process:

In-patients aged 60 or above and diagnosed COPD stage II to IV

Screened by case nurse according to inclusion and exclusion criteria of the guideline to see if they are fit for recruitment

Screened by MO for stable medical condition

Eligible participants → Obtain informed consent

Exclude from the program

Walking Exercise Training

<table>
<thead>
<tr>
<th>Venue</th>
<th>Rehab Garden or Patient’s home</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>30min (15min X 2 times) with 1-2min resting time</td>
</tr>
<tr>
<td>Time</td>
<td>2-3pm</td>
</tr>
<tr>
<td>Frequency</td>
<td>Every day</td>
</tr>
<tr>
<td>Week 1</td>
<td>*Walking Intensity: Individual walking speed at 60%-75% of 6MWT</td>
</tr>
<tr>
<td>Week 2</td>
<td>*Time and distance walked are recorded on a training diary (Appendix XIII)</td>
</tr>
</tbody>
</table>

83
Appendix XI
Sample Size Calculation Process
(by G*Power)

-- Sunday, May 25, 2014 -- 22:00:12

t tests – Means: Difference from constant (one sample case)

Analysis: A priori: Compute required sample size
Input: Tail(s) = One
       Effect size d = 0.7671827
       α err prob = 0.01
       Power (1–β err prob) = 0.95

Output: Noncentrality parameter δ = 4.2020327
       Critical t = 2.4620214
       Df = 29
       Total sample size = 30
       Actual power = 0.9530607

<table>
<thead>
<tr>
<th>Study</th>
<th>Mean CRDQT (Intervention)</th>
<th>Mean CRDQT (Control)</th>
<th>SD of CRDQT (Intervention)</th>
<th>SD of CRDQT (Control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>105.1</td>
<td>84</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>2</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>3</td>
<td>99.6</td>
<td>94</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>4</td>
<td>107</td>
<td>92</td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>5</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>6</td>
<td>99.45</td>
<td>87.2</td>
<td>17.45</td>
<td>19.01</td>
</tr>
<tr>
<td>7</td>
<td>15.5</td>
<td>12.97</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>8</td>
<td>90</td>
<td>82</td>
<td>18</td>
<td>25</td>
</tr>
<tr>
<td>Average</td>
<td>100.23 (H0)</td>
<td>87.84 (H1)</td>
<td>16.15 (Sigma)</td>
<td>20.67</td>
</tr>
</tbody>
</table>

Table of results of CRDQT from reviewed studies.
## 冯END XII

### Chinese Chronic Respiratory Disease Questionnaire (CCRDQ)

**《五项重要活动》**

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3A.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3B.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3C.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3D.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3E.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**《活动表》**

<table>
<thead>
<tr>
<th></th>
<th>Pre</th>
<th>Post</th>
<th>FU</th>
<th>FU</th>
<th>FU</th>
</tr>
</thead>
<tbody>
<tr>
<td>《气喘 (Dyspnea)》</td>
<td>4A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>《疲劳 (Fatigue)》</td>
<td>4B</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>《情绪 (Emotion)》</td>
<td>4C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>《控制疾病能力 (Mastery)》</td>
<td>4D</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>《睡眠 (Sleep)》</td>
<td>4E</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

平均分

*有做过的活动及有气喘，加『√』。有做及无气喘，加『×』。若未气喘，加『○』。

(Chan et al., 2006)
Appendix XIII
Walking Exercise Training Record

請紀錄你每天的步行時間(分鐘)與步行距離(米)

<table>
<thead>
<tr>
<th>週數</th>
<th>日期</th>
<th>步行時間</th>
<th>步行距離</th>
<th>週數</th>
<th>日期</th>
<th>步行時間</th>
<th>步行距離</th>
<th>週數</th>
<th>日期</th>
<th>步行時間</th>
<th>步行距離</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>週數</td>
<td>日期</td>
<td>步行時間</td>
<td>步行距離</td>
<td>週數</td>
<td>日期</td>
<td>步行時間</td>
<td>步行距離</td>
<td>週數</td>
<td>日期</td>
<td>步行時間</td>
<td>步行距離</td>
</tr>
<tr>
<td>------</td>
<td>------</td>
<td>----------</td>
<td>----------</td>
<td>------</td>
<td>------</td>
<td>----------</td>
<td>----------</td>
<td>------</td>
<td>------</td>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix XIV

Staff Questionnaire on WEP

<table>
<thead>
<tr>
<th>Respiratory Medicine Department</th>
<th>Never</th>
<th>Seldom</th>
<th>Sometimes</th>
<th>Usually</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Position/Rank:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. I followed the guideline strictly for recruiting patients into the program.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. I encourage potential patients to join the program.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. I monitored patient’s condition while they are performing walking training.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. I offer oxygen to patients immediately when he/she complain of dyspnoea during walking training.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. I used to prepare before the next education session.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. My colleagues value what I do at work.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. I know how to recognize and identify problems.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. I feel that I am developing professionally from my work here.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. Change is necessary in hospital.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. My working activities are carefully organized.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. My work responsibilities are generally clear.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12. The hospital keeps me informed about things that concern me and my job.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13. I am satisfied with the independence I have in my job</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14. The members of my department are generally cooperative.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15. I enjoy my current work situation.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
References


