A Pharmacist-Informed COPD Service for Delivery in Community Pharmacies

by

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To my partner in love and life, Francisco

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) is a leading cause of death and disability in the US. While COPD is irreversible, evidence-based practices known to reduce disease progression and increase patients' length and quality of life exist. However, they are not routinely being implemented. Due to the accessibility of community pharmacies and the success of pharmacist-provided COPD services in other settings and/or countries, the integration of these services into the community pharmacy workflow may improve management and slow progression of COPD.

Methods: This study used an explanatory sequential mixed methods design to understand community pharmacists' perspectives on providing interventions for patients with COPD. First, community pharmacists across Wisconsin were surveyed to understand their intentions to provide a selection of evidence-based interventions for COPD management. Responses to the Theory of Planned Behavior-informed survey were analyzed using descriptive statistics, correlation matrices, and multivariate linear regression. Second, a sample of survey participants were interviewed to understand how they are currently providing interventions for COPD management, how their ideal COPD service would look, and the materials and skills necessary to successfully implement the service. We conducted a deductive content analysis of interview transcripts within the context of the Knowledge-to-Action model. Finally, survey and interview results were synthesized to identify components and inform the development of the community pharmacy COPD service.

Results: Surveys were completed by 34 practicing community pharmacists in Wisconsin. The surveyed pharmacists had moderate to high intentions to perform medication profile reviews, provide vaccination services, and educate on inhaler technique—intending to provide the intervention for 82.9%, 57.1%, and 50.3% of their patients with COPD, respectively. Perceived moral obligation, subjective norms, and having a private counseling space were significant predictors of intention for multiple interventions. Follow-up interviews were conducted with eight participants. Pharmacists described gaps for three of the five surveyed interventions: lacking the knowledge needed to discuss pulmonary rehabilitation, rarely assessing inhaler

technique when dispensing refills, and discomfort initiating conversations on smoking cessation. Compensation for pharmacist-provided services and variation between types of community pharmacies were identified as important contextual features of this health care environment. Key barriers and facilitators to implementing COPD services in community pharmacies include reimbursement, staffing and time; physical space; demonstration resources; relationships with prescribers; technology; and reduced access to care in rural areas. Pharmacists described five essential components of their ideal community pharmacy COPD service as well as two possible interventions that should be explored further: (1) comprehensive medication review, (2) inhaler education, (3) adherence-related interventions, (4) smoking cessation consultation, (5) immunizations, (6) COPD symptoms assessment, and (7) discussions of pulmonary rehabilitation. Insights gained through integration revealed confirmation, expansion, and discordance between quantitative and qualitative findings.

Conclusions: This study provided a deeper understanding of COPD management in community pharmacies and laid the groundwork for a comprehensive service that aligns with the expanding role of pharmacists in chronic disease management. The envisioned service, which will be iteratively developed in collaboration with community pharmacists, holds the potential to enhance accessibility to high-quality, personalized care for individuals with COPD, contributing to the broader landscape of patient-centered health care delivery.

CHAPTER 1: INTRODUCTION

Chronic obstructive pulmonary disease (COPD) poses a significant public health challenge. It is an irreversible lung condition predominantly caused by long-term exposure to harmful particles or gases.[1] Chronic lower respiratory conditions have been a leading cause of death in the United States since 1979,[2–6] and global prevalence of COPD has been estimated to increase by 23% from 2020 to 2050.[7] Evidence-based practices known to reduce disease progression and increase patients' length and quality of life exist. However, they are not routinely being implemented.

Pharmacist-provided patient care services have emerged as a valuable aspect of health care delivery, offering benefits such as improved chronic disease management, expanded access to care, and reduced cost of care.[8–15] Community pharmacists use their medication expertise to facilitate safe and effective use of medications. Community pharmacies are an essential component in delivering timely advice, medication consultations, and preventive care, especially in rural areas where COPD prevalence are primary care shortages are highest.[16,17] Due to the accessibility of community pharmacies[18–20] and the success of pharmacist-provided COPD services in other settings and/or countries,[8,13,14,21,22] we believe integrating these evidence-based practices into the community pharmacy workflow may improve management and slow progression of COPD.

This thesis addresses the potential of community pharmacies playing a larger role in COPD management. Our goal was to inform the development of a pharmacist-informed COPD service to aid community pharmacies when implementing and expanding services for COPD management. To accomplish this, we utilized social behavioral theory, implementation science, and an explanatory sequential mixed methods study design.

CHAPTER 2: A REVIEW OF THE LITERATURE

2.1. Utilizing Pharmacists to Provide Health Interventions

Pharmacist-provided patient care services have demonstrated numerous benefits, including expanded access to care, improved chronic disease management, and decreased cost of care.[8–15] Pharmacists are highly knowledgeable about medications, including their mechanisms of action, interactions, side effects, and appropriate use. By leveraging their expertise, pharmacists can provide comprehensive medication management, ensuring safe and effective use of medications, and optimizing therapeutic outcomes. Pharmacists can conduct medication reviews to identify potential drug interactions, duplications, or inappropriate prescribing. Collaboration of health care providers can optimize medication regimens, bridging gaps in care and reducing the risk of medication-related problems.

Pharmacist-provided patient care services increase access to health care, particularly in underserved communities or areas with limited health care resources. Pharmacists are recognized as the most accessible health care provider, with 89% of the U.S. population living within five miles of a pharmacy.[23] Pharmacies are readily available in neighborhoods and often have extended operating hours and no need for appointments, making it convenient for patients to access their services. Popovian and colleagues (2022) finds that pharmacies provided greater access to vaccinations for lower-income families than physician practices—with pharmacies offering 95.7% more operating hours.[19] This accessibility enables patients to seek timely advice, receive medication consultations, and access preventive care and disease management services, even in areas with health care provider shortages. An analysis by Surescripts (2023) demonstrates that 61% of the 1,535 counties with a relative primary care physician shortage (one PCP or less for every 1,500 people) in the United States also had a high or medium ratio of the number of pharmacies to the population—meaning there is a significant opportunity for pharmacists to fill these gaps in primary care, especially in rural areas of the Midwest and South.[20]

Pharmacists are pivotal to chronic managing diseases. They provide counseling on lifestyle modifications, monitor disease progression, and adjust medications to achieve optimal disease control and

minimize complications. Pharmacists excel in patient education and can explain complex medical information in a clear and understandable manner, ensuring that patients understand their conditions, treatment plans, and medication regimens. Randomized controlled trials indicate programs centered around pharmacist-led patient education and support improve disease management, quality of life, hospital admissions, and medication adherence. Table 2.1 summarizes evidence of improved outcomes with pharmacist interventions from randomized controlled trials.

Table 2.1: Randomized Controlled Trials Evaluating Pharmacist-Delivered Interventions				
Author and year	**Health care setting**	**Country**	**Disease state**	**Improved outcomes**
Abdulsalim et al., 2018[21]	Teaching hospital	India	COPD	Medication adherence
Ali et al., 2012[24]	Community pharmacies	United Kingdom	Type 2 diabetes mellitus	HbA1c and blood glucose Systolic BP Quality of life (SF-36) Diabetes knowledge (DKT) Belief about the need for medication (BMQ) Medication concerns (BMQ) Satisfaction (SIMS)
Chow et al., 2016[25]	Home visits	Malaysia	Type 2 diabetes mellitus	Medication adherence Diabetes knowledge HbA1c
Clark et al., 2007[26]	Hospital	Turkey	Tuberculosis	Medication adherence
Clifford et al., 2005[27]	Community pharmacies	Australia	Type 2 diabetes mellitus	BMI Systolic and diastolic BP HbA1c and blood glucose 10-year estimated risk of a first CHD event
Farsaei et al., 2011[28]	Outpatient clinic	Iran	Type 2 diabetes mellitus	HbA1c and blood glucose
Faulkner et al., 2000[29]	Hospital	United States	Undergone CABG surgery or PTCA	Medication adherence Total cholesterol, LDL, and triglycerides
González-Martin et al., 2003[30]	Outpatient clinic	Chile	Asthma	Disease specific quality of life for activities, emotions, and symptom domains (PAQLQ)
Hammad et al., 2011[31]	Outpatient	Jordan	Metabolic syndrome	Metabolic syndrome status Systolic and diastolic BP Triglyceride levels
Jarab et al., 2012[14]	Outpatient	Jordan	COPD	COPD knowledge Medication adherence Belief of medication effectiveness Hospital admissions
Karaoui et al., 2021[32]	Hospital	Lebanon	Initiating oral anticoagulant	Post-discharge follow-up with a physician

Khdour et al., 2009[13]	Outpatient clinic	Ireland	COPD	Hospital admissions and ED visits Disease specific quality of life (SGRQ) COPD knowledge Medication adherence
Kooij et al., 2016[33]	Community pharmacies	Netherlands	Initiating antidepressants, bisphosphonates, RAS-inhibitors, or statins	Medication adherence for bisphosphonates, RAS-inhibitors, and statins
Kooy et al., 2015[34]	Community pharmacies	Netherlands	Initiating antidepressants, bisphosphonates, RAS-inhibitors, or statins	Satisfaction with counseling Medication concerns (BMQ)
Liu et al., 2021[35]	Hospital	China	COPD	Antibacterial usage Length of stay and costs of hospitalization Adverse drug reactions rates Medication adherence Impact of COPD on health status (CAT)
López Cabezas et al., 2006[36]	Hospital	Spain	Heart failure	Hospital admissions and days of hospital stay Medication adherence
McLean et al., 2008[37]	Community pharmacies	Canada	Hypertension and diabetes	Systolic BP
Morgado et al., 2011[38]	Outpatient clinic	Portugal	Hypertension	Systolic and diastolic BP Medication adherence
Sánchez Ulayar et al., 2012[39]	Hospital	Spain	Discharged with 5 or more medications (polymedicated)	Hospital admissions Medication adherence
Sarkadi and Rosenqvist, 2004[40]	Hospital	South Korea	Type 2 diabetes mellitus	HbA1c Satisfaction with diabetes knowledge Exercising more to affect blood-glucose levels Ability to predict current blood-glucose levels before measuring it
Shanmugam et al., 2012[41]	Hospital	India	Asthma	Disease specific quality of life (AQLQ) Lung function (PEFR) Asthma control (ACT)

Sookaneknun et al., 2004[42]	University pharmacy, Hospital	Thailand	Hypertension	Systolic and diastolic BP BP control Medication adherence Participation in regular exercise
Tommelein et al., 2014[43]	Community pharmacy	Belgium	COPD	Inhalation technique Medication adherence Severe COPD exacerbations Hospitalizations
Wal et al., 2013[44]	Outpatient	India	Hypertension	Systolic and diastolic BP Quality of life (SF-36)
Wang et al., 2010[45]	Hospital	Taiwan	Asthma	Asthma knowledge (AGKQA-C) Clinical symptoms (AQLQ)
Wang et al., 2013[46]	Hospital	China	Cancer	Pain and analgesic knowledge Pain intensity and interference on daily life (BPI)

ACT: asthma control test, **AGKQA-C**: asthma general knowledge questionnaire for adults, Chinese language version, **AQLQ**: asthma quality of life questionnaire, **BMI**: body mass index, **BMQ**: beliefs about medicines questionnaire, **BP**: blood pressure, **BPI**: brief pain inventory, **CABG**: coronary artery bypass graft, **COPD**: chronic obstructive pulmonary disease, **DKT**: diabetes knowledge test, **ED**: emergency department, **HbA1c**: glycated hemoglobin, **LDL**: low-density lipoprotein, **PAQLQ**: pediatric asthma quality of life questionnaire, **PEFR**: peak expiratory flow rate, **PTCA**: percutaneous transluminal coronary angioplasty, **SF-36**: short form-36, **SGRQ**: St. George's respiratory questionnaire, **SIMS**: satisfaction with information received about medicines

While medication adherence is essential for managing chronic diseases, more than half of adults ages 40 and older with a chronic condition reported multiple forms of noncompliance on the National Report Card on Adherence from the National Community Pharmacists Association (NCPA).[47] The most common reasons for not filling or taking their medication as prescribed were forgetting (42%), running out the of medication (34%), were away from home (27%), trying to save money (22%), or concerned about side effects (21%).[47] Pharmacists can address poor medication adherence through interventions like medication counseling, adherence packaging, reminder systems, and providing 90-day supplies of medications.[48]

Pharmacists' involvement in patient care has been shown to lead to cost savings and more efficient health care delivery. By managing chronic diseases, conducting medication reviews and addressing adherence concerns, pharmacists help reduce polypharmacy, improve disease control, and prevent medication errors, adverse drug events and unnecessary hospitalizations.[49–54] They also offer patients cost-effective medication alternatives, counsel patients on affordable treatment options, and identify opportunities for medication cost savings, such as manufacturer coupons.[53] Shepler (2014) found that even pharmacy students routinely perform cost-effective clinical interventions—with the greatest cost saving per intervention from identifying potential allergic reactions, identifying drug interactions, and resolving contraindications.[55] Additionally, the provision of vaccinations reduces the costs associated with treating infectious diseases. Nearly $27 billion is spent annually in the United States treating vaccine-preventable diseases in adults 50 and older.[56] Most adult vaccinations are now administered at pharmacies, including 60-70% of influenza vaccinations,[57] with average direct costs lower than physician offices or other medical settings.[58] These efforts contribute to reducing health care costs and improving the value of care delivered.

Pharmacist-provided patient care services offer valuable contributions to chronic disease management, access to care, and cost reduction. These services not only enhance patient outcomes and satisfaction but also contribute to more efficient health care delivery systems. By leveraging their knowledge and skills, pharmacists are well-positioned to improve patient care, particularly in the context of chronic respiratory conditions.

2.2. Chronic Respiratory Conditions

Chronic obstructive pulmonary disease (COPD) and asthma are both chronic respiratory conditions that can cause difficulty in breathing, but they have distinct characteristics.[1,59–61] While COPD typically develops later in life, mostly after the age of 40, and progresses over time, asthma often starts in childhood. Childhood asthma may improve or resolve in some individuals as they reach adulthood. However, others continue to experience symptoms throughout their lives. Asthma is generally reversible, meaning that the airflow obstruction is temporary and can be relieved with appropriate treatment, such as bronchodilators or anti-inflammatory medications. COPD is considered a largely irreversible condition. While some treatments can alleviate symptoms and slow disease progression, the lung damage caused by COPD is permanent.

Asthma is defined by the Global Initiative for Asthma (GINA) as a "heterogenous disease, usually characterized by chronic airway inflammation. It is defined by the history of respiratory symptoms, such as wheeze, shortness of breath, chest tightness and cough, that vary over time and in intensity, together with variable expiratory airflow limitation."[59] The presence and severity of asthma's clinical features result from interactions between genetic susceptibility, environment exposure, and risk factors.[60] Exposure to triggers—such as allergens, viral respiratory infections, and air pollution—can cause acute narrowing of the airways (airway hyperresponsiveness), inflammation, and exacerbations.[60] While 8.7% of adults and 6.2% of children in the United States have asthma, deaths are uncommon (1.1 deaths per 100,000 population) and for the most part avoidable with proper treatment.[62,63] Asthma can significantly affect quality of life—particularly for patients with severe or uncontrolled asthma.[64,65] Frequent and intrusive respiratory symptoms can result in fatigue, poor sleep quality, distress, and functional limitations.[64] Furthermore, people with asthma spend $3,266 more per year in medical costs than people without asthma, $1,830 (56%) of which is attributable to prescription medications.[66]

Asthma symptoms are often triggered by specific allergens (e.g., pollen, dust mites, animal dander), irritants (e.g., smoke, strong odors, air pollution), exercise, or viral respiratory infections.[60] Asthma

exacerbations, or "attacks," can occur suddenly and may require immediate medical intervention.[60] Asthma management involves a combination of long-term controller medications (e.g., inhaled corticosteroids, long-acting bronchodilators) to control inflammation and prevent symptoms, as well as quick-relief medications (e.g., short-acting bronchodilators) to provide immediate relief during acute episodes.[59]

COPD is defined by the Global Initiative for Chronic Lung Disease (GOLD) as a *"heterogenous lung condition characterized by chronic respiratory symptoms (dyspnea, cough, sputum production) due to abnormalities of the airways (bronchitis, bronchiolitis) and/or alveoli (emphysema) that cause persistent, often progressive, airflow obstruction."*[1] COPD is predominantly caused by long-term exposure to harmful particles or gases, most commonly cigarette smoke.[1] Other factors such as exposure to environmental pollutants, occupational hazards, genetic predisposition, and respiratory infections can also contribute to the development of COPD. It is a significant global health issue, with a substantial burden on individuals, health care systems, and society. COPD is the third leading cause of death worldwide, with most deaths under 70 years of age concentrated in low- and middle-income countries, where environmental exposure to indoor air pollution is more prevalent.[67] In the United States, more than 5% of the population reports a diagnosis of COPD, a number that has stayed relatively steady over the last decade.[68] Prevalence is highest in rural areas, with 8.2% of people living in rural areas reporting a diagnosis of COPD, compared to 4.7% in large metropolitan areas.[16] Furthermore, COPD is the third and sixth leading causes of healthy life-years lost worldwide and in the US, respectively.[4,69] The hallmark airflow obstruction of COPD significantly impacts individuals' quality of life and limits their ability to engage in daily activities. For example, shortness of breath can make even simple activities like walking up a flight of stairs or taking a short walk challenging and exhausting, causing individuals to avoid physical activities they once enjoyed. There is also a considerable financial burden from limitations in the workplace and home as well as costs of medical treatments. Direct medical costs for patients with COPD are on average twice those of patients without COPD, with an incremental direct cost of $6,246 more than patients without COPD per year.[70]

COPD symptoms may be aggravated by respiratory infections, environmental pollutants (e.g., smoke, dust, chemicals), and other factors.[61] While exacerbations of COPD can be severe, they usually occur gradually over time and are often associated with a worsening of symptoms, such as increased cough, sputum production, and shortness of breath.[61] COPD treatment includes bronchodilator medications (short-acting or long-acting) to help open the airways, reduce symptoms, and improve lung function.[1] Inhaled corticosteroids may also be used in some cases.[1] Pulmonary rehabilitation programs, which incorporate exercise, breathing techniques, and education, are beneficial for individuals with COPD.[1]

While asthma and COPD share some similarities, they differ in terms of underlying causes, disease progression, age of onset, and response to treatment. Proper diagnosis and differentiation between the two conditions are crucial for appropriate management and personalized care.

2.3 Involving Pharmacists in COPD Management

While COPD is irreversible, evidence-based practices known to reduce disease progression and increase patients' length and quality of life exist. However, they are not routinely being implemented. A study of physicians' adherence to GOLD guidelines found that only 54.7% of patients with COPD received guideline-concordant therapy when presenting to an ambulatory clinic.[71] Two pilot studies aiming to improve outpatient COPD management through pharmacist-delivered care programs have successfully increased the provision of guideline-concordant therapy.[8,22]

A team pharmacists and nurse care managers in the Wisconsin Veterans Affairs piloted a COPD primary care bundle titled Chronic Obstructive Pulmonary Disease Coordinated Access to Reduce Exacerbations (COPD CARE).[22] The outpatient service provided interprofessional, evidence-based care to patients with COPD following discharge from the hospital or emergency department. Their COPD CARE Wellness Visits included inhaler technique review, medication adherence assessment, therapy optimization, tobacco cessation therapy, written action plan, spirometry ordering and review, and critical referrals. Compared to treatment as usual, COPD CARE patients were significantly more likely to receive interventions recommended by the GOLD guidelines within 30 days of discharge, including inhaler

technique correction and tobacco cessation counseling.[22] The effectiveness of COPD CARE has led to the expansion of this service to several VA Medical Centers across the county and sets precedent for an outpatient COPD program in Wisconsin that is available to a broader population.

A community pharmacy care model for patients with COPD was piloted in 40 pharmacies in Sydney, Australia.[8] Pharmacists assessed medication therapy, inhaler technique, medication adherence, COPD action plan status and use, pulmonary rehabilitation attendance status, vaccinations, smoking and occupational exposures, COPD knowledge, and exacerbation risk. Then, pharmacists would provide a variety of related interventions including COPD and medication education, practical strategies and motivational support for adherence barriers, referrals for pulmonary rehabilitation and vaccinations, and smoking cessation counseling. Patients who participated in the care model had significant improvements in their knowledge of COPD, inhaler use competence, pneumonia immunization rate, COPD plan ownership, and exacerbation rate.[8]

Due to the accessibility of community pharmacies[18–20] and the success of pharmacist-provided COPD services in other settings and/or countries,[8,13,14,21,22] integrating these evidence-based practices into the community pharmacy workflow may improve management and slow progression of COPD.

Evidence-Based COPD Interventions by Community Pharmacists

This section presents an overview of five guideline-recommended interventions to improve COPD management and further incorporate community pharmacists into the care team. The recommended interventions are: tobacco cessation, inhaler technique education, medication profile review, vaccinations, and discussing pulmonary rehabilitation.

Smoking Cessation

Tobacco smoking is widely recognized as the leading cause of COPD—75% of all COPD cases occur in people with a history of smoking.[72] The harmful effects of smoking on the respiratory system are numerous and well-documented. When tobacco smoke is inhaled, it releases thousands of toxic chemicals, such as nicotine, carbon monoxide, and tar, into the lungs.[73] Over time, the repeated exposure to these

substances weakens the pulmonary innate host defense, narrows air passages, swells bronchial tubes and destroys the alveoli.[61,72,74] The combination of inflammation, damage, and obstruction ultimately results in the characteristic symptoms of COPD, including persistent coughing, wheezing, shortness of breath, and reduced lung capacity.[61] Despite this information, 38% of adults with COPD are current smokers.[75] The destructive nature of tobacco smoke on the respiratory system underscores the urgency for individuals to quit smoking and for public health measures to raise awareness about the dangers of tobacco use.

Smoking cessation brings about a multitude of benefits for both immediate and long-term health. Within the first hours of quitting smoking, patients' heart rate and blood pressure begin returning to normal and blood levels of carbon monoxide start declining, improving the blood's ability to carry oxygen.[76] A few weeks after quitting, circulation improves and the airways start to relax and produce less phlegm, making breathing easier and reducing coughing and wheezing.[76] Over time, substantial improvements in respiratory function may occur. Smoking cessation also significantly lowers the risk for cardiovascular disease and at least 12 different cancers.[77]

Pharmacists are an important support to individuals on their journey to quit smoking. With their extensive knowledge of medications and patient care, pharmacists are well-positioned to provide smoking cessation services. A cross-sectional survey by Xiong and colleagues (2021) found that 91.1% of pharmacists from a large grocery pharmacy chain believed that they can help their patients quit tobacco use; 92.4% agreed that community pharmacists should provide tobacco cessation services.[78] Additionally, a survey conducted by the American Association of College of Pharmacy (AACP) in partnership with the CDC found that 98.9% of colleges and schools of pharmacy include tobacco cessation content in the required coursework, indicating that most pharmacists have received formal training on the topic.[79]

A combination of counseling and a pharmacological smoking cessation agent (i.e., nicotine replacement therapy, varenicline or bupropion SR) is an ideal approach to help patients quit smoking.[80] Five formulations nicotine replacement therapy—patch, gum, lozenge, nasal spray, and oral inhaler—and two non-nicotine medications—bupropion and varenicline—are currently available.[81] Pharmacists can help individuals choose the most suitable option based on their specific needs and health conditions and counsel

on safe and effective use of the medication.[81] Pharmacists can also offer personalized counseling, discuss the challenges and benefits of quitting smoking, help patients set realistic goals, and provide strategies to cope with cravings and withdrawal symptoms. Condinho and colleagues (2021) found smokers were more successful at quitting smoking when they participated in more smoking cessation consultations and telephone sessions with a pharmacist.[82] Pharmacist-provided smoking cessation programs have shown similar success rates to other health care professionals, ranging from 9.9% to 28.0%.[83–85] By working closely with individuals, pharmacists can provide a comprehensive and personalized approach to quitting smoking, improving the chances of long-term success.

Inhaler Technique Education

The correct technique for using an inhaler is of paramount importance for individuals with respiratory conditions. Proper inhaler technique ensures that the medication is effectively delivered to the target areas of the lungs, optimizing absorption and effectiveness. There are at least 22 different inhaler devices available that require different techniques and abilities.[1] Some essential steps that are common for inhalers are priming the inhaler, maintaining a proper distance from the mouth, coordinating inhalation with actuation of the device, and holding the breath for a few seconds afterward. Table 2.2 presents the classes of medications delivered by inhalers that are commonly used for COPD therapy in the United States. Appendix A presents more details on different medications within each class.

Table 2.2: COPD Inhalers by Medication Class

Medication Class	Number of Inhalers	Common Uses		
		Maintenance	Rescue	Exacerbation
Short-acting Beta2-Agonist (SABA)	5		X	X
Short-acting Muscarinic Antagonist (SAMA)	1	X		X
Combination SAMA + SABA	1	X	X	X
Long-acting Beta2-Agonist (LABA)	2	X		
Long-acting Muscarinic Antagonist (LAMA)	4	X		
Combination LAMA + LABA	4	X		
Combination Inhaled Corticosteroid (ICS) + LABA	4	X		
Triple Combination (ICS + LAMA + LABA)	2	X		

A recent systematic review and meta-analysis of inhalation technique errors among U.S. adults with COPD revealed that 86.7% of patients made at least 1 error when using a metered dose inhaler.[86] The steps

that were most frequently missed across the studies were exhaling fully and away from the inhaler before inhalation, holding breath for 5-10 seconds, inhaling slowly and deeply, exhaling after inhalation, and shaking the inhaler before use.[86] Regular assessment and reinforcement of inhaler technique by health care professionals, are crucial to help individuals achieve optimal treatment outcomes and better manage their respiratory conditions. The GOLD guidelines recommend assessing inhaler technique at every opportunity.[1]

Pharmacists have demonstrated greater knowledge of inhalers than prescribers, making them a vital resource for patients who may be using their inhalers incorrectly.[87] In Fathima et al.'s community pharmacy care model, pharmacists asked patients to demonstrate how they use their inhaler and would provide education where needed.[8] They would also apply an instruction label to the inhaler highlighting any problem steps the patient had.[8] The COPD CARE wellness and follow-up visits included an evaluation and correction of patient inhaler technique.[22] Veterans who participated in the program were 12 times more likely to receive inhaler technique education than those in the treatment as usual group.[22]

While pharmacists frequently educate and assess inhaler technique for patients when dispensing a new prescription for metered-dose inhalers (85.4%), these interventions occurred less often for patients using an inhaler for three months (47.4%) and long-term users (21.1%).[88] This disparity for follow-up prescriptions reveals an opportunity for pharmacists to reinforce correct usage and address any questions or concerns that may have arising since the initial dispensing.

Medication Profile Review

Reviewing a patient's medication profile is a core evidence-based pharmacy intervention. While a medication profile review can be as simple as verifying that a new prescription is appropriate for the patient, it has expanded into reimbursable clinical services such as Medication Therapy Management (MTM) and Drug Utilization Review (DUR). A consortium of 11 national professional pharmacy organizations developed a definition of MTM that encompasses various activities, including assessing the patient's health status; formulating a medication treatment plan; selecting, initiating, modifying, or administering medication therapy; comprehensively reviewing the patient's medications for medication-related problems; communicating essential information to the patient's other primary care providers; educating patients on

their medications and how to use them; and providing information, support services, and resources designed to enhance patient adherence.[89]

MTM has shown significant enough benefit that the Centers for Medicare & Medicaid Services has required the inclusion of MTM programs in Medicare Part D plans since 2003.[90] A systematic review and meta-analysis of 81 studies with over 60,000 participants demonstrated that MTM services administered by pharmacists significantly improved clinical outcomes.[91] Notably, MTM services decreased readmission rates, emergency department visits, adverse drug events, and length of hospital stay.[91] A recent cost-effectiveness analysis of the Medicare MTM program found that MTM enrollees had both lower medication costs and medical costs compared with nonenrollees.[92] Across willingness-to-pay thresholds, the net monetary benefit was greater for black patients than white patients.[92]

The GOLD guidelines emphasize that the choice of inhaler device must be tailored to the individual patient and depends on access, cost, and patient's ability and preference.[1] Through a comprehensive medication profile review, community pharmacists can evaluate the patient's needs and insurance limitations. After deciding on the ideal inhaler with the patient, the pharmacist can send their recommendation and rationale to the prescriber, facilitating the change for the patient. Pharmacists, through comprehensive medication reviews, not only contribute to optimal inhaler device selection but also have a vital role in enhancing patient adherence, minimizing adverse events, and ultimately improving the overall quality of health care delivery.

Immunizations

Vaccines provide significant benefits for individuals living with COPD. Vaccinations help protect against infections that can exacerbate COPD symptoms and lead to severe complications. A recent study by Liao and colleagues (2022) found an increased risk of ischemic stroke, pneumonia, respiratory failure, and acute exacerbation for COPD patients with an influenza infection.[93] The influenza and pneumococcal vaccines are vital for people with COPD—both have shown significant reductions in exacerbations.[1,94] Other vaccinations that are recommended for COPD are SARS-CoV-2 (COVID-19), Tdap, and Zoster.[1]

Pharmacists are indispensable when expanding access to vaccinations and promoting public health. A recent systematic review and meta-analysis showed that pharmacists' involvement as immunizers and advocates significantly increased immunization rates.[95] With their extensive knowledge of medications and expertise in patient care, pharmacists are increasingly involved in administering vaccinations. A report by the Global Healthy Living Foundation (GHLF) and IQVIA found that 60-70% of influenza vaccines and 40-50% of pneumococcal vaccines were administered at pharmacies.[57] Furthermore, average direct costs for vaccinations are lower in pharmacies compared to physician offices or other medical settings, increasing vaccine accessibility.[58]

Pharmacy-based immunization training includes identifying the appropriate vaccines for a patient, safely administering vaccines, educating patients about the benefits and potential side effects, as well as dispelling myths and misconceptions.[96] In a 2017 survey by Prescott and Bernhardi, all responding U.S. pharmacy colleges and schools reported educating students on immunization knowledge and skills through the required curricula or a certificate program; 97.5% of pharmacy schools offered either the American Pharmacists Association (APhA) Pharmacy-Based Immunization Delivery Program or another immunization certificate-type program.[97] These results indicate that a large proportion of pharmacy school graduates are already trained and certified to vaccinate.

Pulmonary Rehabilitation

Pulmonary rehabilitation (PR) is a comprehensive intervention designed to help individuals with chronic respiratory conditions improve their quality of life and functional capacity.[1] It is a multidisciplinary approach that combines exercise training, education, and psychological support to address the physical, emotional, and social aspects of living with a chronic lung condition. Benefits of pulmonary rehabilitation include improved exercise capacity, dyspnea and health related quality of life, as well as reductions in symptoms of anxiety and depression, hospitalizations and mortality.[1,98–100] Home-based pulmonary rehabilitation programs have also shown improvements in clinical symptoms, including dyspnea[101–103]— which has the potential to improve access to care for patients in rural areas.

The primary delivery of pulmonary rehabilitation services is typically conducted by a multidisciplinary team that includes respiratory therapists, physiotherapists, and other health care professionals. However, pharmacists can be a valuable support to pulmonary rehabilitation programs. As part of a community pharmacy care model, pharmacists would assess if the patient had attended pulmonary rehabilitation and provide information about local pulmonary rehabilitation programs and referral forms to be completed by their general practitioner.[8] While the increase in PR attendance following this pilot study did not reach statistical significance, 81.5% of patients who had not attended PR in the previous 6 months were provided information and referrals.[8] Additionally, patients enrolled in COPD CARE were 7 times more likely to receive a referral to pulmonary rehabilitation than patients receiving usual care.[22] These results highlight a willingness of pharmacists to become involved in the PR continuum of care.

By leveraging their expertise in medication management and patient education, pharmacists can complement the efforts of the multidisciplinary team in pulmonary rehabilitation programs. Their involvement helps ensure the safe and effective use of medications, enhances patient understanding and adherence, and contributes to the overall success of pulmonary rehabilitation in improving the outcomes and quality of life for individuals with respiratory conditions.

Barriers to Clinical Service Adoption in Community Pharmacies

Providing regular clinical services in community pharmacies is hindered by multiple barriers. The barriers include an unsustainable reimbursement models that fail to cover the staffing and time required to perform clinical interventions,[11,78,104–112] low awareness of pharmacist-provided services by patients and other health care providers,[104,106–108,110,113] and a need to integrate these services into the pharmacy workflow.[106–108,110–112] Ferreri, Hughes, and Snyder (2020) conducted a narrative review on the challenges community pharmacies face when delivering MTM services.[108] Some important barriers described in their review are time constraints, inadequate physical spaces for the service, disconnected health information technology systems that reduce pharmacists' access to patient medical records, limited coverage of MTM services outside of Medicare Part D, and the perception that the pharmacist's role is only that of a medication dispenser.[108] Additionally, a 2019 survey of pharmacy personnel at a large grocery pharmacy

chain found the top-ranked barriers for pharmacist-prescribed tobacco cessation services—in states with prescriptive authority for tobacco cessation—to be "lack of time during normal workflow to deliver tobacco cessation services" and "lack of reimbursement from third-party payers."[78]

Studies in Australia, Belgium, and the United Kingdom have analyzed barriers community pharmacists face when implementing or providing care services for patients with COPD specifically.[110–112,114] Time and workload, remuneration, patient awareness of pharmacy services beyond dispensing, training and educational resources, and communication with primary care were repeated themes between these studies. Importantly, pharmacists in one of these studies reported that providing clinical services without access to patients' medical records was challenging.[111] No studies on this topic in the United States were identified.

Efforts are being made to address these barriers. A public health awareness campaign on expanded pharmacy services titled "Your Pharmacist Knows" resulted in a significant increase in service utilization in rural areas, including MTM and medication synchronization programs.[115] Information and Communication Technology (ICT) supports timely contact between prescribers and community pharmacists. These tools and resources include electronic health record sharing with pharmacies,[116,117] secure messaging systems between pharmacists and prescribers,[116,118] health system consult orders that allow physicians to refer patients to the outpatient pharmacists and easily receive documentation and requests from the pharmacist following the consult,[119] and a program that automatically communicates when prescribers discontinue or change medications.[120] Wisconsin's Medical Assistance program recently started reimbursing pharmacists for performing services within their scope of practice.[121,122] With a reimbursement barrier removed for patients covered by Medicaid, pharmacists may now find it more feasible to incorporate COPD interventions into their regular practice.

CHAPTER 3: THE PURPOSE OF THIS STUDY

The study's goal was to inform the development of a COPD service to aid community pharmacies when implementing and expanding services for COPD management. Involving stakeholders early in the implementation design process is an important factor for sustaining change.[123] As community pharmacists would be implementing and delivering this service, it is imperative to understand their perspectives on providing interventions for patients with COPD.

Specifically, this study aimed to:

Aim 1. Assess pharmacists' intentions to employ COPD interventions in community pharmacies and the extent to which they believe these services can be successfully implemented at their workplace.

Pharmacists working in community settings throughout the state of Wisconsin were quantitatively surveyed to identify interventions pharmacists have intentions to perform using an extended Theory of Planned Behavior.

Aim 2. Explore community pharmacists' perspectives on COPD management in their practice, their ideal COPD service, and materials and skills necessary to implement the service.

The Knowledge-to-Action framework was utilized to conduct qualitative interviews of a sample of survey respondents followed by deductive content analysis to tailor evidence-based interventions for delivery in community pharmacies.

Aim 3. Identify the components of a pharmacist-informed COPD service that community pharmacists can utilize when implementing and expanding evidence-based interventions for COPD management.

Results from the quantitative and qualitative aims were synthesized to identify components and inform the development of a community pharmacy COPD service.

CHAPTER 4: METHODS

This project was designed as an explanatory sequential mixed methods study.[124] Explanatory mixed methods research aims to provide a more comprehensive understanding of a research question by combining qualitative and quantitative data in a sequential manner. With this approach, the researcher typically begins with collecting and analyzing quantitative data and then follows up with qualitative data collection and analysis to further explore and explain the quantitative findings.

In phase one of this study, community pharmacists were surveyed to understand their intentions to provide a selection of evidence-based interventions for COPD management. In phase two, a sample of survey participants were interviewed to understand how they are currently providing interventions for COPD management, how their ideal COPD service would look, and the materials and skills necessary to successfully implement the service. In phase three, survey and interview results were synthesized to identify components and inform the development of the community pharmacy COPD service.

4.1 Theoretical Frameworks

Theory of Planned Behavior

The Theory of Planned Behavior is a widely recognized social cognitive theory developed by Icek Ajzen that explains human behavior by considering the influence of attitudes, subjective norms, and perceived behavioral control.[125] It has been widely used to understand and predict a range of behaviors, including pharmacists' intentions to provide pharmaceutical care.[126–129] According to the Theory of Planned Behavior, an individual's intention to engage in a specific behavior is the key determinant of whether they will perform that behavior. The intention is influenced by three main factors:

1. **Attitude** refers to an individual's positive or negative evaluation of the behavior. It includes beliefs about the outcomes or consequences of the behavior and the overall subjective evaluation of those outcomes. A more favorable attitude towards the behavior increases the likelihood of intention to engage in that behavior.

2. **Subjective Norms** reflect the social influence on behavior. They involve perceptions of social pressure or expectations from significant others, such as family, friends, or colleagues, regarding the behavior. The individual's perception of whether others think they should or should not engage in the behavior influences their intention to perform the behavior.
3. **Perceived Behavioral Control** refers to an individual's perception of their ability to perform the behavior successfully. It includes factors such as self-efficacy (belief in one's ability to perform the behavior), perceived difficulty or ease of performing the behavior, and the presence of external constraints or barriers. Higher perceived behavioral control leads to stronger intentions to perform the behavior.

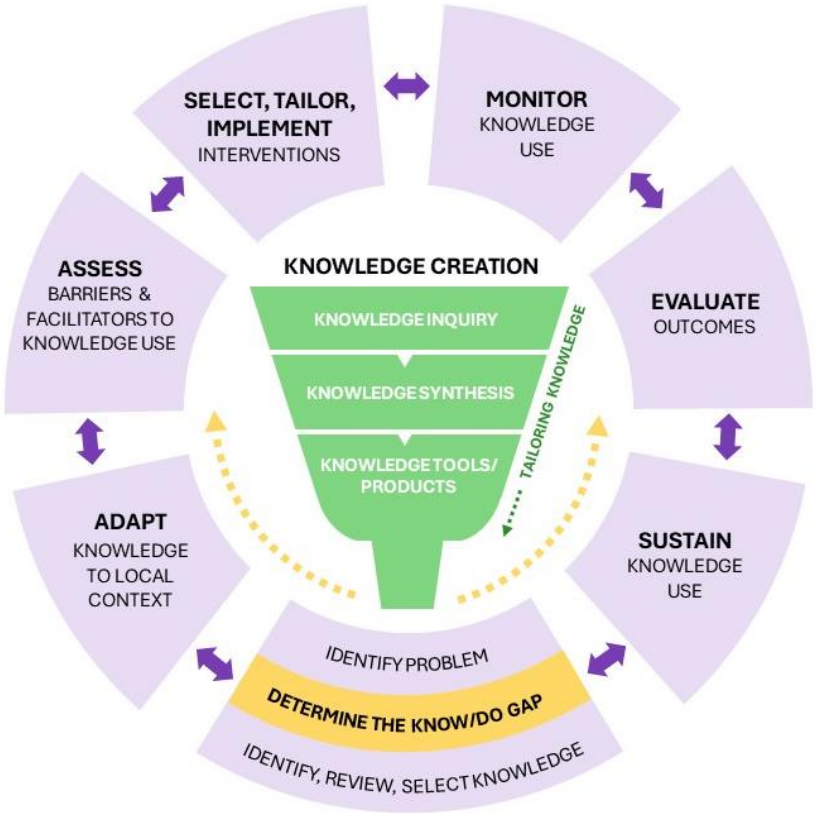
Additional conceptually independent predictors can be included in the Theory of Planned Behavior to explain a greater proportion of the variance in intention. In accordance with the moral responsibility to the patient that underlies pharmacy practice,[130] Rawy and colleagues found perceived moral obligation was a significant predictor of community pharmacists' intention to provide pharmaceutical care services.[131] Therefore, perceived moral obligation was included as a fourth predictor of intention:

4. **Perceived Moral Obligation** is an individual's subjective belief or perception of a moral responsibility or duty to engage in a specific behavior. This responsibility goes beyond external expectations and is driven by an internal commitment to uphold personal values and ethical standards. Believing a behavior is morally right or ethically sound influences an individual's intentions to perform that behavior.

Knowledge-to-Action Model

The Knowledge-to-Action (KTA) model guides the iterative process of translating research knowledge into action and improving the implementation of evidence-based practices. It was developed by Ian Graham and colleagues and has been widely used in implementation science.[132,133] KTA recognizes the complexity and dynamism of knowledge translation. It consists of two main components: Knowledge Creation and the Action Cycle (Figure 4.1).

Figure 4.1: The Knowledge-to-Action Model



Adapted from Graham et al.[132]

Knowledge Creation focuses on the production of knowledge and its transformation into usable information for practice. It is presented as a funnel made up of three phases:

1. **Knowledge Inquiry** refers to primary studies or first-generation knowledge, which is not ready for broad-scale translation but informs future research.
2. **Knowledge Synthesis** involves the identification, appraisal, and synthesis of results from individual research studies. This second-generation knowledge includes systematic reviews and meta-analyses.
3. **Knowledge Tools/Products** represent third-generation knowledge which facilitates knowledge use through the production of actionable, user-friendly tools, such as practice guidelines, protocols, or decision aids.

The Action Cycle represents the steps that may be needed to translate knowledge into practice. The seven phases are derived from more than 30 planned-action theories.[134]

1. **Identify Problem — Determine the Know/Do Gap — Identify, Review, Select Knowledge:** this phase involves identifying a problem, comparing known information with current practices, and determining gaps that need attention.
2. **Adapt Knowledge to Local Context** aims to increase the relevance and applicability of the knowledge. It involves understanding the audience and assessing the value, usefulness, and appropriateness of the knowledge to the setting.
3. **Assess Barriers/Facilitators to Knowledge Use** refers to the identification of factors that hinder or enhance knowledge uptake. Factors relating to the knowledge, the user, and the context should be considered.
4. **Select, Tailor, Implement Interventions** involves planning and executing interventions to bring about the intended change as well as tailoring the interventions to the issue, audience, and context.
5. **Monitor Knowledge Use** to understand how the knowledge has been applied. Knowledge use can be evaluated as conceptual use (changes in understanding or attitudes), instrumental use (changes in behavior or practice), or strategic use (manipulating knowledge to achieve power or profit goals).[132]
6. **Evaluate Outcomes** to assess the impact of using the knowledge on relevant outcomes and whether the implementation process was successful and worth the effort.
7. **Sustain Knowledge Use** recognizes that implemented changes are not self-sustaining and require ongoing monitoring and effort. The sustainability phase continues the action cycle by identifying barriers to knowledge sustainability, tailoring the interventions to overcome these barriers, and monitoring and evaluating the ongoing knowledge use.

4.2 Participant Recruitment

Pharmacist recruitment involved a three-prong approach. First, the study team collaborated with the Pharmacy Practice Enhancement and Action Research Link (PearlRx) to recruit participants using convenience sampling. PearlRx is a practice-based network of Wisconsin pharmacists spanning all practice settings.[135] Four recruitment announcements were sent out through the PearlRx email communication network over six weeks in Spring 2023 (April 18th, May 2nd, May 16th, and May 30th). The announcements described the purpose of the study, requirements of participants, financial incentives, contact information, and a link to the survey. PearlRx also posted a description of the project on their website, which included contact information for those interested in the project.

Second, to ensure a large enough sample for this study, the study team directly invited Wisconsin community pharmacists to participate in the survey via email announcements to individuals identified through the National Community Pharmacists Association (NCPA) directory of independent community pharmacies.[136] While nearly 200 pharmacies in Wisconsin were listed in their directory, email addresses could only be found for 123 of them.

Third, community pharmacists from a list of pharmacists that was compiled by Dr. Ford as part of a prior study were sent the email announcement to participate in the survey. This list, compiled from a directory of licensed pharmacies in Wisconsin, contained significantly more chain and mass merchandiser pharmacies than the NCPA directory. After deleting duplicates from the NCPA pharmacies, 427 additional email addresses were identified.

Individuals were eligible to participate in the study if they were a licensed and practicing pharmacist in the state of Wisconsin working in a community pharmacy setting. Participants were excluded if they primarily practiced as a pharmacist in a hospital setting. The exclusion criterion was evaluated at the beginning of the survey by self-report.

Survey participants who expressed interest in further sharing their perspective through an interview and provided contact information were invited to participate in the interview phase of the study via email and/or

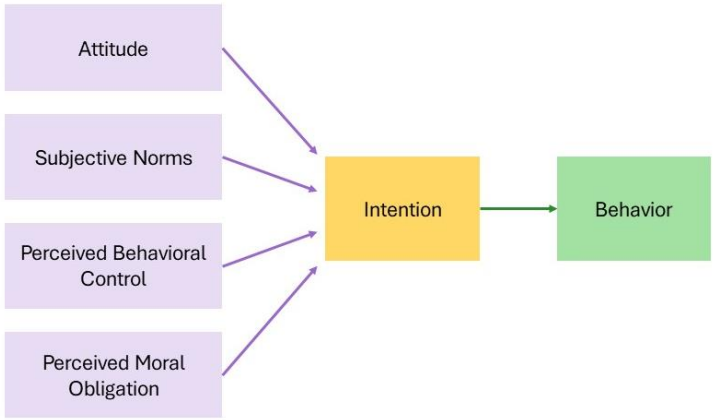
telephone call. Recruitment materials are presented in Appendix B. All participants gave their informed consent before they participated in each phase of the study. Study materials and methods were approved by the University of Wisconsin-Madison institutional review board.

4.3 Quantitative Methods

Data Collection

Surveys were administered via an online surveying platform, Qualtrics.[137] The survey consists of 20 questions that were primarily multiple choice, along with some short-answer responses. Questions were based off a validated, self-administered questionnaire that was guided by constructs from a modified Theory of Planned Behavior framework,[131] Figure 4.2. The original instrument was designed to predict community pharmacists' intention to provide pharmaceutical care services.

Figure 4.2: A Modified Theory of Planned Behavior Framework



Adapted from Rawy et al.[131]

We adapted the original instrument by replacing the pharmaceutical care services with five COPD interventions identified as appropriate and feasible for community pharmacists to perform (Table 4.1). A short description of each intervention was provided in the survey to ensure a consistent understanding of the interventions across participants.

Table 4.1: COPD Interventions	
Intervention	Description
Review the patient's medication profile	Assess the appropriateness of therapy, potential drug interactions, or adverse effects
Provide inhaler technique education	Ask patient to demonstrate how they use their inhaler, provide education on appropriate inhaler technique
Discuss pulmonary rehabilitation	Ask if patient has attended pulmonary rehab, provide information on pulmonary rehab, refer patient to local pulmonary rehabilitation programs
Provide vaccination services	Assess vaccination status, counsel on importance of regular vaccinations, provide vaccinations
Discuss smoking cessation	Assess patient's smoking status and nicotine dependence, counsel on smoking cessation products

The final survey which is available in Appendix C covered the following topics shown in Table 4.2.

Table 4.2: Survey Guide Content	
Survey Section	Description of Survey Content
A. Introduction	The survey opened to a description of the survey's purpose, eligibility, length, and confidentiality.
B. Screening	Participants were asked one screening question before beginning the survey to ensure that their primary practice site was relevant to the study. The screening question was: Do you primarily practice as a pharmacist in a hospital?
C. Intention	Intention was assessed on a sliding scale (0-100) based on the percentage of patients with COPD visiting their pharmacy within the next 30 days for whom they would expect to perform each intervention.
D. Subjective norm	Subjective norm was assessed on a sliding scale (0-100) based on the percentage of (1) patients with COPD who would like them to provide each intervention, (2) physician in their community who would approve of them providing each intervention, and (3) community pharmacists who provide each intervention to their patients with COPD.
E. Perceived behavioral control	Perceived behavioral control was assessed on a Likert scale based on how difficult it is for them to perform each intervention, ranging from "Not at all difficult" to "Very difficult."
F. Perceived moral obligation	Perceived moral obligation was assessed on a Likert scale based on the extent to which they are responsible to perform each intervention, ranging from "Not at all responsible" to "Very responsible."
G. Attitude	Attitude was assessed on a Likert scale based on how likely providing each intervention to patients with COPD in community pharmacies can result in (1) advancing the profession, (2) attracting more patients to the pharmacy, (3) an increase in patient trust in the pharmacist, (4) an increase in pharmacy revenue, (5) an improvement in their job satisfaction, (6) a significant benefit on patients' health outcomes, and (7) a patient's appreciation of the pharmacist's value. The scales ranged from "Not likely at all" to "Very likely."

H. Demographic information	The final section of the survey included questions about their workplace setting, characteristics of the participants, and interest in being contacted for an interview on implementation of COPD interventions.

Data Analysis

The analysis of survey results involved reviewing and cleaning the data, imputing missing data, and statistical analysis. Analyses were conducted using Stata Statistical Software: Release 17.0.[138]

Reviewing and Cleaning the Data

Survey responses that met the exclusion criteria or did not answer any questions were dropped from the analysis. The seven questions related to attitudes were averaged into one variable. Similarly, the three questions assessing subjective norms were averaged into one variable. As needed, variables were multiplied to be a score out of 100 to match the scale of the other variables. As perceived behavioral control was measured using a negative question ("How difficult is ___?), scores were subtracted from 100 so that higher values reflected higher control.

While the survey included five categories and an optional open response for the pharmacy setting, these categories were collapsed into (1) an independent community pharmacy, (2) a pharmacy that is part of a chain or a mass merchandiser, and (3) a pharmacy location in a clinic or affiliated with an HMO or a hospital. Results did not differ after collapsing these values. For linear regression, demographic variables were formatted as binary variables (e.g., Geographic location was represented as 1 = Rural, 0 = Urban; gender as 1 = Male, 0 = Female; highest degree as 1 = PharmD, 0 = Bachelor's; and pharmacy's counseling space as 1 = Private space available, 0 = No private space available).

Imputing Missing Data

For questions evaluating theoretical constructs, eleven variables (17%) had at least one missing response. Variables missing more than two responses were all regarding the discussion of pulmonary rehabilitation, an intervention that is outside of normal pharmacy practice. Missing values were imputed using mean imputation,[139] rounded to the closest value. Descriptive statistics before and after imputation

were evaluated to ensure results were not affected by imputation. Appendix D presents a summary of missing variables, their imputed values, and the means and standard deviations before and after imputation.

The following analyses were conducted for each intervention.

Descriptive Statistics

Descriptive statistics (mean and standard deviation) were calculated using the "summarize" Stata command for each construct (attitude, subjective norms, perceived behavioral control, and perceived moral obligation) across the entire sample and by individual COPD intervention.[140] Similar descriptive statistics were determined for the characteristics of the individual respondents for entire sample and for individual who responded only to the survey and those individuals who participated in the survey and interview.

We utilized either a t-test (age, experience) or a chi-square test (gender, degree, pharmacy setting, private space, and community setting) to determine differences between the respondents who completed both the interview and survey compared to the survey only. These tests were performed using the "ttest" and "tabulate twoway" Stata commands respectively and evaluated at a significance level of 0.05.[141,142] A subsequent exploratory analysis at a significance level of 0.10 was also conducted.

Correlation

Pearson correlations, using the "correlate" Stata command, were calculated to determine the strength of relationship between constructs from the Theory of Planned Behavior.[143,144] These constructs included attitude, subjective norms, perceived behavioral control, and perceived moral obligation. The correlation matrices were constructed for each of the five COPD interventions (Table 4.1). We then explored the degree of correlation (Table 4.3) for the Theory of Planned Behavior constructs for each COPD intervention.[144]

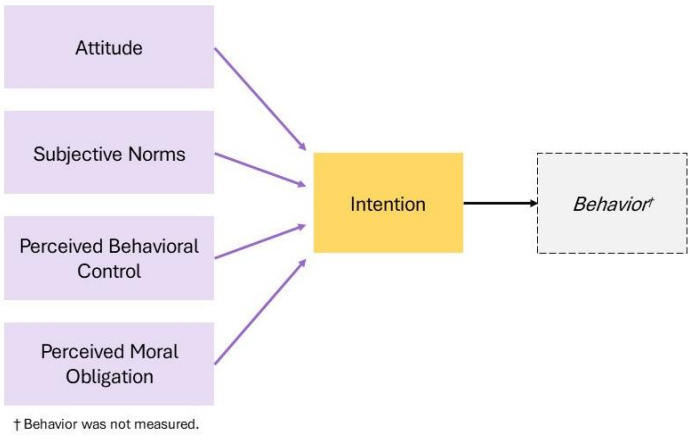
Table 4.3: Degree of Correlation

Degree of Correlation	Pearson Correlation Coefficient (r)	Coefficient of Determination (r^2)
Negligible	< 0.19	< 0.04
Weak	0.20-0.39	0.04-0.15
Fair	0.40-0.59	0.16-0.35
Moderate	0.60-0.79	0.36-0.62
Strong	0.80-1.00	0.64-1.00

Multivariate Linear Regression

The "regress" Stata command was used to perform ordinary least-squares linear regression of attitude, subjective norm, PBC, and PMO on intention to provide the intervention.[145] The basic model for the linear regression is presented in Figure 4.3. Actual behavior was not measured by the survey. Therefore, it was not included in the regression and has been grayed out in the figure.

Figure 4.3: Multivariate Linear Regression Model



The "stepwise" Stata command with significance set to 0.2 was used to identify any demographic factors that may affect pharmacists' intentions to provide COPD interventions.[146] Theoretical constructs were included as a "lockterm," forcing these independent variables to be included in the model. Additional predictor variables tested for model inclusion were having a private counseling space in the pharmacy, rural setting, working in an independent pharmacy, working in a pharmacy location in a clinic or affiliated with an HMO or a hospital, pharmacist gender, highest degree earned, and years of experience. Due to a very strong correlation between age and years of experience (r=0.97), age was not included in the stepwise regression.

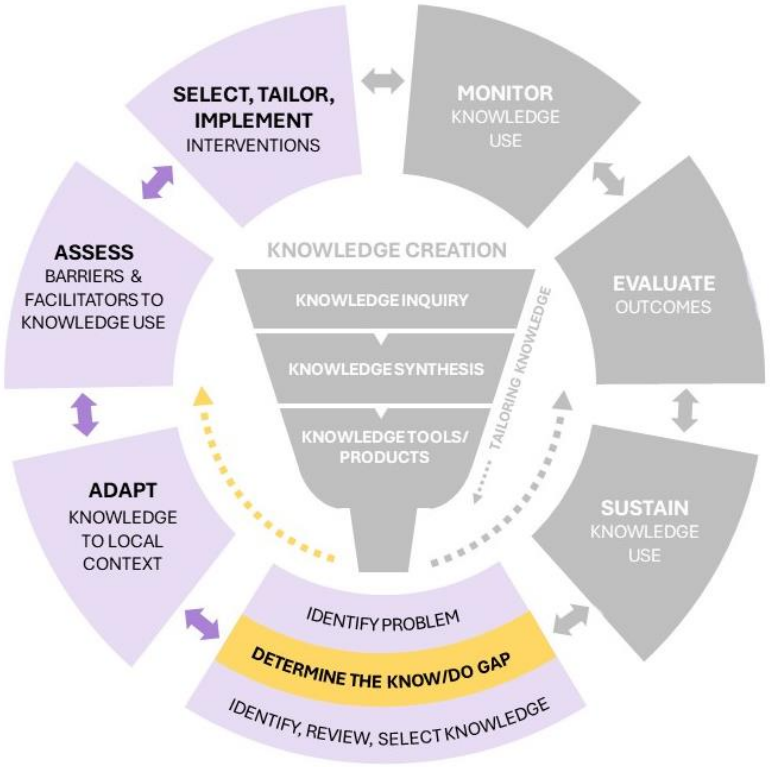
4.3 Qualitative Methods

Data Collection

The interview guide was developed using constructs from the Knowledge-to-Action (KTA) model,[132] shown in Figure 4.1. KTA was developed to help researchers conceptualize knowledge creation and

knowledge application. The action cycle of KTA is derived from theories and models of planned action, outlining how knowledge is integrated into practice. This cycle was the focus of our interview guide and analysis to help understand the provision of COPD interventions in community pharmacies to guide future implementation.[147] Specifically, questions focused on the following constructs: (1) determine the know/do gap, (2) adapt knowledge to local context, (3) assess barriers/facilitators to knowledge use, and (4) select, tailor, implement inventions (Figure 4.4). KTA components in gray were not a part of the analysis.

Figure 4.4: Constructs from Knowledge-to-Action Model Used in Qualitative Analysis



The full interview guide presented in Appendix E covered the following topics shown in Table 4.4.

Table 4.4: Interview Guide Content	
Interview Guide Section	Description of Interview Guide Content
A. Introductory Questions	The interview started by asking what comes to mind when they think of COPD interventions being performed within a community pharmacy followed by what barriers make it challenging for a community pharmacy to offer COPD interventions.
B. Current Practice	Pharmacists were asked what interventions are being performed where they work and how. The interviewer brought up the five interventions used in the survey phase of this study if the pharmacists themselves did not mention those interventions. For each

	intervention not being provided, pharmacists were prompted to explain why and whether there were any factors that would facilitate the provision of the intervention (e.g., training, materials, staffing).
C. Confidence	Pharmacists were asked how confident they were performing each intervention and why. If they reported moderate-to-low confidence, the interviewer probed to see if trainings would help improve their confidence.
D. Brainstorming Tailored COPD Interventions	Pharmacists were asked to imagine an ideal COPD service at their pharmacy and to describe the interventions they would include, what staff would be involved, and whether any changes would need to occur to provide or expand that intervention.
E. Barriers & Facilitators	After pharmacist described their ideal COPD service, they were asked about factors preventing them from providing or expanding the interventions included in their ideal service, as well as factors required for successful implementation.
F. Concluding Question	At the conclusion of the interview, pharmacists were asked if they had any advice to share for any pharmacist considering providing or expanding COPD-related interventions.

The interviews were conducted by the author who is a female, graduate student, and Doctor of Pharmacy with training in advanced qualitative design and methods. The researcher conducted semi-structured, virtual follow-up interviews with community pharmacists via a secure video meeting platform, Zoom. Before starting the interview, the researcher described the purpose of the interview, addressed any questions, and obtained consent. The interviews were recorded with participant consent using Zoom's recording function. Automated transcriptions were generated by Zoom following each interview. The researcher supplemented the Zoom data with field notes made during and immediately following the interview.

Transcripts were reviewed and edited by a member of the research team to reflect the audio recordings verbatim. Edited transcripts were verified by a second member of the research team using the audio recordings. New interviews were conducted until major themes were no longer emerging and new data become duplicative, indicating data saturation.[148]

Data Analysis

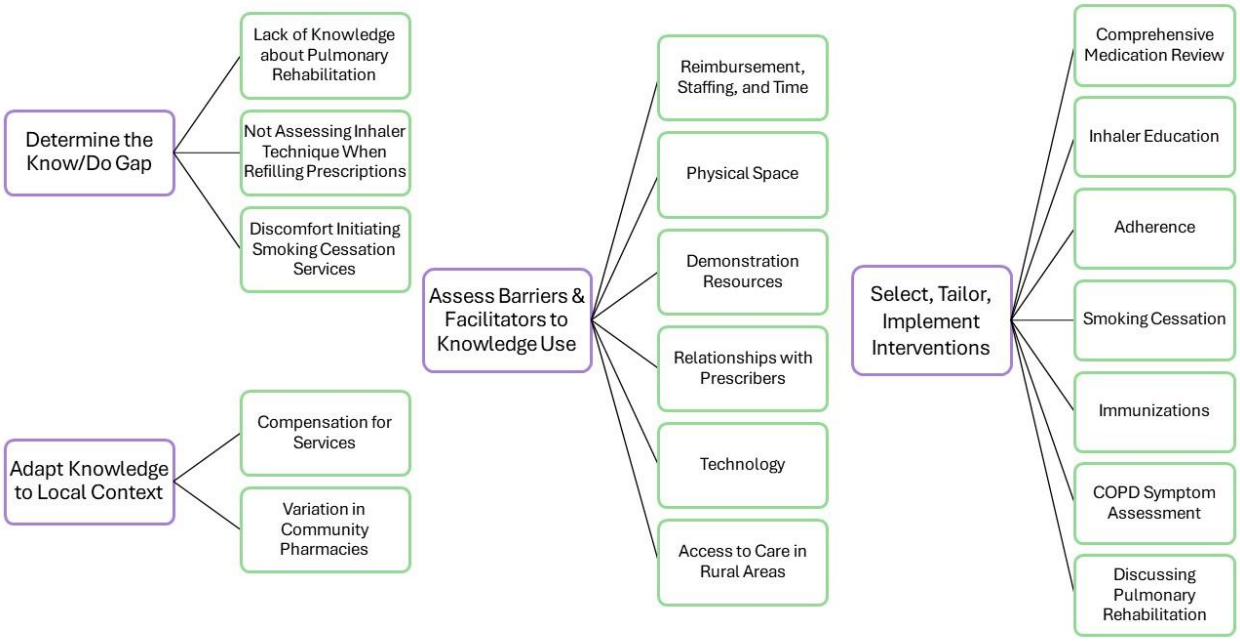
We conducted a deductive content analysis of community pharmacist interviews to explore their perspectives within the context of the Knowledge-to-Action model.[149] Deductive content analysis is used

to systematically describe a phenomenon with an existing theory or model.[150] Relevant constructs from KTA functioned as the main categories of our codebook. The codebook was iteratively modified as data was analyzed to ensure relevant data was captured consistently.[151]

Three researchers independently reviewed two of the interview transcripts for content and coded into the main categories, using a sentence as our unit of analyses. Afterwards, all coding discrepancies and codebook definitions were discussed until agreement was reached. The remaining transcripts were each independently coded by two interviewers. Discussions were held for each transcript, ensuring consensus was reached and that the codebook definitions consistently captured relevant data. When definitions were altered, previous interviews were reviewed and re-coded. The final codebook is presented in Appendix F.

Coded data were further organized in an unconstrained matrix, where similar ideas within each category were grouped and named using "content-characteristic words."[150] The final categorization is presented in Figure 4.5 as a coding tree.

Figure 4.5: Coding Tree



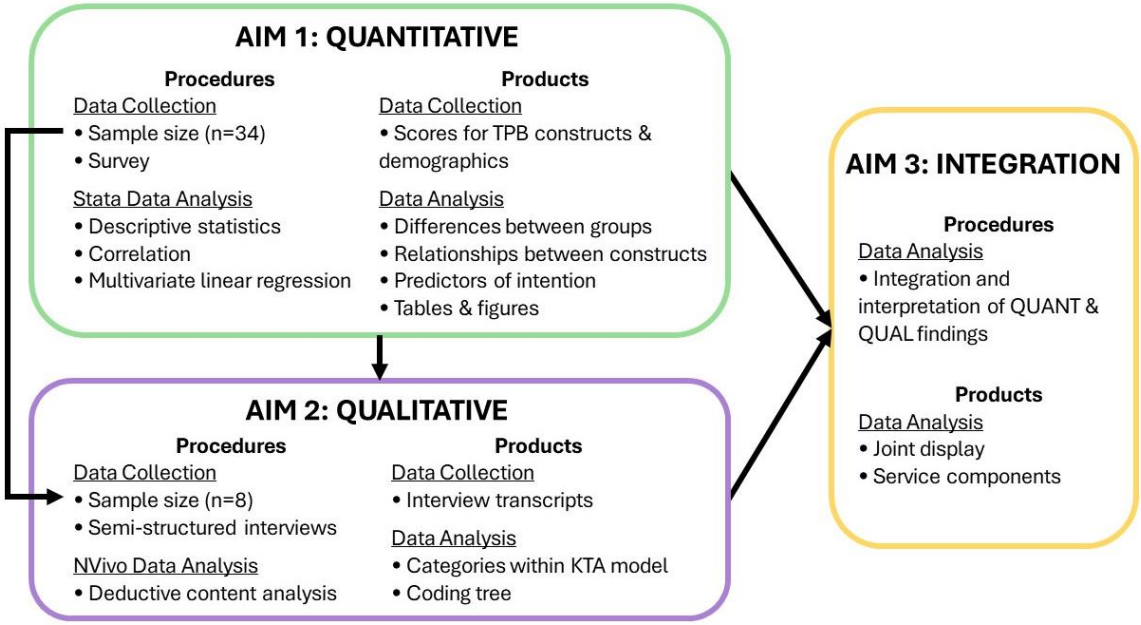
4.4 Integration Methods

Data Analysis

In this mixed methods study, data integration occurred at three levels using the principles described by Fetters, Curry, and Creswell (2013).[124] First, an explanatory sequential approach was used for integration at the study design level. After identifying pharmacists' intent to provide guideline recommended interventions for patients with COPD through our survey, interviews were conducted to better understand how and why pharmacists are or are not providing these interventions. Second, integration occurred at the methods level through merging qualitative and quantitative data together for analysis and comparison. Additionally, interview participants were selected from the population of survey respondents, connecting the sampling frame. Third, a joint display approach was used to integrate the data at the interpretation and reporting level. Through this approach, we brought the survey and interview findings together visually and drew out insights beyond those gained through the separate quantitative and qualitative analyses. The fit of data integration was assessed for confirmation, expansion, and discordance.[124]

Results from the quantitative, qualitative, and mixed analyses were brought together to identify the components of a pharmacist-informed COPD service for implementation in community pharmacies across Wisconsin. Interventions that pharmacists had intentions to perform in the survey, as well as additional interventions brought up by interview participants were outlined. Our mixed methods procedural diagram is outlined in Figure 4.6.

Figure 4.6: Procedural Diagram



CHAPTER 5: RESULTS

Chapter 5 presents the results of this explanatory sequential mixed methods study. First, quantitative survey findings of community pharmacists' intentions to provide COPD interventions are described. Second, qualitative interview findings of community pharmacists' perspectives on COPD management in their practice, their ideal COPD service, and materials and skills necessary to implement the service are explored. Third, results from data integration and the components of the community pharmacy COPD service are presented.

5.1 Quantitative Findings

This section provides the results from a theory-informed survey assessing community pharmacists' intentions to provide COPD-related interventions.

The recruitment announcement was sent to 795 pharmacists in the PearlRx network, 250 of which were community pharmacists. Recruitment emails were sent directly by the study team to 550 pharmacists. The response rate for the survey was 5.4% (n=43). Three participants were excluded at the eligibility question, and six surveys were opened with no response. 34 surveys were included in the analysis—21 were fully completed, and 13 had a partial response. Variables missing more than two responses were all regarding the discussion of pulmonary rehabilitation, an intervention that is outside of normal pharmacy practice. 18 survey participants agreed to be contacted for a follow-up interview. The interview sample (n=8) represents 24% of people who responded to the survey.

Descriptive Statistics

Table 5.1 presents the participant demographic characteristics. On average, pharmacists who participated in this study were middle-aged (40.5 years), female (58.8%), had a Doctor of Pharmacy degree (70.6%) and 16 years of experience. Most participants worked in an urban setting (73.5%) in an independent community pharmacy (52.9%) with a private counseling space (88.2%).

Table 5.1 also compares demographics for participants who completed both study phases (survey and interview) to those who only participated in the survey. No difference at a significance level of 0.05 existed

between the group of pharmacists who participated in both phases of the study (survey and interview) and those who only participated in the survey. At a significance level of 0.10, there was a difference in the community setting, with a larger proportion of pharmacists working in an urban area participating in the survey only. However, the study team purposively selected an equal distribution of pharmacists from urban and rural areas for the interviews to better understand differences in how COPD interventions are provided in these settings.

Table 5.1: Participant Demographics

	Survey + Interview (n=8)	Survey only (n=26)	All (n=34)	Statistical test
Age (years)	40.6 ± 13.8	40.5 ± 10.5	40.5 ± 11.2	t = -0.03 (p=0.98)
Pharmacist experience (years)	15.8 ± 14.6	16.0 ± 12.0	16.0 ± 12.4	t = 0.0564 (p=0.96)
Gender				$X^2 = 2.73$
Female	3 (37.5%)	17 (65.4%)	20 (58.8%)	(p=0.26)
Male	5 (62.5%)	8 (30.8 %)	13 (38.2%)	
Non-binary/third gender	0 (0%)	1 (3.9%)	1 (2.9%)	
Degree				$X^2 = 1.44$
Bachelor's degree	1 (12.5%)	9 (35.6%)	10 (29.4%)	(p=0.23)
PharmD	7 (87.5%)	17 (65.4%)	24 (70.6%)	
Pharmacy setting				$X^2 = 3.83$
Independent	6 (75%)	12 (46.2%)	18 (52.9%)	(p=0.15)
Chain or mass merchandiser	0 (0%)	9 (34.6%)	9 (26.5%)	
Located in a clinic or affiliated with an HMO or a hospital	2 (25%)	5 (19.2%)	7 (20.6%)	
Private counseling space				$X^2 = 0.0054$
No	1 (12.5%)	3 (11.5%)	4 (11.8%)	(p=0.94)
Yes	7 (87.5%)	23 (88.46%)	30 (88.2%)	
Community setting				$X^2 = 2.98$
Rural	4 (50%)	5 (19.2%)	9 (26.5%)	(p=0.085)
Urban	4 (50%)	21 (80.8%)	25 (73.5%)	

The following results are broken down by COPD intervention. The intervention descriptions provided to survey participants are outlined in Table 5.2.

Table 5.2: COPD Interventions	
Intervention	Description
Review the patient's medication profile	Assess the appropriateness of therapy, potential drug interactions, or adverse effects
Provide inhaler technique education	Ask patient to demonstrate how they use their inhaler, provide education on appropriate inhaler technique
Discuss pulmonary rehabilitation	Ask if patient has attended pulmonary rehab, provide information on pulmonary rehab, refer patient to local pulmonary rehab programs
Provide vaccination services	Assess vaccination status, counsel on importance of regular vaccinations, provide vaccinations
Discuss smoking cessation	Assess patient's smoking status and nicotine dependence, counsel on smoking cessation products

Descriptive statistics for the measured constructs from the Theory of Planned Behavior for each intervention are displayed in Table 5.3. Medication profile reviews had the highest values for four of the five constructs, indicating that it is most likely to be performed. Community pharmacists intend to conduct a medication profile review for 82.9% of patients with COPD visiting their pharmacy in the next 30 days. In contrast, they only intend discuss pulmonary rehabilitation with 13.5% of patients with COPD. Participant attitude scores suggest that all the interventions are at least "*likely"* to have a positive impact on seven measured factors (e.g., advancing the profession, attracting more patients to the pharmacy, patients' health outcomes, patient's appreciation of the pharmacist's value), and that providing immunizations, educating on inhaler technique, and reviewing the medication profile would "*very likely"* have a positive impact on these factors. Discussing pulmonary rehabilitation was seen as the most difficult of the interventions to perform, with the average perceived behavioral control score between *"somewhat difficult"* and *"difficult."* Additionally, pharmacists felt *"responsible"* or *"very responsible"* to perform each intervention, except discussing pulmonary rehab.

Table 5.3: Descriptive Statistics						
	Review the Medication Profile	Educate on Inhaler Technique	Discuss Pulmonary Rehab	Provide Vaccine Services	Discuss Smoking Cessation	Total
Intention	82.9 ± 22.9	50.3 ± 28.5	13.5 ± 16.1	57.1 ± 30.5	41.2 ± 31.5	49.0 ± 19.0
Attitude	81.3 ± 16.7	86.9 ± 15.1	70.4 ± 22.9	87.6 ± 16.6	79.1 ± 15.7	81.0 ± 15.6
Subjective Norms	82.1 ± 16.6	67.8 ± 19.4	37.1 ± 19.0	69.7 ± 19.9	59.1 ± 19.8	63.2 ± 13.9
Perceived Behavioral Control	67.1 ± 16.2	60.0 ± 17.8	30.6 ± 19.8	60.0 ± 20.3	50.6 ± 22.1	53.6 ± 12.4
Perceived Moral Obligation	96.5 ± 9.2	92.9 ± 11.9	50.6 ± 19.8	80.6 ± 21.2	75.3 ± 20.3	79.2 ± 10.7
Total	82.0 ± 9.5	71.6 ± 11.8	40.4 ± 13.1	71.0 ± 14.6	61.1 ± 14.3	

Correlation

Tables 5.4–5.8 display Pearson's correlation matrices between constructs from the Theory of Planned Behavior organized by COPD intervention. These constructs include attitude, subjective norms, perceived behavioral control (PBC), and perceived moral obligation (PMO). Overall, the theoretical constructs were weakly correlated with each other, with a few having fair correlations. The strongest correlation—which was still only a fair correlation—was that of perceived moral obligation and perceived behavioral control for immunizations, where 29% of the variability (r^2) in how responsible pharmacists felt to provide vaccines could be explained by how difficult it is to provide them.

Table 5.4: Correlation Matrix for Reviewing the Medication Profile				
	Attitude	Subjective Norms	PBC	PMO
Attitude	1			
Subjective Norms	-0.081	1		
PBC	-0.015	0.207	1	
PMO	0.302	0.368	**0.416**	1

Table 5.5: Correlation Matrix for Educating on Inhaler Technique				
	Attitude	Subjective Norms	PBC	PMO
Attitude	1			
Subjective Norms	0.213	1		
PBC	0.174	-0.065	1	
PMO	0.393	**0.430**	0.172	1

Table 5.6: Correlation Matrix for Discussing Pulmonary Rehabilitation				
	Attitude	Subjective Norms	PBC	PMO
Attitude	1			
Subjective Norms	0.184	1		
PBC	0.131	0.359	1	
PMO	0.394	0.327	0.384	1

Table 5.7: Correlation Matrix for Providing Vaccination Services				
	Attitude	Subjective Norms	PBC	PMO
Attitude	1			
Subjective Norms	**0.407**	1		
PBC	0.206	0.256	1	
PMO	0.318	**0.409**	**0.536**	1

Table 5.8: Correlation Matrix for Discussing Smoking Cessation				
	Attitude	Subjective Norms	PBC	PMO
Attitude	1			
Subjective Norms	0.343	1		
PBC	0.163	0.321	1	
PMO	0.316	0.340	0.249	1

Multivariate Linear Regression

Results from the multivariate linear regression of pharmacists' perceptions on their intentions to provide COPD interventions are presented in Table 5.9. The goodness of fit (R^2) of the regression models were relatively low, ranging from explaining 4.2% of variance in community pharmacists' intention to review the medication profile to explaining 23.2% of variance in community pharmacists' intention to educate on inhaler technique. Subjective norms were a positive predictor for pharmacists' intentions to educate on inhaler technique and to review the medication profile. Higher perceptions of moral obligation were associated with greater intentions to provide vaccinations and inhaler technique education.

Table 5.9: Multivariate Linear Regression of Intention to Provide Five COPD Interventions					
	Review the Medication Profile	Educate on Inhaler Technique	Discuss Pulmonary Rehab	Provide Vaccine Services	Discuss Smoking Cessation
Attitude	-0.03	-0.13	0.13	-0.26	0.30
Subjective Norms	0.48*	0.53**	0.16	0.30	0.40
PBC	-0.72	0.04	0.22	-0.04	0.02
PMO	0.31	0.80*	0.06	0.60*	0.23
Adjusted R^2	0.042	0.232	0.144	0.117	0.060

*p-value < 0.1, ** p-value < 0.05

The resulting models from stepwise linear regression examining factors that may influence pharmacists' intentions to provide COPD interventions are presented in Table 5.10. As pharmacists' perceptions of social pressure (subjective norms) increased, they had higher intentions to educate on inhaler technique and review the medication profile. Greater perceived behavioral control was associated with higher intentions to discuss pulmonary rehabilitation. Responsibility (perceived moral obligation) was positively associated with intentions to educate on inhaler technique and to provide vaccinations. Pharmacists that had access to a private counseling space had greater intentions to educate on inhaler technique and discuss pulmonary rehabilitation. Finally, with more years of experience, pharmacists have higher intentions to provide vaccinations.

Goodness of fit of the regression models improved with the addition of control variables for inhaler technique education, discussing pulmonary rehab, and vaccination services. The model with the best fit was again that of inhaler technique education; 31.3% of variance in community pharmacists' intention to educate on inhaler technique can be explained by Theory of Planned Behavior constructs and access to a private counseling space.

Table 5.10: Stepwise Linear Regression of Intention to Provide Five COPD Interventions					
	Review the Medication Profile	Educate on Inhaler Technique	Discuss Pulmonary Rehab	Provide Vaccine Services	Discuss Smoking Cessation
Attitude	0.02	-0.01	0.15	-0.32	0.28
Subjective Norms	0.47*	0.52**	0.17	0.42	0.38
PBC	-0.08	0.11	0.26*	-0.06	0.003
PMO	0.28	0.86*	-0.01	0.75**	0.23
Private Space		23.95*	17.50*	25.46	
Rural			9.45		
Years of Experience				0.93**	
Adjusted R^2	0.028	0.313	0.219	0.267	0.031

*p-value < 0.1, ** p-value < 0.05

Figures 5.1-5.5 provide a visualization of the stepwise regression models for the five COPD interventions with the mean scores and standard deviations included under each construct.

Figure 5.1: Pharmacists' Intentions to Review the Medication Profile

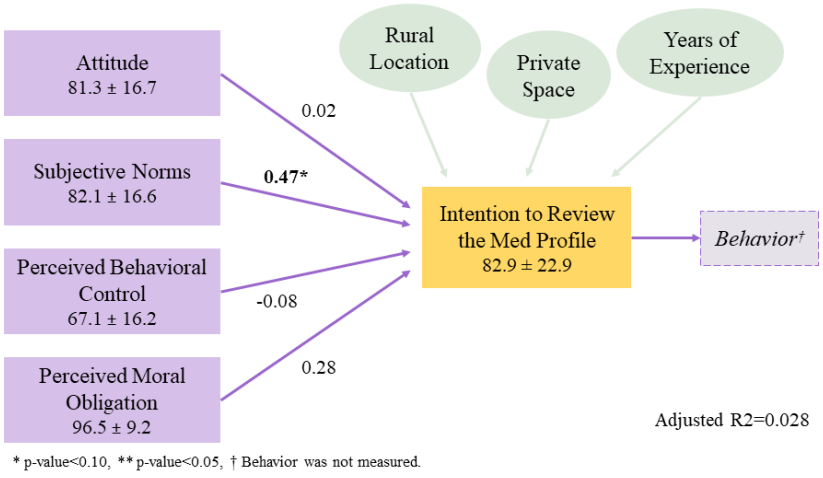


Figure 5.2: Pharmacists' Intentions to Educate on Inhaler Technique

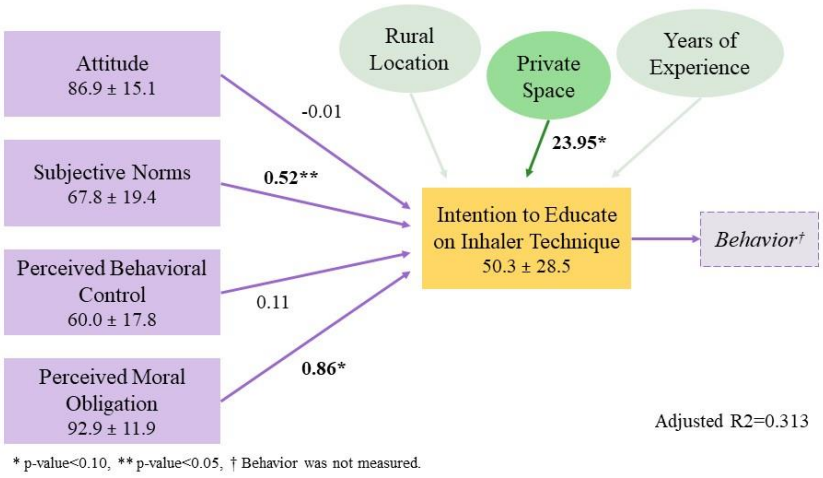


Figure 5.3: Pharmacists' Intentions to Discuss Pulmonary Rehabilitation

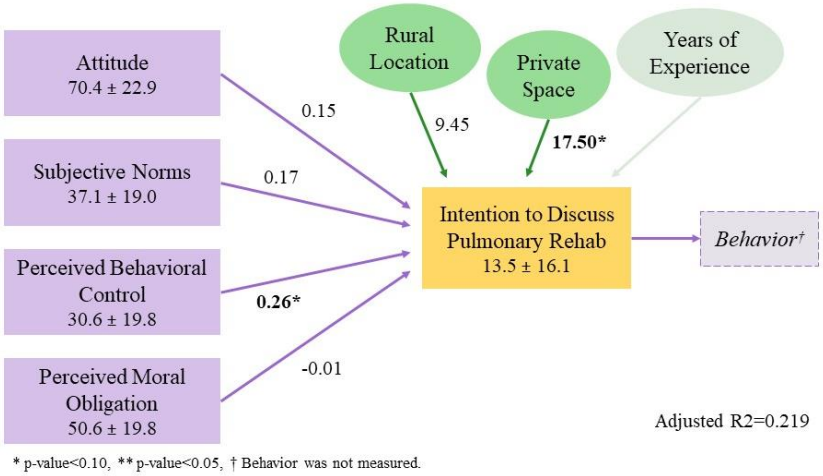


Figure 5.4: Pharmacists' Intentions to Provide Vaccination Services

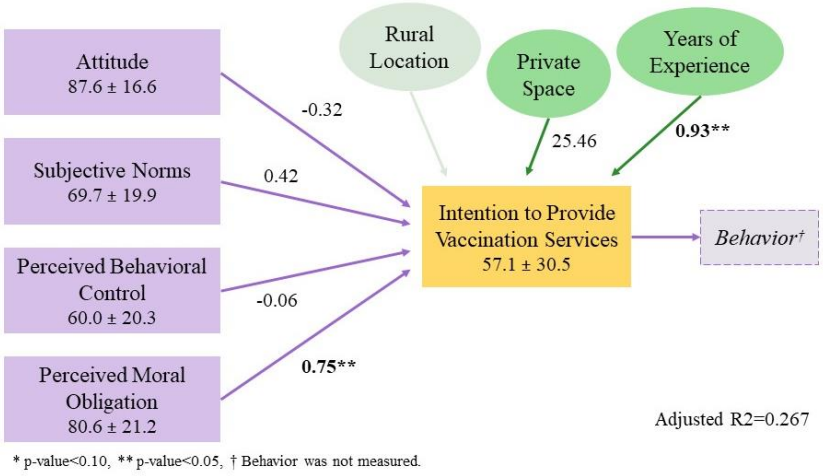
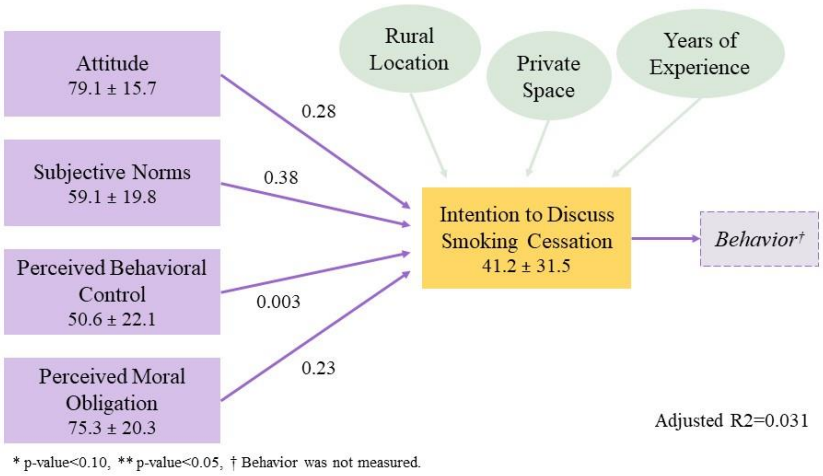


Figure 5.5: Pharmacists' Intentions to Discuss Smoking Cessation



Conclusion

The findings from the theory-informed survey conducted among community pharmacists shed light on their intentions to provide COPD-related interventions. The demographic characteristics of the participants revealed that, on average, the pharmacists were middle-aged, predominantly female, held a Doctor of Pharmacy degree, and had approximately 16 years of experience. The results indicated variations in intentions across different COPD interventions, with medication profile reviews being the most likely to be performed and discussions about pulmonary rehabilitation being the least likely. Descriptive statistics, correlation matrices, and multivariate linear regression analyses provided insights into factors influencing pharmacists' intentions, including subjective norms, perceived behavioral control, perceived moral obligation, access to a private counseling space, and years of experience. The models demonstrated varying degrees of explanatory power for different COPD interventions, with inhaler technique education showing the highest explained variance. Overall, these quantitative findings contribute valuable information for understanding community pharmacists' intentions and drivers of intention for five evidence-based interventions for COPD management.

5.2: Qualitative Findings

Eight community pharmacists across Wisconsin were interviewed to explore their perspectives on COPD management in their practice, their ideal COPD service, and materials and skills necessary to implement the service. Participant demographics are shown in Table 5.11.

Table 5.11: Interview Participant Demographics	
Age (years)	40.6 ± 13.8
Pharmacist experience (years)	15.8 ± 14.6
Gender	
Female	3 (37.5%)
Male	5 (62.5%)
Non-binary/third gender	0 (0%)
Degree	
Bachelor's degree	1 (12.5%)
PharmD	7 (87.5%)
Pharmacy setting	
Independent	6 (75%)
Chain or mass merchandiser	0 (0%)
Located in a clinic or affiliated with an HMO or a hospital	2 (25%)
Private counseling space	
No	1 (12.5%)
Yes	7 (87.5%)
Community setting	
Rural	4 (50%)
Urban	4 (50%)

The qualitative results are presented across four domains. The first domain, Determine the Know-Do-Gap, focuses on current practices reported by pharmacists that do not align with GOLD guideline recommendations. The second domain, Adapt Knowledge to Local Context, describes how contextual features of the health care environment potentially impact a community pharmacy COPD intervention. The third domain, Assess Barriers/Facilitators to Knowledge Use, describes factors that hinder or enhance the provision of COPD interventions by community pharmacists. The fourth and final domain, Select, Tailor, Implement Interventions, is associated with the planning and execution of interviewees' ideal COPD service and tailoring the selected interventions to fit the audience and context. Pharmacists provided

wonderful detail in the interviews, not all of which fit into the main text. Additional quotes from the interviews are presented in Appendix G.

Determine the Know-Do Gap

Pharmacists described gaps for three of the five surveyed interventions during their interviews: lacking the knowledge needed to discuss pulmonary rehabilitation, rarely assessing inhaler technique when dispensing refills, and discomfort initiating conversations on smoking cessation.

Lack of Knowledge about Pulmonary Rehabilitation

Across most of the interviews, pharmacists reported having minimal to no knowledge about pulmonary rehabilitation and were not discussing the service with patients.

> *"I've seen it in people's charts that they have gone to it. They'll say that it worked well for them. But I don't know that I've ever actually talked to them [about it] or recommended it, probably something I should be [doing]."* – RPh 7

> *"I would say, one of the barriers to that would be a lack of awareness and lack of understanding of the options that are available, and how we would even refer a patient to that [pulmonary rehab], or what kinds of discussions would even necessarily be had with the patients. Because to be totally honest, I don't even actually know what happens in a pulmonary rehab session. I find it very interesting, but definitely never something that I have heard of or seen in the community pharmacy setting."* – RPh 3

The absence of knowledge of pulmonary rehabilitation represents a COPD treatment gap. Specifically, the GOLD guidelines suggest that the core components of pulmonary rehabilitation—which include exercise training combined with disease-specific education—improve exercise capacity, symptoms, and quality of life across all grades of COPD severity.

Not Assessing Inhaler Technique When Refilling Prescriptions

The GOLD guidelines state that inhaler technique should be assessed at every opportunity to ensure the medication is being delivered to the lungs. While pharmacists regularly counsel patients on inhaler technique for the first prescription, follow-up counseling is often initiated by the patient.

"The physical demonstration part isn't repeated unless they [the patient] express some difficulty getting a dose or mentioned there's something that confused them about the device. … Then we'll go back into that demonstration step." – RPh 6

This practice may be explained by state law, which does not require counseling on refill medications.

"We do counseling based on the Law of Wisconsin, and that recently changed from previous practice. We need to counsel on new medications, we need to counsel on medication changes if we feel it's appropriate, and we need to counsel on refills if we feel it's appropriate. So, all new inhalers are counseled on and education is provided on how to use that inhaler. For refills, there may be less counseling and more on the patient to ask questions." – RPh 1

Additionally, some pharmacists noted the large number of available inhaler devices that require different techniques. Pharmacists identified this as an area of potential improvement in their practice.

"I think there's always a chance for me to improve, and especially with new inhalers coming out. I might not know the best possible in healing for the patient, just because I haven't learned them all." – RPh 1

"I do have to account for cleaning out the metered dose inhalers. I often have to look at which one's you rinse, which one's you wipe." – RPh 2

Discomfort Initiating Smoking Cessation Services

GOLD notes that smoking cessation is key when helping patients with COPD as smoking has a negative impact on prognosis and progression of COPD. While many interviewed pharmacists seemed to be confident with discussing nicotine replacement therapy (NRT), few were as comfortable initiating conversations about smoking cessation with patients.

"So that one I'm probably a little bit less confident of, just because it's not something we do very often. I can do a new patient type of consultation [for NRT] where we talk through what side effects you should expect, and when you should expect to be done smoking. How do you apply a patch. How do you park gum, or lozenges, or side effects to expect. But after that … I'm not as confident in [talking about NRT]." – RPh 3

"As long as someone comes and asks me for help, I feel even more confident with it. Talking to those patients that have bad cases of COPD and you see them smoking, I'm just not wanting to say, "Should we talk about your smoking?" or to bring it up without being asked." – RPh 4

Some pharmacists noted that they felt their patients that smoke may not be interested in hearing from them about smoking cessation services or that it is not their place to bring it up.

"I maintain my philosophy as the pharmacist that I'm not gonna preach or tell people what they should do or shame them for doing something that is a life decision or situation that they ended up in." – RPh 3

"Personally, I don't always feel that comfortable trying to help people with that, because I feel like people that smoke, they know that they shouldn't smoke. I'm just another person telling them, 'Oh, you shouldn't smoke.'" – RPh 5

Adapt Knowledge to Local Context

As community pharmacies are not the traditional setting for clinical COPD interventions, services should be adapted. Interviewees described important contextual features of this health care environment that affect the feasibility of interventions: how pharmacies are compensated for services and the differences between types of community pharmacies.

Compensation for Services

The feasibility of interventions in community pharmacies is intricately tied to the evolving landscape of provider status and reimbursement models. Pharmacists require a strong understanding of reimbursement processes across a variety of insurances to ensure they are compensated for the care they provide.

"With CMRs (comprehensive medication reviews), there's only certain insurances that will pay for it. Medicaid is a big one, and some of the Medicare plans, but if patients have commercial insurance, they won't always pay. ... If it is Medicaid, they have to have a certain number of prescriptions. So if COPD is the only disease state that they have, and they're only on one inhaler, then they might not qualify." – RPh 7

"There are some insurers in the state of Wisconsin, Navitus has reimbursements for inhaler education. They're one of the few ones that I know." – RPh 6

Pharmacists adopt creative strategies to secure compensation for clinical services, such as collaborating with other providers to bill through medical insurance instead of pharmacy insurance.

"Either medical billing or pharmacy billing probably, depending on their insurance. ... We're working on getting a medical billing set-up in a community pharmacy. If that is set up, and we are able to medically bill that patient's insurance, that'd be the first step. ... One thing that we always talked about is [that] you don't

have to have billable insurance for all the services that you have. And so, if you wanted to start a service like this, you could do a cash-based model." – RPh 1

"Now that we have a nurse practitioner as a part of our practice, we can actually bill for things that pharmacists typically cannot. ... We provide the service and then the provider bills it through their different coding systems. … Through that collaboration, we are able to by-pass PBMs [pharmacy benefit managers] and processing as a prescription—we can process as a service." – RPh 4

Wisconsin Medicaid recently added pharmacists to the list of recognized health care providers. This optional provider status will allow pharmacists to bill Medicaid for specific services, increasing the sustainability and success of clinical services in community pharmacies.

"I'm hoping we can do more services once we get the provider status in place next year." – RPh 7

"I don't know what's going to become of the provider status with Medicaid and how that's going to move into other payers. I think that would give some independence and autonomy and could promote things more, because right now I have to go through providers and get referrals." – RPh 2

Variations of the Community Pharmacy

Pharmacists described differences in service provision based on where they are practicing. Pharmacists highlight the advantages of being located within a clinic, hospital, or health system, where partnerships with other health care professionals are more convenient due to proximity and ease of communication. Additionally, these pharmacies may have greater access to resources, protocols, and support systems, influencing the feasibility of implementing clinical services.

"We're in a hospital outpatient pharmacy, so we have clinics and the discharge program on site. ... I work with a lot of our family care center and internal medicine doctors pretty closely. … I'm either secure chatting them or messaging them. If they have ideas, it's a little bit easier for them to come to us and say, 'This is what I'm thinking. This is the idea that I had. What do you think about this?' Those are partnerships that are a little bit easier." – RPh 3

"I would think someone located within a clinic would have more of that ability to do that [discussing pulmonary rehab] … just based on protocols that maybe the hospital has. …. But truly, for an independent pharmacy, that would be a little bit out there for us." – RPh 4

Independent community pharmacists emphasize unique aspects of their practice, such as developing close relationships with patients and being easily accessible. Frequent informal interactions are seen as a key factor in initiating interventions and gathering information for patient care.

> *"Seeing patients at a weekly, monthly basis I develop relationships with them. They're not only patients, they almost become family or friends. You know the ones who are having more issues. I feel it's easier to talk to them versus someone who makes an appointment to come see someone—as opposed to chewing the fat with someone who just comes in. We have patients who come into the pharmacy to just shoot the shit some days. That's why I think independent pharmacy is such a great place for drawing in this information, to make people feel healthier by the ability of what we do every day. A chain pharmacist doesn't have the time to do this. A clinical pharmacist working at a clinical setting doesn't have the time to do this. We're unique. You can walk in and talk to us anytime; you don't have to make an appointment. So, I think any interventions start with us. Based on what information a physician is looking for, we report that back to them in an email or via whatever media we need to do that for them."* – RPh 4

Pharmacists working in chain or mass merchandiser pharmacies may be burdened with additional responsibilities without a corresponding increase in staffing.

> *"That's a whole other thing with the CVS's and Walgreens. ... They end up dispensing just as much, but then they have all these other jobs that they do on top of that without necessarily getting more staffing. The corporations seem to look at it [implementing clinical services] as another revenue stream, but they don't want to up their staffing to make up for it."* – RPh 2

These features of different community pharmacy settings highlight the importance of local context when designing clinical services.

<u>Assess Barriers & Facilitators to Knowledge Use</u>

Pharmacists described various factors that affect their ability to provide clinical interventions for their patients with COPD. These include reimbursement, staffing and time; physical space; demonstration resources; relationships with prescribers; technology; and reduced access to care in rural areas.

Reimbursement, Staffing, and Time

Insufficient reimbursement represents a significant obstacle for pharmacists in providing essential services, including routine inhaler device education, tobacco cessation intervention and appropriate patient follow-up discussions. Pharmacists are tasked with a multitude of pre-existing daily responsibilities, rendering the delivery of additional services challenging, as it requires diversion from a pharmacist's routine workflow. Executing such services without adequate reimbursement, despite utilizing time, staffing and resources, may potentially place the pharmacy at a financial deficit in delivering these essential services.

"The thing that pharmacies struggle with in providing or implementing services is reimbursement. ... To pull a health professional out of their typical workflow setting, and then spend additional time doing that [service], there's a financial cost to it." – RPh 6

"Commercial insurance … won't always pay for [a comprehensive medication review], so we're not able to set aside that time." – RPh 7

Insufficient reimbursement limits the pharmacy's staffing capacity and time pharmacists have to effectively perform pharmaceutical services.

"I think patients would be very receptive to a service like this. But we can't do the service for free because we don't have enough staff to do the service for free. If we got reimbursed some amount of money, we could then look to hire more people so that we can do the service ongoing." – RPh 1

Staffing issues reduce the time pharmacists can dedicate to quality interactions with their patients. Therefore, performing regular clinical interventions for patients with COPD may not be feasible for pharmacies with significant staffing issues.

"If one of the other pharmacists is out, then I try to make sure that my clinical services time is reduced quite a bit on those days." – RPh 2

One pharmacist did note that independent pharmacies had better staff coverage than large chain pharmacies, allowing them to dedicate more time to interventions.

"We're a[n independent] pharmacy so we do have a little bit higher staffing compared to a Walgreens or something like that. We are still able to take more time to help with the inhalers or look at adherence [using] refill history. … But still, obviously time can be a barrier." – RPh 5

The incorporation of students and residents into the daily workflow helps make these services more feasible. The additional support may allow the pharmacist more flexibility to step away and provide these services to patients. Students can provide select interventions themselves or under the supervision of the pharmacist.

"I'd be willing to let them [students] take on doing nicotine replacement discussion or maybe even the inhalers—with or without supervision depending on what year they were in." – RPh 8

"We definitely include students on that [consults] as well as our CMR, once they feel comfortable doing that, throughout their rotation." – RPh 7

Physical Space

Adequate physical space is crucial for pharmacists to provide additional services. Pharmacists expressed that a separate, distraction-free environment was beneficial for patients to comfortably express their concerns and ensure privacy expectations are upheld.

"Having that dedicated space, it helps because it segments you from the distractions. I can be in the middle of providing great education to somebody and they get interrupted a few times. … It disrupts their [the patient's] thought process, how they're absorbing that information, and how they're taking it in. Whereas, if I'm there, they have undivided attention. It can only help provide better care, better education." – RPh 6

"It's definitely great to have that separated consultation room where we can give immunizations, do more in-depth consultations to give that patient a little bit of extra added privacy. Having that designated space where you can sit down with a patient, and you're not being interrupted by other things." – RPh 3

One pharmacist noted the importance of adequate air circulation for some COPD interventions, such as spirometry, a common, non-invasive diagnostic test used to assess lung function and measure the amount and speed of air that can be inhaled and exhaled.

"I always have to go to a different room to do Spirometry. We don't have any negative pressure rooms which would be ideal. But at least if I have a room that has circulation, that's better than this." – RPh 2

Demonstration Resources

Demonstration inhalers allow pharmacists to physically show the technique to the patient, enhancing the education they can provide. Videos and handouts were also recommended by pharmacists to aid in inhaler education.

> *"I would say most often we are doing device teachings on inhalers. We do have demo inhalers … for all of them. When patients come in, we can show them exactly what it looks like when they're going to take it home so they can see it. ... Those demo inhalers have been lifesavers for teaching a patient and sharing with a patient how to use or even clean their inhaler."* – RPh 3

> *"I have a couple YouTube videos that I just show them. I found that when I demonstrate it, I'm doing it by memory, and I don't do it the same every time. I'll miss something every once in a while. It's more consistent using the video."* – RPh 2

Relationships with Prescribers

Phone calls and faxes are still the primary means of contacting a provider. This can be time-consuming and may lead to delays in getting essential medications for patients.

> *"We are still usually either calling or faxing prescribers. We do have access to Epic for 3 major health systems, which has been nice. We can read all their notes. We just cannot send messages in Epic, so we either have to call or fax."* – RPh 7

> *"I'll call and try and leave a message for the provider, or we send off a fax where we write down which ones were preferred and hope that the doctor sends it back to us."* – RPh 8

Pharmacists emphasized the importance of establishing a good relationship with local clinics. These relationships help pharmacists receive timely responses and enable smooth transitions in patient care.

> *"The most helpful thing is that since we have a pretty good relationship with the clinic, we're able to call and talk to the providers. ... That way [the patient] gets something they can afford and something that also controls their symptoms, or even help them if they're having a little bit more of an exacerbation."* – RPh 8

Collaborative practice agreements (CPA) serve as key facilitator to providing clinical services in community pharmacies. The protocol allows pharmacists to provide specific patient care services and enables them to take proactive steps in patient care. Pharmacists mentioned having CPAs to dispense

nicotine replacement therapy, albuterol inhalers, and naloxone for opioid overdose (which is now an over-the-counter medication), provide vaccinations, and switch medications.

> *"Our pharmacy has a collaborative practice agreement to dispense nicotine replacement. Not all pharmacies do, but they may. If they don't, they might recommend it, or reach out to the provider to see if they'll send a script to kind of go around that."* – RPh 1

> *"We created a collaborative practice agreement, so that we can dispense albuterol inhalers for patients who maybe have a hard time getting into see their prescriber. ... We have the ability to get that person through with a rescue inhaler until they can either see their primary care doctor again, or just replace an expired inhaler."* – RPh 1

> *"We have a collaborative practice agreement for Narcan. ... We have a collaborative practice agreement to give any vaccine within the scope of the CDC and ACIP recommendations."* – RPh 3

> *"If we can, we'll proactively switch it [the inhaler prescription] to something and then send a notification to the provider on the CPA."* – RPh 8

Technology

Leveraging dispensing software and having access to electronic health records aids in delivering clinical services. Dispensing software can assist in proactively identifying nonadherence and potential points of intervention for patients.

> *"I have a pretty good pharmacy dispensing software that allows me to look back at medication possession ratios and gaps. I can use that as a clue for potential talking points to try and hit home, where I discuss how COPD is progressive and with exacerbations, that's the biggest drop in lung function that you will get."* – RPh 8

When providing clinical interventions in community pharmacies, access to the electronic health record provides pharmacists will vital information on the patient's medical history, including lab values and notes from providers, which can inform pharmacist's clinical decision-making and smooth transitions in care.

> *"I would really love to have access to patient charts. ... Seems like everyone else in health care has access to that information but us. I get a prescription for a drug, and I just assume that's typically what the drug is*

used for. Many drugs can have many different uses, so talking to the patient is usually the only way I get access to know why it's being prescribed." – RPh 4

Pharmacists who have access to the EHR also described it as a convenient means to communicate with prescribers.

"We are on Epic, and we have a secure chat function that allows us to directly like instant message the doctors." – RPh 3

The current process for assessing immunization status in community pharmacies is lacking. Pharmacists need to check and update the Wisconsin Immunization Registry (WIR) as part of the vaccination process. However, this process is often not integrated into their software, requiring them to open the program separately.

"Sometimes, it is not feasible to jump from one interface system to another, look somebody up, see where they're at, assess that. It's tough. ... I don't otherwise have an interface that tells me as I'm working through a patient's profile, 'Hey, this person would benefit from a Prevnar. They could use a PNEUMO 23. They haven't had this. They haven't had that.'" – RPh 6

Access to Care in Rural Areas

Pharmacists noted that while rural areas have a higher prevalence of COPD, there are not enough services available for patients with COPD in these areas.

"I have probably a higher percentage of COPD patients than I would see in a metropolitan area, because of the age demographic and the culture that existed in these particular communities, which is probably pretty common throughout rural Wisconsin." – RPh 6

"I'm confident in it [discussing pulmonary rehab]. I often don't bring it up, though, because it's not available. I'll just talk about [it as] an activity that they can maybe do." – RPh 2

"We've got a pulmonologist that bounces between a bunch of clinics. If it wasn't for the fact that I finally talked to him for the first time in 5 years, I would have said he doesn't really exist because he's so hard to get a hold of." – RPh 8

Select, Tailor, Implement Interventions

In the interviews, pharmacists expressed interest in providing a range of interventions. They discussed five essential components of their ideal community pharmacy COPD service as well as two possible interventions that should be explored further. The service should include (1) comprehensive medication review, (2) inhaler education, (3) adherence-related interventions, (4) smoking cessation consultation, and (5) immunizations. Additional interventions could include (6) COPD symptoms assessment and (7) discussions of pulmonary rehabilitation.

Comprehensive Medication Review

Pharmacists described a patient-centered, systematic, and comprehensive approach to their ideal COPD service within the framework of repeatable, structured appointments integrated into existing pharmacy services. They emphasized the importance of establishing follow-up checkpoints based on the individual patient's clinical needs to provide the ongoing care that is essential for COPD management.

> *"One of the main things I think about is having reoccurring appointments with the patients. Whether that be once a month, once a quarter, depending on how often they need it. ... In an ideal world we would be able to bill for these appointments as often as we need to. Where we could really dig into inhaler technique, making changes, following up—whether it be questions on how their COPD is doing, or if there is some objective measure that we could measure—smoking cessation, providing vaccines, a comprehensive COPD service with everything in it that we could do pretty regularly with patients to follow up with them."* – RPh 7

Pharmacists suggested packaging the service within a comprehensive medication review (CMR) or medication therapy management (MTM), as these are billable services that cover a wide range of pharmaceutical care interventions and could be used as a platform to address all aspects of COPD during one-on-one time with patients.

> *"That's obviously just one-on-one time—everything can be addressed in that time with the patient with the CMR. ... Checking the immunization status, checking the adherence, making sure they're on appropriate medications specifically for COPD. ... Because sometimes the guidelines will change a little bit, too. So, getting that updated. The inhaler technique because they'll usually bring in all their medications so I can physically see how they use it."* – RPh 5

"We pull together a list of all the medications that we are filling for the patient. We go through and double check that list with the patient. We ask them if there's anything that we missed, including OTC medications, supplements, all that stuff. Then, we talk about how they're using the inhalers and how they think it's working for them, and any side effects of that as well." – RPh 7

Inhaler Education

All interviewees described new inhaler education as a standard of practice. Education often includes inhaler technique, medication purposes, expectations, and potential side effects. When dispensing refills, pharmacists can inquire on the medication's effectiveness, answer questions, request the patient demonstrate or verbally describe how they have been using their inhaler, and intervene when issues arise.

"When I go up to counsel on an inhaler, I usually ask patients how it's working for them. If they say it's not working, then we can step in, make an intervention right there and talk about that, or set up a separate time to talk. Especially if they're getting an albuterol inhaler, and they're using that more often than they should be, that's a good time for us to pause, dig a little bit deeper, and learn more." – RPh 7

Pharmacists reported the use of a teach-back method to educate on inhaler technique. They first demonstrate how to use the inhaler to the patient, using a demo-inhaler or the patient's inhaler. The pharmacist then asks the patient to demonstrate how they will use the inhaler, helping pharmacists to identify any issues and provide facilitating feedback. This hands-on approach allows patients to actively participate in the learning process.

"Another part of it is technique. There are a lot of different inhalers that have different mechanisms. Demonstrating and showing how to appropriately use that device that we happen to be consulting on or happen to be dispensing, that's another obviously important role that we play in the management of individuals' COPD. ... Each individual that picks up [an inhaler] has face-to-face interaction with me. It usually centers around either, show and tell or a rundown of what we've got, and if I have any other education points or compliance things to address or anything. That happens at that time of pickup. That's typically where we intervene. ... We get their actual inhaler out and then show them by a mock demonstration of it. ... I hold it in my hand, show them, and explain the technique [for] it. Then [I] turn it around, have them explain it, and ask them to do it in front of me." – RPh 6

Visual resources, such as handouts and videos, may also be used to ensure the education is accurate and to aid patient comprehension.

> *"We print off those handouts. I'd go through our technique on the handout together, so I'm not miscommunicating between all the different inhalers and all the different little caveats that the manufacturers put out there."* – RPh 2

For the COPD service, RPh 1 suggested offering this education as a "first dose consultation," which would involve having patients perform the first dose under supervision, instead of doing a mock dose.

> *"What I'm thinking is that you would do the first dose consultation where the patient actually does their first dose in the private room. Then you do that every time they pick up, so that you know the patient has started the inhaler and when that inhaler is going to either expire or be used up depending on what they're using. That way you can really get that feedback to the patient and say, 'Hey last month we started your inhaler in the pharmacy, and now we're on this month you should be out.' And if that person says, 'Well, I have 10 doses left.' Then you can start thinking about adherence, and why that person didn't use all their medication when they should have."* – RPh 1

Adherence

Pharmacists utilize various methods to assess adherence. Interview participants reported leveraging electronic systems to monitor adherence. They review the patient's medication fill history (when they pick up their medication from the pharmacy and the days supply) to identify possible gaps where patients may not have any medication available.

> *"Looking at fill data, you compare when they picked up the medication to the day supply for the medication. So, for an example, if someone picked up a medication 34 days ago but it's a 30-day supply, did we miss 4 days? Did you have extra from a previous pharmacy?"* – RPh 1

> *"We're looking at compliance, at last fills, at three-month opportunities, to help either save them some money in those three-month opportunities or increase compliance, reduce the number of trips to the pharmacy, all that. There are certain things I'm looking for when it's a routine fill."* – RPh 6

For patients with COPD specifically, a main concern is ensuring patients use their scheduled maintenance inhalers regularly and distinguishing them from as-needed inhalers.

"Adherence would be the main focus—making sure patients are using their scheduled maintenance inhalers regularly and their PRN ones as needed instead of vice versa." – RPh 5

Pharmacists will engage patients in conversations about their medication adherence during prescription pickups or CMRs. By asking patients about their medication usage, pharmacists explore potential reasons for non-adherence, such as side effects, cost concerns, or forgetfulness. These efforts help pharmacists understand the underlying issues affecting adherence and offer relevant solutions.

"Just try to find out why. Is it because the medicine is too costly? They're only using it once a day as opposed to twice a day to have it last longer. Address any cost issues. Or remembering to use it; try to give tools for that, like an alarm on their phone. Those are probably the most common adherence issues, forgetting or because of cost or side effects. If they have a bad side effect, try to address that." – RPh 5

Pharmacists recognize the cost of inhalers as a significant adherence barrier for this patient population. Cost-reducing interventions that pharmacists utilize for patients include finding therapeutic equivalents with better coverage or lower prices, prior authorizations for medications not covered by insurance, contacting physicians to explore alternative medications, and checking for coupons or manufacturer copay cards.

"Another big thing that we do is make sure that patients can afford them. Compliance correlates to whether individuals can afford, understand, and use the appropriate inhalers appropriately. [We are] finding products that are affordable that match the needs of the patient." – RPh 6

"If we are recommending a new inhaler—usually because they are brand name nowadays—we do try to run a test claim before to make sure that they're covered by their insurance. I'm not going to recommend this other inhaler and then they can't get it because it's $500." – RPh 7

Automatic refill programs and medication synchronization programs are employed to enhance efficiency and reduce the need for frequent trips to the pharmacy. Pharmacists encourage patients to enroll in these programs to streamline medication management.

"We have a majority of our patients on med-sync, like 75%. It's easier for the patients, but it's also easier for us in the pharmacy to do it that way. A little bit of work ahead of time getting them set up, but then we're

taking less phone calls for refills, less trips for the patients coming in. So, we really encourage that for our patients." – RPh 5

"We also utilize med sync, which can be used as adherence tool. We use it to make sure the patient is getting their inhaler filled on time, so they aren't missing doses." – RPh 1

Additionally, pharmacists suggested practical strategies, such as habit staking or different behavioral interventions, for patients to remember inhaler use. For example, pairing inhaler use with daily activities like brushing teeth. They also emphasize the importance of daily use for controlling symptoms and preventing disease progression.

"Trying to tell them strategies to remember is usually a big one. I love pairing it with people brushing their teeth because most people do that, and they usually get like an, 'Oh, yeah, that sounds like a great idea,' because otherwise they're sitting going, 'How on earth am I gonna remember to use this stupid thing?' Setting timers on phones, things like that. Then trying to talk to them about using it every day." – RPh 8

Smoking Cessation

Pharmacists reported conducting full consultations when patients are prescribed smoking cessation medications like Chantix or nicotine replacement therapy (NRT). The ability to prescribe nicotine replacement therapy was considered a beneficial addition to smoking cessation services. Some pharmacies already have collaborative practice agreements in place to dispense nicotine replacement therapy.

"Smoking cessation comes to mind. A lot of times people who are diagnosed with COPD are also smoking. They seem to go hand in hand. Our pharmacy has a collaborative practice agreement to dispense nicotine replacement. Not all pharmacies do, but they may. If they don't, they might recommend it, or reach out to the provider to see if they'll send a script." – RPh 1

Motivational interviewing was a common technique pharmacists employed to engage patients in discussions about their smoking status and readiness to quit. This method helps them understand individual motivations, potential obstacles, and strategies that may work for each patient.

"I try to do a lot of motivational interviewing to find out what is important [to] them. What makes them want to continue to smoke? What would it take for them to want to quit smoking?" – RPh 7

"It just starts with motivational interviewing to talk to them about their smoking status, and then how they feel about quitting smoking, if they're smoking. Then discussion goes from there to talk about if they're interested. Then we can go into specifics about what they can do. If they're not interested, then we talk about that a little bit, what some of their reluctance is at that time. But, I'll bring it up again so, whenever you're ready, you can give it a shot." – RPh 2

Pharmacists reported addressing behavioral aspects of addiction as well. For example, they address issues such as the tactile need associated with smoking and provide alternatives to smoking-related habits.

"I've got a spiel where I talk about [that it is not only] replacing cigarettes, but also replacing a lot of the other parts. [I] talk to them about the tactile need: 'You do something with your hands when you're smoking, so you need something to do with your hands, most likely. Otherwise, you're going to find yourself fidgeting, getting anxious.' I usually recommend that they do something about that, like carry a pencil, bag of carrots, fidget spinner and whatever they need to have something to do with their hands." – RPh 8

Pharmacists described follow-up care and emotional support as essential for helping patients to quit smoking. They acknowledge the common challenges of smoking cessation and provide emotional support for their patients. They educate patients about the likelihood of multiple quit attempts to manage expectations and alleviate stress associated with potential relapses.

"Let them know that most people fail the first couple times to give them some relief. Obviously, based on their health also, most people aren't successful the first couple times. You need to take that stress off them, to let them know that 'If you succeed, you're one of the few that did it the first time. So, you get a star.' ... That's what I'm here to help with, different ways of doing it, and obviously, support. They can always come in and talk." – RPh 4

Pharmacists expressed the need for continuing education that covers the entire process of smoking cessation, from initiating conversations with patients to providing ongoing motivation.

"Some of the processes of how to follow up with a patient, and how to talk to them about how their quit attempt is going [requires] digging way back into school [to recall] some of the behavioral changes too that can help with the smoking cessation in addition to the nicotine replacement aids. I think [that] any type of

continuing education that goes through the whole process [is needed]. Not just talking to a patient about getting started with it, but how to continue to motivate them throughout the whole quit attempt." – RPh 3

To help initiate smoking cessation discussions, pharmacists suggested advertising this service, so patients are aware of this option and can seek help when they are ready to make the change.

"If it was advertised like, 'Trying to quit again or trying to quit? Talk to the pharmacist about starting nicotine replacement therapy. We can get your insurance to cover it.' That's one easier access point. They don't have to wait another three to six months or a year to try and see their doc again, to try and get them to write it." – RPh 8

"Having information that's there so the patient can let us know when they're ready to talk about it [quitting smoking], instead of us guessing, 'Are they ready to make a change today?'" – RPh 5

Immunizations

Community pharmacists regularly provide vaccinations—including influenza, COVID, pneumonia, and shingles—and are familiar with recommendations for patients with COPD.

"I feel very confident in that. I did almost 10,000 COVID vaccines in the last three years." – RPh 4

"That [vaccinations] is something that I didn't even think of because it's just such a routine part of the things we do." – RPh 3

"For the purposes of respiratory stuff, I'll look at influenza, pneumococcal and then COVID. I'll probably start looking at RSV, too." – RPh 2

Vaccinations provided in the pharmacy are usually done by appointment. RPh 7 mentioned that their location conducts vaccine clinics with nurses to efficiently administer vaccines during flu season.

"With flu season coming up, we have a big vaccine clinic every week. ... We do it once a week, we have 3 or more nurses. ... We'll get a bunch of people done at once. They also go out to all of our assisted living facilities and [vaccinate them] as well." – RPh 7

When patients come to the pharmacy for a vaccine, pharmacists will proactively identify any additional vaccines the patient may need. Pharmacists mentioned the Wisconsin Immunization Registry (WIR) as a tool they use to assess vaccination history. RPh 8 reported that they also check the neighboring state's immunization registry.

"We check the Wisconsin Immunization Registry. ... We also have a neighboring state we are licensed in and are in their immunization registry. We check that one, too, to make sure we're not missing anybody if they go across the border to one of the major cities nearby and get the stuff done there because some people will go to providers in the neighboring state and get their care there. ... That way when we're looking at them in flu season, when a lot of pharmacists generally are actively going like, 'Does this patient need something besides their flu shot?' We can look and see, 'Well, we've already done the pneumonia vaccines. We know that, so those are done.' That's really helpful, so we're pretty proactive in how we do that." – RPh 8

COPD Symptom Assessment

Continuous monitoring of symptoms and assessing control levels is an integral part of COPD management. As such, pharmacists described inquiring about patients' well-being, especially when there are challenging environmental conditions that are known to exacerbate COPD symptoms, such as poor air quality or high humidity. This information would be used to gauge medication efficacy and identify any issues that require attention. How this task is accomplished may vary by pharmacy.

"Maybe five to ten times a day I have people picking up inhalers that we're either reviewing [or] asking them how it's going, how they're feeling. If we're having bad air quality, I ask them how their breathing's doing or how this weather is impacting them. If we're having stretches of high humidity, same thing, to gauge how the medication is helping them or impacting them in more difficult times, or if the medications [are] working. Then using that as a roundabout way to assess how they're doing it, or if they're doing it well, or if we need to review [the] technique." – RPh 6

While pharmacists described the use of point-of-care testing for other disease states, such as diabetes and hypertension, only one pharmacist reported using spirometry to assess the lung function of their patients with COPD. Another pharmacist did bring up pulmonary function tests as an intervention pharmacists could feasibly incorporate into their practice.

"At this site, I'm working in a clinic, and I get referrals from providers here to do COPD management. ... We can do the spirometry for the diagnosis and then start getting people plugged into the treatment. That's where we use the GOLD guidelines." – RPh 2

"I don't know if measuring FEV [forced expiratory volume], and all that stuff is on your list. That could be something pharmacies do. We don't. I know we did practice how to do that when I was in school. ... We can dispense the thing that you use to do PFTs [pulmonary function tests] for patients. But we haven't really been doing that. Blood pressure is one of our main things, and then point of care testing, A1c, blood glucose, and cholesterol." – RPh 7

Discussing Pulmonary Rehabilitation

Finally, pharmacists reported zero to minimal familiarity with pulmonary rehabilitation. However, pharmacists were interested in how they could discuss pulmonary rehab with patients and would like to learn more about it. RPh 3, who works in an outpatient pharmacy affiliated with a hospital, even thought it would be a simple and feasible intervention if they had more resources to share.

"I do find the pulmonary therapy to be an interesting thing, and I could see that [discussing pulmonary rehab] would potentially be useful. ... But, I don't know how we would get that to a pharmacist level for intervention." – RPh 8

"Especially with our integration within our health system, the discussion of pulmonary rehab, with more education on that, that's definitely something I feel like we could make referrals for. ... I don't know what it would all entail. But the way that I'm picturing it, it doesn't seem all that time intensive to have that discussion with the patients. We're doing that anyways. We're talking to patients. We're doing those inhaler device type teachings. To have an extra 3-5 minutes to talk about pulmonary rehab, and how they could possibly get set up with that, or even if it's just talking with their physician further about it. If we can provide them additional information, I feel like that would be something that would be fairly inexpensive. I mean, it wouldn't cost anything, as far as I know, and would be something that I think would be easy for us to do with the right education." – RPh 3

There is a need for resources explaining what pulmonary rehab is, when it is appropriate, and how to refer someone to it. These materials should include lists of centers and outpatient clinics where patients can receive pulmonary rehabilitation and information about insurance coverage and out-of-pocket costs.

"I think [it would be helpful to have] resources on what it is, when it would be appropriate, how we would go about referring someone to it." – RPh 7

"Having a list of centers where the patient would even be able to go. I know our health system has pulmonary rehab clinics. I don't think they have one at the hospital that I'm at, but they have one at another hospital. Are there other outpatient clinics not associated with our health system that we could refer patients to? What is the insurance coverage for patients? I'm sure that would be a big question for our patients. 'What would the out-of-pocket cost be? How often would I be going? Because I depend on transportation in order to get there.' Those kinds of things would definitely be questions I could foresee our patients having. If that was something that we were to be doing here as well." – RPh 3

Conclusion

The findings from the interviews with eight community pharmacists across Wisconsin provided valuable insights into the current practices, challenges, and opportunities related to COPD management in community pharmacy settings. First, we identified areas where current practices deviate from guideline recommendations. Second, we explored the context of the community pharmacy as a location for clinical COPD interventions. Third, we highlighted various factors affecting pharmacists' ability to provide clinical interventions. Finally, we reported pharmacists' perspectives on seven COPD-related interventions. The role of pharmacists in COPD management is dynamic and involves collaboration and innovative approaches to ensure comprehensive patient care. Further exploration and development of resources are essential to support pharmacists implementing or expanding evidence-based interventions for COPD management.

5.3 Integration Results

Community pharmacists' intentions to perform evidence-based COPD-related interventions (quantitative findings) and their perspectives on how interventions are currently being provided as well as how they could be provided in an ideal situation (qualitative findings) were brought together to identify the components of a community pharmacy COPD service.

Integration revealed eight confirmatory findings, including a moral obligation to conduct medication profile reviews, private counseling spaces facilitating inhaler technique education, and vaccination services attracting patients to the pharmacy. Interview findings expanded upon five survey results. For example, surveyed pharmacists indicated that they intend to educate on inhaler technique for an estimated 50.3% of COPD patients. Interviewees revealed that inhaler technique education is provided for all new prescriptions but rarely for refills and often only if the patient reports an issue or asks a question. Only three discordant insights were gained through integration. Notably, the discomfort initiating conversations about smoking cessation was contrasted by the low to moderate difficultly reported in the survey. Additionally, the physical distance to pulmonary rehab reduced pharmacists' intentions to discuss the topic, but rural location was not a significant influence on intent in the survey.

The COPD interventions, Theory of Planned Behavior constructs, survey responses, Knowledge-to-Action Framework phases, interview quotes, and interpretation of integrated data are presented as a side-by-side joint display in Table 5.12.

Table 5.12: Joint Display of Integrated Survey and Interview Findings				
TPB Construct	Quantitative Survey Finding	KTA Phase	Qualitative Interview Finding	Interpretation of Integrated Results
Reviewing The Patient's Medication Profile				
Perceived Moral Obligation	On average, pharmacists reported that they are *very responsible* for reviewing the patient's medication profile. 97.1% of survey participants reported feeling *responsible* (n=4) or *very responsible* (n=29) to perform this intervention.	Select, Tailor, Implement Interventions	*"If I notice that they're using their albuterol too much … or the patient has an issue with their medication … or there's a cost issue, … then I'm really looking at their file to make sure they have the appropriate types of inhalers for COPD."* – RPh 5	**Confirmation**: Community pharmacists view medical profile reviews as their responsibility. They feel a moral obligation to ensure their patients are using the correct medications.
Intention	On average, community pharmacists intend to review the medication profile for 82.9% of all patients with COPD who will visit their pharmacy within the next 30 days with a new or a refill prescription—the highest intention of the five interventions.	Select, Tailor, Implement Interventions	*"[I review the medication profile] between 95 and 100% of the of the time. … It's definitely done for every new prescription that we see."* – RPh 3	**Confirmation**: Survey participants' high intention to review medication profiles was confirmed by interview findings.
Subjective Norms	On average, pharmacists felt 88.2% of physicians in their community would approve of them providing medication profile reviews to their patients with COPD. 76.5% (n=26) responded that 100% of physicians in their community would approve of them providing a medication profile review for their patients with COPD. Additionally, subjective norms were a significant influence on intent (β = 0.47, p-value < 0.10).	Assess Barriers & Facilitators to Knowledge Use	*"I had a guy just the other day. He was using his albuterol inhaler a lot, and he had all 3 of the medication classes for inhalers. I was like, 'Hey, let's set up a CMR to meet,' because I felt he had more questions. [In addition,] he had another medication that might be exacerbating his COPD. … He didn't show up … because one of his psychiatrists said not to do it. We're going to reach out to that doctor and be like, 'I'm not sure why you said that, because he actually really needs one.'"* – RPh 7	**Discordance**: While pharmacists overall reported high physician approval for medication profile reviews, some pharmacists described some push back from prescribers when trying to perform these interventions.
Providing Inhaler Technique Education				

Intention	On average, community pharmacists intended to provide inhaler technique education to 50.3% of all patients with COPD who would visit their pharmacy within the next 30 days with a new or a refill prescription.	Determine the Know/Do Gap	*"On refills, we don't always talk to each patient individually. It's more so if they would solicit questions at that point in time, or call us if they have issues with dose counters or things like that once they get home."* – RPh 3	**Expansion**: In our survey, community pharmacists indicated that they intend to educate on inhaler technique for 50.3% of COPD patients on average. Interviews provided further information on this result; pharmacists provide inhaler education on all new prescriptions, but only counsel on refills when prompted by the patients.
Intention	Having a private counseling space was a significant influence on intent (β = 23.95, p-value < 0.1).	Assess Barriers & Facilitators to Knowledge Use	*"That person coming in getting their new inhaler would come in and we'd use the private room. … You would do the first dose consultation where the patient actually does their first dose in the private room."* – RPh 1	**Confirmation**: Interview findings confirmed survey results; pharmacists feel that having a private space to educate on inhaler technique facilitates the provision of this intervention.
Perceived Moral Obligation	94.1% of survey participants—and 100% of interviewees—reported feeling *responsible* (n=8) or *very responsible* (n=24) to provide inhaler technique education to their patients with COPD. Additionally, PMO was a significant driver of intention to provide this intervention (β = 0.86, p-value < 0.1).	Select, Tailor, Implement Interventions	*"If cost is an issue, we would—with permission from the patient—we would contact the physician about any other drugs we could try, try to give some recommendations."* – RPh 4 *"They can at least get their hands on it even if they don't have their own inhaler with them or if they haven't started using it, yet."* – RPh 2 *"We try to hand out those packets to people so they can take that home and use it, because sometimes it's hard to remember all the steps if you just tell them. … I'd go through our technique on the handout together so I'm not*	**Expansion**: Pharmacists highlighted strategies they use to help patients use their inhaler correctly. This priority may stem from a strong sense of responsibility to ensure their patients receive an affordable inhaler (facilitating adherence) and education that is accurate and thorough.

			miscommunicating between all the different inhalers and all the different little caveats that the manufacturers put out there." RPh 1	
Attitude	79.4% (n=27) of survey respondents—and 100% of interviewees—felt providing inhaler technique education to patients with COPD in community pharmacies was *very likely* to result in a patient's appreciation of the pharmacist's value. Inhaler technique education had the highest average for this question. Additionally, 85.3% (n=29) felt this intervention was *very likely* to increase patient trust in the pharmacist.	Select, Tailor, Implement Interventions	*"It's a lot of education. 'No, you shouldn't be using your albuterol inhaler 3 times a day, that's not normal.' It's a lot more education on that, and having them see us as more of that medication expert and not just [someone] handing out the prescription, selling them something. I'm showing them that we are the experts on these medications."* – RPh 7	**Confirmation**: Community pharmacists in the survey and interviews believe educating on inhaler technique improves patient's perception of the pharmacist.
Discussing Pulmonary Rehabilitation				
Intention	Rural location was not identified as a significant influence on intent to discuss pulmonary rehabilitation.	Assess Barriers & Facilitators to Knowledge Use	*"I'm confident in it. I often don't bring it up, though, because it's not available."* – RPh 2 *"They would have to drive 2 hours to the nearest city to do that, because our local clinic doesn't have that. They have cardiac rehab, but they don't have pulmonary rehab."* – RPh 8	**Discordance**: While rural location was not a significant influence on intent to discuss pulmonary rehab, rural pharmacists described distance to clinics or pulmonary rehabs as a barrier that patients face that influences their likelihood to discuss the topic.
Perceived Behavioral Control	On average, pharmacists reported that discussing pulmonary rehab was between *somewhat difficult* and *difficult*—the lowest PBC of the five interventions.	Determine the Know/Do Gap +	*"Probably just a knowledge gap would be my guess [as to why we are not discussing pulmonary rehab]. It's not something that we think about regularly."* – RPh 1 *"I think [it would be helpful to have] resources on what it is, when it would be appropriate,*	**Expansion:** Pharmacists find it difficult to discuss pulmonary rehab with COPD patients to because they do not have the knowledge necessary to bring this intervention to action.

	Only 11.8% of survey participants reported it was *not at all difficult* (n=1) or *a little difficult* (n=3). Additionally, PBC was a significant driver of intention to provide this intervention ($\beta = 0.26$, p-value < 0.1).	Select, Tailor, Implement Interventions	*how we would go about referring someone to it."* – RPh 7 *"A list of centers where the patient would even be able to go. … What is the insurance coverage like for patients? Because I'm sure that would be a big question for our patients."* – RPh 3	
Attitude	58.8% (n=20) of survey respondents felt discussing pulmonary rehabilitation with COPD patients in community pharmacies would *very likely* result in a significant benefit on patients' health outcomes. Additionally, no pharmacists reported that this discussion would be *not at all likely* to result in significant benefit.	Determine the Know/Do Gap	"*I've seen it in people's charts that they have gone to it. They'll say that it worked well for them."* – RPh 7 *"I do find the pulmonary therapy to be an interesting thing, and I could see that [discussing pulmonary rehab] would potentially be useful."* – RPh 8	**Confirmation**: Community pharmacists in the survey and interviews saw that pulmonary rehabilitation and discussing it with their patients with COPD could benefit their health.
Providing Vaccination Services				
Attitude	58.8% (n=20) of survey respondents felt providing vaccination services for their COPD patients in community pharmacies would *very likely* attract patients to the pharmacy. Of the five interventions, it was rated the most likely to attract patients to the pharmacy.	Select, Tailor, Implement Interventions	*"We have flu season coming up, so we have people there for an immunization—for that alone. That's a time where I review immunizations as a whole."* – RPh 6	**Confirmation**: Pharmacists recognize that providing vaccination services attracts patients to the pharmacy; patients who do not normally go to the pharmacy will go when in need of an immunization.
Perceived Moral Obligation	On average, pharmacists reported that they are *responsible* for providing vaccination services. 73.5% of survey participants reported feeling *responsible* (n=11) or *very responsible* (n=14) to perform this intervention.	Select, Tailor, Implement Interventions	*"Each profile should be reviewed to say, "Yes, this patient has received those immunizations." … that should always be something that's being offered."* – RPh 3 *"I know if I have somebody that's higher risk. [People with] COPD or diabetes, … it's of*	**Confirmation**: Community pharmacies feel it is their duty to provide vaccines for their patients with COPD.

			utmost importance for them to get those … routine pneumonia vaccinations." – RPh 6	
Perceived Behavioral Control	On average, pharmacists reported that providing vaccination services was *a little difficult*. Only 8.8% of survey participants reported it was *difficult* (n=2) or *very difficult* (n=1) to provide vaccination services. RPh 2 rated providing vaccination services at *very difficult*.	Assess Barriers & Facilitators to Knowledge Use	*"Our EHR is a little confusing to use to do vaccination status. Sometimes I'll go into the WIR and look at that. For some reason I lose access once in a while, and I have to get access again."* – RPh 2 *"It circles back to my computer system—it has an inbuilt [program] to try and identify people that need pneumococcal vaccine, but it was very rudimentary. … I turned that one off because it was not as helpful."* – RPh 8	**Expansion**: The difficulty providing vaccination services reported by a minority of pharmacists may be due to technology issues.
Discussing Smoking Cessation				
Intention	On average, community pharmacists intended to discuss smoking cessation with 41.2% of all patients with COPD who will visit their pharmacy within the next 30 days with a new or a refill prescription—the highest intention of the five interventions. 26.5% of pharmacists reported they intend to discuss smoking cessation with 0-10% of COPD patients.	Determine the Know/Do Gap	*"I will help the patient with smoking cessation if they ask. I am not super proactive, get on their case, if they're smoking."* – RPh 4 *"I maintain my philosophy as the pharmacist that I'm not going to preach or tell people what they should do, or shame them for doing something that is a life decision or situation that they ended up in."* – RPh 6	**Confirmation**: Interview findings confirmed pharmacists' low intention to discuss smoking cessation identified in survey results.
Perceived Behavioral Control	On average, pharmacists reported that discussing smoking cessation was between *a little difficult* and *somewhat difficult*. 55.9% of survey participants reported it was *not at all difficult* (n=7) or *a little difficult* (n=12).	Determine the Know/Do Gap	*"[Patients] know their doctor is going to tell them that they should stop smoking. I'm afraid in the pharmacy if we're too much, not lecturing, but too much trying to change their behavior, then sometimes they can be less open to share things or less responsive. It's a balancing act."* – RPh 5	**Discordance**: While discomfort initiating smoking cessation services was identified in interviews, surveyed pharmacists indicated this intervention had a low to moderate difficulty level.

			"I don't know if I'm playing a big role in that, being one other small voice in the choir that pushes them to go do the thing or not. I'm usually not the instigating one to start nicotine replacement." – RPh 8	
Multiple	RPh 2 had above average scores for intention (50.0), subjective norms (73.3), PBC (a little difficult), and PMO (very responsible) for discussing smoking cessation.	Select, Tailor, Implement Interventions	*"I'm a certified tobacco treatment specialist too. … Every visit it [smoking cessation]'s brought up. Somebody seeing me for COPD management—it's always a topic."* – RPh 2	**Expansion**: The interviewee who is a certified tobacco treatment specialist had above average scores for intention, subjective norms, PBC, and PMO. Further education in smoking cessation may increase pharmacists' likelihood to perform smoking cessation interventions.
KTA: Knowledge-to-Action, PBC: perceived behavioral control, PMO: perceived moral obligation, RPh: Registered Pharmacist, TPB: Theory of Planned Behavior.				

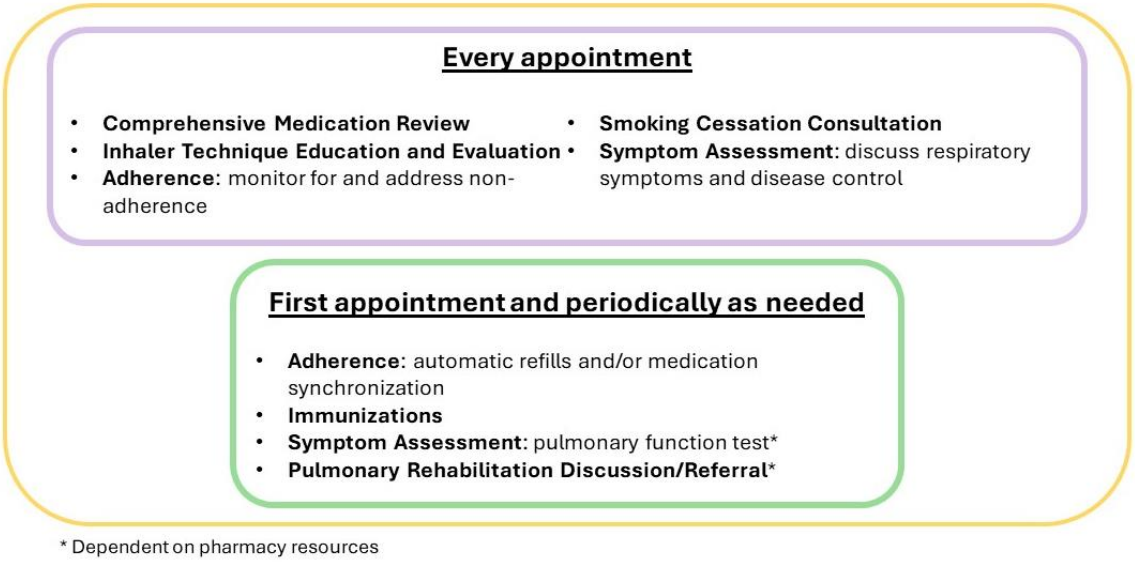
The components of the community pharmacy COPD service that was informed by the quantitative, qualitative, and integrated findings from this study are described below.

- **Comprehensive Medication Review (CMR):** The service should be packaged as a CMR, allowing for an easier reimbursement process. CPAs may be created to modify inhaled therapies for affordability and guideline concordance and to dispense emergency albuterol inhalers.
- **Inhaler Technique Education and Evaluation:** education should be performed on the initial fill and all refills. The “teach-back” approach should be used to assess the patient's technique through demonstration. Any issues with technique should be addressed at this point. Demo inhalers, instructional documents, and videos may be used to ensure education is consistent and accurate.
- **Adherence Interventions:** Automatic refills and medication synchronization should be offered to the patient to facilitate adherence and improve pharmacy workflow. Pharmacists can employ electronic systems to monitor adherence. Non-adherence can also be addressed through behavioral interventions (e.g., habit stacking) or cost-reducing interventions (e.g., identifying affordable therapeutic equivalents or coupons).
- **Smoking Cessation Consultation:** Full smoking cessation consultations should be provided to all patients with COPD who smoke. Motivational interviewing can be used to engage patients in these discussions. Pharmacists can provide emotional support and address behavioral aspects of addiction (e.g., offering alternatives to smoking-related habits). CPAs may be created to dispense nicotine replacement therapy.
- **Immunizations:** Vaccination status should be assessed for all patients with COPD. Recommended immunizations include but are not limited to influenza, SARS-CoV-2, and pneumococcal vaccines. Immunization registries can be used to identify vaccine history.
- **Symptom Assessment:** Pharmacists can engage patients in discussions of respiratory symptoms and disease control, gauge medication efficacy, and identify any issues that require attention. Point-of-care testing (e.g., spirometry) may be considered for objective assessment of lung function.

- **Pulmonary Rehabilitation Discussion/Referral:** Involving pharmacists in discussions about and referrals to pulmonary rehab may not be feasible at this time. Pharmacists express minimal familiarity with the intervention but show interest in learning more and discussing it with patients. There is a need for resources explaining pulmonary rehab, referral processes, locations, insurance coverage, and out-of-pocket costs. Pharmacists who work within a health system that provides pulmonary rehab may have an easier time integrating these discussions and referrals into the service.

Pharmacists emphasized that a community pharmacy COPD service should be delivered repeatedly to ensure patients receive adequate follow-up care and maximize the benefit of the service on health outcomes. Figure 5.6 provides an example structure of how each component could be addressed over a series of visits.

Figure 5.6: Example Structure of the Community Pharmacy COPD Service Visits



The actual structure and flow of each appointment should be determined through a participatory design process with community pharmacists and patients with COPD, as appropriate.

CHAPTER 6: DISCUSSION

6.1 Summary

In this study, we (1) assessed community pharmacists' intentions to perform COPD interventions using an extended Theory of Planned Behavior, (2) explored their perspectives on current practices, challenges, and opportunities related to COPD management in community pharmacy settings with the Knowledge-to-Action model, and (3) identified the components of a pharmacist-informed COPD service that community pharmacists can utilize when implementing and expanding evidence-based interventions for COPD management.

6.2 Setting

Community pharmacists described themselves as access points for care, especially in rural areas where there are fewer physicians. This aligns with previous research that specifically identified primary care shortages in rural areas of the Midwest as a significant care gap for pharmacists to fill.[20] Additionally, a study exploring key attitudinal predictors of prescription medication adherence found patients' perceived personal connection with their pharmacy to be highest for patients using neighborhood pharmacies, living in the Northeast or the Midwest, and living in rural areas.[47] Interviewees in our study working in rural independent pharmacies described their personal connection with patients as an important factor to identify and addressing medication issues.

Health care barriers for persons with chronic diseases living in rural areas are well researched. Common barriers include the physical distance to health care facilities and transportation difficulties, shortages of local health care professionals, and feelings of cultural marginalization in urban care contexts.[152] A qualitative systematic review of hospital discharge interventions for patients with COPD identified transportation to facilities providing pulmonary rehabilitation as a main barrier to accessing the intervention.[153] Transportation and distance to pulmonary rehab were also concerns expressed by our interviewees, especially those working in rural areas.

Community pharmacists described factors affecting clinical service adoption that were similar to previous literature such as reimbursement issues that result in insufficient staffing and time,[11,78,104–112] physical space,[108] relationships with prescribers,[110,111] and disconnected health information technology infrastructure that leaves pharmacists with little to no access to patient medical records.[108,111] One of our interviewees, who works as a community pharmacist within a health-system, reported access to the electronic health record facilitated care through patient medical records and easier communication with providers. Study findings suggest that implementation of electronic health record-sharing with pharmacies and pharmacist-prescriber secure messaging systems facilitates collaboration and improves workflow efficiency.[116–118]

6.3 COPD Interventions

Interview results highlighted the importance of comprehensive and repeated interventions to successfully manage COPD. A systematic review examining the components of pharmacist-delivered COPD self-management interventions found that the first meeting was delivered individually, in person, and lasted an average of 35 minutes with 6 follow-up sessions.[154] Pharmacists in our study did not specify a number of follow-up sessions they believed were necessary, but they did note the frequency should be individualized to the patient's clinical needs.

Pharmacists emphasized the importance of counseling and education when patients receive a new inhaler. This involves hands-on training and discussions about proper usage, including steps, frequency, and any specific instructions provided by manufacturers. There is strong and valid international evidence for the "teach-back" approach utilized by pharmacists in our study.[155] The technique includes individual education and patient demonstration back of the skills, following by repeated instruction. Employing the "teach-back" approach has been shown to be a particularly effective way to correct COPD patients' inhaler use.[1,155] However, the effectiveness of such interventions as part of a comprehensive community pharmacy COPD service has not been explored.

Pharmacists described using package labeling, handouts with pictures of inhaler techniques, and videos to provide consistent and accurate inhaler technique education. This method helps maintain accuracy and provides a visual reference for patients. The pharmacists also highlighted the importance of providing patients with written materials to use as a reference at home and reinforce the information given during counseling. The Global Strategy for Prevention, Diagnosis and Management Of COPD: 2023 Report specifies that the package labeling is insufficient to providing proper education, and that physical training and use of videos is not effective for all patients and only for the short-term.[1] Therefore, pharmacists should be encouraged to use the "teach-back" approach instead of education alone. Future studies could compare the effectiveness of these two approaches in a community pharmacy setting to encourage appropriate inhaler use among COPD patients.

Some pharmacists described having trouble remembering all the inhaler technique steps across the ever-growing list of devices and the importance of using manufacturer labeling or educational aids to ensure all vital points are discussed with the patient. The majority (67.6%) of our survey respondents indicated that educating on inhaler technique was not at all difficult (n=12) or a little difficult (n=11). The low perceived difficulty for most participants may be related to pharmacists' high knowledge of inhaler technique compared to other health care providers. Karle and colleagues (2020) conducted a survey of inhaler comfort and knowledge across various prescribers and non-prescribers involved in inhaler education.[87] Pharmacists in their study correctly answered 71% of knowledge question, which was better than prescribers (47%) and second only to respiratory therapists (85%). This finding highlights the importance of providing education and training to community pharmacists to maintain or improve their knowledge of appropriate inhaler use.

Adherence interventions were not included in the survey or interview guide. However, they were discussed by most pharmacists interviewed in this study. Kim and colleagues (2018) described patient-centered adherence interventions pharmacists can provide that were similar to our interview findings: reducing medication cost, automatic refills, adherence packaging, minimizing adverse effects, and ongoing communication.[48] Additionally, the most common causes for non-adherence identified in our interviews—forgetfulness, cost, and side effects—were similar to patient-reported reasons in the National Report Card

on Adherence: forgot (42%), ran out (34%), away from home (27%), trying to save money (22%), and had side effects (21%).[47]

While 22% of nonadherence was due to cost in the national report card, it was described as a main barrier for patients with COPD in our study. The high costs of inhalers, which are a cornerstone of COPD management, provides an explanation for cost being perceived as a more significant barrier in our sample compared to the national report card, which included a variety of chronic diseases. A 2018 study exploring the economic burden of COPD found that direct pharmacy costs were on average $1,626 greater each year for patients with COPD compared to those of matched controls.[156] Pharmacists' recognition of cost as an essential factor when deciding an inhaler device aligns with the GOLD guidelines, which say the choice within each medication class "depends on the availability and cost of medication and the clinical response balanced against side effects."[1] These findings underscore the importance of conducting research to determine the most effective adherence intervention for COPD patients within community pharmacies.

A survey of pharmacy personnel from a large grocery pharmacy chain by Xiong and colleagues (2021) found 92.4% agreed that community pharmacists should provide tobacco cessation services and 91.1% believed that they can help their patients quit tobacco use. Our study found that 94.1% believed they are at least somewhat responsible for discussing smoking cessation—a similar result to Xiong et al. However, our sample indicated lower perceived behavioral control: 20.5% reported discussing smoking cessation as difficult or very difficult. The difference may be explained by wording of the questions or the population of pharmacists from which each study sampled. Xiong et al. surveyed pharmacists from a large grocery pharmacy while only 26.5% of our survey sample worked in a similar setting (chain or mass merchandiser pharmacy). Xiong et al.'s sample consisted mostly of pharmacists from three Western states and all pharmacists in our sample were from a single Midwestern state. Future studies could explore these beliefs with a larger and more representative sample.

The recent shift to pharmacies being a main provider of adult vaccinations was reflected by our survey and interview results, with one pharmacist administering nearly 10,000 COVID vaccines. A literature review quantifying the contributions of America's pharmacists in COVID-19 clinical interventions found

that community pharmacy programs provided more than 270 million vaccinations from December 2020 through September 2022.[157] This impressive public health feat exemplifies the expanding role community pharmacists have in clinical service provision and disease prevention. Community pharmacists in our study felt responsible for providing vaccinations for their COPD patients and viewed this task as a routine part of their practice. During flu season, pharmacists reported hosting vaccine clinics or offering appointments to efficiently immunize their communities. Additionally, pharmacists described capitalizing on the seasonal increase in the demand for vaccines to recommend additional immunizations for their patients.

6.4 Limitations

This study has some limitations that must be noted. First, the sample size was small—with only 34 survey participants and 8 interview participants—limiting the representatives of the population and the ability to identify differences between groups. Additional research should be conducted to confirm findings across a larger sample. However, the demographics of the study sample were akin to those of Wisconsin pharmacists. According to the 2020 Wisconsin Pharmacy Workforce survey, the median age of practicing pharmacists was 40 years old.[158] The average age of our sample was 40.5 years old. Their survey also found that 57.9% of practicing community pharmacists were female, similar to the 58.8% of our sample. Additionally, 50% of community pharmacists had received their first pharmacists' license in the last 20 years. This aligns with our sample, which had an average of 16 years of pharmacist experience. One notable difference is that our sample did have a higher proportion of pharmacists with a PharmD (70.6% vs. 55.1%). Additionally, while the sample size was small, interview data was duplicative across major themes, indicating data saturation was reached[148]—many categories identified through content analysis had supportive quotes from more than half of participants.

Second, actual behavior was not measured and intent to perform behaviors was used as a proxy. The actual provision of clinical interventions for patients with COPD by community pharmacists likely differs from the survey results. In the study, we compared intention and drivers of intention across the measured interventions with the goal of deciding evidence-based interventions to include in the community pharmacy

COPD service. Future research should examine actual behavior of pharmacists providing clinical interventions to patients with COPD.

Third, mean imputation was used to fill in missing responses in survey data. Because these values were imputed by the observed sample mean, the variance estimates for the eleven imputed variables may be underestimated.[139] Fourth, interview transcripts were analyzed using deductive content analysis, limiting the identification of new patterns or themes discussed by pharmacists that did not fit within the theoretical framework.[150]

6.5 Next Steps

In this study, we described the components of a community pharmacy COPD service. Future studies are needed to confirm the structure of components and the sequence of events. Next steps in this line of research involve the development and pilot testing of implementation packages for each intervention. Pharmacists should be involved in the design and refinement of the implementation packages. Components could include a service template for the pharmacy's dispensing software; recommendations for tailoring the service to their available resources; detailed strategies to enhance the adoption, implementation, and sustainment of the service; editable advertisements; a compilation of resources to aid service delivery; and training focused of inhaler technique across devices, specific vaccinations for patients with COPD, and pulmonary rehabilitation.

Pilot testing should explore the impact of the service on patient clinical, humanistic, and economic outcomes as well as key implementation outcomes, such as fidelity to the core service components, adaptations made during implementation, facilitators and barriers to implementation, resources used, and cost of providing the service.

CHAPTER 7: CONCLUSION

This study successfully applied social behavioral theory, implementation science, and a mixed methods design to illuminate key components of a community pharmacy COPD service. By applying the Theory of Planned Behavior to our quantitative approach, we delved into the intentions of community pharmacists regarding COPD-related interventions, identifying factors influencing their willingness to engage in evidence-based practices. The Knowledge-to-Action model utilized in our interviews complemented this theoretical framework, shedding light on the pragmatic considerations and workflow integration necessary for effective service implementation in community pharmacy settings.

Our findings provided a deeper understanding of COPD management in community pharmacies and laid the groundwork for a comprehensive service that aligns with the expanding role of pharmacists in chronic disease management. The envisioned service, which will be iteratively developed in collaboration with community pharmacists, holds the potential to enhance accessibility to high-quality, personalized care for individuals with COPD, contributing to the broader landscape of patient-centered health care delivery.

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APPENDICES

Appendix A. Common Inhalers for COPD Management

Table A: Common Inhalers for COPD Management				
Generic Name	**Image**	**Brand**	**Device Type**	**Delivery Method**
Short-Acting Beta$_2$-Agonist (SABA)				
Albuterol sulfate		ProAir	RespiClick	Dry powder inhaler
		ProAir	Digihaler	Dry powder inhaler
		Proventil	HFA	Metered dose inhaler
		Ventolin	HFA	Metered dose inhaler
Levalbuterol tartrate		Xopenex	HFA	Metered dose inhaler
Short-Acting Muscarinic Antagonist (SAMA)				
Ipratropium bromide		Atrovent	HFA	Metered dose inhaler
Combination SAMA + SABA				

Ipratropium bromide and albuterol		Combivent	Respimat	Soft mist inhaler
Long-Acting Beta$_2$-Agonist (LABA)				
Salmeterol xinafoate		Serevent	Diskus	Dry powder inhaler
Olodaterol hydrochloride		Striverdi	Respimat	Soft mist inhaler
Long-Acting Muscarinic Antagonist (LAMA)				
Umeclidinium		Incruse	Ellipta	Dry powder inhaler
Tiotropium bromide		Spiriva	Handihaler	Dry powder inhaler
		Spiriva	Respimat	Soft mist inhaler
Aclidinium bromide		Tudorza	Pressair	Dry powder inhaler
Combination LAMA + LABA				
Umeclidinium and vilaterol		Anoro	Ellipta	Dry powder inhaler
Glycopyrrolate and formoterol fumarate		Bevespi Aerosphere	HFA	Metered dose inhaler

Aclidinium bromide and formoterol fumarate		Duaklir	Pressair	Dry powder inhaler
Tiotropium bromide and olodaterol		Stiolto	Respimat	Soft mist inhaler
Combination ICS + LABA				
Fluticasone propionate and salmeterol		Advair	Diskus	Dry powder inhaler
		Wixela	Inhub	Dry powder inhaler
Fluticasone furoate and vilanterol		Breo	Ellipta	Dry powder inhaler
Budesonide and formoterol fumarate dihydrate		Symbicort	HFA	Metered dose inhaler
Triple Combination (ICS + LAMA + LABA)				
Budesonide, glycopyrrolate and formoterol fumarate		Breztri Aerosphere	HFA	Metered dose inhaler
Fluticasone furoate, umeclidinium and vilanterol		Trelegy	Ellipta	Dry powder inhaler

Appendix B. Recruitment Materials

Research Participant Recruitment Announcement for PearlRx [Survey]

Email Subject Line: UW-Madison Pharmacist-Provided Interventions for COPD Management Survey

Email Content:

Title of Study: Community Pharmacists' Perspectives on COPD Interventions to Guide Future Implementation

Study Investigators: Dr. Sara Hernandez and Dr. Jay Ford, UW School of Pharmacy, Social and Administrative Sciences Division

Drs. Sara Hernandez and Jay Ford at UW-Madison are engaged in a research study to identify COPD-related interventions pharmacists feel confident performing and how to tailor those interventions to be successfully implemented in community pharmacies.

You are being asked to participate in this survey because you are a licensed pharmacist in Wisconsin. The objective of the survey is to get a better understanding of COPD-related interventions providing by your pharmacy, such as assessing inhaler technique, discussing smoking cessation, or providing vaccinations to reduce the incidence of lower-respiratory tract infections. However, you do not have to currently be providing COPD-related interventions to participate in this survey since we also are interested in learning why pharmacies are not providing them.

Upon completing the survey, you will be entered into a lottery for a 50 USD Amazon gift card for your participation.

The survey consists of 20 questions that are primarily multiple choice, along with some short-answer responses. Completing the entire survey will take no more than 15 minutes.

Completing the survey is voluntary and all responses will remain confidential. If you agree to be contacted in the future so that we can learn more about your perspective of COPD-related interventions in community pharmacies, you will need to provide your email address. However, you do not have to provide your email address to complete the survey. Risks of completing the survey may include psychological stress and the potential for breach of confidentiality.

You can skip any survey questions that you do not want to answer. Even if you start the survey, you are not required to complete it. You can stop at any time.

Please contact Dr. Sara Hernandez at [email] with questions about the survey.

If you would like to participate, please click this link to start the survey: [insert survey link]. We ask that you complete this survey in the next 2 weeks.

Project Description on PearlRx Website

Community Pharmacists' Perspectives on COPD Interventions to Guide Future Implementation

Investigators: Sara Hernandez, PharmD and Jay Ford, PhD

Dates: April 1, 2023 – August 30, 2023

Pharmacist-provided patient care services improve chronic disease management, expand access to care, and decrease the cost of care. Community pharmacists can help improve outcomes such as increased medication adherence and reduced exacerbation risk for patients with COPD through several patient-centered strategies. These include educating patients about their medications and appropriate inhaler technique, supporting medication adherence and self-management, and providing smoking cessation services and vaccinations to decrease the incidence of lower respiratory tract infections.

This project aimed to (1) assess pharmacists' intentions to employ COPD interventions in community pharmacies and (2) explore pharmacists' perspectives of COPD management in their practice, their ideal COPD service, and materials and skills necessary to implement the service. We recruited pharmacists to participate in a survey and optional follow-up interview to inform the development and implementation of a prototype intervention to deliver to patients with COPD in the community setting. We expect that increasing the provision of COPD interventions in community pharmacies will expand patient access to these services and improve outcomes including appropriate inhaler use, immunization rate, and exacerbation risk.

For more information, please contact sehernandez2@wisc.edu

Research Participant Recruitment Email [Survey]

Email Subject Line: Seeking Participants for a Survey on Pharmacist-Provided Interventions for COPD Management

Email Content:

As a manager of a community pharmacy, we invite you to participate in our survey and to distribute this email to other pharmacists in your organization.

Title of Study: Community Pharmacists' Perspectives on COPD Interventions to Guide Future Implementation

Study Investigators: Dr. Sara Hernandez and Dr. Jay Ford, UW School of Pharmacy, Social and Administrative Sciences Division

Drs. Sara Hernandez and Jay Ford at UW-Madison are engaged in a research study to identify COPD-related interventions pharmacists feel confident performing and how to tailor those interventions to be successfully implemented in community pharmacies.

You are being asked to participate in this survey because you are a licensed pharmacist in Wisconsin and work for an organization that employs multiple pharmacists. The objective of the survey is to get a better understanding of COPD-related interventions providing by your pharmacy, such as assessing inhaler technique, discussing smoking cessation, or providing vaccinations to reduce the incidence of lower-respiratory tract infections. However, you do not have to currently be providing COPD-related interventions to participate in this survey since we also are interested in learning why pharmacies are not providing them.

Upon completing the survey, you will be entered into a lottery for a 50 USD gift card for your participation.

The survey consists of 20 questions that are primarily multiple choice, along with some short-answer responses. Completing the entire survey will take no more than 15 minutes.

Completing the survey is voluntary and all responses will remain confidential. If you agree to be contacted in the future so that we can learn more about your perspective of COPD-related interventions in community pharmacies, you will need to provide your email address. However, you do not have to provide your email address to complete the survey. Risks of completing the survey may include psychological stress and the potential for breach of confidentiality.

You can skip any survey questions that you do not want to answer. Even if you start the survey, you are not required to complete it. You can stop at any time.

Please contact Dr. Sara Hernandez at [email] with questions about the survey.

If you would like to participate, please click this link to start the survey: [insert survey link].

Since your organization employs multiple pharmacists, we would appreciate that you distribute this email to other pharmacists in your organization.

If you do not wish to receive further communication about this study, please contact Sara Hernandez at [phone number] OR please reply to this email with a request to be removed from the contact list for this study.

Research Participant Recruitment Email [Interview]

Email Subject Line: Seeking Participants for a Community Pharmacy Provided COPD Interventions Study

Email Content:

Title of Study: Community Pharmacists' Perspectives on COPD Interventions to Guide Future Implementation

Study Investigators: Dr. Sara Hernandez and Dr. Jay Ford, UW School of Pharmacy, Social and Administrative Sciences Division

Thank you for expressing interest to participate in a follow-up virtual interview related to the survey you completed for our study.

Drs. Sara Hernandez and Jay Ford at UW-Madison are engaged in a research study to identify COPD-related interventions pharmacists feel confident performing and how to tailor those interventions to be successfully implemented in community pharmacies. We invite you to participate in an interview because you are a licensed pharmacist in Wisconsin who indicated interest and/or experience in performing interventions to improve COPD management.

The purpose of the interview is to explore how COPD-related interventions could be successfully delivered in community pharmacies. We are doing this so that we can develop a prototype intervention to deliver to patients with COPD.

You will receive a 50 USD gift card for your participation.

The virtual interview should take approximately 1 hour, and you may skip any questions that you are uncomfortable answering or are not relevant. You may also stop the interview at any time. The interview is anonymous, and no one will be able to link your answers back to you. During the interview, we will ask that you do not say your name or other information that could be used to identify you in your responses to the interview questions.

Audio recordings will be made of the interview. Only the researchers will have access to these recordings. The audio recording will then be converted to a written document (called a transcription) to document what people said during the interview. The transcription will be saved but the recording will be deleted at the end of the study. No information that could identify you will be included in the transcription or in the reporting of the interview content.

Being in this study is voluntary. Please contact Sara Hernandez at [phone number] or [email] with questions about this study. **If you are interested in participating in this study, please respond to this email indicating your interest and the researcher will be in touch with you to schedule the interview.**

If you do not wish to receive further communication about this study, please contact Sara Hernandez at [phone number] OR please reply to this email with a request to be removed from the contact list for this study.

Thank you for your consideration.

Research Participant Recruitment Telephone Script [Interview]

Title of Study: Community Pharmacists' Perspectives on COPD Interventions to Guide Future Implementation

Study Investigators: Dr. Sara Hernandez and Dr. Jay Ford, UW School of Pharmacy, Social and Administrative Sciences Division

[If the pharmacist is not available, thank the person who answered and say goodbye and/or ask if there is a good time to call back to reach the pharmacist.]

[If the pharmacist is available, confirm you are speaking to the correct person and proceed.]

Hello, I am a researcher at the University of Wisconsin-Madison School of Pharmacy. We are conducting a research study to identify COPD-related interventions pharmacists feel confident performing and how to tailor those interventions to be successfully implemented in community pharmacies.

Is this a good time to talk?

- *If Yes, continue*
- *If No, ask, "Can we schedule another time to talk?"*

We invite you to participate in an interview because you are a community pharmacist who indicated interest and/or experience in performing interventions to improve COPD management. The purpose of the interview is to explore how COPD-related interventions could be successfully delivered in community pharmacies. We are doing this so that we can develop a prototype intervention to deliver to patients with COPD.

You will receive a 50 USD Amazon gift card for your participation.

Participation in the study is voluntary. If you decide to participate, the interview should take approximately 1 hour, and you may skip any questions that you are uncomfortable answering or are not relevant. You may also stop the interview at any time. The interview is anonymous, and no one will be able to link your answers back to you. During the interview, we will ask that you do not say your name or other information that could be used to identify you in your responses to the interview questions.

Do you have any questions about the study?

Would you like to participate in this study?

- *If Yes, schedule a time to conduct the interview and ask for their email so that you can send a copy of the Information Sheet ahead of the interview. Thank the person for their time.*
- *If No, state, "Thank you for your time."*

If you have any questions about this research study, you can contact Dr. Sara Hernandez at [phone number] or [email].

Appendix C. Survey

Pharmacist-Provided Interventions for COPD Management Survey

We are surveying pharmacists throughout Wisconsin to help us better understand the provision of interventions for the management of Chronic Obstructive Pulmonary Disease (COPD) in pharmacies.

You are being asked to participate in this survey because you are a licensed pharmacist in Wisconsin, so that we can get a better understanding of interventions provided by your pharmacy that can help improve COPD management. However, you do not have to currently be providing COPD-related interventions to participate in this survey since we also are interested in learning why pharmacies are not providing them.

The survey consists of 20 questions that are primarily multiple choice, along with some short-answer responses. Completing the entire survey will take no more than 15 minutes.

Completing the survey is voluntary and all responses will remain confidential. If you agree to be contacted in the future so that we can learn more about your perspective of COPD-related interventions in community pharmacies, you will need to provide your e-mail address. However, you do not have to provide your email address to complete the survey. Risks of completing the survey may include psychological stress and the potential for breach of confidentiality.

All responses should be related to your primary pharmacy practice setting. If you work at multiple pharmacy locations, the primary pharmacy practice setting would be the location where you work at least 50% of your time as a practicing pharmacist. If you work at multiple pharmacy locations but none of these locations at least 50% of the time, please respond for the pharmacy where you work the greatest number of hours.

We greatly appreciate your participation in this important work.

This study is focused on pharmacists who primarily practice in the community/outpatient setting. Do you primarily practice as a pharmacist in a hospital?

a. Yes b. No

If yes, participant will be shown the following and not continue with survey:

"Thank you for your interest, you are not eligible to complete this survey."

If no, participant will continue the survey.

1. Think about all patients with COPD who will visit your pharmacy within the next 30 days with a new or a refill prescription. For what percentage of those patients would you expect to perform the following tasks?

a. Review the patient's medication profile (e.g., assess the appropriateness of therapy, potential drug interactions, or adverse effects)
b. Provide inhaler technique education (e.g., ask patient to demonstrate how they use their inhaler, provide education on appropriate inhaler technique)
c. Discuss pulmonary rehabilitation (e.g., ask if patient has attended pulmonary rehabilitation, provide information on pulmonary rehabilitation, refer patient to local pulmonary rehabilitation programs)
d. Provide vaccination services (e.g., assess vaccination status, counsel on importance of regular vaccinations, provide vaccinations)
e. Discuss smoking cessation (e.g., assess patient's smoking status and nicotine dependence, counsel on smoking cessation products)

Sliding scale 0 10 20 30 40 50 60 70 80 90 100

2. In your opinion, what percentage of patients with COPD visiting your pharmacy would like you to provide the following?
   a. Review the patient's medication profile (e.g., assess the appropriateness of therapy, potential drug interactions, or adverse effects)
   b. Provide inhaler technique education (e.g., ask patient to demonstrate how they use their inhaler, provide education on appropriate inhaler technique)
   c. Discuss pulmonary rehabilitation (e.g., ask if patient has attended pulmonary rehabilitation, provide information on pulmonary rehabilitation, refer patient to local pulmonary rehabilitation programs)
   d. Provide vaccination services (e.g., assess vaccination status, counsel on importance of regular vaccinations, provide vaccinations)
   e. Discuss smoking cessation (e.g., assess patient's smoking status and nicotine dependence, counsel on smoking cessation products)

Sliding scale 0 10 20 30 40 50 60 70 80 90 100

3. In your opinion, what percentage of physicians in your community would approve of you providing the following to your patients with COPD?
   a. Review the patient's medication profile (e.g., assess the appropriateness of therapy, potential drug interactions, or adverse effects)
   b. Provide inhaler technique education (e.g., ask patient to demonstrate how they use their inhaler, provide education on appropriate inhaler technique)

c. Discuss pulmonary rehabilitation (e.g., ask if patient has attended pulmonary rehabilitation, provide information on pulmonary rehabilitation, refer patient to local pulmonary rehabilitation programs)
d. Provide vaccination services (e.g., assess vaccination status, counsel on importance of regular vaccinations, provide vaccinations)
e. Discuss smoking cessation (e.g., assess patient's smoking status and nicotine dependence, counsel on smoking cessation products)

Sliding scale 0 10 20 30 40 50 60 70 80 90 100

4. In your opinion, what percentage of pharmacists working in community pharmacies provide the following to their patients with COPD?
   a. Review the patient's medication profile (e.g., assess the appropriateness of therapy, potential drug interactions, or adverse effects)
   b. Provide inhaler technique education (e.g., ask patient to demonstrate how they use their inhaler, provide education on appropriate inhaler technique)
   c. Discuss pulmonary rehabilitation (e.g., ask if patient has attended pulmonary rehabilitation, provide information on pulmonary rehabilitation, refer patient to local pulmonary rehabilitation programs)
   d. Provide vaccination services (e.g., assess vaccination status, counsel on importance of regular vaccinations, provide vaccinations)
   e. Discuss smoking cessation (e.g., assess patient's smoking status and nicotine dependence, counsel on smoking cessation products)

Sliding scale 0 10 20 30 40 50 60 70 80 90 100

5. Think about all patients with COPD who visit your pharmacy. Please indicate how difficult it is for you to perform the following tasks.
   a. Review the patient's medication profile (e.g., assess the appropriateness of therapy, potential drug interactions, or adverse effects)
   b. Provide inhaler technique education (e.g., ask patient to demonstrate how they use their inhaler, provide education on appropriate inhaler technique)
   c. Discuss pulmonary rehabilitation (e.g., ask if patient has attended pulmonary rehabilitation, provide information on pulmonary rehabilitation, refer patient to local pulmonary rehabilitation programs)

d. Provide vaccination services (e.g., assess vaccination status, counsel on importance of regular vaccinations, provide vaccinations)
e. Discuss smoking cessation (e.g., assess patient's smoking status and nicotine dependence, counsel on smoking cessation products)

☐ Not at all difficult ☐ A little difficult ☐ Somewhat difficult ☐ Difficult ☐ Very difficult

6. Think about all patients with COPD who visit your pharmacy. In your opinion, to what extent are you responsible as a pharmacist to perform the following tasks?
   a. Review the patient's medication profile (e.g., assess the appropriateness of therapy, potential drug interactions, or adverse effects)
   b. Provide inhaler technique education (e.g., ask patient to demonstrate how they use their inhaler, provide education on appropriate inhaler technique)
   c. Discuss pulmonary rehabilitation (e.g., ask if patient has attended pulmonary rehabilitation, provide information on pulmonary rehabilitation, refer patient to local pulmonary rehabilitation programs)
   d. Provide vaccination services (e.g., assess vaccination status, counsel on importance of regular vaccinations, provide vaccinations)
   e. Discuss smoking cessation (e.g., assess patient's smoking status and nicotine dependence, counsel on smoking cessation products)

☐ Not at all responsible ☐ A little responsible ☐ Somewhat responsible ☐ Responsible ☐ Very responsible

7. How likely can reviewing the medication profile (e.g., assess the appropriateness of therapy, potential drug interactions, or adverse effects) of a COPD patient in community pharmacies result in: ……?
   a. Advancing the profession
   b. Attracting more patients to the pharmacy
   c. An increase in patient trust in the pharmacist
   d. An increase in pharmacy revenue
   e. An improvement in your job satisfaction
   f. A significant benefit on patients' health outcomes
   g. A patient’s appreciation of the pharmacist's value

☐ Not likely at all ☐ A little likely ☐ Somewhat likely ☐ Likely ☐ Very likely

8. How likely can providing inhaler technique education (e.g., ask patient to demonstrate how they use their inhaler, provide education on appropriate inhaler technique) to patients with COPD in community pharmacies result in: ……?
    a. Advancing the profession
    b. Attracting more patients to the pharmacy
    c. An increase in patient trust in the pharmacist
    d. An increase in pharmacy revenue
    e. An improvement in your job satisfaction
    f. A significant benefit on patients' health outcomes
    g. A patient's appreciation of the pharmacist's value

☐ Not likely at all ☐ A little likely ☐ Somewhat likely ☐ Likely ☐ Very likely

9. How likely can discussing pulmonary rehabilitation (e.g., ask if patient has attended pulmonary rehab, provide information on pulmonary rehab, refer patient to local pulmonary rehab programs) with COPD patients in community pharmacies result in: ……?
    a. Advancing the profession
    b. Attracting more patients to the pharmacy
    c. An increase in patient trust in the pharmacist
    d. An increase in pharmacy revenue
    e. An improvement in your job satisfaction
    f. A significant benefit on patients' health outcomes
    g. A patient's appreciation of the pharmacist's value

☐ Not likely at all ☐ A little likely ☐ Somewhat likely ☐ Likely ☐ Very likely

10. How likely can providing vaccination services (e.g., assess vaccination status, counsel on importance of regular vaccinations, provide vaccinations) in community pharmacies result in: ……?
    a. Advancing the profession
    b. Attracting more patients to the pharmacy
    c. An increase in patient trust in the pharmacist
    d. An increase in pharmacy revenue
    e. An improvement in your job satisfaction
    f. A significant benefit on patients' health outcomes
    g. A patient's appreciation of the pharmacist's value

☐ Not likely at all ☐ A little likely ☐ Somewhat likely ☐ Likely ☐ Very likely

11. How likely can discussing smoking cessation (e.g., assess patient's smoking status and nicotine dependence, counsel on smoking cessation products) in community pharmacies result in: ……?
    a. Advancing the profession
    b. Attracting more patients to the pharmacy
    c. An increase in patient trust in the pharmacist
    d. An increase in pharmacy revenue
    e. An improvement in your job satisfaction
    f. A significant benefit on patients' health outcomes
    g. A patient's appreciation of the pharmacist's value

☐ Not likely at all ☐ A little likely ☐ Somewhat likely ☐ Likely ☐ Very likely

12. Which of the following best describes your pharmacy?
    a. An independent community pharmacy
    b. A pharmacy that is part of a chain (e.g., Walgreens, CVS)
    c. A pharmacy that is part of a mass merchandiser (e.g., Wal-Mart, Costco)
    d. An outpatient pharmacy that is affiliated with a hospital
    e. A pharmacy located in a clinic or affiliated with an HMO
    f. Other: ___

13. Does the pharmacy have a private place for patient counseling?
    a. Yes b. No

14. Which of the following best describes your community setting?
    a. Urban b. Rural

15. Age: ___

16. Gender:
    a. Male b. Female c. Non-binary / third gender e. Prefer not to say

17. Highest degree:
    a. Bachelor's b. Master's c. PharmD e. Other: ___

18. Years of experience as a licensed pharmacist: ___

19. Are you interested in being entered into raffle for a $50 gift card for completed the survey?
    a. Yes b. No

20. Are you interested in being contacted to participate in a 1-hour compensated interview to discuss the best interventions to implement and how to best implement those interventions to help patients with COPD?
    a. Yes b. No

21. If you answered "yes" to either question above, please provide your contact information (name, e-mail address, and phone number). ___

We thank you for your time spent taking this survey.
Your response has been recorded.

Appendix D. Imputation

Table D.1: Imputed Values of Missing Variables					
Question	Variable	Number & Proportion of Missing Values	Mean	Median	Imputed Value
1b	Intention, Educate on Inhaler Technique	1 (2.9%)	50.3	50	50
1c	Intention, Discuss Pulmonary Rehab	8 (23.5%)	14.6	10	10
1d	Intention, Provide Vaccine Services	2 (5.9%)	56.9	60	60
2b	Patient Subjective Norms, Educate on Inhaler Technique	1 (2.9%)	67.6	70	70
2c	Patient Subjective Norms, Discuss Pulmonary Rehab	3 (8.8%)	36.5	30	40
2d	Patient Subjective Norms, Provide Vaccine Services	2 (5.9%)	67.8	80	70
2e	Patient Subjective Norms, Discuss Smoking Cessation	1 (2.9%)	57.3	50	60
3b	Physician Subjective Norms, Educate on Inhaler Technique	1 (2.9%)	91.2	100	90
3c	Physician Subjective Norms, Discuss Pulmonary Rehab	2 (5.9%)	64.1	70	60
4c	Pharmacist Subjective Norms, Discuss Pulmonary Rehab	7 (20.6%)	10.7	10	10
8f	Attitude, Educating on Inhaler Technique Can Result in a Significant Benefit on Patient's Health Outcomes	2 (5.9%)	4.8	5	5
9e	Attitude, Discussing Pulmonary Rehab Can Result in an Improvement in Your Job Satisfaction	1 (2.9%)	3.7	3	4
10g	Attitude, Providing Vaccine Services Can Result in a Patient's Appreciation of the Pharmacist's Value	1 (2.9%)	4.3	5	4

Table D.2: Descriptive Statistics Before Imputation						
	Review the Medication Profile	Educate on Inhaler Technique	Discuss Pulmonary Rehab	Provide Vaccine Services	Discuss Smoking Cessation	Total
Intention	82.9 ± 22.9	50.3 ± 29.0	14.6 ± 18.4	56.9 ± 31.5	41.2 ± 31.5	50.3 ± 19.6
Attitude	81.3 ± 16.7	87.1 ± 15.4	70.8 ± 23.2	87.3 ± 16.7	79.1 ± 15.7	81.8 ± 14.4
Subjective Norms	82.1 ± 16.6	67.6 ± 20.0	38.3 ± 20.1	69.8 ± 20.4	59.6 ± 19.9	61.9 ± 14.7
Perceived Behavioral Control	67.1 ± 16.2	60.0 ± 17.8	30.6 ± 19.8	60.0 ± 20.3	50.6 ± 22.1	53.6 ± 12.4
Perceived Moral Obligation	96.5 ± 9.2	92.9 ± 11.9	50.6 ± 19.8	80.6 ± 21.2	75.3 ± 20.3	79.2 ± 10.7
Total	82.0 ± 9.5	72.0 ± 12.3	43.2 ± 13.0	72.0 ± 13.8	61.7 ± 14.1	

Table D.3: Descriptive Statistics After Imputation						
	Review the Medication Profile	Educate on Inhaler Technique	Discuss Pulmonary Rehab	Provide Vaccine Services	Discuss Smoking Cessation	Total
Intention	82.9 ± 22.9	50.3 ± 28.5	13.5 ± 16.1	57.1 ± 30.5	41.2 ± 31.5	49 ± 19.0
Attitude	81.3 ± 16.7	86.9 ± 15.1	70.4 ± 22.9	87.6 ± 16.6	79.1 ± 15.7	81.0 ± 15.6
Subjective Norms	82.1 ± 16.6	67.8 ± 19.4	37.1 ± 19.0	69.7 ± 19.9	59.1 ± 19.8	63.2 ± 13.9
Perceived Behavioral Control	67.1 ± 16.2	60.0 ± 17.8	30.6 ± 19.8	60.0 ± 20.3	50.6 ± 22.1	53.6 ± 12.4
Perceived Moral Obligation	96.5 ± 9.17	92.9 ± 11.9	50.6 ± 19.8	80.6 ± 21.2	75.3 ± 20.3	79.2 ± 10.7
Total	82.0 ± 9.5	71.6 ± 11.8	40.4 ± 13.1	71.0 ± 14.6	61.1 ± 14.3	

Appendix E. Interview Guide

Pharmacist-Provided Interventions for COPD Management Interview Guide

Hello. My name is _____. I am a (researcher/research assistant) at the University of Wisconsin School of Pharmacy. Thank you for taking the time to speak with me today.

Since you are a pharmacist who is practicing in the community setting, I would like to understand your perspective on which interventions should be implemented and how to best implement them to help patients with Chronic Obstructive Pulmonary Disease, which I will refer to as COPD throughout the interview. We are doing this so that we can guide future implementation of COPD-related interventions in community pharmacies.

I am going to record this interview so I can accurately capture what you say. Even though I am recording our conversation, everything we talk about is confidential. Please try not to give names or any other information that could identify you or others. The interview should take a minimum of 30 minutes, and you may skip any questions that you are uncomfortable answering or are not relevant. You may also stop the interview at any time. Do you have any questions before we begin?

Introductory Questions:

As I mentioned, the overall goal of the project is to guide future implementation of COPD-related interventions in community pharmacies. Based on your experiences, I would like to get your feedback on community pharmacists providing COPD interventions.

1. What comes to mind when you think of COPD interventions being performed within a community pharmacy?
2. What are the perceived barriers in your community that is making it challenging for a community pharmacy to offer COPD interventions?

Current Practice:

Based on your experiences in the pharmacy where you work, I would like to get your feedback on the current practice of COPD-related interventions.

3. What COPD-related interventions are being performed where you work that help patients with COPD?

   Prompt with interventions from this list, if not mentioned. This list of interventions will be utilized throughout the interview.

   a. **Review the patient's medication profile** (e.g., assess the appropriateness of therapy, potential drug interactions, or adverse effects)
   b. **Provide inhaler technique education** (e.g., ask patient to demonstrate how they use their inhaler, provide education on appropriate inhaler technique)

c. **Discuss pulmonary rehabilitation** (e.g., ask if patient has attended pulmonary rehabilitation, provide information on pulmonary rehabilitation, refer patient to local pulmonary rehabilitation programs)
d. **Provide vaccination services** (e.g., assess vaccination status, counsel on importance of regular vaccinations, provide vaccinations)
e. **Discuss smoking cessation** (e.g., assess patient's smoking status and nicotine dependence, counsel on smoking cessation products)

For each intervention identified by pharmacist, ask the following. If no COPD-related interventions were identified, skip.

4. How are [identified intervention] currently being carried out at your pharmacy?
    a. How often is [identified intervention] performed at your pharmacy?
    b. Who is involved in providing [intervention]? Pharmacists, technicians, both?
    c. What tools are they using?
    d. Where is [intervention] being provided? In a private room?

If no COPD-related interventions were identified, ask the following for each intervention from the above list.

5. Why is your pharmacy not providing COPD-related interventions?
    a. What training would be needed to provide them?
    b. What materials would be needed to provide them?
    c. Is there a dedicated space to provide such interventions?
    d. Are there available staff to provide [intervention]?

<u>Confidence</u>:

To help me understand what interventions would be best to try to implement in community pharmacies, I want to get an idea of how confident pharmacists feel providing a few COPD-related interventions that literature shows could be effective to perform to community pharmacies.

For each intervention identified by pharmacist, ask the following. If no interventions were identified, skip.

6. How confident do you feel performing [identified intervention]?
    a. Why are you [repeat confidence response]?

If no/not all interventions were identified, ask the following for each intervention from the list. If all interventions on the list were identified, skip.

7. You are not performing [intervention], how confident do you feel performing [intervention]?

If pharmacist reported moderate-to-low confidence for any of the interventions, ask the following questions. If pharmacist reported high confidence to all interventions, skip.

8. What training or trainings would you need to feel confident in performing these COPD interventions?
9. How would the training differ for the different interventions?

Brainstorming Tailored COPD Intervention(s):

Now that I have gotten an idea of what COPD-related interventions are performed at your pharmacy and how, I would like for you to imagine an ideal COPD service at your pharmacy. It could involve as many or as few components as you like. I could involve providing new interventions or expanding ones that you already have in place. Keep in mind the physical structure, workflow, and staffing of your pharmacy while you image this service.

For each intervention to be provided, ask the following. If no new interventions are to be provided, skip.

10. What COPD services could the pharmacy provide?
11. What staff would be involved?
    a. What would they do?
12. How would the intervention look in your pharmacy?
13. Would you change or modify your pharmacy to provide [identified intervention]?
    a. If yes, how would you change or modify your current workplace structure?

For each intervention to be expanded, ask the following. If no interventions are to be expanded, skip.

14. What COPD services currently offered in the pharmacy could be expanded?
15. What staff are currently involved?
    a. What do they do?
    b. Are there any staff you would like involved, but are not currently?
        i. *If any staff are identified:* What would they do?
16. Earlier, you told me how [identified intervention] is currently provided at your pharmacy. How would your expanded intervention look?
17. Would you change or modify your pharmacy to expand [identified intervention]?
    a. If yes, how would you change or modify your current workplace structure?

Barriers & Facilitators:

Now that we have a good picture of what your ideal COPD service would look like in your pharmacy, I would like to talk about the barriers and facilitators you currently face that impact this service.

For interventions to be provided, ask the following. If no new interventions are to be provided, skip.

18. You indicated that you could provide [intervention(s)], what is currently preventing you from providing [intervention(s)]?
    a. Does this apply to all interventions?
19. What would you need to successfully implement [identified intervention]?

   a. What materials would you need?
   b. What skills or training would you need?

For interventions to be expanded, ask the following. If no interventions are to be expanded, skip.

1. You indicated that you could expand [intervention(s)], what is currently preventing you from expanding [intervention(s)]?
   a. Does this apply to al interventions?
2. What would you need to successfully expand [identified intervention]?
   a. What materials would you need?
   b. What skills or training would you need?
3. Given all that you have talked about today, what advice would you have for another pharmacist who is thinking about providing or expanding COPD-related interventions?

That is the last question I have for you. I really appreciate your taking time out of your busy schedule to talk with me. It means a lot to the success of this project. Do you have anything you would like to add before we end?

Appendix F. Codebook

Table F: Codebook		
Code	**Shorthand**	**Definition**
Determine the Know-Do Gap	Gap	How are guideline recommendations NOT being followed? What information do pharmacists not have or are not using?
Adapt Knowledge to Local Context	Local context	What features of the community pharmacy make delivering clinical interventions different from other places that deliver health care?
Barriers to Knowledge Use	Barrier	What factors are inhibiting pharmacists' ability to provide COPD interventions?
Facilitators to Knowledge Use	Facilitator	What factors are aiding pharmacists' ability to provide COPD interventions?
Select Interventions	Select	What interventions would pharmacists include in their ideal COPD service? What interventions should we include in our toolkit/prototype?
Tailor Interventions	Tailor	How do pharmacists currently modify or how should we modify guideline-recommended interventions for delivery in the pharmacy? How should these interventions be delivered?
Implement Interventions	Implement	What implementation strategies can we use to ensure success? How should the program/intervention be set up?

Appendix G. Additional Interview Quotes

Table G: Additional Interview Quotes	
Category	Quotes
Determine the Know/Do Gap	
Lack of Knowledge about Pulmonary Rehabilitation	"We might ask if they have a follow up appointment. But I don't think we've ever actually asked about rehabilitation. … Probably just a knowledge gap would be my guess. It's not something that we think about regularly. The patient themselves might not call it pulmonary rehabilitation. They might call it like 'I'm going to my next appointment in a couple of days.' They might not actually say what that appointment is for. So, we don't even know that they're in it a lot of the times." – RPh 1
Not Assessing Inhaler Technique When Refilling Prescriptions	"Usually, the very first time they pick it up. Subsequent prescriptions after that, we always ask if they have any questions or concerns. Typically, we do not go into the full-blown 'this is how you use your inhaler' every time though. We don't have the time for it right now." – RPh 4 "Certainly, at first pick up we get it out, we demonstrate it. I'll have them do it in front of me. When I know it's the second one or say, a subsequent fill, then I check with them, ask them how it's going, if they're experiencing any side effects or noticing any differences after they take it. If they miss any doses, do they notice any difference from when they get it versus not get it? So, it depends on the situation. There is some level of follow up with it." – RPh 6
Adapt Knowledge to Local Context	
Compensation for Services	"To get involved in clinical services and tell PBMs to go screw themselves—I'm sorry for the verbiage—but it is a great idea and something that we're going to go full-board if there's something like this available. I want to deal with patients and help them. I don't want to worry about insurance companies taking money back because they think they can. Clinical services are the way we're going to be able to do that." – RPh 4

Variation in Community Pharmacies	"We have access to their clinic notes here, so before she got the Metformin, I looked at the provider's note and saw that she was having some issues with some costs and stuff, and she smoked. So, then I talked to her about that a little bit. So, we set up an appointment for her to come in next week to talk in more detail about that." – RPh 2 "At this site I'm working in a clinic, and I get referrals from providers here to do COPD management." – RPh 2
Assess Barriers & Facilitators to Knowledge Use	
Reimbursement, Staffing, and Time	"We are fairly busy. I would say keeping track of those patients that we're doing some of these new dispenses for and having that time to follow up with them is something that's a little bit tougher. … Immunizations take time to do and time to give." – RPh 3 "We do not go into the full-blown 'this is how you use your inhaler' every time though. We don't have the time for it right now." – RPh 4 "So, we have pharmacy residents on site as well, and I assist in precepting the immunizations rotation. The last 2 years each of the residents has done some projects in order to help update pharmacy staff and providers on some of the new pneumococcal vaccine recommendations, so that pharmacy providers or the pharmacists who are working in the pharmacy with us are familiar with them, so we can offer them to patients appropriately." – RPh 3 "I have an intern that's working with us—she's starting her second year. She works a couple days or a day per week. She just started, but I hope to get her involved in more of the clinical aspects." – RPh 4
Physical Space	"So, if we don't have a space for that counseling to happen, or if there are not enough registers in a community setting where you can ring someone else up who maybe doesn't need that much time, that can feel rushed. That can be a barrier for both the pharmacist and for the patient." – RPh 1

	"We have a wonderful, dedicated consultation booth space. When patients have more questions, we're able to sit down with them. … We can actually sit down with the patient in a room separate from everything else in the pharmacy where they're able to sit and really think about and answer those questions honestly, so that we can talk through things with them." – RPh 3
Demonstration Resources	"We try to hand out packets from the package labeling. All inhalers have techniques, pictures of techniques on their package labeling. We try to hand out those packets to people so they can take that home and use it, because sometimes it's hard to remember all the steps if you just tell them. … I'd go through our technique on the handout together so I'm not miscommunicating between all the different inhalers and all the different little caveats that the manufacturers put out there." – RPh 1 "If they have their inhaler there, and it's time for them to use it, then I'll do that. That's with more of a metered dose, and then I have some sample devices for the Respimat and stuff like that. That way they can at least get their hands on it even if they don't have their own inhaler with them or if they haven't started using it yet." – RPh 2 "It helps definitely to have those demo inhalers, too. You can physically show the patient something. Those are really helpful. … Some of our primary providers will send patients down to the pharmacy, and they don't necessarily have their inhaler with them. I'm able to pull out an inhaler that looks exactly like what they have at home out of the drawer, and say, 'Is this what you're looking at while at home?' They can say 'yes' and then you can actually go through it even though I don't have [their inhaler] right there in front of me." – RPh 3 "We do have practice inhalers. We would probably use those as opposed to the patient's inhaler. Now, sometimes like with the Combivent inhalers which need to be put together, we would probably use theirs to begin with, to show them how to put it together. And then it's ready to go. That would probably be the only time we use theirs." – RPh 4

	"We do have quite a few trainers, dummy inhalers. On new prescriptions we'll definitely go grab and show them how to use it. … I'll point out the patient inserts and things like that, too." – RPh 5 "I used to have a bunch of practice inhalers, but I don't know where they've gone through the years. We get their actual inhaler out and then show them by a mock demonstration of it." – RPh 6 "We do have samples of most of the inhalers, so we can physically show people how to use them." – RPh 7 "Usually, if it's a new kind of inhaler, I have a little demo box that I can pull out. I don't have every kind of demo inhaler in there, but usually I can walk it through or at least pantomime what they look like and walk them through technique." – RPh 8
Relationships with Prescribers – Communication	"We are still usually either calling or faxing prescribers. We do have access to Epic for 3 major health systems, which has been nice. We can read all their notes. We just cannot send messages in Epic, so we either have to call or fax. Usually what we'll do after a CMR—especially if we have multiple recommendations—is we'll write it all out and fax it over to them, kind of in that SBAR format (Situation-Background-Assessment-Recommendation). We try to make it really easy for [the prescriber,] where they can literally just check the recommendation, sign it, and then that counts as a prescription. We do that quite often. We'll include what we learned from [the patient] about their asthma and their COPD, how often are they using their rescue inhaler, how do they feel it's working, if we need to switch from this to this, and why we feel we should do that. Then, we make it easy for them to write that prescription." – RPh 7 "Oftentimes they'll also pick them up, because we'll send off to the pulmonologist for the refill. And we won't see anything for like a week, and it's like "Well, they need it now." So, then we send it to their primary [care physician] and then they send it right to us, because they know what's up with that." – RPh 8

Relationships with Prescribers – Collaborative Practice Agreements	"We don't have any collaborative practice agreement in the pharmacy specifically for prescribing assist aids [for smoking cessation] or anything like that." – RPh 3 "If 90% of your patients go to that particular clinic or to that particular health system, it's easier to create collaborative practice agreements … [and to] work referral services or know the resources that are available to somebody. In the case of COPD, you know different professionals that you can refer somebody to." – RPh 6 "I can switch it to a preferred product. I send off the collaborative practice agreements notification form saying, like 'For your patient, … you wrote this inhaler with these directions and this many refills, and according to our chart on our collaborative practice agreement, that lines up with this guy, which was set as a preferred product and this was done…' I have the option to switch [to a different inhaler] if they also have an issue with it, like adverse effects or cost savings. Let's say someone started their Advair, and they got a really hoarse throat and it was driving them nuts. We could switch it to Symbicort, see if that works better, and mark that off, too. But, we don't do too many of those, it's usually just a cost savings one." – RPh 8
Technology – Accessing Medical Records	"We have access to their clinic notes here, so before she got the Metformin, I looked at the provider's note and saw that she was having some issues with costs and stuff, and she smoked." – RPh 2 "Our prescription processing system is actually on Epic as well. It interfaces directly with the medical chart, so any doctors or any prescriptions that are written by a doctor within the system that I work for are easily accessible. We don't even have to go to a different Epic screen. They're easily accessible right from our prescription processing center. The setting that I'm in definitely helps." – RPh 3
Technology – Vaccination Status	"We do include vaccine screenings during the CMRs. It was a decimal part I always like tend to forget because we usually print it out on another page. I'm like, "Oh, well next one we'll talk about that." – RPh 7

	"We check—it circles back to my computer system—it has an inbuilt [program] to try and identify people that need pneumococcal vaccine, but it was very rudimentary. The one that is built by the company only covers if someone's older than sixty-five and if they haven't had [the vaccine], it'll flag them. I turned that one off because it was not as helpful. I rebuilt it, so that it was … also based on medication-fill history. If someone is below sixty-five, but they get those maintenance inhalers or if they get insulin or other things that would prompt for that vaccine schedule, it flags them and it pops up in my system." – RPh 8
Access to Care in Rural Areas	"Yeah, that's been a real challenge because it's rural and there's really nothing available. We haven't been too successful, and we have a health coach here, so sort of a structure of pulmonary rehab. I've tried to get people to visit him so that he could just do some basic exercise stuff and get them active. But yeah, they're not available. There's a cardiac rehab that's in town, but they don't do pulmonary rehab." – RPh 2 "We're in Central Wisconsin, very small communities, not a lot of provider network infrastructure. Most of our patients travel great distances, especially to see specialists. They have in most cases, a minimum forty-five-minute distance to see some of these specialists." – RPh 6 "To have some type of collaboration or a go-to for service referral is very difficult because you have seven different health care systems that these patients might be going to, and [we don't know] what resources come to those particular clinics, or if [patients] have to go all the way to Madison (the state capitol), which from us is an hour plus drive." – RPh 6
Select, Tailor, Implement Interventions	
Comprehensive Medication Review	"That service ideally would be an available service every month. You come in and you're checking adherence, and you're making sure that patient is taking the medication correctly on their first dose as they leave the pharmacy. Then, of course, you could ask them about issues or changes, or anything that's come up while the service is happening. Say month 3 they change their inhaler for some reason, because the insurance changed or their prescriber changed something. Then you can repeat the whole process, but be very involved each month on that process. … When we're talking specifically about COPD, it would

	really be that month-to-month interaction where I would think we'd get the most benefit. … Then ideally, you'd put them on an appointment-based schedule. But we know that appointments have pitfalls too, right? But ideally, you'd say, 'Okay, your next inhaler is due in 30 days or 29 days or whatever. We're going to put you on the calendar. If you can come at 10 am in 29 days, then we'll walk through all the steps and everything again and make sure everything is going okay.'" – RPh 1 "Now, we do have something called MTM services where an insurance company or an insurance payer will ask us to do a med review." – RPh 4 "Creating the appropriate follow up, maybe at different checkpoints, three months, six months, nine months, whatever it is. Having something systematic that you then are getting reimbursed for makes those services more attainable." – RPh 6 "If we need to set up a CMR, a Comprehensive Medication Review, we can do that as well. We do quite a few of those and that's where we really dig into COPD. We can go through some of the screening questions to see how they're using [their inhaler]. Then we can make interventions, whether it be inhaler technique or changing a medication and all that. That's usually the time where we can really dig into that medication therapy. … We usually ask patients to bring in their medications with them. We'll have them show us how they use their inhalers [as part of the CMR]. … We do have a question that asks about tobacco use on our [CMR] sheets, so it prompts us to ask about that." – RPh 7
Inhaler Education	"First is probably going to be counseling, right? Someone is gonna get a new inhaler; they're not necessarily going to know how to use that inhaler. We're going to counsel them, train them, or give them paper handouts on how to use that inhaler. … We can talk with the patient, or even have them use a dose if they want to. It's totally up to them. Then we try to hand out packets from the package labeling. All inhalers have pictures of techniques on their package labeling. We try to hand out those packets to people so that they can take that home and use it, because sometimes it's hard to remember all the steps if you just tell them. … I'd go through our technique on the handout together so I'm not miscommunicating between all the different inhalers and all the different little caveats that the manufacturers put out there." – RPh 1

	"Going over inhaler technique, that would be a pretty basic thing. … I have a couple YouTube videos that I show them. … Then I go over it with them afterwards. … Once they learn how to use it, I have them describe what they do verbally. I'll look and see how they describe it. If they need to change something, I'll talk to them about that." – RPh 2 "Making sure the patient is familiar with the inhaler, the technique of this specific inhaler, how to use it and how often it should be used, whether they need to rinse their mouth afterwards, priming instructions, preparation for using it." – RPh 3 "Inhaler technique too. With all the different devices, making sure the patients know how to use the inhalers. … On new prescriptions we'll definitely go grab [a demo inhaler] and show them how to use it. … If someone says that it doesn't seem like it's working as well or [they're] having issues on refills, then we'll grab it as well. If an albuterol gets clogged and they bring it in, we'll usually help them clean it. Take the canister out and put it through water and clean it for them. … I'll visually show someone the breaths, too. Like breathing out and then holding your breath. … I'll point out the patient inserts and things like that, too. … If I don't know specifically how one works, I'll figure it out beforehand if I haven't seen it before, like a new inhaler or something." – RPh 5 "Sometimes, if people tell me their inhaler isn't working well, I'll ask them to demonstrate it for me. … That way I can tell if they are using it correctly and walk them through it. My favorite one, when someone pantomimed it, was they spritz themselves with their albuterol, like it was perfume. Then I had to walk them through how you don't do it that way and how to do it correctly. … [I tell the patient] what the medications does, like, 'it tells the muscles to open up, or knocks down inflammation so that way the airways can kind of stay open, they're not as inflamed,' and walking them through how you would use it each day. [I also tell them] what side effects to watch out for, whether it's thrush with a steroid, or if it's potential hoarseness, … [or] if you have sudden worsening new breathing. [Then I am] trying to tell them strategies to remember … trying to talk to them about using it every day. And then, explaining what COPD is to an extent, because sometimes people will go in [to see their

	physician] and they'll get told that they have something and then they don't get told much else, because all the time for the appointments has been eaten up." – RPh 8
Adherence	"I think the first issue that usually comes up is having the inhaler that is covered by insurance. So, what we would do is set people up on Med Sync first so that we knew when those inhalers were coming due as a notification. Make sure that the inhaler is covered, and have it ordered into the pharmacy before the patient picks up." – RPh 1 "We work on prior authorizations for medications that may not be covered under patient's insurance. We have a high Title XIX population. A lot of the like preferred inhalers for COPD are not covered or preferred on the State formulary. So, working through prior authorizations with the doctors." – RPh 3 "Discuss it with the patient, if they haven't gotten a medication filled in a while. Ask if it's something their doctor wanted them to do or if they're doing it on their own. Get some buy-in from them to get a little more information from them, why it's not being used as prescribed. … Watch their compliance on getting their inhalers filled. If they deviate, then have a conversation. Ask them if there's a reason they're not using their inhaler on a regular basis, as prescribed. Then get into if it's side effects, is it cost, is it this, is it that? By probing a little bit further, we can draw that information out. … If cost is an issue, we would—with permission from the patient—we would contact the physician about any other drugs we could try, try to give some recommendations." – RPh 4 "We check our refill history on each prescription, each fill. If something is a little bit out of line, then we'll make a note on the refill to check and see if there is an issue. We get the majority of our patients set up on med-sync as well. … A lot of our more expensive inhalers we'll put on automatic refill so we can order it. We don't have them all sitting on our shelves at once, so we can order it when the patient will need it. Then it sends them a notification that it's ready to be picked up." – RPh 5

	"I'll check to see if a coupon is available through the manufacturers. But of course, you can't use those if somebody does have Medicare." – RPh 5 "If I identify [non-adherence] when I'm filling a maintenance inhaler, … I'll make a note to find out if there's some reason why they don't feel like they're doing it. Maybe, the doctor told them they could reduce it to one puff, if they're simply feeling good. So we address different things based on the patient and the particular circumstance surrounding them." – RPh 6 "[I am] sitting down and explaining to them [the patient] the component of what their deductible is, this is what their typical copay looks like it would be. 'You have this expense because of the insurance that you have. This is that one time charge because of that, but then going forward, it should be this.' For some patients, that's enough. … Some patients, that's not, [they say] 'I can't afford that.' Then we take a different approach, try to find a therapeutic equivalent that either has better coverage or a lower price point. … Work back with the provider or prescriber to get them something that is more reasonable or more affordable for them. … We have private pay patients. If it's a brand inhaler, I proactively find copay offers. … For manufacturer copay cards, [I] get them enrolled in them, help them do it right there on the spot. … We get involved in the finance part of it. We help make sure patients can afford this stuff. That's probably the biggest factor of compliance, is whether somebody can afford it or not. … Maybe they don't have the money upfront, but I can do accounts receivable where I say, 'Hey, if you can afford this over three months, why don't we work out something where I let you pay a little bit now, pay a little bit next month, pay a little bit to offset that shock price.' We have the ability to get creative, for the sake of helping compliance and helping these people. … But it's all worth it. We see it, that it's worth it, when I take the time to get and show somebody how to use it, to work through the cost factors with them. … It's easy to see that that is beneficial for the patient's health, and them staying with the medication, understanding and all that, that ties into that. … Understand that financial stuff matters. We are in our bubble every day, so we understand deductibles. We understand co-pays. We think that a twenty-five-dollar copay for a brand medication is a reasonable copay. Somebody else may not, and you have to understand that and not tell them, 'Oh, this isn't a big deal.' You have to take the different perspectives to work through that point and understand that that is a big, big point for whether somebody is going to take [their medication], whether they're going to continue to take it." – RPh 6

	"I don't try and pull out the big scary guns of, 'Do you want to go on oxygen?' unless things are getting really bad for them. But, I usually try and say like, 'Well, do you want to have to go on another inhaler?' or 'Do you need your albuterol every single day?' And they're like, 'No', and I'm like, 'Well, using your controllers more effectively, trying to remember it, will help out.' Then talking about different ways to remember, like if there's [a patient] with a corticosteroid, talking about using [the inhaler] when they brush their teeth or take their dentures out. … That way they have that built-in mechanism of 'I'm going to rinse my mouth out after using this inhaler, and I already have a habit I do every day that's been hardwired since I was a child.' And usually that can help out some people." – RPh 8
Smoking Cessation	"With smoking cessation, it really comes down to the follow up. A lot of these patients are put on Med Sync to follow up with them and see if they need more of a particular nicotine replacement or if things are working for them. It's not so much on the initial counseling. There is some to be said there, but a lot of it is on the follow up. Because we know that trying to quit smoking takes many attempt, so the follow up is more important." – RPh 1 "Another [intervention] would be looking at the smoking status and offering help with quitting smoking. … I might give them information about the Quitline. There's a website that I refer them to, and there's that text texting stuff that's available. Depending on what they're interested in or [what] their technical interests are." – RPh 2 "When patients are prescribed new smoking cessation assist devices, like Chantix or Nicotine patches, we do full consultations with patients. … When they're first starting things, we don't necessarily have like any kind of follow up or call back program or anything like that. We mostly just do consultations. I would say, that's probably somewhere where we could do more." – RPh 3 "It's more or less providing education. There's different queues for me as a pharmacist when I'm talking to somebody. Say they're picking up an inhaler, and there's a pack of cigarettes in their pocket, or they smell of obvious smoke. Most patients do understand, obviously, that [smoking] is something that's not the best thing for their situation. They know that. So it's offering

	help. ‘I see a few months ago you were prescribed nicotine patches. You haven't gotten them again. Has it been going okay?’ Depending upon that response, we go into a certain direction. Depending upon the willingness to continue to share information, we go in a direction. It's assessing the different queues that are there for me, whether that's in my database or my system or physically what's in front of me. Then we take it from there, dealing with different things, options for prescription drug therapy, options for over-the-counter nicotine replacements, or just general counseling on the habit component of nicotine. ... I find those opportunities and approach them in a certain way that is most beneficial to the particular person in front of me.” – RPh 6 “I think the biggest thing is just finding out where the patient is in that cycle of change, if they’re really in precontemplation. I’m not as confident getting them to [the] contemplation stage and action stage. But if they're ready to take action on it, [I am] very confident on what the options are and how to go about doing that. … I try to do a lot of motivational interviewing to find out what is important [to] them. What makes them want to continue to smoke? What would it take for them to want to quit smoking? Is it because of their family, or they want to live healthier, or be able to move more? Maybe they can't even walk that far because they get out of breath. Then, reminding them of what the harms of [smoking], and then how, when they stop, how that could be a benefit. If they have diabetes or they've had a heart attack or something, and they're scared of having another one. ‘Okay, well, this puts you at higher risk and if you stop smoking, even after a year, you lower your risk.’ … Sometimes there are other things going on that we need to prioritize first before we get to smoking cessation. But at least [I am] planting those seeds in their head, … ‘I want you to think about it. And, next time we'll follow up on it.’” – RPh 7 “I think one really easy thing. … would be the ability for a pharmacist to prescribe nicotine replacement therapy. There are very few things that would be an issue with that as an add-on service. That would be very helpful, and it would lower a barrier to that care. It would not include things like Varenicline, or generic Chantix, or Bupropion for quitting. Nicotine replacement therapy by itself would be very helpful, because a lot of people would find that as an easy in to at least get started.” – RPh 8 “I've got a spiel where I talk about [that it is not just] replacing cigarettes, but also replacing a lot of the other parts. [I] talk to them about the tactile need: ‘You do something with your hands when you're smoking, so you need something to do with your

	hands, most likely. Otherwise, you're going to find yourself fidgeting, getting anxious.' But I usually recommend that they do something about that, like carry a pencil, bag of carrots, fidget spinner and whatever they need to have something to do with their hands, while they're doing the things they would normally do. Talking about avoiding smoke breaks or smoke pits if they're at work. Talking about trying to cut back on places where people would smoke. Up here, you either go to the church or you go to the bar. Usually, if they're smokers, they're often going to the bar. Think [about] cutting back on going to the bar as much because that's where everyone goes out to smoke. Even though they can't do it inside, they go outside, smoke, they come back in. The smell [of smoke is] on them, and it might draw you to do that. Which is a tough sell and I admit that to him, because oftentimes that's your friends and social support. But sometimes you got to try and talk to [your friends] about trying to quit again. Maybe trying to get one of them to quit with you. That way you can have a buddy system going, like an "accountabili-buddy." I also ask them if they were given the 1-800 Quit-Now line number, which a lot of times they aren't given by providers. I will write that down because … they can talk to you about strategies and coping mechanisms and things like that to help coach you a little bit. They also help with getting nicotine replacement products and things like that. So, I figure it's at least an extra resource someone can have if they don't have good social support for trying to quit outside of the clinic. … It's not that often, not a ton of people approach me looking to quit. Oftentimes they'll be quitting for a reason. Either they had a hospitalization related to pneumonia or COPD, and then they got fear got put in them, and they want to quit. … Or they have a surgery coming up, and they're told they need to quit. Sometimes I'll get the one where, like, 'Well, I'm gonna be a grandparent now, and I want to be around for them.' But, I don't have too many [people who] organically show up for that. If they're new a consult for COPD … we'll be like, 'Well quitting smoking will help you out, too' and they'll be like, 'I know, I'm just not ready.' I'm like, 'Okay.' Then you do … motivational interviewing [and check in] with them occasionally." – RPh 8
Immunizations	"Another [intervention] could be looking at immunization history to make sure that somebody's up to date on all their immunizations." – RPh 2 "We were already doing quite a bit of [immunizations]. I would say we could do more and do better, if we wanted to specifically focus on immunizations that are related specifically to COPD." – RPh 3

	"Flu, COVID, Shingles, Tetanus, Hep-B. Those are the main ones; those are just the ones we've been asked to do so far. Meningitis probably. We just don't have the vaccine on-hand all the time." – RPh 4 "We check the WIR to see if they're due for other vaccinations. We'll take the time to do that." – RPh 5 "We don't have necessarily an interface that goes back with WIR to find missing immunizations or gaps in immunization therapy. The big thing that I do is I make it accessible, try to educate when things do arise. … For example, we have flu season coming up, so we have people there for immunization, for that alone. That's a time where I review immunizations as a whole. We could look at a 365 and catch somebody that's maybe overdue for a pneumonia shot in July. Absolutely. Sometimes, this is not feasible to jump from one interface system to another, look somebody up, see where they're at, assess that. It's tough. … I know if I have somebody that's higher risk, COPD or diabetes for example, and know that it's of utmost importance for them to get those routine pneumonia vaccinations. ... Come flu shot time, we're systematically going through and saying, 'Do you know if you've had both of them [flu and pneumonia vaccinations]?' and if they're not sure, we cross reference WIR and try to work through it at that time. We take advantage of peak times. … We make it easy for people when they do need and want them. But as far as a day-to-day workflow, I don't have anything implemented." – RPh 6 "We do try to screen for other vaccines when people do come in for just one." – RPh 7 "We do most of our vaccines by appointment only. We try to rarely do walk-ins for those." – RPh 7 "We do pneumococcal vaccine as well as influenza. And once we figure out what we're doing for COVID or RSV, we'll be doing those. … We identify for the most part. We have some people that approach us, but then also some people approach us to get their pneumonia vaccine year after year and we have to tell them no every time because they've already gotten it. But like, we carry both the PNEUMOVAX23, for people that might be like double, immune-compromised and then they might also have

	lung issues like COPD, and they might be younger age but they'd fit in that bracket where they would be in that kind of grayish area of the guidelines, where you could still get them for those every five years before sixty-five. We also have the PREVNAR20 for most other cases when we would see that need, based on the CDC vaccine schedule." – RPh 8
COPD Symptom Assessment	"I talk about different measurements or gauges that would assess how their breathing is doing outside of frequency of symptoms. Explaining to people why they might be on that particular medication. Maybe they left primary care physician not really understanding why they got prescribed it [the inhaler]. They just thought they've had a little cough-type symptom the last few months and they got put on this, and they don't understand. [I ask,] 'Did you do some spirometry? Did they have you breathing in a tube and checking the capacity of your lungs?' I use some of that type of stuff to help put context to what they're doing." – RPh 6
Discussing Pulmonary Rehab	We haven't been too successful, and we have a health coach here, so sort of a structure of pulmonary rehab. I've tried to get people to visit him so that he could just do some basic exercise stuff and get them active." – RPh 2