

**BEYOND DISSEMINATION: A KNOWLEDGE TRANSLATION STUDY TO
IMPLEMENT AND EVALUATE A TOOL TO SUPPORT SAFE AND EFFECTIVE
ACTIVITY IN AECOPD (AECOPD-MOB)**

by

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Abstract

Background: Acute exacerbations of COPD (AECOPD) are episodes of acute deterioration in airway function and respiratory symptoms. Physical activity and exercise are important components in the recovery of patients from exacerbation. AECOPD-Mob is an evidence-based clinical decision-making tool on best practice for safe and effective exercise for hospitalized AECOPD patients. In our lab, we developed four formats of the tool (the original paper version, a Learner module, a Smartphone app and a traditional Inservice) and evaluated their usability by physical therapists (PTs) and registered nurses (RNs) working in acute care hospitals.

Methods: In this study, we have examined the insights of 17 PTs and 3 RNs about the usability and intended use of the AECOPD-Mob formats. The participants were provided with access to the four AECOPD-Mob formats, completed an Evidence-Based-Practice (EBP) Barriers Questionnaire, the Post Study System Usability Questionnaire (PSSUQ) and participated in focus groups to share their thoughts and experiences.

Results: We have found that the health care providers (HCPs), PTs and RNs, were satisfied with the usability learner module but were less satisfied with the usability of the Smartphone app. In addition, we originated four key themes from the focus groups: 'HCPs' knowledge gaps', 'HCPs preferences', 'Tool quality and usability' and 'Improvement suggestions' and found that the overall preferred version the AECOPD-Mob tool was the original paper version. The learner module and the Inservice were seen as interchangeable and provided necessary information, while the learner module had the benefit of being accessible at any time and, the Inservice had the benefit of better enabled discussion amongst colleagues. The app was considered challenging to use at the bedside, but the content was very favorable. Interestingly, we have

found that RNs had a preference for more concise information, while PTs were looking for more broad information in the formats which give more of an overview.

Conclusion: We found that PTs and RNs found the AECOPD-Mob paper version to be the easiest and most versatile format. There were concerns about using an App in a hospital setting. Future research should investigate the impact of AECOPD-Mob on patient outcomes.

Lay Summary

COPD is a lung disease that affect approximately 10% of Canadians. Acute exacerbations of COPD (AECOPD) are episodes of worsening of the severity of the disease and often results in hospitalizations. Physical activity and exercise are important non-pharmacological interventions for AECOPD.

Although knowledge regarding how to treat and mobilize people with AECOPD exists, evidence-based guidance tools for health care providers (HCPs) are required. In our lab, we developed the AECOPD-Mob tool in order to assist HCPs such as physiotherapists and nurses to apply evidence-based practice while treating hospitalized people with AECOPD.

In this study we developed four different formats of the AECOPD-Mob tool (the original paper version, a Learner module, a Smartphone app and a traditional lecture by a senior clinician) and assessed their usability.

We have found that HCPs preferred the paper version over the others and found its usability experience to be very convenient.

Preface

The development of the AECOPD-Mob Formats: I, under the supervision of Dr. Pat Camp and my M.Sc. supervisory committee, took part in the logistics of filming the videos and still photos for the AECOPD-Mob formats, took part in the content creation of the Inservice, learner module and Smartphone app, and edited the raw videos and photos for the learner module and Smartphone app. In addition, I coded the back-end html of the learner module and created the user orientation manual of the study.

Conducting the study: I, under the supervision of Dr. Pat Camp recruited participants with the assistance of education leaders (Frank Chung, Aggie Black, Beena Parappilly, Chiara Singh, Amy Ellis, Philip Sweeny, Rosalyn Jones, Ellen Woo and Sandra Squire), adapted questionnaires, designed, conducted and supervised all focus groups, and analyzed and interpreted all data generated, with the exception of one focus group conducted on Feb 7th, 2018 by Ashley Kirkham and another focus group conducted on Feb 20th by Barbara Karlen and Abbie Wright.

All of the focus group recordings were transcribed by Joanne Desrosiers.

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List of Abbreviations

ADL	Activities of daily living
AECOPD	Acute Exacerbation of COPD
BC	British Columbia
BH	Burnaby Hospital
CAD	Canadian dollars
CESEI	Centre of Excellence for Simulation Education and Innovation
CIHR	Canadian Institutes of Health Research
COPD	Chronic Obstructive Pulmonary Disease
CTS	Canadian Thoracic Society
CURN	Conduct and Utilization of Research in Nursing
EBM	Evidence-based medicine
EBP	Evidence-based practice
FEV ₁	Forced expiratory volume in 1 second
FVC	Forced vital capacity
GBD	Global Burden of Disease
GOLD	Global Initiative for Chronic Obstructive Lung Disease
HCPs	Healthcare professionals
ISO	The International Organization for Standardization
KT	Knowledge translation
LABA	Long-acting-beta ₂ -agonists
LAMA	Long-acting antimuscarinic antagonists

PR	Pulmonary Rehabilitation
PSSUQ	Post-Study System Usability Questionnaire
PTs	Physiotherapists
RNs	Registered Nurses
SABA	Short-acting-beta ₂ -agonists
SAMA	Short-acting antimuscarinic antagonists
SMH	Surrey Memorial Hospital
SPH	St. Paul's Hospital
VGH	Vancouver General Hospital
6MWD	6-minute-walk-distance distance

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To my Loving wife Naomi

And to my little Maya

Chapter 1: Introduction

1.1 Chronic Obstructive Pulmonary Disease (COPD) and Acute Exacerbation of COPD (AECOPD)

Chronic obstructive pulmonary disease (COPD) is a common respiratory disorder characterized by almost irreversible and usually progressive lung airflow obstruction (1, 2). The pulmonary deterioration in COPD is due to an enhanced chronic inflammatory response in the airways, caused by various respiratory irritants, such as cigarette smoke and noxious gases (1, 2). This inflammatory response tends to occur mainly in the airways that are less than 2 mm in diameter, and eventually affects the parenchyma and pulmonary vasculature (3). Therefore, the airflow obstruction in COPD is caused by a combination of small airway remodeling (airway inflammation) and emphysema (parenchyma and alveoli destruction) which lead to disorders in respiratory function (1).

1.1.1 Epidemiology and economic burden:

COPD is a leading cause of morbidity, mortality, and healthcare utilization worldwide. It is estimated that approximately 10% of adults over 40 years of age have COPD (4). In Canada alone, more than 700,000 individuals over the age of 35 are diagnosed with COPD. However, COPD prevalence might be underestimated since the disease can be under diagnosed due to the multiple definitions of terminology and criteria (1). Moreover, patients might not be aware of the symptoms, or might not seek medical attention until the respiratory symptoms become evident (5).

A Global Burden of Disease (GBD) study showed that COPD is the fourth leading cause of death worldwide and is predicted to become the third leading cause of death by 2020 (6). Data collected from healthcare providers and emergency department visits, illustrate that COPD creates an extensive economic burden on both patients and society, mainly through hospitalization and re-hospitalization

costs (5). Current data shows that COPD is the leading cause of hospitalizations and accounts for approximately 10% of all acute medical admissions (4, 7). In British Columbia (BC), approximately 10% of people with COPD are admitted to the hospital every year, with admission duration of seven to ten days on average, with an estimated cost of more than 10,000 Canadian dollars (CAD) per admission (7). As a result, COPD is a substantial economic burden on the healthcare system, with costs of more than one billion CAD per year (7).

1.1.2 Diagnosis:

Individuals presenting symptoms such as cough, sputum production, and dyspnea, as well as a history exposure to specific risk factors, should be considered for COPD diagnosis. The symptoms become more obvious as lung function deterioration occurs, and worsens with exacerbation of the disease (1, 2, 8) In order to confirm COPD diagnosis, it is necessary to measure airflow obstruction through a spirometry test. Spirometry is a reliable and effective test that measures the amount and speed of air a person can blow out from the lungs (2, 9).

The Global Initiative for Chronic Obstructive Lung Disease (GOLD) classification of severity of lung function impairment is decided based on the post-bronchodilator Forced Expiratory Volume in 1 second (FEV₁) and Forced Vital Capacity (FVC) spirometry result. Zero or one exacerbation in the past 12 months, along with GOLD 1 or 2 levels, will propose a low risk for exacerbation in the future, while GOLD 3 or 4 levels propose a high future risk (Table 1.1) (2).

Table 1.1 COPD classification by symptoms/disability

COPD stage *	Symptoms	Spirometry
GOLD 1: Mild	Shortness of breath from COPD with strenuous exercise or while hurrying on the level or walking up a slight hill	FEV ₁ >80% predicted
GOLD 2: Moderate	Shortness of breath from COPD causing the patient to walk slower than most people of the same age on the level or stop after walking about 100 m on the level	50%≤FEV ₁ <80% predicted
GOLD 3: Severe (High risk for AECOPD and hospitalization)	Shortness of breath from COPD resulting in the patient too breathless to leave the house, or breathless after dressing or undressing or the presence of chronic respiratory failure or clinical signs of right heart failure	30%≤FEV ₁ <50% predicted
GOLD 4: Very Severe (High risk for AECOPD and hospitalization)		FEV ₁ < 30% predicted
FEV ₁ -Forced expiratory volume in 1 s; * Table adapted from the GOLD Management and Prevention of COPD 2017 report		

1.1.3 COPD and physical function

It has been shown that people with COPD of all stages reduce their physical activity. Although lung function is primarily affected by COPD, in many cases, people with COPD adopt an inactive lifestyle because they suffer from reduced skeletal muscle function, compared to healthy individuals. In addition, a correlation between FEV₁ and physical function has been shown, and poor muscle function is associated with reduced exercise performance and poor health condition.

The causes to reduced muscle function lays in several direct and indirect complex of factors:

Direct factors:

Airflow limitation and dyspnea are direct causes for muscle deconditioning, as it makes the individual to reduce the intensity and duration of physical activity. Over a period of time, physical inactivity is a major factor for reduction of muscle strength and exercise capacity. Quadriceps strength and peripheral muscles are affected the most in people with COPD and muscle fatigue is a main factor limiting exercise tolerance. Further to this, daily anaerobic activities encourages lactate and carbon dioxide production, which results in early acidosis and increase of ventilatory requirements (2, 10).

Indirect factors:

Oxidative stress that caused from inhaled noxious particles, like cigarettes, metabolic changes occurring in people with COPD, all resulting in a systematic inflammation. It has been shown that inflammatory process in people with COPD is associated with the severity of the disease and is a risk factor for peripheral muscle weakness (2, 10).

1.1.4 Treatments for Stable COPD:

Patients with stable COPD can manage their condition and delay the progress of the disease with a combination of one or more actions - using medications to relieve symptoms and reduce exacerbations, smoking cessation, oxygen supplementation where warranted and attending a pulmonary rehabilitation program (1, 7, 11).

1.1.4.1 Medications for Stable COPD:

Common pharmacological treatments for COPD include the use of bronchodilators and glucocorticosteroids by inhaler. Additional medications to treat inflammation and bronchoconstriction are prescribed according to the individual's needs. Bronchodilators are prescribed in order to reduce resistance in the respiratory airways by relaxing the muscles around the airways, and ease breathing by improving the airflow to the lungs (1, 2). Different kinds of bronchodilators are prescribed according to the disease symptoms and severity. Short-acting-beta₂-agonists (SABA) are prescribed for patients with mild COPD. Long-acting-beta₂-agonists (LABA) are prescribed for people with severe COPD or for patients whose symptoms are not controlled with SABAs alone. Short-acting antimuscarinic antagonists (SAMA) and long-acting antimuscarinic antagonists (LAMA) are agents that compete with acetylcholine on the muscarinic receptors, and thus inhibit potential bronchoconstriction (11). Glucocorticosteroids are a class of steroid hormones which influence several targets in the biochemical inflammation reaction chain and inhibit inflammation pathways. This reduces airway swelling, increases airflow and mitigates dyspnea in people with COPD. Inhaled glucocorticoid medications are used alone, or in combination with LABA medications to improve their effectiveness. However, long term use of inhaled glucocorticoids is associated with increased risk of respiratory infections, thus needs to be monitored daily (12).

Other pharmacological treatments for COPD are prescribed according to the individual's needs and the source of the disease. Antibiotics, mucolytic agents, antioxidant agents and immuno-regulators are prescribed in order to manage certain COPD conditions (2, 7, 11).

1.1.4.2 Pollutant management:

Cigarette smoking and inhaling noxious gases are the leading causes of COPD, thus, smoking cessation and reducing the exposure to air pollution are critical actions in order to manage the disease. Joining a smoking cessation program (which includes pharmacotherapy as well as behavioral modification techniques), and avoiding air pollution is crucial for COPD management, and should be offered to all people with COPD (11).

1.1.4.3 Pulmonary Rehabilitation (PR):

PR is a wide-ranging intervention designed to improve the physical and psychological condition, and to support health-enhancing behaviors of people with chronic respiratory diseases. It is based on patient assessment and patient tailored therapies. This includes education for self-management, behavior change, and exercise training (13). Most individuals with moderate to severe COPD have symptoms that limit their activities of daily living (ADL), (e.g. functional mobility, bathing, dressing). It has been shown that people with COPD walk significantly less and have lower walking pace than healthy individuals (14). In addition, many people with COPD do not fully recover after an exacerbation and suffer from permanent worsening in their lung function (7). Increased dyspnea, wheezing and excess sputum causes reduce in physical activity, and decline in physical function (14). As a result, a negative feedback loop is created in which the individuals become less active, until ADL tasks require substantial effort. In order to restore their physical capabilities, people with COPD are commonly referred to a PR program (2, 13).

A PR program usually include a team of multidisciplinary health care professionals (HCPs) with expertise in physical training, patient education, nutrition and behavior modification, that, based on a comprehensive assessment of the patient, prescribes a specific treatment plan. The exercise training

includes endurance training, interval training and resistance training in order to regain abilities to perform ADL (13).

Evidence for the effectiveness of PR programs for people with COPD is undisputed. Supervised exercise training improves exercise tolerance for COPD (1, 15). In addition, these programs reduce dyspnea, fatigue, anxiety and depression along with other COPD symptoms (1). Participation in PR programs significantly reduces the direct and indirect costs of COPD by decreasing utilization of the healthcare system, particularly with hospital admissions (16). Thus, pulmonary rehabilitation is recommended in management of patients with moderate to severe COPD (1, 17).

1.1.5 AECOPD and physical function

Exacerbations of COPD typically results in a bedrest and additional reduction of physical activity. Exacerbation of all of the symptoms of people with stable COPD, in conjunction of symptoms like fever due to infection, acute inflammation and respiratory failure and additional comorbidities leads to a limited ability to maintain muscle function and results in accelerated muscle atrophy. (2)

1.1.6 Treatments for Hospitalized Patients with AECOPD:

People with COPD can suffer from exacerbations ranging in severity from mild declines in functional status to fatal events (18). Acute exacerbations of COPD (AECOPD) are episodes of sudden acute deterioration in airway function, characterized by an increase in cough, sputum production, and/or dyspnea for people with COPD (7). AECOPD is usually triggered by viral or bacterial infections as well as environmental pollutants and often happen during the colder times in the year (8,

19). The result can range from symptoms that resolve without treatment to episodes of respiratory failure that require hospitalization and mechanical ventilation (7).

In-hospital treatment of AECOPD includes the use of antibiotics, oral and inhaled steroids, long acting bronchodilators and supplemental oxygen therapy. The excessive sputum production creates a rich breeding ground for opportunist bacteria (e.g. *Streptococcus pneumonia*), which take advantage of the immune-compromised system of people with COPD (8). In addition to treating the underlying pathogens, antibiotics help to prevent further exacerbations by reducing the overall bacterial load of infecting agents (8, 19). Oral corticosteroids are used as anti-inflammatory treatments for exacerbation, which reduce pulmonary symptoms, and decrease the length of hospital stay due to a faster recovery of pulmonary function; however use of these medications may result in side effects such as high blood sugar, pneumonia, osteoporosis, muscle weakness and eventually respiratory failure (7, 20).

Hypoxemia is a common risk for patients with AECOPD. The Canadian Thoracic Society (CTS) recommends oxygen therapy for patients with oxygen saturation (SpO₂) lower than 88% (normal SpO₂ of oxygen, in the arterial blood, is 94%-100%). In extreme cases, the patient may require mechanical ventilation until respiratory failure can be reversed (7).

In addition to pharmacotherapy and oxygen supplementation, physical therapists and nurses work to improve the mobility of patients in hospitals, as low mobility, reduced activity levels and muscle weakness are known complications of AECOPD (7). In a study done by Spruit *et al.* (2003) (21), it was shown that in hospitalized people with AECOPD, there was a significant reduction of lung function, as well as weakening of respiratory and peripheral muscle associated with lack of activity (21). These findings were supported by Pitta *et al.* (2006) (22), whom conducted an observational study of 17 hospitalized people with AECOPD, and reported that during an exacerbation, patients

performed limited physical activity with an average walking time of less than 20 minutes/day. In addition, a one month follow up revealed that these patients' walking time continued to be lower than stable COPD patients -approximately 50 minutes/day (22).

Reduced physical activity after hospitalization for AECOPD results in continuing negative health impacts. Garcia-Aymerich *et.al.*(2003) (23) conducted a observational cohort study of 340 people with AECOPD who were recruited in the hospital and followed for 13 months. Although lung function, severity of disease, and use of supplemental oxygen were risk factors for readmission, physical inactivity was the strongest independent predictor of readmission. The authors reported that patients who were more active in their daily life (equivalent to more than 60 minutes walking per day) were 46% less likely to be readmitted during the follow-up period (23). One way to potentially impact the amount of physical activity after discharge is to ensure patients are as active as possible during their AECOPD hospital stay (23).

Although hospitalized patients with AECOPD may have poor oxygen levels, increased dyspnea, and peripheral muscle weakness, evidence shows that exercise for these patients is beneficial. Puhan *et al.*(2016) (18) conducted a systematic review with a meta-analysis that summarized reports from twenty different trials where exercise programs were prescribed for people with AECOPD. The meta-analysis showed that trials which offered and implemented a comprehensive PR program for their patients, including treadmill training, cycling training and resistance training, significantly improved the participants' quality of life. In addition, 6-minute-walk-distance (6MWD) tests were significantly improved and had a positive effect on patient readmission. An important example of one of the trials is the study of Troosters *et al.* (2010) (24), which demonstrated that resistance training during hospitalization can be safe and effective for people with COPD following an acute exacerbation, as well as having a positive effect on lower extremity muscle strength, with a 16%

increase in quadriceps muscle force reported (24). Puhan *et al.* concluded that comprehensive pulmonary rehabilitation following an AECOPD has a positive effect on the participants' quality of life and exercise capacity. The hospitalization and mortality rates, however, showed heterogeneity. The protocols for executing a PR programs and the facilities used may have a large effect on the patients' outcomes (18).

1.1.7 Challenges mobilizing in-patients with AECOPD:

Despite the evidence supporting the benefits of exercise for hospitalized people with AECOPD in the research setting, many HCPs might not provide mobilization activities due to various challenges present in the clinical setting. Novice physiotherapists report lack confidence mobilizing patients in the acute care ward. Insufficient time to fully implement the exercise prescription and changing health status of people with AECOPD leading factors as well (25, 26). Nurses encounter similar barriers, and report additional barriers like lack of knowledge of the evidence supporting inpatient rehabilitation/exercise programs for hospitalized AECOPD patients; increased levels of patient acuity in the ward setting; lack of confidence in mobilizing hospitalized patients; lack of specific training regarding mobilizing hospitalized patients; competing patient care responsibilities and lack of resources; the perception that the task of mobilizing patients is someone else's responsibility; and time restrictions (27-29) New graduates or inexperienced HCPs may have less confidence in their clinical abilities (27), and are uncertain on obtaining information by themselves (29), which can further challenge their ability mobilizing people with AECOPD. As a result, care givers may need practical and accessible tools in order to further promote mobilization and exercise to hospitalized patients with AECOPD.

Implementing research from scientific studies to practice, evidence-based practice (EBP), is the gateway to improve effectiveness and quality of patient care based on research evidence, clinical expertise and patient values (30, 31). However, converting evidence to practice is usually an extremely long process (30, 32) In order to develop efficient tools to overcome these challenges to implement EBP, knowledge translation (KT) methodologies were developed.

1.2 Knowledge Translation (KT) – tools to bridge between research and practice:

It is well-recognized that very little research is applied to clinical practice. Studies show that 17 years, on average, are required to convert research knowledge into practice (30, 32). In order to address this problem, the field of KT was developed.

1.2.1 What is KT?

The Canadian Institutes of Health Research (CIHR) defines KT as “*a dynamic and iterative process that includes synthesis, dissemination, exchange and ethically-sound application of knowledge to improve the health of Canadians, provide more effective health services and products and strengthen the healthcare system.*” (33). In other words, knowledge translation is a detailed process on implementing evidence into practice, by providing a validated structured plan on how to best achieve this goal. This process involves a collaboration between stakeholders, researchers and the end users.

1.2.2 The benefits of using KT:

There are many benefits of using KT. First and foremost, there is the ability to successfully expedite the implementation of evidence into practice by taking into consideration many factors and components that impact how research evidence is incorporated into clinical care. These factors include the characteristics and beliefs of the end users, the influence of other stakeholders and the quality of research itself (33).

A KT plan breaks down the processes of incorporating research-to-practice into specific components. These components acknowledge the various barriers to effective KT, which present themselves on several levels: national, provincial and municipal levels, as well as within health authorities, hospital departments and at the level of the clinicians' themselves (34) Some barriers occur because of archaic rules and regulations, and the bureaucracy bound to it. Other barriers occur on the individual and organizational levels. These barriers may derive from lack of ability to access new research studies, insufficient training resources, or lack of tools and guidelines on how to carry out assignments. The methods of KT address these barriers by outlining a path from knowledge creation to adoption by clinician. CIHR articulated this process with the development of their CIHR Knowledge to Action cycle (Fig. 1.1) (27, 35).

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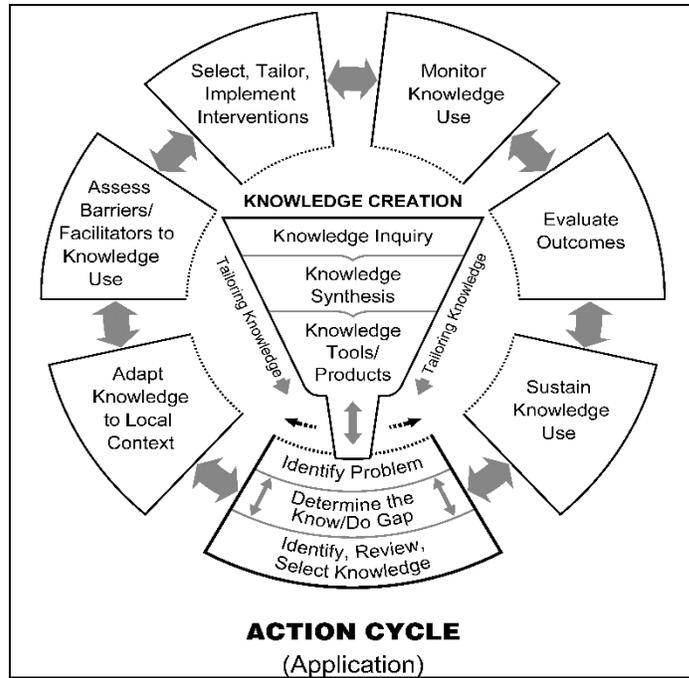


Figure 1.1 CIHR Knowledge-To-Action Cycle

The core of the cycle illustrates the processes and steps of knowledge creation.

1.2.3 Knowledge synthesis:

Knowledge is constantly being created in the research setting (e.g. randomized controlled studies, observational studies, systematic reviews and meta-analyses), as well as via clinical experience. The knowledge synthesis process is an active process of collecting all of the relevant research from the literature and other sources, in order to create a comprehensive overview of the information for a particular question and convert it into a consensus summary. The summary is then presented in the form of guidelines, quality indicators, and decision aid tools (30, 35) Knowledge synthesis should be done carefully and transparently and undergo peer review to ensure that it is robust and replicable (33).

1.2.4 Knowledge dissemination:

After having a synthesized product, the next step is knowledge dissemination. First, the end user (target population) should be identified; then, the distribution strategy will be tailored to suit both the audience and the information that needs to be conveyed. It is important to ensure that the audience is able to access the material readily (30, 35). Dissemination strategies can include paper formats as well as alternative methods such as webinars, videos, and audio clips. These alternative dissemination formats provide different learning opportunities to present knowledge and can be available in any time and place (36). The next step is to address the audience and introduce the product via presentations, email, pamphlets and other relevant methods. The end user will receive the product along with explanations of the background, purpose and rationale of the product.

1.2.5 Knowledge exchange and implementation:

It is not enough to distribute information. Once all of the above is complete, HCPs must see how the new information can be utilized, or implemented, in their clinical practice. Guidance on how to use the evidence should be provided so that implementation in real-life practice can occur. A knowledge exchange process, in which feedback is then received back from the end user, should follow the implementation. This process enables the researcher to alter and revise the knowledge product to increase efficiency and accessibility. This creates a mutual learning environment that can lead to an ongoing process of improvement (35).

1.3 The AECOPD-Mob tool: A Knowledge synthesis Product for Safe and Effective Mobilization of Hospitalized Patients with AECOPD

Inpatient pulmonary rehabilitation, that includes structured exercise, for patients with AECOPD has shown to be safe and effective at improving the patients' functional capacity and quality of life, as well as their exercise capacity (18).

In order to bridge the gap between evidence and practice, Camp *et al.*(2015) developed the AECOPD-Mob tool (37). The AECOPD-Mob is an evidence-informed clinical decision-making tool that was created based on the framework developed by Jacobson *et al.* through integration of KT processes (38). The tool's purpose is to provide assistance in dealing with the challenges of mobilizing hospitalized people with AECOPD. It is important to note that this tool may be especially helpful for novice healthcare graduates, clinicians new to the COPD field and healthcare educators who mentor clinicians working with AECOPD patients. The information presented in the tool was obtained from a systematic review of the literature, combined with a Delphi panel. The Delphi panel was comprised of researchers, healthcare providers, patients/families and focus groups of frontline clinicians from multiple disciplines (37).

1.3.1 The development of the AECOPD-Mob tool with an integrated KT approach

A team of COPD patients, clinicians (Physicians, Nurses and Physiotherapists) and researchers with knowledge and experience with COPD were assembled to Delphi panel in order to create the AECOPD-Mob tool. In three rounds, The Delphi panel identified key items from preselected objects from a comprehensive literature review. The first-round included key parameter identification, the second round included agreement of items and classifications and the third round resulted in rating of the key statements. The Summary of these items are presented as the paper based AECOPD-Mob.

1.3.2 The characteristics of the AECOPD-Mob tool:

The AECOPD-Mob tool provides the clinicians with specific items to consider while mobilizing hospitalized people with AECOPD. These items help obtain key information (according to the current health status of the patient) and guide the clinicians to safe and effective exercise prescriptions.

The items are divided into five main sections:

“What to assess before mobilizing”:

This section is an overview of safety points that should be considered before mobilizing the patient, including environmental factors, available equipment and the patient’s current condition and comorbidities.

"When to consider not mobilizing or to discontinue mobilization ":

This section couples with the previous to guide assessment of the patient, providing with details on other COPD related comorbidities that needs to be taken in consideration, like cardiovascular and respiratory conditions that may worsen during mobilization.

"What to monitor during mobilization":

This section provides the HCPs with a set of recommendations that will assist them to perform an informed assessment of the patient and decide whether to continue with mobilization or not. These assessments are required in order to keep the patient’s safety a top priority. Necessary items to monitor during mobilization are patient’s objective parameters, such as cognition, balance, heart rate and oxygen saturation, as well as the patient’s subjective feedback like dizziness, fatigue and dyspnea. If these parameters are compromised, it is recommended to alter treatment.

"How to progress":

This section provides a set of items enabling the clinicians to assess the patient’s current level of mobility, determine a suitable level of exercise, and prescribe an appropriate exercise program

according to the patient's progress. This section includes 4 different levels (Levels V-VIII) of mobility and provides suggested exercises to improve muscle strength, balance, flexibility and endurance. Clinicians are advised to refer to SAFEMOB (a mobility tool for patients in critical care settings) (39) if their patients' mobility scores are lower than Level V.

"What to confirm before discharge":

This section provides a list of items which are necessary to check, in order to prepare the patient for discharge. The list includes items to confirm before discharge, such as home status (e.g. accessibility), future referrals for treatment, patient education and further rehabilitation.

Referring back to the CIHR Knowledge-to-Action cycle, the synthesis of information has resulted in the development of AECOPD-Mob. The next KT steps, "Knowledge dissemination" and "Knowledge exchange and implementation", are now required. In order for knowledge implementation to occur, clinicians must be able to access and interpret the evidence in a format that is user-friendly, and appropriate in the context of the acute care hospital setting. Therefore, the purpose of this study is to disseminate, implement and evaluate the use of the AECOPD-mob tool through a KT study in an acute care hospital setting.

1.4 Aim and Objectives

The AECOPD-Mob tool provides guidance and assistance with decision making for HCPs mobilizing hospitalized people with AECOPD. This tool provides them knowledge on best practice and exercise prescription advice. Following this, the AECOPD-Mob tool may increase HCPs' confidence and skills on mobilizing AECOPD patients and eventually improve patients' outcome.

In order to achieve this, the aim of this study is to implement and evaluate the use of AECOPD-Mob in acute care hospital settings, using a KT strategy.

To achieve the aim, we have set three objectives:

1. Develop and implement different formats of AECOPD-Mob to address HCPs' barriers.
2. Identify the barriers to implementation of AECOPD-Mob in physical therapy and nursing acute care practice.
3. Evaluate formats' usability, and self-reported intended use of AECOPD-Mob.

Chapter 2: Methods

2.1 Study Design:

Furthering the integrated KT process of developing the paper version of the AECOPD-Mob, a mixed-method prospective implementation study was conducted with a sample of newly-graduated, or new to the AECOPD practice area, Registered Nurses (RNs) and Physiotherapists (PTs), who care for hospitalized patients with an AECOPD. The study includes two steps: Step 1: Development, where we developed new formats of the AECOPD-Mob tool (Smartphone application, Learner module and Inservice); and Step 2: Implementation and Evaluation, where we implemented the different AECOPD-Mob formats and evaluated them via questionnaires, focus groups, and online usage tracking. Ethical approval for this study was obtained from the Research Ethics Boards at the University of British Columbia/Providence Health Care (Certificate # H15-01582), Fraser Health (Certificate #2017-037 (H15-01582)), and Vancouver Coastal Health (Certificate # V15-01582). All study participants provided written, informed consent.

2.2 Study Team

RN and PT education leaders, as well as clinicians, researchers and health sciences students assisted in adapting the materials of the AECOPD-Mob to its new formats, assisted in creating the new material (e.g. illustration videos and still photos) and provided input on the various content of study.

2.3 Settings:

This study was conducted at four acute care hospitals in Metro Vancouver: St. Paul's Hospital (SPH), Burnaby Hospital (BH), Surrey Memorial Hospital (SMH) and Vancouver General Hospital

(VGH). These hospitals are teaching hospitals affiliated with the University of British Columbia, Vancouver, Canada. These locations were specifically chosen because they have in-patient acute care programs with sufficient numbers of patient admissions for AECOPD and clinicians (including new graduates) that were potentially eligible to participate.

2.4 Overview of Study Procedure:

Looking back at the KTA cycle, the study procedures were focused in this study were on the left side of the cycle. “Adapt knowledge, Assess barriers, Select Tailor and Implement”.

This study included an intervention period of approximately 1 month. It was embedded in a longer, 3-4 months study. The purpose of the study related to the Masters’ project was to assess the usability of the different AECOPD-Mob formats. The rest of the study examined the feasibility of using the different formats and integrating them into practice and is not included in this thesis.

Procedures of the study are summarized in Figure 2.1.

We obtained informed consent from the participants following an explanation about the study’s rationale, objectives and the participants’ rights. Each participant then participated in a 30-minute orientation that included completing the EBP questionnaire, scheduling attendance at a future Inservice, and learning how to access the learner module and installing the Smartphone application. The Inservice was typically scheduled for the first week of the “intervention period”. Three weeks from the orientation, the participants were invited to a focus group to discuss about their experience of using the different formats of the tool.

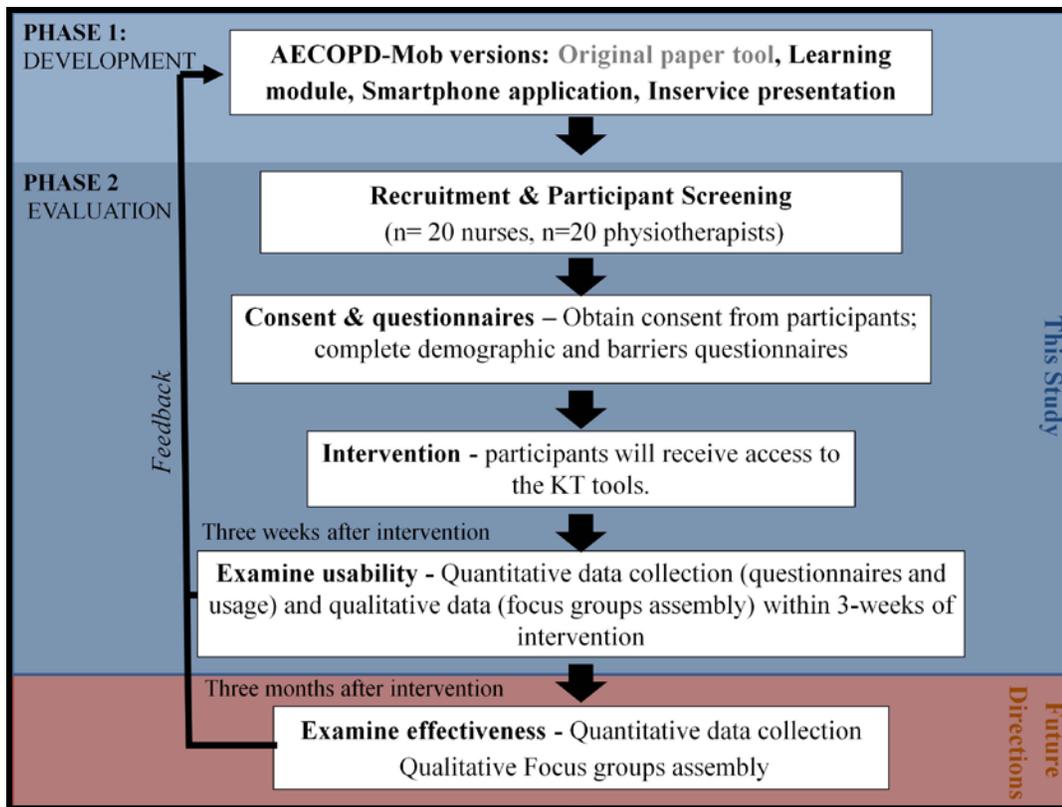


Figure 2.1 - Research summary

In order to be consistent with the orientation of the learner module and the Smartphone app, we developed an orientation protocol. This protocol was a guide provided to each participant after giving informed consent to participate in the study and was developed by first pilot-testing the learner module and the Smartphone app with our team members to better understand how participants might have trouble using the formats (e.g. how to access the learner module, how to install the app). Each protocol also contained the unique username and password to access the learner module, and the paper version of the AECOPD-Mob tool.

2.5 Development of the AECOPD-Mob Learner module:

The University of British Columbia Centre of Excellence for Simulation Education and Innovation (CESEI) (<http://cese.org>) specializes in web-based medical education and provides support for the creation of clinical learning modules to advance clinical knowledge, skills and techniques. Working with CESEI, we developed an AECOPD-Mob web-based learning module that included video, written content, and knowledge tests (Appendix A.1). The videos consisted of patient care scenarios with healthcare providers and patient actors. CESEI provided the professional video-filming team and equipment, and the research team directed the video scenarios. The narration for the video was completed on a separate day at CESEI's studio. Following this, our team edited and produced the videos using a professional video editing software (Adobe Premiere, Adobe, San Jose, California, United States). The individual pages of the learner module were then coded in "html" by our team and loaded onto the UBC "Blackboard" interface. The UBC "Blackboard" interface is available online at all times for clinicians with login and computer access and was considered a suitable host the AECOPD-Mob Learner module.

2.5.1 Development of the AECOPD-Mob Learner Module Content

The AECOPD-Mob Learner module is an interactive web-based tutorial that introduces and demonstrates the use of the AECOPD-Mob tool. Its purpose is to enable clinicians to better understand the AECOPD-Mob paper tool by illustrating the content in various ways. The Learner module guides clinicians through each specific section of the tool and uses the video case scenarios to highlight important key points. The Learner module begins with an outline of the AECOPD-Mob tool and learning objectives, followed by a 3-page overview on COPD and AECOPD. After that, a "COPD Mini-Test" – (a short general COPD knowledge test of 6 multiple choice questions) is provided. The

module continues with a breakdown of the AECOPD-Mob tool into its five main sections. 5 videos with audio and narration are used to demonstrate patient care scenarios and how the tool can be used to assess and treat mobility issues. For example, Video 3, “What to Monitor and How to Progress for Effectiveness” demonstrates a scenario of an attempt to mobilize a patient. It is shown that sometimes multiple attempts are needed in order to successfully mobilize a patient. The last section of the module is a 5-question multiple choice “Post-Module Quiz”. The questions are based on a case scenario, which requires the health care professional to navigate through the tool and integrates the knowledge acquired throughout the Learner module to answer the questions. The users are not able to skip forward in the module but can go back and view previous sections.

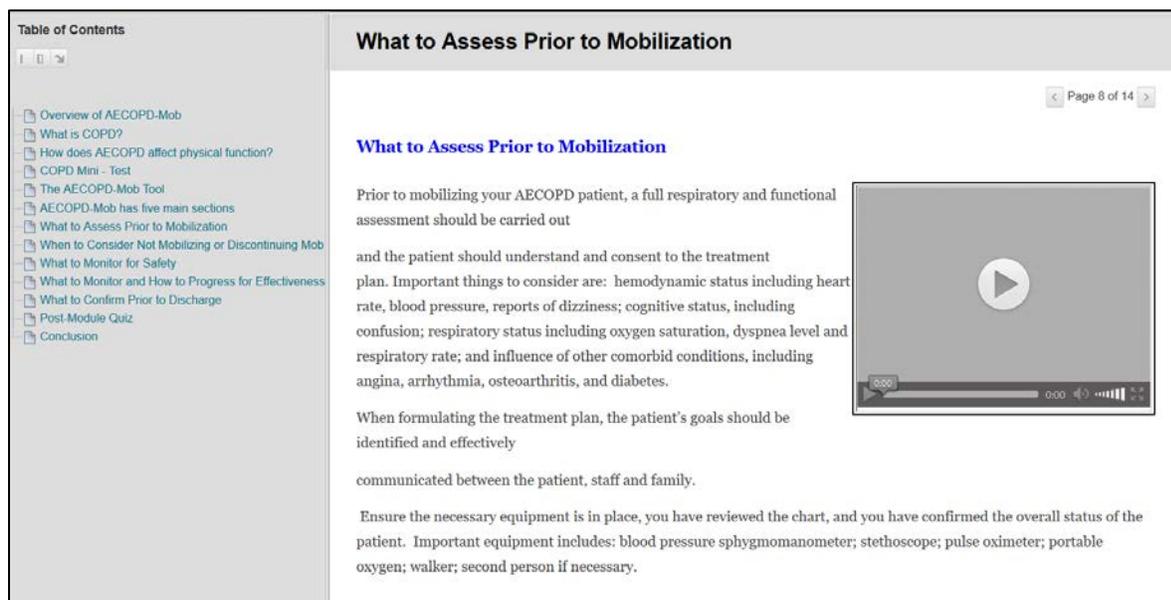


Figure 2.2 Illustration of a video page in the Learner module

2.6 Development of the AECOPD-Mob Smartphone application

The AECOPD-Mob Smartphone application (“app”) is a Smartphone format of the AECOPD-Mob tool. This app format allows the AECOPD-Mob tool to be accessible for clinicians, with no need

for internet connection, as often as they like, regardless of time and place. In addition, the app contains photos which illustrates exercises to prescribe and how to execute them (Appendix A.2).

QxMD (Vancouver, Canada) is a software application company that develops apps to assist clinicians in their practice through their Smartphone or tablet. The “Calculate” app by QxMD is a free Smartphone application which is compatible to most devices and is available in Google Play and Apple App Store. The application is a decision support tool for the medical community and holds commonly-used prognostic and diagnostic aids for clinicians. Depending on the aid, the clinician is prompted to answer a few brief questions, and then the app “calculates” patient status scores, treatment risks, and treatment pathways. We adapted the AECOPD-Mob tool to this format by distilling the information we considered to be the most suitable for an app and creating a series of questions related to the main items of the tool (Figure 2.3). We added a still photographs of healthcare providers and patient actors demonstrating the different options of exercises as described in AECOPD-Mob. The ‘Calculate’ feature displays a recommended treatment plan based on the patient’s mobility parameters and physiological measures. The app was designed to allow the HCPs make rapid yet evidence-based decisions at the patient’s bedside.

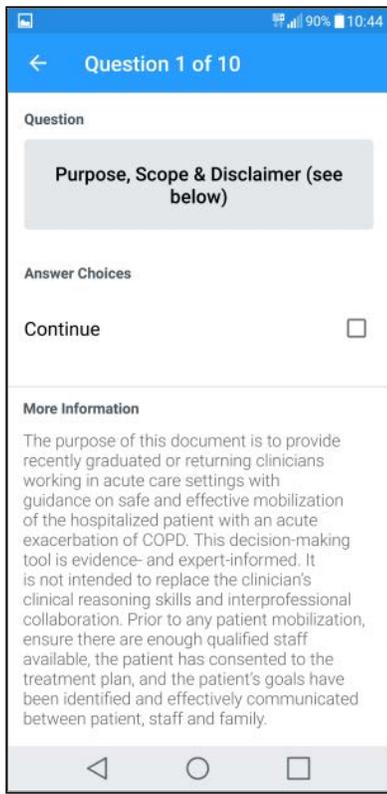


Figure 2.3 AECOPD-Mob Application

2.7 Development of an Inservice presentation:

An Inservice program is another professional training method, where professionals exchange knowledge and train with other peers. It is a prominent form of continuing medical education for HCPs (40, 41). The AECOPD-Mob Inservice was developed and delivered by our research team with clinical expertise in the safe and effective mobilization of hospitalized patients with AECOPD and was in the form of a face-to-face group lecture with visual aids, and opportunities to ask questions. The Inservice included an overview of COPD and AECOPD, treatments and gaps, and information about the AECOPD-Mob tool, as well as photos, graphs and case scenarios (Appendix A.3). Each participant attended only one Inservice.

2.8 Study Population:

The study population consisted of recently graduated or inexperienced physiotherapists and nurses who provide care to hospitalized people with AECOPD. The selection of this population was based on our assumption that PTs and nurses are the health care professionals who are mainly involved in mobilizing hospitalized people with AECOPD. In addition, new graduates or inexperienced HCPs were selected under the assumption they may be less confident in their abilities to mobilize AECOPD patients. (27) HCPs who met the inclusion and exclusion criteria was recruited consecutively as they became available.

2.8.1 Inclusion\exclusion criteria:

Table 2.1 Inclusion\exclusion criteria

Inclusion	Exclusion
Registered HCP	No regular access to a computer
Recently graduated students (less than 3 years from entry-level) or inexperienced (working less than two years in AECOPD acute care)	Without a Smartphone or compatible device
Minimum of five people with AECOPD per month (on average)	
Work at least two days per week in a recruiting hospital on an acute care ward during the study period	

2.8.2 Recruitment of Physical Therapists:

We recruited PTs from the departments of Physical Therapy from each hospital by contacting the physical therapist clinical specialist or Professional Practice Lead, who then contacted the potential participants. The interested participants that met the inclusion criteria were contacted by our team and were invited to participate in the study. Each participant provided an informed consent to participate and contributed approximately 4 hours to this study, not including the time using the tool in clinical practice. PTs in the study participated during their normal work day and received a \$30 CAD gift card as compensation for participating. Acute care physiotherapists from all participating hospitals have regularly participated in research studies in the past and the Practice Leads routinely support clinicians who wish to participate.

2.8.3 Recruitment of Nurses:

We recruited RNs from St. Paul's Hospital by contacting their practice leads or the clinical educator nurse specialist, and by placing recruitment posters and information pamphlets in the departments. Nurses typically do not participate in research studies during their regular work time, as most of their time is dedicated to direct patient care. Therefore, the nurses that participated received a \$100 CAD honorarium provided by the RN Director of Professional Practice and funded by the Providence Health Care RN continuing education fund.

2.9 Data collection - Instruments

2.9.1 EBP questionnaire:

There are several questionnaires which measure the EBP barriers experienced by HCPs. We selected the questionnaire for the study based on the following criteria: the questionnaire had to be used in previously-published studies with at least 200 participants; it had to address barriers on implementing EBP; and was designed for clinicians. After conducting a review of the literature, the following four candidate questionnaires met our criteria and were reported in the following papers:

1. Adopting evidence-based practice in clinical decision making: nurses' perceptions, knowledge, and barriers by Majid et. al (2011) (42)
2. Barriers to Using Research Findings in Practice: The Clinician's Perspective by Funk et. al (1991) (43)
3. General practitioners' perceptions of the route to evidence-based medicine: a questionnaire survey by McColl et. al (1998) (44)
4. Evidence-Based Practice: Beliefs, Attitudes, Knowledge, and Behaviors of Physical Therapists by Jette et. al (2003) (45)

Majid et.al (42) developed a questionnaire to explore the knowledge and attitudes of nurses toward EBP, as well as the factors that might create barriers for EPB adoption. This questionnaire deals with clinicians' resources and ability to obtain information and address the barriers preventing clinicians from adopting EBP in their workplace and on the individual's level. In addition, it allows participants to add additional information on personal barriers as well as addressing technology use barriers. However, the questionnaire focuses the attention mainly on knowledge acquisition, and less on the implementation of EBP.

Funk et.als' (43) questionnaire explored clinicians' perceptions of the barriers towards using research findings in practice. This questionnaire has been used extensively in many research studies of opinions of nurses regarding barriers for EBP. It was developed from a literature review and experts' opinions and was adapted from the Conduct and Utilization of Research in Nursing (CURN) questionnaire (46). This questionnaire is short and concise, with forthright plain language questions that allow participants to add additional personal barriers and rate the three greatest barriers. However, this questionnaire is copyrighted and requires an extensive approval process for any modifications and subsequent use from Dr. Funk.

McColl et.al (44) explored the attitude of general practitioners towards evidence-based medicine (EBM) and their related educational needs. This questionnaire has been used in research as a building block for other studies and questionnaires and has been cited over 800 times in the literature. It was developed after identifying gaps and themes on barriers for implementing EBM, and addresses data acquisition resources with regards to time and place. In addition, it was previously adapted to identify barriers in specific conditions. However, this questionnaire was developed as an exploratory questionnaire that focuses less on practical barriers and more on accessibility of resources.

Finally, the questionnaire developed by Jette et.al (45) explored physical therapists' attitudes and beliefs regarding EBP, as well as education and knowledge acquisition, and perceptions of the barriers towards EBP. This questionnaire examined barrier types like attitudes, beliefs and motivation toward EBP, abilities to interpret information and use of the literature, and perceived barriers of using evidence in practice. This questionnaire has been used in many research studies that sought the feedback of physiotherapists regarding barriers to research utilization in practice. The questionnaire has been modified to answer barriers specific to a practice area (45). It covers a broad

range of barriers, addresses data acquisition resources, including online resources, and was therefore suitable for our study.

In order to examine what are the barriers of the HCP to implement EBP in their practice, we have provided them with a modified Jette EBP barriers questionnaire, where they were asked to provide information about their practice, demographics, general barriers and their ‘Primary barrier’ and ‘Top three barriers’ to implement EBP in their practice. The demographic data (gender, age, profession etc.) that was collected with the questionnaire is presented as descriptive statistics in table 3.1.

2.9.2 Qualitative data collection: Focus groups

Focus groups are an excellent way to capture viewpoints of the people engaged. It involves using dynamic conversation to allow people to express their opinion, while also hearing the opinions of others (47). This process enables them to develop their ideas and thoughts during the conversation. Focus groups are also an efficient way of collecting qualitative information from a large number of people and is often more feasible to conduct than multiple one-to-one personal interviews (47). In this study, we used focus groups to capture the insights and opinions from HCPs about the usability experience of each AECOPD-Mob format (Paper, Learner Module, App and Inservice).

To facilitate the focus group, we composed a script that included a preamble, guidelines for focus group conduct, and open-ended questions with additional prompts to guide the conversation (Appendix B.4). The focus groups were conducted in the workplaces of the HCPs and were facilitated by a team member that had prior knowledge about the different formats. In addition, a second team member took notes and asked follow-up questions where appropriate. Each focus group was audiotaped and transcribed verbatim by a professional transcriber.

2.9.2.1 Focus groups quality control

To ensure the rigour of the qualitative data collection, the following items were addressed (see Appendix C.1 for more details).

Building rapport – Creating a good atmosphere and mutual trust is essential in order to make the participants feel comfortable providing information. Rapport was built in the following ways: 1) individual contact via email was done with each participant to book the orientation and focus group; 2) Collecting the data at the participant's work location; 3) Providing participants with refreshments during the focus groups; 4) Providing compensation for their time.

Avoiding completing statements for the participant - Ideally, the participant should come up with their own ideas and thoughts during the focus group. Completing a statement of a participant may ultimately result in obtaining false information. In this study, this was avoided by ensuring the facilitator of the focus groups was prepared and had experience in previous groups as a secondary facilitator. This learning process enabled to reduce mistakes while conducting the focus groups.

Avoiding pushing for a response - If a participant is uncomfortable with the question, the facilitator should not insist upon the answer, as this may cause the participant to be uncomfortable and not cooperative. In this study, we reassured participants that they may respond or not at will. In addition, we created questions that would not likely to create awkward moments.

Avoiding probing too much or failure to probe – The role of the facilitator is to create a fluent conversation; however, it has to be balanced. Too much probing can result in loss of data due to

confusion, and failure to probe will not generate enough data. In this study, probing problems were avoided by creating a linear script with questions that were linearly based on one another.

Following the script – The facilitator needs to find the fine balance between unscripted follow-up questions that provide more in-depth information and keeping the conversation to the research objectives. In this study the facilitators read the script and practiced it in advance, in order to know where and how to lead the conversation. In addition, they reviewed transcripts of former focus groups, noted where there seemed to be not enough discussion, and brought that to the attention of the team in order to improve the next focus group script.

Understanding deeper context – Body language and tone of voice communicate information that is not easily read from transcripts. In this study, we took notes during each focus group to capture information that was not shown in the transcriptions, such as dominance during the conversation; a lack of interest of participants; and individual body language and more. This allowed for a better understanding of the transcribed data.;

Focus groups size – Too many or too little participants may affect the quality of data: with too many participants some opinions can be missed, and too little participants may not reflect enough opinions. In this study, we endeavoured to assemble focus groups larger than four, but not more than eight participants, in order to have a reciprocating conversation between the participants.

2.9.3 Quantitative Data Collection: Usability questionnaire and Task completion rate

Usability of a product is commonly characterized by ease of use, ease of learning the embedded information, and simplicity of the user interface. Usability can be evaluated objectively and subjectively (48).

Each participant completed a Post-Study System Usability Questionnaire (PSSUQ) (48). This questionnaire is commonly used in research studies to examine usability of systems, software and applications, and has a high reliability as a usability measurement (49). It uses a 7-point Likert scale on 17 subjective usability parameters. In order to evaluate the level of participant satisfaction from both the learner module and the smartphone app, we have provided the participants with an adapted PSSUQ questionnaires.

We also collected objective usage data for the learner module. A key component in objective usability evaluation of the learner module was task-completion rate, which is completeness of specific pre-determined goals. This was a complimentary indicator which helps to determine good or bad usability (50).

2.10 Quantitative data analysis

The PSSUQ consists of a satisfaction scale questions (items) divided into subscales as followed: Items 1-8 compose 'system usefulness', items 9-13 compose 'information quality' and items 14-17 compose 'interface quality'. We modified the questionnaire to specifically address the usability of the Learner module (Appendix B.2) and the Smartphone application (Appendix B.3). Each question is scaled from 1 (Strongly agree) to 7 (Strongly disagree). Unanswered questions were scored as a '4' (Neutral). The primary result is presented as mean scores, when lower scores indicate better usability and vice-versa. We described the results as follows: Score below 1.50 – Excellent. Score

between 1.51 to 2.0 – Very good, Score between 2.01 to 2.5 – Good, Score between 2.51 to 3.5 acceptable and Score over 3.5 – Poor. Median, range and standard deviation were presented as well (48).

In order to assess the Learner module’s task completion rate, we have examined the completion of seven predefined learner module tasks by the participants. This included: watching five videos in the learning module and successfully completing two mini-quizzes. Our assumption for completing the ‘video watching tasks’ was that the participants spent a minimum time on the video page (the length of the video clip), while ‘successfully completing the mini-quizzes’ was successfully answering 80% of the quiz questions. If the actual measured time to complete is less than the minimum time, the task has not been completed – the learner has “skipped” that section. The results for each task are presented as a sum of all users that completed the task divided by the total users. We defined a task to be successfully completed overall, when 78% (ISO cut off) of users completed the task (50).

2.11 Qualitative data analysis:

Thematic analysis is a qualitative research method that emphasize on examining recurrent topics inside a data set (47). This method allows obtaining notions and concepts from the data, which often cannot be achieved from quantitative data.

Applied Thematic Analysis:

Applied Thematic Analysis is a methodological framework that is comprised of a synthesis of different qualitative analysis approaches. This framework is considered rigorous approach that helps to obtain transparent and credible information from transcribed text. This analysis approach is tailored to analyze focus groups and interviews data (47).

Themes are clusters of mutual units of information that caught the attention of the data analyst. These units (codes) are generated by the process of marking valuable points in the data segments and assigning it a specific code.

2.11.1 Processing the dataset:

Prior to coding the data, a data cleaning process needs to be done. Data cleaning is the process where the analyst reads the raw data, and eliminates irrelevant information from the dataset (e.g. interruptions like phone ringing or external person that enters the room), as well as speech artifacts (e.g “ammm”s and “ahhh”s).

2.11.2 Coding process:

In this study, the coding process was done using MS Word. The Codebook (Appendix C.2) was created during the coding process. Each code was generated from the context of the data, labeled as a “comment” in MS Word, and logged in the codebook with a code number, name and definition. An example of a code and a definition in the codebook is "Need for alternative knowledge resources" and is used whenever participant mentions a need of different sources of information. This process was done on each focus group transcript.

Once the coding was done, we identified possible themes after clustering similar codes and short descriptive sentences. Themes that appeared on the text included usability and design factors, as well as user satisfaction and experience. Where necessary, themes and codes were grouped to eliminate repetition.

Data saturation is the state where no new data emerges from the focus groups. Whenever no new codes emerge from the transcripts, there is no need to continue conducting focus groups or

interviews (51). Saturation was reached after the 5th focus group, as no more new codes were emerged from the transcripts, thus focus groups 6 and 7 where not analyzed.

Chapter 3: Results

3.1 Participant Characteristics

Of 40 eligible HCPs (15 RNs and 25 PTs) at five participating hospitals, three RNs (20%) and 17 PTs (68%) consented to participate in the study. The hospitals that participated in the study were acute care hospitals in three health authorities in Metro Vancouver. Each hospital had a minimum of 300 beds, were teaching hospitals affiliated with medical, physiotherapy and nursing schools, and had clinician educators which are responsible for the continuing education of new and current staff.

Participant characteristics are detailed in Table 3.1. Notably, 95% of the participants were females, and 85% were PTs. No participant identified themselves as a specialist, and 94.1% of the PTs and 100% of the RNs had graduated from their entry-level professional training program within the last five years.

Table 3.1 Descriptive statistics

Demographic	Value	N = 20
Gender	Male	5%
	Female	95%
Age	20-29 y	80%
	30-39 y	20%
Profession	Physiotherapist (PT)	85%
	Registered Nurse (RN)	15%
Education	Bachelor's Degree	20%
	Entry level Master's	65%
	Advanced Master's	15%
Specialty	Yes	0%
	No	100%
Years practicing	<5 years	95%
	5-14 years	5%
Hospital	Hospital 1	25%
	Hospital 2	15%
	Hospital 3	45%
	Hospital 4	15%

3.2 Barriers for implementing EBP

The primary barrier and top three barriers to implementing evidence-based practice, based on the answers given on the Jette questionnaire, are presented in table 3.2.

Table 3.2 ‘Primary barrier’ and ‘top three barriers’ to implement EBP

Barriers for EBP	Primary barrier for implementing EBP (Participants %)	Mentioned as one of top three barriers for implementing EBP (Participants %)
Insufficient time	60%	90%
Lack of information resources	5%	10%
Access to practice guidelines	0%	20%
Lack of research skills	0%	5%
Poor ability to critically appraise the literature	0%	15%
Lack of generalizability of the literature findings to my patient population	10%	70%
Inability to apply research findings to individual patients with unique characteristics	10%	45%
Lack of understanding of statistical analysis	5%	10%
Lack of collective support among my colleagues in my facility	10%	25%
Lack of interest	0%	5%
No clinical specialist or expert in my facility to demonstrate	0%	5%
Unsure how to apply research findings to a clinical situation	0%	0%
Other	0%	0%

According to the EBP questionnaire, the top barriers for implementing EBP are ‘Insufficient time’ (60% of participants stated this as their primary barrier and 90% stated as one of top three barriers), ‘Lack of generalizability of the literature findings to my patient population’ (10% of participants stated this as their primary barrier and 70% stated as one of top three barriers), ‘Inability to apply research findings to individual patients with unique characteristics’ (10% of participants stated this as their primary barrier and 45% stated as one of top three barriers) and ‘Lack of collective support among my colleagues in my facility’ (10% of participants stated this as their primary barrier and 25% stated as one of top three barriers).

In addition to stating the top three barriers, we also asked the participants to state their confidence level in mobilizing hospitalized patients with an AECOPD; 15% of participants stated that they were ‘extremely confident’, 60% stated that they were ‘somewhat confident’ and 25% stated that their confidence was ‘neutral’.

When asked regarding availability of guidelines for AECOPD mobilization, only 40% of participants stated that they knew of available practice guidelines in their facility for mobilizing/exercising hospitalized patients with COPD. In addition, 30% of participants actively seek guidelines for hospitalized AECOPD patients, and 50% use practice guidelines for treating hospitalized AECOPD patients (Table 3.3).

Table 3.3 Guideline availability for HCPs

Statement	Value	N=20
Practice guidelines for mobilizing/exercising hospitalized patients with COPD are available to me.	Yes	40%
	No	30%
	Do not know	30%
I actively seek practice guidelines for treating hospitalized patients with COPD with mobility problems.	Strongly agree / Agree	30%
	Neutral	30%
	Strongly disagree / Disagree	40%
I use practice guidelines while treating hospitalized patients with COPD with mobility problems.	Strongly agree / Agree	50%
	Neutral	30%
	Strongly disagree / Disagree	20%

3.3 Tool satisfaction level

3.3.1 Learner module usability and satisfaction

The results from the learner module PSSUQ questionnaire demonstrated that the HCPs were, in general, satisfied with their experience with the learning module (overall score 1.87 of a 7-point scale, lower scores indicating greater satisfaction). The highest median score for any one item was 3 out of 7. Most of the items had a median value of < 2". Only one item "I believe I could become more productive using this learning module" received a median score of 3. The range, median and mean scores with standard deviations are presented in Table 3.3, and calculated subscales are detailed in Figure 3.1.

Table 3.4 Learner module PSSUQ

Item	Item text	Range	Median	Mean (SD)
1	Overall, I am satisfied with how easy it is to use the Learner module.	1-4	2	1.95 (0.83)
2	The interface of this Learner module was pleasant.	1-5	1.5	1.85 (1.14)
3	I liked using the interface of this Learner module.	1-4	2	1.85 (0.99)
4	It was simple to use the Learner module.	1-5	1	1.55 (1.00)
5	I could effectively answer the questions and navigate through pages in the Learner module.	1-4	1	1.65 (0.99)
6	I felt comfortable using the Learner module.	1-4	1	1.45 (0.83)
7	It was easy to learn how to use the Learner module.	1-5	1	1.5 (1.00)
8	I believe I could become more productive using the Learner module.	1-6	3	2.85 (1.27)
9	Whenever I made a mistake navigating in the Learner module, I could recover easily and quickly.	1-4	1	1.65 (0.88)
10	The Learner module's media (Videos, Photos & Narrations) functioned properly.	1-7	1.5	2.9 (2.49)
11	It was easy to find the information I needed.	1-4	1.5	1.7 (0.86)
12	The instructions provided with the Learner module were clear.	1-4	1	1.55 (0.89)
13	The information in the Learner module was effective in helping me care for my COPD patients.	1-4	2	2.35 (0.99)
14	The organization of information in the Learner module was clear.	1-4	1	1.6 (0.99)
15	This Learner module has all the functions and information I expect it to have.	1-4	1	1.75 (1.02)
16	I was able to complete all of the tasks in the Learner module.	1-6	1	1.9 (1.41)
17	Overall, I am satisfied with this system.	1-3	2	1.75 (1.41)
Overall			1	1.87 (1.19)

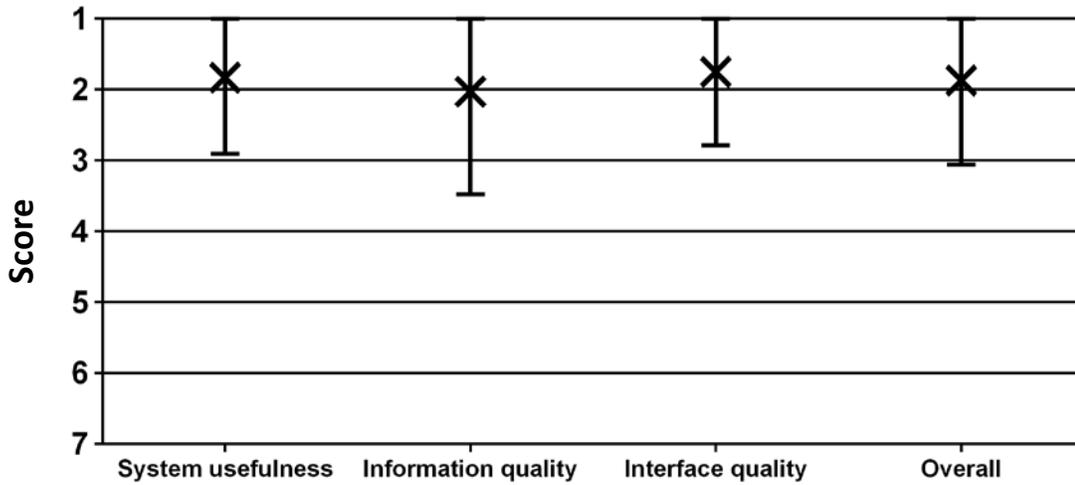


Figure 3.1 PSSUQ subscale for the learner module

This figure presents average score of questions related to ‘system usefulness’, ‘information quality’ and ‘interface quality’. Error bars: SD, n = 20 participants. Note: Lower scores indicate better usability.

The participants’ free text comments relating to the learner module usability were that “navigating through the learner module was easy, however frustrating, as there is an obligatory button to proceed”, and “without the initial orientation, there might be a problem to login”. The participants reported that the videos in the learning module ran smoothly, and the content was a “good review”. Notably, 65% of the participants mentioned they may refer back to the learner module in the future.

3.3.2 Smart phone app usability and satisfaction

The results from the smart phone app PSSUQ questionnaire demonstrated that the HCPs were, in general, neutral with respect to the satisfaction with the usability of the app (mean score 2.5 of a 7-point scale). Results are presented in Table 3.4, and calculated subscales are detailed in Figure 3.2.

Table 3.5 Smart phone app PSSUQ

Item	Item text	Range	Median	Mean (SD)
1	Overall, I am satisfied with how easy it is to use the Smartphone application.	1-7	2	2.28 (1.60)
2	The interface of this application was pleasant.	1-7	2	2.17 (1.58)
3	I liked using the interface of this application.	1-7	2	2.61 (1.69)
4	It was simple to use the Smartphone application.	1-7	1.5	2.06 (1.55)
5	I could effectively answer the questions and move from screen to screen in the Smartphone application.	1-7	2	2.11 (1.45)
6	I felt comfortable using the Smartphone application.	1-7	2	2.39 (1.69)
7	It was easy to learn how to use the Smartphone application.	1-7	1	1.89 (1.53)
8	I believe I could become more productive using the Smartphone application.	1-7	3	3.11 (1.41)
9	Whenever I made a mistake navigating in the Smartphone application, I could recover easily and quickly.	1-7	3	3.17 (1.65)
10	The Smartphone application's photos and graphics functioned properly.	1-7	1	2.00 (1.57)
11	It was easy to find the information I needed.	1-7	2	2.72 (1.49)
12	The instructions provided with the Smartphone application were clear.	1-7	1.5	2.06 (1.63)
13	The information in the Smartphone application was effective in helping me care for my COPD patients.	1-7	3	3.00 (2.03)
14	The organization of information in the Smartphone application was clear.	1-7	1	2.11 (1.71)
15	This Smartphone application has all the functions and capabilities I expect it to have.	1-7	2.5	2.78 (1.90)
16	I was able to fully utilize the Smartphone app's potential.	1-7	3	3.28 (1.74)
17	Overall, I am satisfied with this system.	1-7	2.5	2.83 (1.62)
Over all			2	2.5 (1.66)

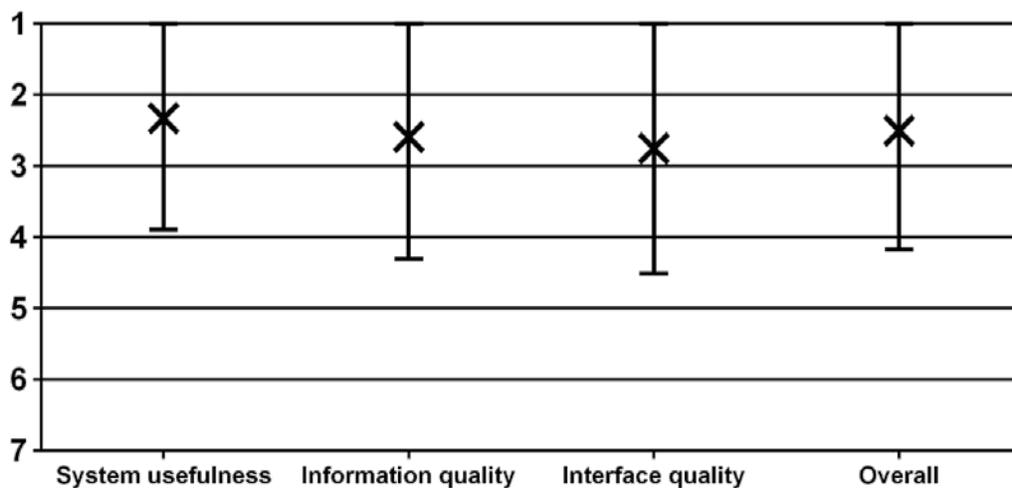


Figure 3.2 PSSUQ subscale for the smartphone app

Graph presents average score of ‘system usefulness’ questions, ‘information quality’ questions and ‘interface quality’ questions. Error bars: SD, n = 18 participants. Note: Lower scores indicate better usability.

The main comments in the questionnaire discussed a difficulty using a smart phone in the medical facility due to “infection control” and “looking unprofessional”. In addition, participants noted that the setup process was “complicated”. 60% mentioned they may use this version of the app in the future.

3.4 Learner module Task completion rate:

In the current learning module interface, most tasks were not completed. As presented in Figure 3.3, 5% of participants watched the five videos to completion, and only 15-20% of participants watched any individual video. Quiz 1 and Quiz 2 were successfully completed by 100% and 95% of the participants, respectively. The overall task completion rate for the learner module was 41.4%.

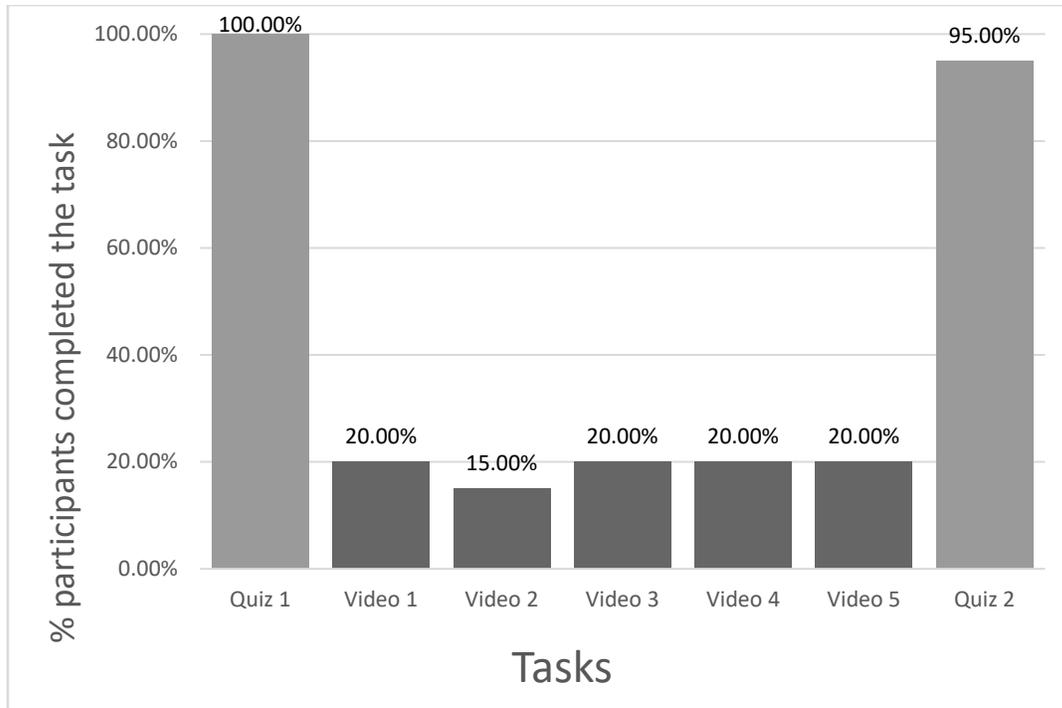


Figure 3.3 Successful learner module task completion rate

The graph represents the percentage of participants who completed every one out of the seven tasks (watching five videos and successfully completing two quizzes). n=20.

3.5 HCPs’ insights on the different formats – Focus groups

The following findings are from a series of five focus groups conducted with HCP participants. Each focus group lasted approximately an hour and was conducted in their workplace. The main discussion in the focus groups was about the HCPs’ opinions and usability experience using the different formats of the AECOPD-Mob.

The responses from the focus group were cleaned (removed irrelevant data) and 42 individual codes were created. From these codes, four key themes were formulated: Theme 1- ‘HCPs’ knowledge gaps’, Theme 2- ‘HCPs preferences’, Theme 3- ‘Tool quality and usability’ and Theme 4- ‘Improvement suggestions’ (Appendix C.3-C.6).

In general, participants in all groups mentioned that there is an interest in alternative knowledge resources, however the AECOPD-Mob paper version was felt to be the most comprehensive and provided the quickest access to important information. The learner module and the Inservice were seen as interchangeable and provided the necessary background information, however the learner module had the benefit of being available to access at any time, while the Inservice had the benefit of enabling discussion amongst colleagues. The focus group participants felt that it was challenging to use at the bedside, but the exercise pictures in the app were helpful for illustrating the recommended exercises.

3.5.1 Theme 1- HCPs' needs and expectations:

3.5.1.1 Subtheme 1.1- Need for alternative knowledge resources

The need for additional knowledge and resources regarding mobilizing people with AECOPD was clearly noted in the focus groups. The participants mentioned there is a requirement for additional knowledge, specifically regarding COPD, and emphasized the need for fast accessibility to the knowledge.

“When you’re on the medical units we need something that’s pretty fast where you can look at it and have a couple ideas. So, it’s nice having the different format”

“More education is needed for sure... and I appreciate that the study is trying to address that, because I think COPD kind of gets swept under the rug.”

3.5.1.2 Subtheme 1.2- Expectations from the tools before use

This need led to high expectations of the different AECOPD-Mob formats from many of the HCPs, especially from the Lerner module and the Smartphone app, and from the idea of a number of different formats.

“I was really excited about there being an app because it’s so simple and I feel like we just want quick and dirty”

“I thought it would be kind of cool... since everything nowadays seems to be on the computer and on your phone, I thought that might be something useful.”

“I thought having more than one format is good because people prefer one format over the other.”

A few HCPs had doubts about using the various formats in practice and stated that they feel most comfortable with a paper version due to its accessibility.

"Just the paper has always functioned great for me and... having to go use an app or a computer which I don't typically have in front of me for patient care... seemed a little bit not what I'm accustomed to."

"I wasn't sure how I would use it [the smartphone app] in practice 'cause... I don't use it that much [the phone]... I don't bring it out [to work]."

3.5.2 Theme 2- HCPs' preferences:

The HCPs preferences of using the different formats were divided to two clinical situations: the learner module and Inservice were seen as overview and background information sources, while the smartphone app and the paper version were deemed more practical tools to use in real time.

"I felt that the Inservice and the online module were pretty similar and then I guess, those were more educational whereas the paper form and the app... you could actually use when you're working with a patient".

"I would almost feel like they're [learner module and Inservice] pretty equal for a learning tool".

3.5.2.1 Subtheme 2.1- Preferred format- Overview (In-service vs. learner module):

In the focus groups, participants compared the Inservice and learner module. There was a preference towards the Inservice, due to the opportunity to discuss mobility and AECOPD with senior clinicians and ask questions. In addition, participants mentioned that, in a self-driven format, people might not complete it.

"I like paper. I also like the Inservice, it's nice to be able to talk to someone..."

"[I preferred the] in-service... because you can talk about it after and ask questions."

"If it's self-driven [learning module] some people might not do it. So, if it's an Inservice, [it] is hard to ignore what's being presented to you. I'd prefer to keep the Inservice and then add the videos in there."

While some participants were indifferent about the learner module as a stand-alone format:

"It was nice having both actually... the in-service and... the learner module after. [The learning module was] a nice refresher and the videos and stuff, I liked that. But if it was just the learner module I don't think it would have sunk in as well"

Some participants did not feel the learner module added any value and clearly preferred the Inservice:

“I think the Inservice would be more helpful than the online module, but... I don’t think anybody frankly would do the module on their own accord, but if they mandated it like a competency one time or something.”

“I felt like the module was like another module that we have to go through... I didn’t get value from the module and the Inservice was great but it was very temporary.”

3.5.2.2 Subtheme 2.2- Preferred Format-Practical (paper vs. app)

The majority of the participants stated that the most convenient and practical AECOPD-Mob format was the original paper version. One main reason was the habit and familiarity of using paper tools.

“We’re still pretty paper driven in healthcare and I found that was pretty easy cause I could just have it in my hand right away and show people.”

“I like the paper. It’s easy... similar to the Safe-MOB and I can quickly go to the computer and print off the Safe-MOB and show it to them [Patients]”

The concept of using an app for mobilizing people with AECOPD was viewed positively by the participants; however, certain logistical issues with the app arose, such as not being able to use the phone in front of the patients.

“I thought the Smart phone one would be the most I preferred. It takes a while to get to where it is [the content] and you’re just standing outside a patient’s room and trying to figure [it] out. So, I think that the paper is easier to navigate.”

“I find myself using the sheet a lot more than the app itself cause I’m just not comfortable taking my phone with me.”

3.5.3 Theme 3- Tool quality and usability (Smartphone and learner module):

3.5.3.1 Subtheme 3.1- Learner module usability:

When discussing the Learner module usability, the subthemes that emerged were related to the time invested in Learner module, the opinions regarding the quizzes and videos, the visual properties, the content and the login experience.

Most of the participants reported that the time to complete the learner module was appropriate.

“I was worried about the time but in the end, it did not turn into being an issue. They were reasonable length in use.”

“It [time spent on the learning module] was a good amount of time cause it was enough that you were... engaged in it and... [to] cover everything”.

The participants mentioned that the learning interface (“Connect”) was not a convenient learning platform.

“I just don’t like... Connect”

It was also mentioned that the system required assistance in order to log in and navigate.

“It actually took me longer just to log in [to the learner module] than to actually do it.”

“I think the look was okay but I definitely think the intro that [that was given to us]...about having to press what button, that was very useful and maybe it would have been more confusing if we hadn’t done that.”

The decision to add a button that forced scrolling through the page and pressing it in order to continue (“Mark reviewed”), hurt the flow of the learning

“It’s not... easy to follow. Because all the topics don’t show up at once so... you said you have to click ‘reviewed’... before you go onto the next part.”

The participants liked the media and the graphics of the module

“I like the videos.”

“Content [of the learning module] was really good and really well laid out.”

The RNs in the study found the learner module as over-informative, and the questions in the quizzes were irrelevant for them.

“I think it was too long... I think as nurses we have to do lots of modules for different things and... it's just lots of detail.”

“I'm not gonna remember [it] all... it was just almost like too much information... I didn't find that the information was that valuable.”

“I did it [the learner module quizzes] and I passed the quizzes and stuff but I could tell you about any of the info right now? No. And I felt like a lot of the questions on the quizzes... [don't] apply to me, this is unnecessary in terms of how I'm gonna use this information.”

In contrast, most of the PTs found the information as a comprehensive review about AECOPD, and the quizzes as useful.

“I like the learner module I'd say a bit more cause it had the questions [Quizzes] and it was more interactive. I think the quizzes are good...it emphasized... important points.”

“I found it [the learning module] very straightforward. I liked the way it divided up all the like respiratory rate and oxygen sats that you would know anyway but it's just helpful to be reminded of your parameters and what you're looking for specifically...”

3.5.3.2 Subtheme 3.2- App usability:

As previously described, the app had very high expectations, and the responses from the participants extremely varied. The usability and compatibility of the app in its current state were criticized mainly because of infection control and professional concerns.

“I think I personally probably won’t use the app. For infection, I have my gloves on and I’m not gonna... play around with my phone.”

“I personally don’t like having my phone out at work... with the infection control I don’t really want to be going in on and off my phone cause then I’m holding it up to my face”

“Especially with a patient I wouldn’t want to be on my phone “

“I don’t usually like having something right in front of a patient and saying like ‘oh just a minute, I’m gonna put these values...’

“I feel like sometimes, even like as a bystander if you’re looking at some of the other online health stuff that are pulling out their phone, the first instinct is usually like ‘are you checking your messages’.”

Regarding the design of the smartphone app, a main issue that came up was that the app’s interface was inflexible, and for each individual use, there was a need to answer all questions from the beginning.

“You can compare all of the levels at once [with the paper version of AECOPD-Mob]. Whereas the app you can only see one at a time and then if you let’s say choose incorrectly or you want to change your mind, then you have to start all over again.”

"It doesn’t leave any room for interpretation or wiggle room. [Interviewer: So, then you have to sort of lie [to move forward in the app]?] Yes."

In addition, the setup of the app had some difficulties and was considered a considerable barrier.

“[The initial setup of the app] would definitely be a barrier to me using it. I did find the pictures [in the app], I liked them. I found them beneficial.”

On the other hand, many participants liked the simplicity and the exercise illustration photos in the app and thought it ‘user friendly’.

“[the app is] easy to get into, it’s easy to navigate, like it’s really user friendly. It’s not very flashy.”

“It [general look of the app] was good.”

“It [the app] felt like it was very basic in terms of you don’t have a lot of options, you can either go forward or you can go back.”

Interestingly, RNs found the app especially useful assisting patients with specific exercises, where they can see visual them.

“The pictures [in the app] were helpful... Sometimes they [physios] go in patient’s room and it’s [recommended exercises are] written on the white board... I don’t know what those are half the time. [With the app] I can look at it and kind of try and teach the patient as opposed to if I read it I have no idea what that is...”

3.5.4 Theme 4- Improvement Suggestions

3.5.4.1 Subtheme 4.1- Learner module improvement suggestions:

The suggestions for the learner module were related to the flow of the learning process. The participants suggested to remove the page progressing limitation, so they could skip ahead if they already know the material. The button “Mark reviewed” was felt to be unnecessary and could be removed.

“I found with each page when I got to the end of the page and I’d press mark reviewed then it would refresh to the same page and then have to go to the next page.”

“I would say I’m glad that you gave us that orientation to begin with ‘cause it’s not absolutely super easy to follow. Because all the topics don’t show up at once so you have to click ‘reviewed’ or whatever before you go onto the next part.”

Additionally, it was suggested to add a progress bar, and let users know the video lengths.

“Some of the videos didn’t tell me how long they were... I find I get quite antsy when I don’t know if I’m sitting and watching this for a half an hour... [or] if it’s two minutes.”

3.5.4.2 Subtheme 4.2- Smartphone app improvement suggestions:

As noted, one of main issues of the app was the obligation to answer all questions in every run. To solve that, participants suggested consolidating the first nine questions, or to provide flexibility answering them.

“Getting rid of the first part- questions 1 to 9... Maybe just like a disclaimer that says check all of these things [questions 1-9] before, and then go into question 10.”

“If I could just continue down [in the app] and that way if I want to enter [the] information I just scroll back up and then change that or something.”

A formative suggestion was to add an option to create a personalized exercise program for patients and be able to print it and hand to them.

“Take it one step further, if it [results from app] comes like a print option with all the exercises ... That would be amazing... And if you send it to a patient that would be even better so we don’t have to go find those exercises and put it together...”

Chapter 4: Discussion and Conclusions

Hospitalized patients with an AECOPD should perform physical activity in order to reduce the risk for readmission in the future and improve their quality of life (18, 23). Many HCPs encounter different barriers to take action and make decisions regarding whether, and how to mobilize AECOPD patients. The clinical decision-making tool, AECOPD-Mob, was developed to mitigate these barriers and provide guidance to HCPs; however, different formats of the tool may improve its use in clinical practice.

In our study, we have developed and evaluated the usability of four different formats of the AECOPD-Mob tool. The Paper version was the original tool, and furthering the KT process, we created a web-based Learner module, a Smartphone app and a traditional Inservice. These formats were intended to enable the dissemination and implementation of the AECOPD-Mob tool in order to provide assistance to HCPs to address their different barriers. We gave these tools to 17 PTs and 3 RNs from four main hospitals in greater Vancouver area, and examined the usability of these tools.

4.1 HCPs barriers to implement EBP- barriers may be addressed by different formats

Previous studies have pointed out that different type of barriers such as lack of confidence, difficulties to interpret the literature, and lack of available resources, may prevent HCPs to implement EBP (15, 25, 28). In order to identify which barriers newly graduated HCPs that care for hospitalized AECOPD patients face, we used the Jette EBP Barriers questionnaire and asked our participants to rank their top three barriers from a list of 13 barriers, while one of them being an 'Other' option.

We found that the main barrier noted by the HCPs was ‘Insufficient time’. Both the app format and the paper format may assist in dealing with this barrier since both can provide quick recommendations for mobilization.

Two other leading barriers were ‘Lack of generalizability of the literature findings to my patient population’ and ‘Inability to apply research findings to individual patients with unique characteristics’. Both these barriers may also be addressed by the app and paper formats, as well as the learner module and Inservice, since all four formats provide evidence-based information of the literature, generalized and unique to specific characteristics.

Interestingly, ‘Lack of collective support among my colleagues in my facility’ was also mentioned by 10% of participants as a primary barrier, and 25% of participants as one of the three greatest barriers. The Inservice format might assist dealing with this barrier since it enables conversation, gives an opportunity to ask questions and discuss difficulties in mobilizing people with AECOPD.

These barriers are similar to other reports from the literature, where in general the main barriers of HCPs to implement EBP are also ‘Insufficient time’, ‘Lack of generalizability of the literature to my client population’ and ‘Inability to apply research findings to patients with unique characteristics’ (52, 53). This indicated that HCPs across professions experience similar barriers in their practice.

When asked about available guidelines on mobilizing AECOPD patients in their facility, most HCPs stated that they do not know of available guidelines, and half stated that they do not use guidelines in their practice. In order to assess if the different formats of the AECOPD-Mob tool will address the barriers of HCPs and provide them with effective guidance, there is a need to further the

KT process by re-evaluating the formats, adapting them to the HCPs' needs and examining how they affect HCPs' practice.

4.2 Usability of the AECOPD-Mob tool formats

To successfully address the HCPs' barriers and expedite the implementation of evidence into practice, we have evaluated the use of the AECOPD-Mob tool in acute care hospital settings through an integrated KT strategy.

We have developed the four AECOPD-Mob tool formats in the 'Knowledge dissemination' stage and have examined the usability of our tool formats as part of the 'Knowledge exchange and implementation' stage of KT, where we received feedback from HCPs. This will assist in revising the knowledge product and help the ongoing process of improvement.

While in the KT dissemination stage it is common to provide the knowledge through different technological formats such as webinars, videos, and audio clips, the majority of our participants stated that they preferred using the paper version format. This is consistent with the literature since, although it is shown that alternative dissemination formats provide different learning opportunities to present and access knowledge (36), technological formats can be a distraction in hospital settings (54). Therefore, it is important for us to use the KTA to properly assess and improve the different technological formats so they can be beneficial for overcoming EBP barriers and not create a distraction.

Usability is an important aspect in promoting EBP. Poor usability will result in low usage and sustainability of the EBP tool (55, 56).

4.2.1 Usability of the learner module

In order to examine the usability of the Learner module format, we approached this topic in three different ways; we inspected the task complication rate of the module by the participants, we collected information from the PSSUQ questionnaire and we asked questions about usability of the learning module in the focus groups.

According to the PSSUQ questionnaire, the average satisfaction score of the learning module was 1.87 (out of 7). While the overall SD was 1.19, showing that the distribution of opinions was not large, the overall median was 1.0, which points to a very good general satisfaction rate. This score is considered high, when compared to other reports (57-59). For example, in study done by Dosani et.al about a "clinical evaluation of algorithms for context-sensitive physiological monitoring in children", 13 anesthetists completed the questionnaire, with an overall mean score of 2.8. The usability reported was considered good. In another study done by Weegen et.al. about usability testing of a tool to stimulate physical activity, they reported that users were satisfied with the tested app, with scores between mean of 5.2 to 6.3 of 7 (reverse scale) (58). Dunsmuir et.al. reported that median scores between 2-3.5 are considered good usability (59).

When divided into subscales, the 'interface quality' received the highest score (less usable), whereas 'information quality' received the lowest score. Consistent with the literature (60, 61), where HCPs see web-based learning as a positive experience, the HCPs in this study showed interest towards a web-based Learner module and overall, were satisfied with the learner module. This data was supported by the feedback from the focus groups: many of the participants reported satisfaction with the media, graphics and time it took complete the learning module.

A web-based Learner module should typically be built on an intuitive platform, to promote best usability (61). However, it was mentioned that the learning interface of UBC ("connect") is not a

convenient learning platform. This might be supported by a low task completion rate of the learning module (41.4%). It is important to point out that tasks that were completed by almost all participants were the quizzes, which are mandatory in order to continue to the next stage.

Interestingly, the RN participants commented that the learner module was too long, that the questions in the quizzes do not apply to them and that the information in the learner module was too detailed for their needs.

In the focus groups both the learner module and Inservice were seen as an overview of COPD management and treatment. It was mentioned that the main benefits of the Inservice, compared to the learner module, were the opportunity to ask questions, and that while an Inservice can be mandatory, it might be hard to persuade HCPs to spend their time on the learning module. The main benefit of the learning module that was mentioned was the videos, yet this is contradicted by the low task completion rate of video watching. It is important to note, that almost half of the participants fully completed at least one video, and therefore based their opinions on that.

The main suggestions for the learner module were to remove the page progressing limitation in order to enable the user more flexibility, to add progress bar to the videos to let the user know how long the videos will be and to improve the flow of the learner module by removing the “Mark reviewed” button.

Overall, it seemed that most participants were quite satisfied from the learner module’s usability, although many participants preferred taking part in a traditional Inservice in order to obtain knowledge in the field. In addition, comments and suggestions for improving the usability of the Learner module were made and will provide grounds for the next KTA stage of improving usability in the future.

4.2.2 Usability of the smart phone app

In order to examine the usability of the Smartphone app, we collected information from an adapted PSSUQ questionnaire and have directed usability questions regarding the app in the conducted focus groups.

According to the PSSUQ questionnaire, the average satisfaction score of the smartphone app was 2.5 (out of 7). We consider this score acceptable, though not as strong as the learner module. The overall SD stands on 1.66; this shows that the opinion distribution of the participants, although generally quite homogenous, were more diverse than in the learner module. The median score of the questions was 2.0, pointing to a good satisfaction rate.

When divided into subscales, the 'system usefulness' received the highest score, while the 'interface quality' received the lowest score. Overall, it seemed that while 'system usefulness' was acceptable, 'information quality' and 'interface quality' seemed less satisfying.

Consistent with current literature, the desired apps by clinicians using smartphones, are mainly focused of scientific references, training and techniques/guides (62). The HCPs in our study found the prescription guides and knowledge extremely helpful. However, the app's flow was not accepted well. It is reported that many health-related apps have flaws in the initial design, which is consistent with our findings (63).

Two main concerns regarding using an app in health care work settings are infection control, and appearing professional in front of staff and patients by not seeming to use the phone for personal affairs (54). In a study done by Gill et. al, it has been shown that smartphone apps, when not regulated properly, are a great distraction for the HCP. In addition, hygiene and security issues may occur if not maintaining guidelines for regulating smartphones (54). These concerns were mentioned in our study as well. Using a personal device in front of patients and colleagues, both heavily affect

the usability (54). In order to address these issues, it is possible to use organization-provided devices with only the relevant job-specific functions (54).

It is important to point out that participants who are RNs seemed to respond to the app very positively to the app and especially liked the recommended exercises and the pictures of the exercises.

The main suggestions for the app were improving the design and presenting the questions in the beginning (1-9) as a check list or a disclaimer. An additional suggestion was to create a personalized exercise program in the app and print it out to and hand to the patients. As part of the KT process, changes to the app are in order to be better adapted to the characteristics and needs of the HCPs.

Overall, it seemed that although participants were interested in the app, and fairly satisfied from many usability aspects, however major issues such as “infection control” and “looking unprofessional” were extremely affecting the choice of the participants to use the app.

These comments and suggestions can improve the usability and provide grounds for the next KTA stage that will lead to necessary adaptations to organization-provided devices (e.g. computer stations and perhaps hospital tablets).

4.3 Limitations of the study

This study had a number of limitations. The first limitation was the number of participants we recruited. Out of a possible 40 eligible HCPs, we recruited 20, and among the RNs, we only recruited three (out of 15). Therefore, although our focus group data has reached saturation with our PT participants, it would be beneficial to obtain additional data from RN participants, to allow for a more detailed understanding of their needs and perspectives.

Another limitation of our study is the interface of the learner module. The interface available to us was the UBC 'Connect', which has limited data collection tools, and lack of flexibility of the content display and external 'add ons' (such as Google Analytics). With the tools available to us, we could collect task completion data, but not comprehensive usage data, which would have allowed us to better evaluate usability. We encountered a similar issue with the app interface that had limited data collection tools as well, and collecting individual usage was not possible. This is because the app was not a standalone product but was used through QxMD calculator, which did not have this option.

We also did not use the questionnaire answers in the focus group discussions. It may have been interesting to explore the specific barriers an individual reported and if the different formats addressed those barriers. However, the group focus group format did not allow these individualized discussions. One-to-one interviews may have provided a more detailed understanding of individual barriers to EBP and how different formats address those barriers.

Lastly, users of both the learning module and the app required an orientation to set up and log in to the formats. Therefore, the participants may have reported the formats to be easier to use than if they hadn't received the orientation. It is unlikely that an orientation would be available in the clinical setting.

4.4 Future Considerations

HCPs encounter barriers to implement EBP while mobilizing hospitalized AECOPD patients, including 'Insufficient time', 'Lack of generalizability of the literature findings to my patient population' and 'Inability to apply research findings to individual patients with unique

characteristics’. We developed different formats of the AECOPD-Mob tool and examined the usability of these different formats.

4.4.1 Future of the Learner module

We found that the usability of the learner module was good in general, there was positive feedback regarding content and representation of the knowledge, though a dissatisfaction regarding the interface. In order for the Learner module to be sustainable and usable, there is a need to transfer it to a different interface. In addition, according to feedbacks received, the Learner module might be better incorporated as part of a continue education Inservice for practicing HCPs and as a course for HCPs in training.

4.4.2 Future of the Smartphone app

We found that the usability of the app was satisfying, however difficult to use in the hospital settings and in front of patients because of ‘infection control’ and ‘professional concerns’, though the content received positive feedback. In addition, the design of the app, being incorporated in another app, was not comfortable for the users, from setting it up to the rigidity of the input options.

A standalone app will solve the design problems and will allow flexibility to implement the suggestions of the HCPs. Then, it will most likely be more usable in the hospital setting.

As for the infection control concern and looking unprofessional, using a dedicated facility provided device, rather than a personal device, will address this issue.

With these findings, we can improve and adapt the formats of the AECOPD-Mob tool as part of the “Knowledge exchange and implementation” process, and encourage COPD EBP, that will hopefully result in better patient outcomes.

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Appendices

Appendix A Illustrations of the different AECOPD-Mob formats

A.1 Illustrations of the Learner module

The screenshot shows the 'Introduction' page of the AECOPD-Mob Learner Module. At the top, there is a header with the UBC logo, the text 'a place of mind', 'THE UNIVERSITY OF BRITISH COLUMBIA', and 'Connect'. Below this, the title 'The AECOPD-Mob Learner Module' is followed by a brief description: 'AECOPD-Mob is a clinical decision-making tool to guide health care professionals who are mobilizing hospitalized patients with an acute exacerbation of COPD (AECOPD). This module will review the AECOPD-Mob clinical decision-making tool with the emphasis on practical scenarios of relevance to physiotherapists, nurses and rehabilitation assistants.' Underneath, 'Learning Objectives' are listed, stating that upon completion, learners will be able to create a mobilization and exercise treatment plan. Five specific objectives are provided, ranging from demonstrating knowledge to using the tool to develop a safe and effective plan. A 'Click Here to Begin' link is present at the bottom left, and a note at the bottom right provides links to download the PDF or view the browser image version.

Figure A.1 Introduction to the AECOPD-Mob Learner module:

In this page the HCPs are presented with the objectives of the AECOPD-Mob Learner module

The screenshot displays the 'Overview of AECOPD-Mob' page. On the left is a 'Table of Contents' with a list of topics such as 'Overview of AECOPD-Mob', 'What is COPD?', 'How does AECOPD affect physical function?', 'COPD Mini-Test', 'The AECOPD-Mob Tool', 'AECOPD-Mob has five main sections', 'What to Assess Prior to Mobilization', 'When to Consider Not Mobilizing or Discontinuing Mob', 'What to Monitor for Safety', 'What to Monitor and How to Progress for Effectiveness', 'What to Confirm Prior to Discharge', 'Post-Mobility Quiz', and 'Conclusion'. The main content area, titled 'Overview of AECOPD-Mob', contains text explaining that the tool is a clinical decision-making tool for safe and effective mobilization and exercise prescriptions. It also mentions that the tool is similar to SAFEMOB and is an evidence-based, expert-informed tool. Two photographs are included: the top one shows a patient in a hospital bed with their arms raised, and the bottom one shows a healthcare professional assisting a patient with a walker in a clinical setting.

Figure A.2 Overview of AECOPD-Mob Learner module:

In this page, the HCPs are presented with the rationale of the AECOPD-Mob tool and the evolution of it.

Take Test: COPD Mini - Test

Test Information
 Description: _____
 Instructions: _____
 Multiple Attempts: This test allows 2 attempts. This is attempt number 1.
 Force Completion: Once started, this test must be completed in one sitting. Do not leave the test before clicking **Save and Submit**.

Question Completion Status:

Save All Answers Save and Submit

QUESTION 1 15 points Save Answer
 Chronic obstructive pulmonary disease is characterized by:
 Increased fibrotic tissue surrounding the alveoli, making it difficult for patients to inhale
 Increased hyperresponsiveness of the airways, caused by allergies or other environmental triggers
 Fever, infection and consolidation of one or more lobes
 Alveolar destruction, reduced surface area for gas exchange, and changes to the airway wall

QUESTION 2 14 points Save Answer
 In Canada, COPD is primarily caused by:
 Genetically-acquired alpha-1 antitrypsin deficiency
 Cigarette smoking
 Marijuana smoking
 Coal mining

QUESTION 3 14 points Save Answer
 In addition to dyspnea, activity intolerance in people with COPD is also due to:
 Muscle weakness
 Anxiety
 Physical deconditioning
 Poor balance
 All of the above

QUESTION 4 15 points Save Answer
 The prevalence of COPD in Canada in the older adult population is:
 1 in 5
 1 in 10
 1 in 20
 1 in 50

QUESTION 5 14 points Save Answer
 Choose all correct answers:
 Physical activity in COPD is associated with:
 Decrease in quality of life
 Increased mortality rates
 Increase in quality of life
 Reduced mortality rates
 Reduced readmissions to hospital for AECOPD

QUESTION 6 14 points Save Answer
 Choose all correct answers:
 COPD exercise should focus on:
 Resistance training due to the muscle wasting that can occur
 Aerobic training due to deconditioning
 Exercise time - Not less than two hours per day
 Flexibility training due to the effects of being sedentary

QUESTION 7 14 points Save Answer
 What are the risks associated with immobility in hospitalized patients with AECOPD?
 Impaired balance and a high risk of falls
 Decreased muscle strength and endurance
 Chronic hypercapnia and oxidative stress
 All of the above

Click **Save and Submit** to save and submit. Click **Save All Answers** to save all answers.

Save All Answers Save and Submit

Figure A.3 Illustration of breakdown of the mini-test:

HCPs are asked about general knowledge on COPD and AECOPD. The meaning of this test is to study; The answers and rationales are available at the end of the mini-test, and the HCPs may take it again to affirm their knowledge.

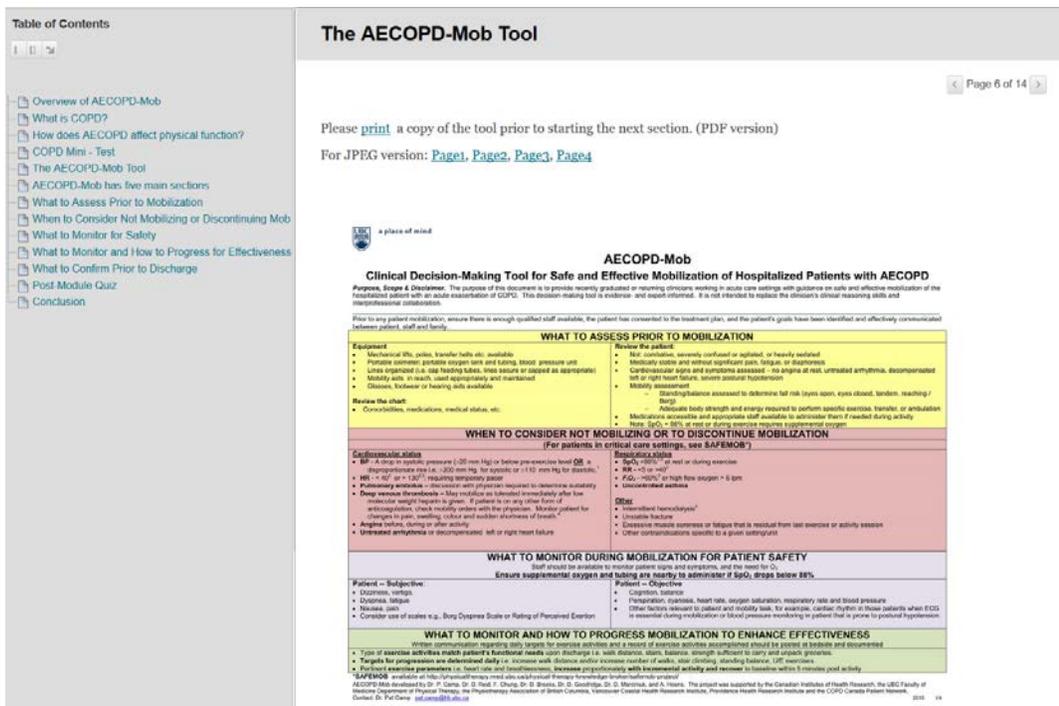


Figure A.4 The AECOPD-Mob Tool:

In this page the HCPs get the opportunity to have additional access to the AECOPD-Mob tool in different digital formats – as a photo and ad a PDF document

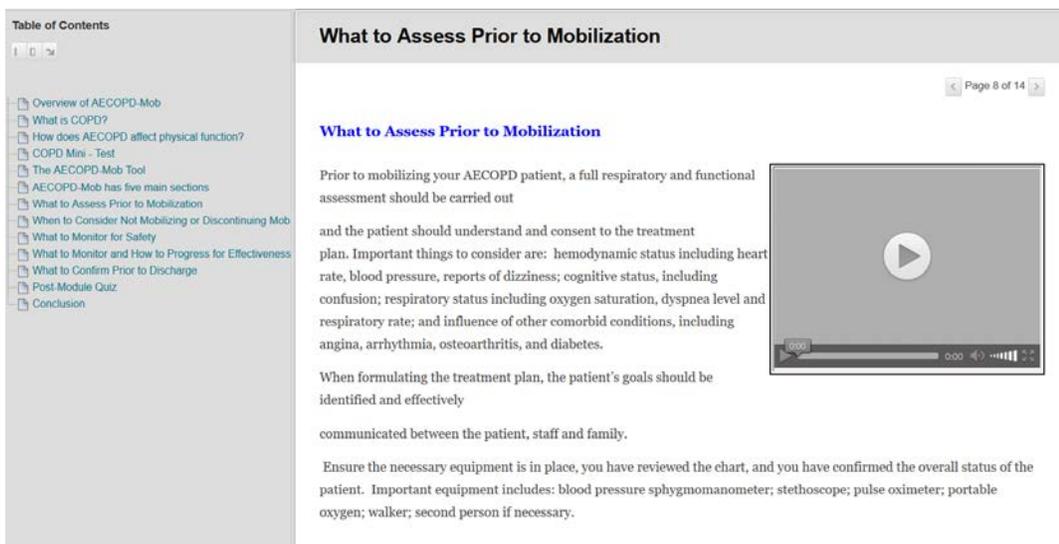


Figure A.5 Illustration of breakdown of the AECOPD-Mob tool

In this page, the HCPs have the opportunity to watch a video with a case scenario of a senior clinician assessing what is needed prior to mobilization

A.2 Illustrations of Smart phone app

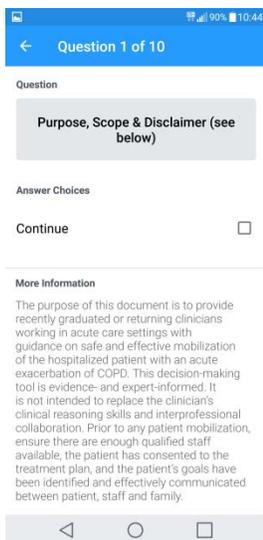


Figure A.6 Purpose, scope & Disclaimer

Page \ Question 1- Purpose scope and disclaimer

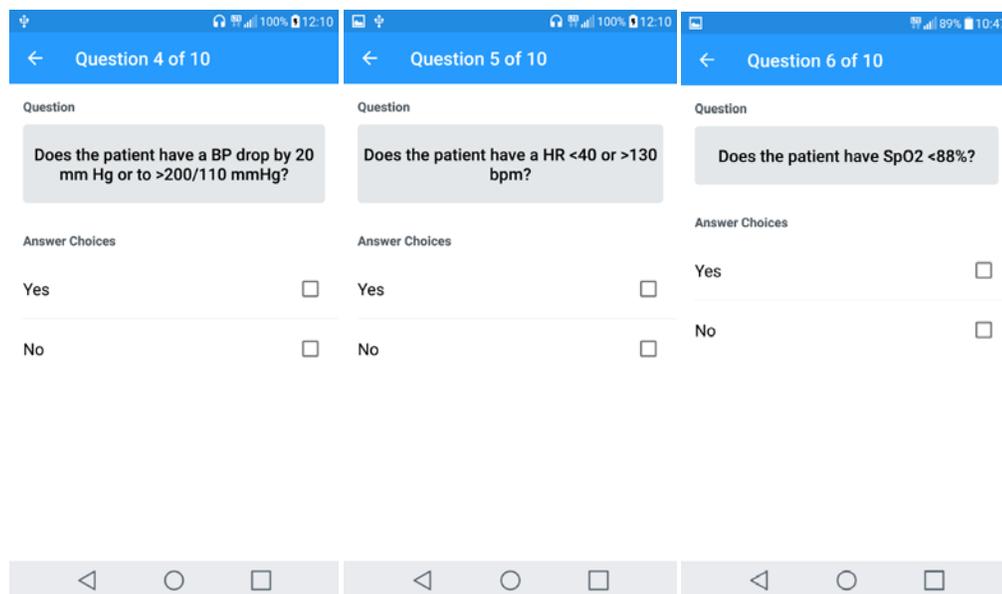


Figure A.7 Example for Safety questions

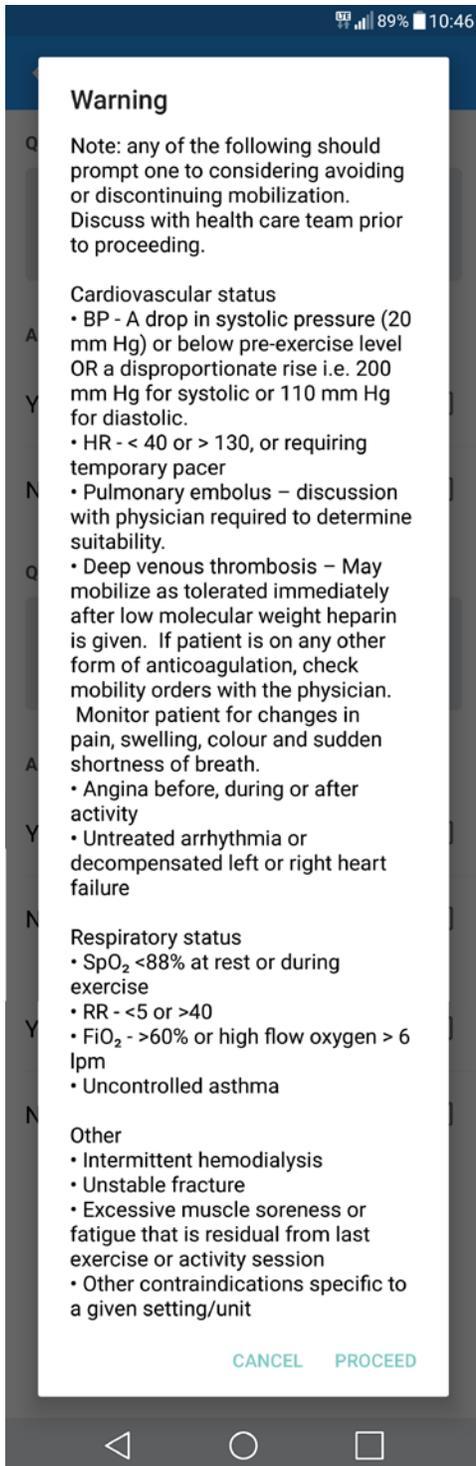


Figure A.8 Example for a warning

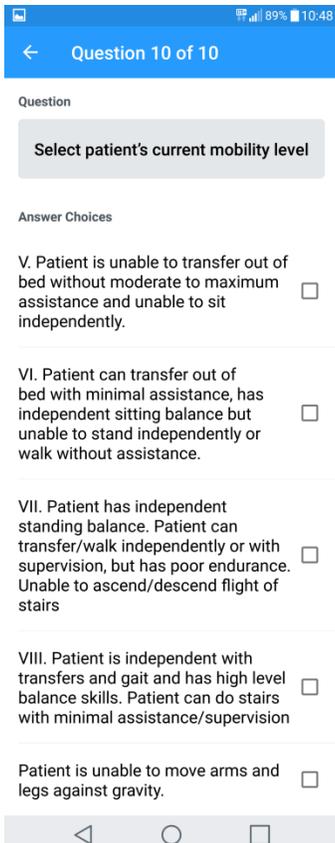


Figure A.9 Illustration of level selection

Selected levels: “Level V”, “Level VI”, “Level VII”, “Level VIII” or “Unable to move arms and legs”,

Forward lean for sit to stand	Trunk rotation – hands clasped	Reaching	Throwing

Figure A.10 Example from “Mobilization and Progress exercises” photos

A.3 Illustrations of Inservice

Background: COPD

What is COPD?

- ❖ Progressive airflow limitation, which usually worsens over time^[1,2]
- ❖ Leading cause of morbidity and mortality worldwide^[1,2]
- ❖ 11% of adults worldwide are reported to have COPD^[3]



Background: COPD

- ❖ COPD is caused mainly by smoking and exposure to noxious particles & gases^[1,2]
- ❖ COPD is associated with multiple comorbidities which include ischemic heart disease, peripheral muscle dysfunction and cancer^[1,2,6]
- ❖ Anxiety and depression rates in COPD patients vary from 20% to 50%^[7]



COPD Treatments

- ❖ Pharmacological treatments^[1,2]
- ❖ Smoking cessation^[1,2]
- ❖ Supplemental oxygen^[1,2]
- ❖ Immunization (preventive treatment)^[1,2,6]
- ❖ Pulmonary Rehabilitation (PR)^[1,2,6]
 - Exercise training
 - Self-management education

COPD Treatments

Benefits of Pulmonary Rehabilitation

Significant improvement in:

- ❖ Muscle force
- ❖ 6-minute walk distance
- ❖ Dyspnea
- ❖ Quality of Life



Figure A.11 Example for background presented on COPD in the Inservice

What is AECOPD?

Sudden worsening of pulmonary function and respiratory symptoms^[1,2,6]

- ❖ viral or bacterial infections
- ❖ 10-15% acute medical admissions for COPD



AECOPD

Economic Burden

- ❖ AECOPD hospitalizations last approximately 7-10 days cost more than \$10,000/admission^[9]
- ❖ AECOPD results in a substantial economic burden with costs exceeding one billion CAD/year^[9]



AECOPD – Treatments

- ❖ Pharmacological treatments^[1,6]
- ❖ Mechanical ventilation^[1,6]
- ❖ Mobility and Exercise^[10,11]

Physical inactivity:
 ❖ Key problem in AECOPD^[12]
 ❖ Risk factor for hospital readmission^[13]



AECOPD – Treatment Gaps

During a hospital admission^[12]

- ❖ Physical activity is decreased
- ❖ PA remains decreased for at least 1 month post-d/c

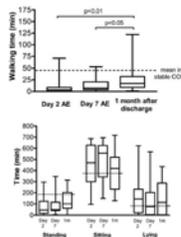
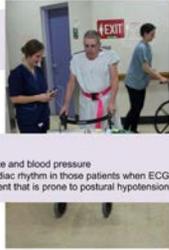


Figure A.12 Example for background presented on AECOPD in the Inservice

What to Monitor During Mobilization

Patient – Subjective:

- Dizziness, vertigo,
- Dyspnea, fatigue
- Nausea, pain
- Consider use of scales e.g. Borg Dyspnea Scale or Rating of Perceived Exertion



Patient – Objective

- Cognition, balance
- Perspiration, cyanosis, heart rate, oxygen saturation, respiratory rate and blood pressure
- Other factors relevant to patient and mobility task, for example, cardiac rhythm in those patients when ECG is essential during mobilization or blood pressure monitoring in patient that is prone to postural hypotension.

What to Assess Prior to Mobilization

Review the patient:

- Not combative, severely confused or agitated, or heavily sedated
- Medically stable and without significant pain, fatigue, or diaphoresis
- Cardiovascular signs and symptoms assessed – no angina at rest, untreated arrhythmia, decompensated left or right heart failure, severe postural hypotension
- Mobility assessment
 - Standing/balance assessed to determine fall risk (eyes open, eyes closed, tandem, reaching / Berg)
 - Adequate body strength and energy required to perform specific exercise, transfer, or ambulation
- Medications accessible and appropriate staff available to administer them if needed during activity
- Note: SpO₂ < 88% at rest or during exercise requires supplemental oxygen



How to Progress

LEVEL V																									
Mobility Criteria for Entering this Level	Patient is unable to transfer out of bed without moderate to maximum assistance and unable to sit independently.																								
TURNING AND BED MOBILITY	QD1: Encourage patient to reposition self.																								
EXERCISE PROGRAM **	Bed exercise program should include targeted lower limb, upper limb and abdominal strengthening exercises in supine as well as sitting balance exercises. (See Appendix B&C) Consider inclusion of: - Ansey clearance techniques - Additional exercises / mobilization as indicated by PT assessment. - Progress exercise duration/weight or time at a target rate e.g. percentage of the maximum load.																								
MOBILIZATION	Sitting balance exercises with physio as appropriate. 5 to 10 minutes initially QD, then progress to BID and increased duration as tolerated. Increasing time and/or frequency as patient tolerates. Ensure safe use of oxygen tank and tubing.																								
	<table border="1"> <thead> <tr> <th colspan="2">Bed Based Flexibility (Level V)</th> </tr> </thead> <tbody> <tr> <td>Scapular retraction</td> <td>Reaching*</td> </tr> <tr> <td>Ankle Pump</td> <td>Ankle inversion/ eversion</td> </tr> <tr> <td>Knee to Chest (flexion)</td> <td></td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="2">Bed Based Strengthening (Level IV)</th> </tr> </thead> <tbody> <tr> <td>Bench Press</td> <td>Hip ab / adduction</td> </tr> <tr> <td>Inner range quads*</td> <td>Brisking</td> </tr> <tr> <td>Side lying to sitting</td> <td>Heel drag</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th colspan="2">Seated Strengthening (Level VI)</th> </tr> </thead> <tbody> <tr> <td>Shoulder abduction*</td> <td>Chest pull with resistive band</td> </tr> <tr> <td>Arm chair push</td> <td>Knee extension</td> </tr> <tr> <td>Sit to stand</td> <td></td> </tr> </tbody> </table>	Bed Based Flexibility (Level V)		Scapular retraction	Reaching*	Ankle Pump	Ankle inversion/ eversion	Knee to Chest (flexion)		Bed Based Strengthening (Level IV)		Bench Press	Hip ab / adduction	Inner range quads*	Brisking	Side lying to sitting	Heel drag	Seated Strengthening (Level VI)		Shoulder abduction*	Chest pull with resistive band	Arm chair push	Knee extension	Sit to stand	
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Figure A.13 Example for using the AECOPD-Mob tool presented in the Inservice

Case Scenario

Past Medical History

- ❖ Right hip replacement, 2002
- ❖ Falls, 1999 & 2000
- ❖ 2 hospitalizations for AECOPD in past year

Current Status

- ❖ Oxygen by NP @ 1 lpm
- ❖ SpO₂: 91%
- ❖ RR: 18 bpm
- ❖ HR: 89 bpm
- ❖ BP: 128/80 mmHg
- ❖ Dyspnea: 5/10



Will you mobilize Mrs. Smith? Why?

What resources will you need?

Mobility Status

Mrs. Smith is able to stand at the bedside with minimal 1 person assist and a 4 wheeled walker.



What is her current mobility status?

What mobility level should she be working toward?

What exercises can you select to improve her mobility?

How often should she do her exercises?

Case Scenario

Discharge Planning

Mrs. Smith lives alone in a 1 bedroom apartment in the West End of Vancouver

What questions should you ask Mrs. Smith to determine her discharge needs?

Who else needs to be involved?

What resources are available in the hospital and community to support his discharge?

What instructions should Mrs. Smith be given prior to leaving the hospital?



Figure A.14 Example for 'Case Scenarios' presented in the Inservice

Appendix B Focus group preamble and questions

Introduction: Thank you for agreeing to take part in this study. My name is _____

and I will be the facilitator for today's group discussion. I am a master's student working with Dr.

Pat Camp, who is an Associate Professor in the Dept. of Physical Therapy of the Faculty Medicine at

the University of British Columbia as well as a Principal Investigator at the UBC James Hogg

Research Centre/Centre for Heart Lung Innovation.

We invited you to take part in this group discussion today to receive feedback from you about the

different AECOPD-Mob formats.

Before we begin, I would like to review a few ground rules for the discussion:

I am going to ask you several questions; we do not have to go in any particular order but we do want

everyone to take part in the discussion, as your ideas are all important to our research. We ask that

only one person speak at a time.

Feel free to treat this as a discussion and respond to what others are saying, whether you agree or

disagree. We're interested in your opinions based on your own personal experiences, so there are no

right or wrong answers. We are here to learn from you.

Don't worry about having a different opinion than someone else, but please do respect each other's

answers or opinions.

We will treat your answers as confidential. We are not going to ask for anything that could identify

you and we are only going to use first names during the discussion. We also ask that each of you

respect the privacy of everyone in the room and not share or repeat what is said here in any way that

could identify anyone in the room.

We are tape-recording the discussion today and are also taking notes because we don't want to miss any of your comments. Once we start the tape recorder, we will not use anyone's full name and we ask that you do the same.

We ask that preceding any answers or comments you state your first name. We need this to happen in order to identify who is speaking when gathering data from the recordings.

We will not include your names or any other information that could identify you in any reports we write. We will destroy the notes and audiotapes after we complete our study and publish the results. Finally, this discussion is going to take about one hour. You are free to leave at any time, though we would prefer you stay for the whole time.

Does anyone have any questions before we start?

[Start recorder]

Engagement questions;

1. When you heard that the AECOPD-Mob would be in a web-based and app formats, what were your thoughts about that?
2. How do you feel about integrating new clinical decision tools into your practice?
3. Did you have a preferred AECOPD-Mob format? Why?
4. Do the additional formats add anything to your learning?
5. When do you see yourself using these materials?
6. What do you think is the right order to start using the different formats (paper, LM, App, inservice)?

AECOPD-Mob Learning module questions:

7. Was the time invested in the learning module too long, or too short? Why?

8. What do you think about the learner module's general look? Why?
9. Could you find specific information needed for your practice? Give an example.
10. What obstacles did you encounter using the learner module? What did you do?

AECOPD-Mob Application:

11. Was it easy to use the app? What makes the app unapproachable?
12. What do you think about the app's general look?
13. Do you think you managed to utilize the full potential of the app? Why?
14. What obstacles did you encounter using the app?
15. What did you like about the app? What would you improve?

Content-wise improvements;

16. Are any of the formats standalone?
17. Overall, for all 4 formats, was the information enough? Is there anything missing?
18. Is there anything else you would like to say about your experience using the different AECOPD-Mob tools?

Thank you very much for your time and for sharing your opinions with us.

Appendix C -Learner module focus group

C.1 Focus groups quality control

Table C.1 Focus groups quality control

Rated Good\Moderate\Fair

ITEM	Focus Group 1	Focus Group 2	Focus Group 3	Focus Group 4	Focus Group 5	Focus Group 6	Focus Group 7
Building rapport	<p>Good</p> <p>In this focus group, rapport was built at the beginning of the meeting. The procedures were read in advance, and all understood their rights. The facility was adequate with table and comfortable chairs. Casual talk, providing refreshments and creating a good atmosphere. The group's participants knew the interviewers in advance.</p>	<p>Fair</p> <p>In this focus group, rapport was not built at the beginning of the meeting; <i>The participants looked like they are occupied with other concerns, and not so keen to participate.</i> The procedures were read in advance, and all understood their rights. The facility was not ideal, as there were only assorted seating places. Refreshments were provided, however not consumed during the session. The group's participants knew one of interviewers in advance.</p>	<p>Good</p> <p>In this focus group, rapport was built at the beginning of the meeting. The procedures were read in advance, and all understood their rights. The facility was adequate with table and comfortable chairs. Casual talk, providing refreshments and creating a good atmosphere. The group's participants knew one of interviewers in advance.</p>	<p>Moderate</p> <p>In this focus group, rapport was built at the beginning of the meeting. The procedures were read in advance, and all understood their rights. The facility was adequate with table and comfortable chairs. Some background noise from outside. One participant came in late. Casual talk, providing refreshments and creating a good atmosphere. The group's participants knew one of interviewer in advance.</p>	<p>Good</p> <p>In this focus group, the rapport was built prior to the meeting. The consent process was very friendly and was done in a coffee house. The procedures were read in advance, and all understood their rights. The facility was adequate with table and comfortable chairs. Casual talk, providing refreshments and creating a good atmosphere. The group's participants knew the interviewer in advance.</p>	<p>Moderate</p> <p>In this focus group, rapport was built via email. The procedures were read in advance, and all understood their rights. The facility was adequate with table and comfortable chairs. Casual talk, providing refreshments and creating a good atmosphere. The group's participants knew one of interviewer in advance.</p>	<p>Moderate</p> <p>In this focus group, rapport was built via email. The procedures were read in advance, and all understood their rights. The facility was adequate with table and comfortable chairs. Casual talk, providing refreshments and creating a good atmosphere. The group's participants knew one of interviewer in advance.</p>

ITEM	Focus Group 1	Focus Group 2	Focus Group 3	Focus Group 4	Focus Group 5	Focus Group 6	Focus Group 7
Completing statements for the participant	Good Most of the times the participant completed their own statements. When this happened, the other participants completed he statements. participants discussed among themselves	Moderate In this group, a there were a few time that the interviewer summarized a statement of a participant before finishing the sentence. The participant then agreed. "	Good Most of the times the participant completed their own statements. When this happened, the other participants completed he statements. participants discussed among themselves	Good Most of the times the participant completed their own statements. When this happened, the other participants completed he statements. participants discussed among themselves	Good Most of the times the participant completed their own statements. When this happened, the other participants completed he statements. participants discussed among themselves	Good Most of the times the participant completed their own statements.	Good Most of the times the participant completed their own statements.
Pushing for a response	Good Interviewers did not push for direct answers. The questions were rephrased or probed to follow-up questions	Moderate Interviewers did not push for direct answers. The questions were rephrased or probed to follow-up questions	Good Interviewers did not push for direct answers. The questions were rephrased or probed to follow-up questions	Good Interviewer did not push for direct answers. The questions were rephrased or probed to follow-up questions	Good Interviewer did not push for direct answers. The questions were rephrased or probed to follow-up questions	Good Interviewer did not push for direct answers.	Good Interviewer did not push for direct answers.

ITEM	Focus Group 1	Focus Group 2	Focus Group 3	Focus Group 4	Focus Group 5	Focus Group 6	Focus Group 7
Probing too much	Good The interviewers probed the discussion well, keeping a balance between keeping the conversation going and allowing participants to express their opinions and develop the questions. Ideas to improve the outcomes were suggested.	Moderate For this group there was a strong need to probe. The participants answered questions individually, and nearly did not refer to the other participants' comments, except for "Like AnS said..." or "I agree with..."	Good The interviewers probed the discussion well, keeping a balance between keeping the conversation going and allowing participants to express their opinions and develop the questions. Ideas to improve the outcomes were suggested.	Good The interviewer probed the discussion well, keeping a balance between keeping the conversation going and allowing participants to express their opinions and develop the questions and ideas specific to their profession	Good The interviewer probed the discussion well, keeping a balance between keeping the conversation going and allowing participants to express their opinions and develop the questions and ideas specific to their profession	Poor The interviewers didn't probe the discussion enough. Not many ideas were shared among participants.	Poor The interviewers didn't probe the discussion enough. Not many ideas were shared among participants.
Failure to probe	Good The interviewers kept the conversation going. No awkward silence has occurred. The conversation developed very well. All of the participants contributed to the conversation.	Good The interviewers kept the conversation going. Some cases were the participant did not answer (<i>shy?</i>), the interviewers rephrased the question.	Good The interviewers kept the conversation going. No awkward silence has occurred. The conversation developed very well. All of the participants contributed to the conversation.	Good The interviewers kept the conversation going. No awkward silence has occurred. The conversation developed very well, and many ideas were heard. All of the participants contributed to the conversation.	Good The interviewers kept the conversation going. No awkward silence has occurred. The conversation developed very well, and many ideas were heard. All of the participants contributed to the conversation.	Poor The interviewers kept the questions at the basic level. No additional probing was done. The format was question-answers.	Poor The interviewers kept the questions at the basic level. No additional probing was done. The format was question-answers.

ITEM	Focus Group 1	Focus Group 2	Focus Group 3	Focus Group 4	Focus Group 5	Focus Group 6	Focus Group 7
following the script	Good Some off-script items were mentioned, talking about general practice experiences of the participants and possible participants to recruit, however essentially worked around the script	Good The interviewers kept to the script of the questions.	Good Some off-script items were mentioned, pulling the learner module in the middle of discussion to probe questions around it. however essentially worked around the script	Moderate The interviewer followed the questions script, however participate coming in late, and pulling the smartphone app to probe\answer some questions changed the flow.	Good Some off-script items were mentioned, talking about general practice experiences of the participants and possible participants to recruit, however essentially worked around the script	Good The interviewers kept to the script of the questions.	Good The interviewers kept to the script of the questions.
Notes were taken	Moderate Mostly summarizing key points from the focus group. No notes were taken on body language and\or participants' overall attitude	Moderate Mostly summarizing key points from the focus group. No notes were taken on body language and\or participants' overall attitude	Good In the notes, the key points were summarized. Notes on body language and\or participants' overall attitude were taken as well.	Moderate Notes were taken on key items. There was only one interviewer, thus some items may have been missed	Good In the notes, the key points were summarized. Notes on body language and\or participants' overall attitude were taken as well.	Moderate Mostly summarizing key points from the focus group. No notes were taken on body language and\or participants' overall attitude	Moderate Mostly summarizing key points from the focus group. No notes were taken on body language and\or participants' overall attitude

C.2 Codebook

Table C.2 Codebook

#	Code	When to use
Theme 1- HCPs needs and expectations		
1	Need for organization tools	Use whenever participant mentions a need to arrange information
2	Need for alternative knowledge resources	Use whenever participant mentions a need of different sources of information
3	Knowledge intake difference\ learning differences	Use whenever participant mentions difference in knowledge learning techniques
4	Openness for new information\tools	Use whenever a participant shows an interest or no interest in new tools or information
5	Willing to improve (professionally)	Use whenever participant mentions if there is a desire or no desire to improve their practice
6	Use of technology	Use whenever participant mentions a usage of technology in practice
8	Mentoring inexperienced HCPs	Use whenever participant mentions an opportunity to use a tool to teach new HCPs
16	Familiarity with learner modules	Use whenever participants mention a prior use \ no use of learner modules
20	Need to know background	Use whenever participants mention a need to receive background information about (specifically COPD\AECOPD) diseases
34	General: familiarity with similar tools	Use whenever participants mention other tools that are similar
HCPs preferences		
7	Learner module preference	Use whenever participants mention their preference of a Learner module over the others
9	Smartphone app preference	Use whenever participants mention their preference of an app over the others
13	Tool formats delivery order preference	Use whenever participants mention a preferred delivery order (which tool should come first)
27	Paper version preference	Use whenever participants mentions their preference to use the paper tool over the others
29	General content organization preference	Use whenever participants mention their organization preference
32	General content – Standalone format	Use whenever participants mention the traits of a tool and if it might be an only tool
33	Content: Learner module and Inservice comparison	Use whenever participants mention a comparison between the Inservice and learner module – function, content and usability
35	Inservice preference	Use whenever Inservice is mentioned as a preference
37	General content – Combination of tools	Use whenever combination of tools if preferred\mentioned
38	General content – Tool sections preference	Use whenever a participant mentions a content preference about a certain section
40	Use in the future	Use whenever a participant mentions future intentions with the tool

#	Code	When to use
HCPs preferences		
41	App and paper comparison	Use whenever the participant mentions paper and app functions
Tool quality and usability		
10	Tool Efficiency	Use whenever participant refers for efficiency of a tool, (e.g. information accessibility)
11	App content - Media (images, Videos)	Use whenever participants mention a feedback about app media
12	App Content – design	Use whenever participants mention a feedback about the app design and general view
14	Learner module content – Tolerance	Use whenever participants mention a feedback about their ability to continue using the learner module
15	Orientation troubleshooting	Use whenever participants mention that the prior orientation was helpful and troubleshooted problems
17	Learner module content – appearance	Use whenever participants mention a feedback about the learner module design and view (e.g. Font size)
18	Learner module user experience	Use whenever participants mention a feedback about a general user experience (eg. Navigation through the module)
19	Learner module content – professional	Use whenever participants mention a feedback about the learner module content (e.g. too much\little info, inaccuracies etc.)
21	Learner module content – breakdown to details	Use whenever participants mention a need of detailed information of too much details in the learner module
23	App content – real time use	Use whenever participants mention a feedback about the actual app user experience
24	App content – incompatibility	Use whenever participants mention that the app cannot be used because it doesn't suit the patient
26	App usage – real time problems	Use whenever participants mention that the app cannot be used because it is not suitable for the situation
28	App - Logistics issues	Use whenever participants mention app devices issues
30	Privacy issues	Use whenever participants mention a case where using a tool (or a device the tool in on) might suggest a privacy issue (e.g. ipad's camera, recording options etc.)
31	App content – Charting alternatives	Use whenever participants mention app function for charting
36	Inservice content – real time	Use whenever Inservice has a unique trait
39	General content – amount of information	Use whenever participants refer to the amount of content, too much\little
42	User availability and time	Use whenever the participant mentions an availability issue, time restrictions etc.
Improvement Suggestions		
22	Learner module content – suggestions	Use whenever participants suggest new idea to improve the module
25	App content – suggestions	Use whenever participants suggest new idea to improve the app

C.3 Theme 1- HCPs needs and expectations

Table C.3 HCPs needs and expectations

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 1.1- Need for alternative knowledge resource				
		When you're on the medical units we need something that's pretty fast where you can kind of look at it and have a couple ideas. So it's nice having the different format	More education is needed for sure... and I appreciate that the study is trying to address that because I think COPD kind of gets swept under the rug.	
		I think in school we all learned about so much research that's out there and I think that it takes so long to get it into practice so it's nice having different tools for us to pull from to integrate it more.	When people are in with COPD exacerbation, they can be very panicky and they can be very hesitant to want to... do anything that's gonna make them more short of breath. So it's good to know... it is actually safe to be getting you up and moving you and it is beneficial... So you feel... more confident pushing them.	
			I think that's what I also mean [do not know the exercises] in terms of like level of detail, I'm like okay you're doing bed exercises, move your limbs, move your toes, we want to get things going. But I'm like very basic, I'm not like roll your shoulder.	

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 1.2- Expectations from the tools before use				
I wasn't sure how I would use it [the phone app] in practice cause... I don't use it that much [the phone]... I don't bring it out [to work].	Just the paper has always functioned great for me and... having to go use an app or a computer which I don't typically have in front of me for patient care... seemed a little bit not what I'm accustomed to.	I thought it [the tools] might probably be good cause you get a million sheets of paper and they... get lost... so [it will] be good to have a kind of alternate route to get the information and get more knowledge.	I was really excited about there being an app because it's so simple and I feel like we just want quick and dirty... it needs to be easy, it needs to be fast.	I feel like because, especially for newer grads, we don't know too much [about] their clinical judgment yet. I think you could have like a solid guideline.
	I thought it would be kind of cool... since everything nowadays seems to be on the computer and on your phone, I thought that might be something useful.	Nice to look at all the different kinds of tools cause each one of us learns differently and picks up certain things from written stuff versus more of a verbal orientation.		I thought having more than one format is good because people prefer one format over the other. For example, I'm more of a paper person as opposed to an online person but some of my colleagues prefer online things and phone things opposed to having paper so it's kind of allows people to pick and choose what they learn best from.

C.4 Theme 2- HCPs preferences

Table C.4 HCPs preferences

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 2.1- Preferred format- Overview (In-service vs. learner module)				
[I preferred the] in-service... because you can talk about it after and ask questions.	I like paper. I also like the Inservice, it's nice to be able to talk to someone... I find applications can be just a little bit tiring at times.	I would almost feel like they're [learner module and Inservice] pretty equal for a learning tool. I felt like a lot of the information was similar so I don't know that you would actually need both.	I felt like the module was like another module that we have to go through... I didn't get value from the module and the in-service was great but it was very temporary.	I think I prefer both online and the paper version over the Smart phone which is different from my original thought when I first learned about the study.
It was nice having both actually... the in-service and... the learner module after. [The learning module was] a nice refresher and the videos and stuff, I liked that. But if it was just the learner module I don't think it would have sunk in as well.	I felt that... [the] Inservice and the online module were pretty similar... those were more educational whereas this the paper form and the app... you could actually use when you're working with a patient.	I like the learner module I'd say a bit more cause it had the questions and it was more interactive.	I think the Inservice would be more helpful than the online module, but... I don't think anybody frankly would do the module on their own accord, but if they mandated it like a competency one time or something.	
If it's self-driven [learning module] some people might not do it. So if it's an in-service [it] is hard to ignore what's being presented to you.	The online module... was good in a way because... we could do it whenever we had the time to do it , whereas the Inservice... had to schedule time... so the other one [Learning module] gives you a bit more flexibility about when you do it and then you can split it up too if we couldn't finish.	I actually liked the learning module. I think it would be a good tool [especially] when you're starting off... I think that was a bit more helpful.		
I'd prefer to keep the in-service and then add the videos in there.				

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 2.2- Preferred format-Practical (paper vs. app)				
I like the paper. It's easy... similar to the Safe MOB and I can quickly go to the computer and print off the Safe MOB and show it to them [Patients]	I felt that... [the] Inservice and the online module were pretty similar... those were more educational whereas this the paper form and the app... you could actually use when you're working with a patient	I think for the students starting out it would be nice to just get a good orientation... I'd be more likely to turn to the Smart phone app if I'm just thinking 'okay I have a patient here and they're at this functional level' for me to quickly look up some stuff for them.	I prefer the app over the paper based format because I think there's a lot of paper stuff out there and I'm not really gonna go right away to look it up.	I thought the Smart phone one would be the most I preferred. It takes awhile to get to where it is [the content] and you're just standing outside a patient's room and trying to figure [it] out. So I think that the paper is easier to navigate.
We're still pretty paper driven in healthcare and I found that was pretty easy cause I could just have it in my hand right away and show people.		It can be difficult as well [to carry paper] on medical floors cause you may not necessarily have one area that you're constantly charting [desk] so you have to... bring everything with you. So the less paper that you're carrying around sometimes the better	I find myself using the sheet a lot more than the app itself cause I'm just not comfortable taking my phone with me.	I like the paper a lot more than the other tools and personally I do think it's a little bit rude to have a phone on yourself and... it's not very hygienic to bring it in and personally I also like everything more concise and altogether rather than flipping the module and waiting for the internet to work.
		I think you're gonna get people's attention most with the app. I think it seems like the least amount of work. I personally just like paper... But I think most people, the simplicity of it being on your phone, you always have your phone on you, it's always accessible, like I think that would intrigue people to want to use it more.	I found there was a lot of information [in the app] so... I was trying to swipe through it quickly, cause some things were not applicable... whereas I found with the paper I could just quickly scan, find what I needed... I liked how on the paper there was 'when not to mobilize' ... were bolded so... I could quickly scan the mobility in terms of where they're at to assess what to do.	I liked having multiple formats... just because I think having a Smart phone app it great , but at the same time probably don't want to bring your personal phone in with your patient. So having a paper format is useful cause you can put it in your office or have it nearby with you and that can be something to look at.

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 2.2- Preferred format-Practical (paper vs. app)				
				I felt like the paper was great for like kind of summarizing and summarizing the information and I liked how the Smart phone it kind of gave you step to, step by step things and it can kind of replicate a scenario for you
				I personally use the paper more because with an App it took too long so I felt like, especially when you have a heavier caseload or a busier day, you don't have the time to actually go through all the steps.
Subtheme 2.3- Intention of tool usage				
I'm gonna use mostly the second and third page [paper tool] . And then the app if I don't have this [the paper tool] on me... If I have a student or if one of the nurses is curious about some of this I may direct them to the learning module but it's not something that I'd probably use as a refresher.		I want to use the app more for the exercise prescription...it's a good reminder for all their vital signs and all that but I think it is a really good way just for me to break each patient down and use the exercises.	I think there is value in the technology and particularly with the COPD aspect because that definitely is an area that kind of gets forgotten. My initial response would have been that I think it would be more valuable for a new grad, but as I'm reflecting now I could see myself still using it in certain situations. I don't think it's a one size fits all model for all COPD patients, but in early stages of acute exacerbation I think it could be quite beneficial.	
I don't think I'll look at the learner module again. I probably won't use the app either unless I don't have this [paper] on me and I need it to quickly look it up.		I'd utilize the app much more than I would the learning module. But having that said it's good to have it as a foundation.		

C.5 Theme 3- Tool quality and usability

Table C.5 Subtheme 3.1- Tool quality and usability- Learner module

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 3.1.1- Time invested in Learner module				
It [time spent on the learning module] was a good amount of time cause it was enough that you were... engaged in it.	I was worried about the time but in the end, it did not turn into being an issue. They were reasonable length in use.	Maybe some of the videos [in the learning module]... accumulatively were a bit long but other than that it wasn't too bad	I think it was too long... I think as nurses we have to do lots of modules for different things and... it's just lots of detail.	I thought it was a good amount of preparation and it didn't take me a long time. It actually took me longer just to log in [to the learner module] than to actually do it so I don't think there was anything that should have been changed at all. Like I thought it was a good summary of all the information.
Not too much [time] that you were losing interest.	It [the learning module] was a good amount of time			Depending on the target audience... So for me I found it's [the time invested in the learning module] longer because I know some of the stuff is not like a hundred percent learning process
Subtheme 3.1.2- Quizzes and videos				
I like the videos. I just don't like... Connect		I like the learner module I'd say a bit more cause it had the questions [Quizzes] and it was more interactive	I did it [the learner module quizzes] and I passed the quizzes and stuff but I could tell you about any of the info right now? No. And I felt like a lot of the questions on the quizzes... doesn't [don't] apply to me, it's, this is unnecessary in terms of how I'm gonna use this information .	I think what was very useful for the online module is that there was quizzes that you can do to test your knowledge.
				I think the quizzes are good...it emphasized... important points. Don't recall too much of the video content actually.

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 3.1.3- Learner module visual				
Some of the buttons are really small and... it's not intuitive to navigate. I kept having go back and it was like oh, I have to open it up again.	It's not... easy to follow. Because all the topics don't show up at once so... you said you have to click 'reviewed'... before you go onto the next part.	I found it [the learning module] very straightforward. I liked the way it divided up all the respiratory rate and oxygen sats that you would know anyway but it's just helpful to be reminded of your parameters and what you're looking for specifically...	[In the learner module] there's no obvious like 'click here' to go next [page]... I thought when I saw that it, 'they must be doing this on purpose so that I'm like staying intent and listening'... It wasn't intuitive.	I like that when you do the online mobile one, I just played around with it and I would like arbitrarily click no they don't have this. I like how it pops up and it tells you right at that moment what the problems are. You're thinking 'oh they've got this respiratory, it should mobilize it but then it says like oh you shouldn't mobilize for these reasons and okay that's, that's good.
When I got to the end of the page and I'd press 'mark reviewed' then it would refresh to the same page and then [I would] have to go to the next page.		I think the look was okay but I definitely think the intro that Ori gave us about having to press what button , that was very useful and maybe it would have been more confusing if we hadn't done that.	I like to look at pictures to know what's going on so I wish there was more visuals for me.	Speaking on the flow, I, it took me two seconds to realize this, but I thought when you clicked on continue it would automatically take you to the next one [page] but you click on continue and then it opens the next one and then you have to click on the next one and I was like ' wait, why am I not automatically moving'.
It's [navigating in the learning module] not easy and I feel like if people aren't computer savvy they could get lost and not finish it.				

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 3.1.4-Learner module content				
Content [of the learning module] was really good and really well laid out			I think I just need to know, when to mobilize and how to do it and the rest I just don't really care about. I'm not gonna remember all... it was just almost like too much information... I didn't find that the information was that valuable . Sometimes it would like talk about different groups, not really describing it very well.	I thought there was a good amount of statistics and like actual learning on the practical stuff.
			I feel like there was a lot of overlap when we do the orientation [with the learner module].	
Subtheme 3.1.5- Learner module set up				
		Setting it up... was kind of probably the hardest website...		

Table C.6 Subtheme 3.2- Tool quality and usability- App usability

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 3.2.1- App use and content				
<p>It's [the app] easy to get into, it's easy to navigate, like it's really user friendly.</p>	<p>It [information in the app] was easier to break it down, like you have the chart in front of you [in paper] but if you know what function level they're at you can just click it and then all the information you need is right there...</p>	<p>The pictures [in the app] were helpful... Sometimes they [physios] go in patient's room and it's [recommending exercises are] written on the white board... I don't know what those are half the time. [With the app] I can look at it and try and teach the patient as opposed to if I read it I have no idea what that is</p>	<p>It [the app] felt like it was like very basic in terms of you don't have a lot of options, like you can either go forward or you can go back. It's not like you can search. If you... had a search drop down, if I was looking for something specific, otherwise you just kind of had to go through stuff.</p>	<p>Because the way, like it guides you is you have to choose before you get to the next step. It's not like you have that one representation of a Cap screen or something. It takes awhile to get to where it is and these kind of like you're just standing outside a patient's room and trying to figure out and it takes awhile.</p>
<p>Because I feel like after time I would just quickly toggle through the first few [screens] just to get to the information that I really wanted at the end [of the app].</p>	<p>I think [for] the app, the part where all the vitals that you're checking... was good because then it gets you to make sure you've checked all those things... But I found once you got to the part where it's asking about the activity level, then I would have preferred if you could have gone back and... changed your selection so you could see what the other options were. That's what I liked about this paper version... you can compare all of the levels at once. Whereas the app you can only see one at a time</p>	<p>I felt the questioning at the beginning... [are] very black or white, like 'is it this or not' and if you say no ever then it cuts out... it doesn't leave any room for interpretation or wiggle room.</p>	<p>[The initials setup of the app] would definitely be a barrier to me using it</p>	<p>I liked the example of all the different exercises [in the app] cause... I find I go into a habit of using the same set of exercises over time and that's the first few ones that come to our mind and then when we look at it and there's actually similar level but alternatives that you can do to give to the patients, that's a refresher I find that we can give them different options to do.</p>

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 3.2.1- App use and content				
I.. would prefer... if it was... separated into buttons,... like exercises, what to assess before mobilizing and then it brought up stuff like... what level are they at... and then it'll take you to the exercises that are appropriate for them.		I: So then you have to sort of lie [R1: Yeah] in order to move forward.		It's pretty easy to use
It was actually really easy to get in [the app] and out of and easy to navigate once you're in it	Answering it [the questions from the app] after was easier than to use it at the same time. That's where I find it's better for the exercise programs and for the assignment of tests to the rehab assistance and getting ideas for that than in the moment decision making.	I'm in critical care and the first question [in the app] says 'are you in critical care?' and it's like ahhh no. But I did it on patients that were medically ...		
Subtheme 3.2.2- Use of phone in hospital				
Not all people carry their phones and... have room on their phone for different applications	I don't know if I'd use the app at the bedside. Even the paper... I don't usually like having something right in front of a patient and saying like 'oh just a minute, I'm gonna put these values...', but I think it's good to look...beforehand. I found maybe it's not as easy to use with a brand new patient but maybe one that you've worked with before.	We don't all have internet... in the hospital so... we expected to use our own data, so that's another reason why I wouldn't fully use it [the app]. So I think there's a couple things that are limiting...		I feel like sometimes, even like as a bystander if you're looking at some of the other online health stuff that are pulling out their phone, the first instinct is usually like 'are you checking your messages'

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 3.2.2- Use of phone in hospital				
	<p>I tried using it [the app]with a patient that I didn't know, and so I started off with them, checked the vitals and then I said okay I'll be back in a minute, so I put the stuff in and then it gets to the point where you're asking about the activity level and so if you don't know that then I'd have to go back in,check it and then let's say they're able to sit up on the edge of the bed and then I have to leave again. Like it's not always safe to just leave a patient to... check the sheet or check the phone.</p>			
<p>I personally don't like having my phone out at work... with the infection control I don't really want to be going in on and off my phone cause then I'm holding it up to my face</p>		<p>When you're in the actual assessment, everything's happening live and I don't want to be taking my attention away on my phone to wait for a certain question.</p>		<p>I don't carry my phone with me when I'm with patients and I don't like to take it out unless I'm in extremely extenuating circumstances cause I just feel it makes the patient feels like you're not connected to what you're doing with them, that you're playing on your phone, you're doing something else. So I try to stick with the paper one.</p>

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 3.2.2- Use of phone in hospital				
<p>It's also very handy to have that bridge between technology and our phones with our profession and how we can optimize it the best.</p>		<p>I think we learn so much on clinical reasoning... I think those first questions [in the app] in terms of like what vital signs you're looking for... [are] good to review before but yeah I liked using the phone after to just keep myself on kind of breaking down their exercise prescription and giving them exercises. But using it live... I found it challenging.</p>		
<p>I think I personally probably won't use the app. For infection, I have my gloves on and I'm not gonna... play around with my phone. But ... an app for a patient might be a bit more effective.</p>				<p>I do think it's a little bit rude to have a phone on yourself and so many other patients have like certain precautions too that it's not very hygienic to bring it in and personally I also like everything kind of more concise and altogether rather than like flipping through, um, through like the module like flipping through and waiting for the internet to work.</p>

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 3.2.2- Use of phone in hospital				
<p>I don't like to have my phone out when I'm on the ward as well, like it's kind of makes you look like you're just texting your friend.</p>				<p>Pulling out their phone, the first instinct is usually like 'are you checking your messages'... 'are you looking up a medication because there are always computers around and they usually use the computers to look up medication or whatever, so yes, I would say there is a negative perception of that</p>
<p>I'm not gonna... check their blood pressure and then... bring my phone out and check</p>				<p>Especially when it's your personal phone cause a lot of the workers they have like the work Blackberries but when you bring something else out it's quite obvious that it's not the work phone and so it's clearly not a work related thing that you are doing.</p>
<p>Especially with a patient I wouldn't want to be on my phone</p>				<p>I think in addition to that like other than the fact that they might say oh this person's doing something personal is that they might think oh is this person lacking knowledge, are they trying to look up things and they might not feel very comfortable with you working</p>

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 3.2.3- App visual				
It's not very flashy.	I did like the Smart phone more for the levelled exercises that they would be at, I felt that was the most useful part of the app. So I think that gave the information what to look for, how to get started, when's the right time to get someone up and then the what level they're at.	I also liked the fact that you had the little pictures of the exercises [in the app] . It's just handy to have that to kind of see, these are my options and then cause you probably have your own way of in your head of describing those particular exercises	I did find the pictures [in the app], I liked them. I found them beneficial.	I did like the pictures as like really.
I liked the visual explanation of the exercises... and also the discharge considerations		It [general look of the app] was good		
		The graphics [in the app] came out well		
Subtheme 3.2.4- Are the tools a stand-alone? Best order to present tools				
I think if you're gonna have the learning module don't do the in-service or you're gonna have the in-service you don't necessarily need the learning module.... It depends on the person for the app. Some people may feel really strongly about using apps and use them a lot, and then there's a few I know physios that we work with that are not so tech savvy and would strongly use the paper.		the paper one does have everything on it and it's all in one place.	I think the paper has to go hand in hand with the actual app itself... Because even now for me as I'm going through the steps in the app, I'm still conceptualizing how that translates on the paper, so I understand where the app's going... It could [be a stand alone] but I think there's benefit in having both.	Web first and then in-service... [I2: cause then they can talk, actually talk to someone and ask questions]... Mmm Mmm. And then the paper is almost like the handout you give at the end of the in-service.

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 3.2.4- Are the tools a stand-alone? Best order to present tools				
		I would feel comfortable to having the app as a standalone. I think... it doesn't give as much as an introduction as like the learner module... But if you had the basic information you could use it by itself.	If I was gonna have just only one as a standalone, for me the paper would be the most useful... everything was there and available just cause with the app, it's so linear and stuff I think you would just feel like 'am I missing something?' Whereas the paper was just a bit more comprehensive	I think the paper one [is a stand-alone]... it's pretty self explanatory. We just need time to go read it thoroughly...
		I think it's [information in the Inservice and the learner module] good for... a refresher to relate to the app and... even to the paper to kind of get a background.		I think they could all stand alone but they couldn't stand alone for the same, to be used at the same time... you could use just the app and you'd be able to use it... not right at the bedside with the patient but you could use it outside of their room... not with the patient, you could do the Learning Module not with the patient. When you get your patient's information the first time you could go into the Learning Module and then with the paper you could use it but... I don't think the times that the paper stands alone that the app could stand alone in the same place.

C.6 Theme 4 -Improvement Suggestions

Table C.7 Improvement Suggestions

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 4.1- Suggestions for the learner module				
I think in the... quiz you can do more of a case example of what level would you find this person at and what exercises would you prescribe, so like a... quiz is more based on an actual example cause that's how you would actually use the tool in practice.			Maybe, even further summarizing the information from the module so that there's like one or two particular pages that are... the key take-aways, like this is the most pertinent information so that I don't have to sit there and try and determine what is relevant and what is irrelevant ...	The only change I probably would have made [in the learner module] was have more questions for the quiz cause if you failed you got the exact same ones.
I learn really strongly with case-based examples, so anything that.. putting it in the context of a patient, I find that most effective.			Yeah [I would skip ahead in the learner module if you of had the option], I basically want to scan it for what I think applies to me and is useful... And I think it's helpful to see what's coming up.	

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 4.2- Suggestions for the app				
<p>Getting rid of the first part-questions 1 to 9... Maybe just like a disclaimer that says check all of these things [questions 1-9] before and then go into question 10.</p>	<p>Some of the videos didn't tell me how long they were... I find I get quite antsy when I don't know if I'm sitting and watching this for a half an hour... [or] if it's two minutes.</p>	<p>If like you had saved ones [answers for questions in the app]... I guess [if] you could favorite it... You can add it to your favorites</p>	<p>If I could just continue down [in the app] and that way if I want to enter information I just scroll back up and then change that or something.</p>	<p>I almost feel like they can fit two questions on one page [in the app] so you can do multiple selections instead of one thing per page cause if they are kind of borderline in between you're like 'I want to know whether to click here... Where does it go next' instead of doing everything all over again.</p>
<p>Or even... having an option of going through questions associated with... what have you assessed before and then having... the select patient's current mobility level as just... question 10 being like a separate thing for questions 1 to 9 so if you want to go through you're assessing someone you can go through that but if you want to skip directly to their mobility level to have a look at the exercises after then it would be a way of doing that.</p>		<p>A comment would be is the first question is are they in critical care, not but just cause they're in critical care doesn't mean that they're like beyond three litres nasal prongs and pretty decently stable . Like it doesn't, giving like probably would be appropriate for the app and the assessment too but it cuts it off right away.</p>	<p>You... could do [the] app with two versions... the version for the physios that just has way more detail and the version for the nurses that's just way more simple .</p>	<p>I think... having more questions on one page [of the app] because internet here isn't great either so it takes long to load, so having the ability to select multiple answers to the questions... maybe tick boxes.</p>

Focus Group 1-PTs	Focus Group 2-PTs	Focus Group 3-PTs	Focus Group 4-RNs	Focus Group 5- PTs
Subtheme 4.2- Suggestions for the app				
<p>What would be really nice if there was... a [COPD] booklet that we give to all of our patients... with exercises and... a checklist for the patient before they go home.</p>			<p>Level of detail... like I'm not gonna spend 45 minutes with them mobilizing. I'm gonna spend 15... So just in terms of detail and what kind of nurses are looking for I think that it is different than what physios are looking for.</p>	<p>Take it one step further, if it [results from app] comes like a print option with all the exercises ... That would be amazing... And if you send it to a patient that would be even better so we don't have to go find those exercises and put it together.</p>
				<p>If it was just like an ipad sitting around, if you could go and you would just be like a drop-down menu of everything and then it spits out, it'd be good.</p>
Subtheme 4.3- General suggestions				
			<p>I'm sure you struggled getting nurses to come to Inservice s, and like I think people have good intentions and would be happy to use the material... We have our educators come, we do check-in in the morning at like 8:00 with the CNL and a lot of time the educator will come and share changes or new information or whatever. If the educator was like 'hey we're gonna try this new COPD app, there's the paper, use it with your COPD patients', I think that would be enough.</p>	