Clinical Pharmacists in Chronic care [Part 1]

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Abstract

Pharmacy practice has changed substantially in recent years. The professionals could contribute directly to patient care in order to reduce morbimortality related to medication use, promoting health and preventing diseases. Healthcare organizations worldwide are under substantial pressure from increasing patient demand. Unfortunately, a cure is not always possible particularly in this era of chronic diseases, and the role of physicians has become limited to controlling and palliating symptoms. The increasing population of patients with long-term conditions are associated with high levels of morbidity, healthcare costs and GP workloads. Clinical pharmacy took over an aspect of medical care that had been partially abandoned by physicians. Overburdened by patient loads and the explosion of new drugs, physicians turned to pharmacists more and more for drug information, especially within institutional settings. Once relegated to counting and pouring, pharmacists headed institutional reviews of drug utilization and served as consultants to all types of health-care facilities. In addition, when clinical pharmacists are active members of the care team, they enhance efficiency by: Providing critical input on medication use and dosing. Working with patients to solve problems with their medications and improve adherence.

Keywords: Chronic care; Pharmacy intervention; Diabetes care; CVD prevention; Inflammatory bowel disease.

Abbreviations: American Association of Colleges of Pharmacy (AACP); Accreditation Council for Pharmacy Education (ACPE); International Diabetes Federation (IDF); Hemoglobin A1c (HbA1c); Ischemic Heart Disease (IHD); Myocardial Infarction (MI); Coronary Heart Disease (CHD); Disability-Adjusted Life Year (DALY); Quality of Life (QoL); Drug Related Problems (DRPs); Inflammatory bowel disease (IBD); Hormone replacement therapy (HRT); Bone-Mineral Density (BMD); Chronic obstructive pulmonary disease (COPD); LDL cholesterol (LDL-C); Gastroesophageal Reflux Disease (GERD)

Background

Clinical pharmacology is a professional discipline that combines basic pharmacology and clinical medicine. A clinical pharmacist offers invaluable support in the development of a final prescription with better patient management and enhanced safety [1]. Its development began in the early 1950s, primarily as a result of the efforts of Harry Gold. Pharmacist rounding with inpatient hospital services has been traced to the University of Kentucky in 1957 [1,2]. Drug therapy was becoming much more complex. Graham Calder pioneered a new role for pharmacists on hospital wards in Aberdeen [3]. The role of clinical pharmacists underwent important changes from the 1960s through 1990s as their participation in direct patient care increased. In the early 1970s, federal funding assisted with greatly expanding clinical pharmacy faculty in Colleges of Pharmacy [4]. Pharmacy education debated where clinical pharmacy fit within pharmacy training. The AACP spearheaded an effort to examine this issue. Till then, two full generations of pharmacists have been educated and trained after the general adoption of the aims of clinical pharmacy [4,5]. ACPE has revised the standards for colleges and schools of pharmacy

several times since 2000. ACPE Standards 2016 go into effect July 1, 2016 Figure 1.

Figure 1: Clinical pharmacy offers chronic care services like asthma, diabetes, nutritional supplement counseling, smoking cessation, weight reduction, geriatric care, hyperlipidemia, hypertension, naturopathy and wound care. The integration of clinical pharmacists into primary care clinics could have positive effects on the clinical outcomes of patients in glycemic control, blood pressure, lipid profile, in accordance with current guidelines.

To some extent, pharmacy took over an aspect of medical care that had been partially abandoned by physicians [6]. Overburdened by patient loads and the explosion of new drugs, physicians turned to pharmacists more and more for drug information, especially within institutional settings. A clinical pharmacist often has a somewhat different approach to the use of drugs and may give valuable supplementary information about for example interactions, during the physician's decision-making process concerning potential changes of and the follow-up of the medication [7,8]. The concept of pharmaceutical care emphasizes the pharmacists' responsibility to pursue the best possible patient outcomes of medication therapy

[9]. They possess in-depth knowledge of medications that is integrated with a foundational understanding of the biomedical, pharmaceutical, socio-behavioral, and clinical sciences [10]. To accomplish wanted therapeutic goals, the clinical pharmacist applies proof based therapeutic guidelines, developing sciences, rising advancements, and important lawful, moral, social, social, financial, and proficient standards [11-13]. In understanding, clinical pharmacists accept accountability and responsibility for overseeing medication therapy in direct patient consideration settings, in the case of rehearsing freely or in meeting or joint effort with other healthcare professionals [14,15].
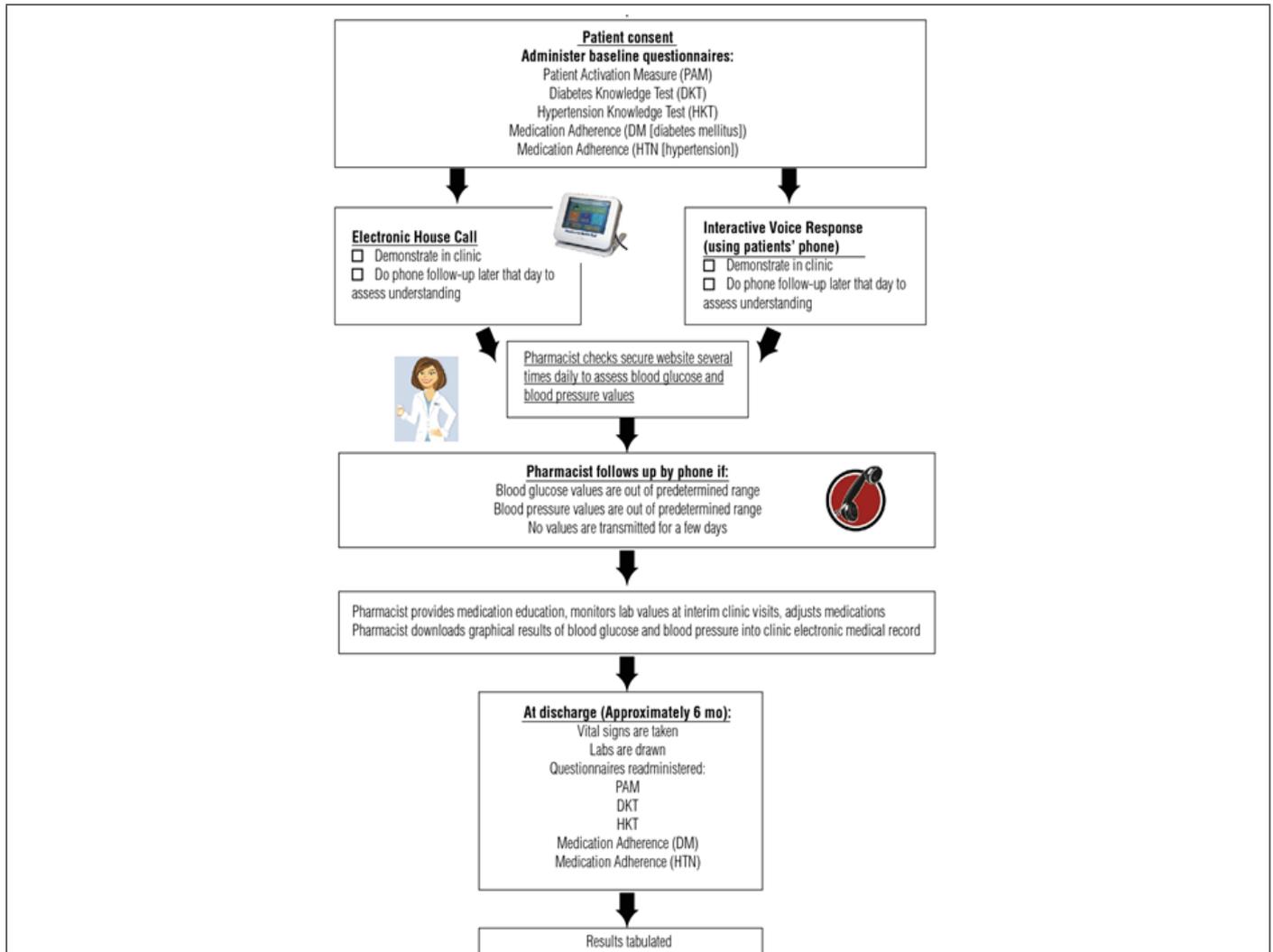

Figure 2: Telemonitoring model for providing clinical pharmacy services to patients with diabetes [62].

Their functions encompass comprehensive medication management (i.e., prescribing, monitoring, and adjustment of medications), nonpharmacologic guidance, and coordination of care. Interdisciplinary collaboration allows pharmacists opportunities to provide direct patient care or consultations by telecommunication in many different clinical environments, including disease management, primary care, or specialty care [16-19]. Pharmacists may manage chronic or acute illnesses associated with endocrine, cardiovascular, respiratory, gastrointestinal, or other systems [20]. Clinical pharmacist researchers generate, disseminate, and apply

new knowledge that contributes to improved health and quality of life [21-24]. Inside the arrangement of healthcare, clinical pharmacists are specialists in the therapeutic utilization of medications. They routinely give medication therapy assessments and suggestions to patients and healthcare professionals [25,26]. Clinical pharmacists are an essential wellspring of logically legitimate data and counsel about the sheltered, proper, and financially savvy utilization of medications [27,28]. They get restorative and medication history, check medication blunders including prescription, dispensing and administration mistakes, distinguish drug interactions, screen ADR,

propose individualization of measurement routine, give patient counseling, and so forth [29-35]. They also provide information about the use of drugs and medical devices like inhaler, insulin pen, eye drops, nasal sprays, etc. [36]. Participation of a clinical pharmacist in ward/ICU rounds and clinical discussions helps to identify, prevent or reduce drug interaction and ADR [29], [37-39] Figure 2.

Introduction

Population aging has increased the burden of chronic diseases globally. There are both ethical and reasonable goals to address health inequity issues identified with chronic disease management for people with social multifaceted nature, existing programs regularly don't fittingly address the necessities of these people. This prompts low degrees of support in programs, imperfect chronic disease management, and higher healthcare usage [40]. Unlike acute conditions, chronic diseases require consistent care and management outside of the healthcare setting, in the community or primary care setting, in terms of medication, lifestyle management, and health behavior modification [41-45]. It is typically a multi-component intervention that includes medication therapy review, patient medication education, medication monitoring, immunizations, disease self-care and support, and/or prescribing authority. Patients who take multiple medications due to chronic disease have a high risk of drug duplication, interaction, or adverse side effects, which could result in extended hospital stays and higher costs [46]. To increase the safety and effectiveness of treatment, these patients must have specific needs met, with regards to appropriate medication use [47]. Studies have shown that integrating pharmacists into ambulatory clinics can improve chronic disease management and optimal use of medications [48]. Besides, pharmacist contribution in patient care may decrease unseemly medication use, explicitly in the old. A study in Canada saw the extent of patients accepting an improper medication drop essentially after medication audit and enhancement by a group that incorporated a pharmacist [49]. Contrasted with regular care, pharmacist-drove care was related with comparable frequencies or paces of office, earnest care or ED visits, and hospitalizations and medication adherence, expanded the number or portion of medications got and improved study-selected glycemic, circulatory strain, and lipid objective achievement [50]. Another recent study shows telehealth-based chronic disease management program including clinical pharmacy specialists imparted statistically significant improvements in diabetes and hypertension outcomes along with clinically significant improvements in the areas of lipid management and tobacco cessation [51].

Diabetes Care

As the seventh-leading cause of death in the US, diabetes can lead to various health complications such as blindness, kidney disease, amputations, and heart disease. The worldwide existing prevalence of DM is about 425 million people, of whom 279 million are in urban areas and 146 million are in rural zones [52]. The IDF estimates that by 2040, one in 10 adults (642 million) will have diabetes. Around 50% (212.4 million) of patients are unaware of their diabetes. More than 12% of total global health expenditure goes to diabetes, according to IDF [53]. Annual worldwide economic cost of diabetic care was calculated at $727 billion in year 2017 which is predicted to be $776 billion for year 2045 respectively [54]. Currently, more than 230 million Asian individuals are living with diabetes, accounting for approximately 55% of the world's diabetic population. China and India collectively are home of nearly 110 million diabetic patients [55]. It is a risk factor for CVD and has been related with 2-4-fold higher mortality [56] and another study says that half of all diabetic demise was expected to CVD [57]. The quantity of deaths brought about by diabetes in the age scope of 60-99 years in 2017 was 3,200,000 [58]. About portion of diabetes-related mortality (48%) happens in people more youthful than 60 years and it keeps on diminishing future by 6-8 years in people analyzed at 50 years old years [59]. Over 35% patients didn't get any diabetes education, while 30% diabetic patients were compliant with drug regimens and the non-compliance was higher among the lower socioeconomic groups [60].

Pharmacist may provide a face-to-face counseling regarding knowledge on diabetes, self-monitoring of blood glucose, regular checkup of systolic blood pressure, body weight, and serum cholesterol levels. The pharmacist may also counsel regarding non-pharmacological management strategies such as diet control, exercise therapy, and early identification of symptoms of hypoglycemia (blurred vision, rapid heartbeat, sweating, fatigue, headache, dizziness, trouble thinking, seizures, and coma) and its management. In a satisfaction survey of 24 providers or clinical pharmacists, nearly 90% had favorable responses toward the protocol and its effect on access to and quality of care [61]. Management of DM remains a significant challenge in the US, as estimates indicate that greater than 40% of diabetes patients are uncontrolled with a HbA1c. Diabetic patients who received care from the collaborative team, including a clinical pharmacist, had improvement in most key indicators of diabetes like HbA1c, in both high and low-income countries and in both urban and rural areas [62-71]. Emphasizing medication adherence, particularly for patients with longer duration of diabetes and those with multiple comorbid diseases should be strongly considered in future diabetes management programs implemented to improve glycemic control in patients with type 2 diabetes [72]. A mobile phone text message can serve as a simple and cost-effective option in improving medication adherence and clinical outcomes by providing information between clinic visits has been reported [73,74]. A report from the National Diabetes Commission suggested that an inappropriate attitude of health care professionals toward diabetes could lead to poor patient outcomes [75]. In educational program, a clinical or community pharmacist can improve adherence by giving medication consultation administration, making an individualized patient timetable on administration times and dosage of every medication, instructing the patient on the significance of medication adherence,

dietary adherence and exercise on better glycemic control, offering guidance on the best way to diminish adverse effects of medications, and furthermore by instructing how to take medications in the holy month of Ramadan or different religious fasting, and how to utilize pill boxes and diary logs to decrease absent mindedness. Writing demonstrates various interventional studies including pharmacist-based educational intercessions, indicating clinically noteworthy enhancements in the clinical results of the diabetes patients [76].

CVD Prevention

Hypertension is the single most important risk factor for CVD and a key driver of global disease burden [77]. It is a major risk factor for CHD, stroke, retinopathies, and renal dysfunction. 18 million people die each year from CVDs, an estimated 31% of all deaths worldwide [78]. Of these deaths, 85% are due to MI and stroke [79]. CVD is currently the leading cause of morbidity and mortality and over 80% occur in LMICs [80]. Nearly 50% patients with chest pain related to exercise have obstructive coronary artery disease [81]. Coronary artery spasm plays an important role in the pathogenesis of IHD, including angina pectoris, MI, and sudden death, occurring most often from midnight to early morning [82].

A study of 1,015 patients with stable coronary artery disease showed a 4.4-fold increase in the risk of stroke and a 3.8-fold increase in the risk of death among patients who self-reported as nonadherent [83]. IHD has topped the list of causes of years of life lost for more than a decade, highlighting the shift in the global burden of disease from communicable to chronic disease. Risk factors for CVD, including raised blood pressure, hypercholesterolemia and high BMI, are among the most important contributors to DALYs [84]. CVD claimed death of some 900,000 death in US in 2016 [85]. BP is yet uncontrolled in half of the US population with hypertension. Moreover, BP can remain ineffectively controlled regardless of up to six doctor visits for each year [86].

Crosswise over South Asia, in general hypertension prevalence is assessed to be 27%. Prospective Urban Rural Epidemiology study has demonstrated over half are ignorant of it and up to 80% of hypertensive patients have low adherence to medication. Uncontrolled BP was discovered over half in Bangladesh, 70% in Pakistan and practically 60% in Sri Lanka [87]. The goals of treatment of hypertension are to restrict target organ damage, in this manner decreasing the horribleness and mortality related with the disease [88]. Numerous factors including financial status, conviction about medications, comorbidity, accessibility of medications, access to healthcare, level of health proficiency, number of medications, duration of therapy, age, gender, culture, educational status, and learning of the disease and treatment have been related with the pace of adherence. Absence of medication accessibility, low degree of mindfulness about the disease and treatment, failure to manage the cost of prescriptions, question in western drug, and more trust on traditional and spiritual healers are exceptionally normal in the rural population [89].

Non-drug therapies have been shown to lower BP, enhance antihypertensive drug efficacy, and decrease cardiovascular risk. All patients with hypertension and those in the prehypertensive category should be advised to make life-style modifications in addition to any pharmacologic treatment that they receive [90]. Surprisingly, 60%- 80% of the population around the world (according to WHO) are partially or fully dependent upon herbal drugs for primary healthcare [91]. Interactions of certain ingredients in supplements with other anti-hypertensive and cardiovascular arrangements are well-reported [92]. Green tea demonstrated 85% abatement in plasma concentration of nadolol, for instance [93]. The pharmacist may assume a significant job in primary and secondary prevention of cardiovascular diseases, chiefly through patient education and counseling, drug safety management, medication audit (survey of both drug-food and drug-drug cooperation), monitoring and reconciliation, discovery and control of explicit cardiovascular risk factors (e.g., circulatory strain, blood glucose, serum lipids) and clinical outcomes [94].

Pharmacist intervention can increase patients' knowledge about their condition in a way that positively modifies their beliefs about medicines, increased medication intensification without significant change in medication adherence, modify factors affecting adherence, improve adherence and patient QoL by reducing BP levels in patients treated with antihypertensive agents, increased referral acceptance [86], [95-99]. Interventions that were most effective included combinations of more convenient care, information, reminders, self-monitoring, reinforcement, counseling, family therapy, psychological therapy, crisis intervention, manual telephone follow-up, and supportive care [83]. Weight loss has been noted to modify risk factors via improving insulin sensitivity, reducing inflammation, decreasing blood pressure and modifying the lipid profile [100]. It is astonishing that 7-28% of patients with coronary heart disease still smoke, but around half of smokers are planning to quit [101]. The World Bank proposes that around 180 million tobacco related deaths could be forestalled among now and 2050 if grown-up tobacco utilization diminished by half by 2020 [102].
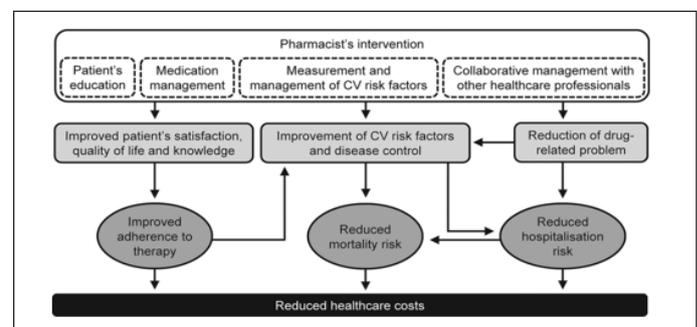

Figure 3: Effects of pharmacist's intervention on humanistic, clinical and economic outcomes in patients with CVD [94].

A clinical pharmacist prepared for smoking cessation counseling can play a key job in giving such mediations, including the evaluation of pharmacotherapy interactions with tobacco

smoke [103]. Prescription smoking cessation medications include bupropion and varenicline [104]. A recent Canadian survey shows that pharmacist-led intervention resulted in more than 70% of patients using nicotine replacement therapy for smoking cessation [105] Figure 3.

Obesity Management

In each nation on the earth, the rate of obesity is rising constantly with coronary artery disease, hypertension, type 2 diabetes mellitus, respiratory disorders and dyslipidemia [106]. The WHO assessed that in 2016 more than 1.9 billion grown-ups were overweight (almost 40% of the population) and more than 650 million (13% of the population) were people with heftiness [107]. Globally, the yearly cost of corpulence related diseases has come to $2 trillion as per an ongoing report by McKinsey Global Institute [108]. Corpulence expands cardiovascular risk through risk factors, for example, expanded fasting plasma triglycerides, high LDL cholesterol, low HDL cholesterol, raised blood glucose and insulin levels and hypertension [109,110]. Likewise, obesity causes cerebral vasculopathy, gallbladder lithiasis, arthropathy, ovarian

polycystic, sleep apnea syndrome, and a few neoplasms [111].

Successful obesity treatment plans incorporate diet, exercise, behavior modification (with or without drug treatment), and/or surgical intervention [112]. Prior to recommending any treatment, the clinician must evaluate the patient for the presence of secondary causes of obesity, such as thyroid dysfunction [113,114]. If secondary causes are suspected, then a more complete diagnostic workup and appropriate therapy is important. The clinician should then evaluate the patient for the presence and severity of other obesity-related diseases, evaluating appropriate lab tests as indicated. Based on the outcome of this medical evaluation, the patient should be counseled on the risks and benefits of available treatment options (along with obesity-related comorbidities, including T2D prevention, and improvements in dyslipidemia, hyperglycemia, osteoarthritis, stress incontinence, GERD, hypertension, and PCOS [115,116]. If obesity is present without other comorbid conditions, then the goal would be absolute weight loss. In the presence of comorbid conditions, relatively small reductions in total body weight can have significant effects on comorbidity [117] Figure 4.
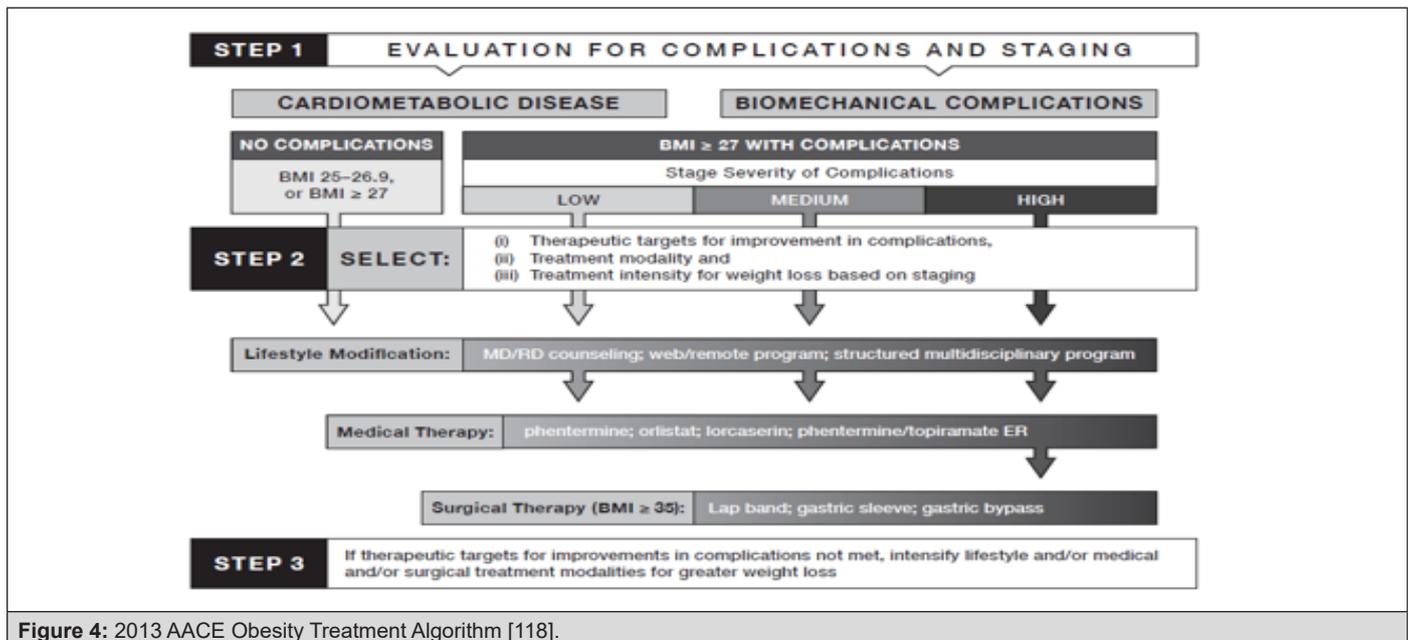

Figure 4: 2013 AACE Obesity Treatment Algorithm [118].

Pharmacists, regularly viewed as one of the most dependable and open healthcare professionals, are in a perfect world arranged to give counseling to weight and way of life management. All around prepared pharmacists to perform fundamental physical evaluations, for example, weight, abdomen circumference, blood glucose monitoring, and pharmacotherapy counseling, while extra training could be effectively acquired for administrations that would incorporate dietary counseling, direction on physical activity, and behavioral counseling [108], [119,120]. As pharmacists currently do not have a well-identified role in obesity management, but study results display that pharmacist intervention was beneficial [121].

According to Canadian Pharmacists Journal, 2016 pharmacist prescribing resulted in >3-fold more patients achieving target

LDL-c levels [122]. Pharmacists who identify and treat patients with dyslipidemia, including those with inadequately controlled LDL cholesterol levels, are better than physicians at getting patients to goal [123]. Studies have demonstrated that pharmacist-led interventions, including lipid clinics, can help patients achieve these more aggressive goals [124,125].

Asthma & COPD management

Asthma and COPD are common chronic conditions that comprise nearly 80% of direct health care costs associated with respiratory diseases in the EU [126]. In the UK alone, 5.4 million patients are currently receiving treatment for asthma; of these, 1.1 million are children. Over three million people die of COPD

worldwide each year, an estimated 6% of all deaths worldwide [127]. It is the second most common reason for emergency hospital admission. According to WHO, COPD has become the fourth leading cause of mortality in the US. It is estimated to become the fifth leading cause of disease burden in 2020 [128]. In 2015 alone, the death toll due to asthma was 383,000 globally [129]. One in five individuals with a diagnosis of COPD, asthma, or both asthma and COPD in primary care settings have asthma-COPD overlap [130]. In COPD, the outpatient therapeutic and management goals are to reduce symptoms and risks from exacerbations, and to maintain drug therapy. In contrast with asthma, COPD is a disease caused by chronic and often daily exposure to noxious particles or gases. The small airways in COPD are gradually destroyed leading to chronic bronchitis and emphysema [131].

Ideal pharmacological treatment including fast treatment of exacerbations, can improve symptoms, diminish exacerbation recurrence, and improve practice resilience, while poor medication adherence and imperfect inhaler technique contrarily sway outcomes [132]. Adherence to breathed in medication is poor and shows extraordinary inconstancy, going from as low as 20% to over 60% [133]. To improve adherence, the therapeutic choices ought to be talked about with the patient and should contemplate their lifestyle factors, demographic attributes (age, co-morbidities, physical confinements, mental and cognitive status), and pharmacological factors (polypharmacy regimens) to pick the best inhaler device for that patient [134]. Pharmacist-led comprehensive therapeutic interchange program of COPD inhalers may provide 30% pharmacy cost savings, improved medication adherence, knowledge of disease, decrease the number of prescriptions for exacerbations for these patients. and reduces 30-day readmission rate [135-138]. A pharmacist-driven spirometry service was associated with quality testing results, identified respiratory disease abnormalities, and helped modifications of pulmonary drug regimens based on evidence-based guidelines [137].

Despite advances in inhaler device technology, estimates of those making inhaler errors range up to 90% of patients irrespective of the device type used. Poor inhaler technique accounted for over €750 million in direct and indirect costs in 2015 in the UK, Spain and Sweden [139]. By providing pharmaceutical care to patients with asthma, the pharmacist can help them to achieve treatment goals, e.g. improvement of disease control and reduction of asthma symptoms, exacerbations and medication-related side effects [140]. Step up therapy contained expanding or beginning corticosteroid/long-acting beta agonist mix inhaler; corticosteroid inhaler; short-acting muscarinic antagonist inhaler; oral corticosteroid; oral montelukast; or long-acting muscarinic antagonist inhaler. Step down of therapy included diminishing or halting corticosteroid/long-acting beta agonist mix inhaler; corticosteroid inhaler; or long-acting muscarinic antagonist inhaler. The pharmacist directed exercises, for example, giving asthma activity plans, instructing patients, prescribing to step up/down therapy, auditing inhaler technique and making other significant proposals, for example, gadget changes (e.g., dry-powder to metered-dose inhaler) [141]. Polypharmacy is oppressive and related with patients hospitalized with intense intensifications. It is conceivable that rehashed pharmacist intervention to guarantee ideal pharmacotherapy and limit adverse effects, with an immediate connect to a consultant respiratory physician, and the patient's GP, may prompt improved results [142]. The interventions identified focused on key areas of asthma and COPD management and support including assessment of current symptoms; assessment and rectification of inhaler technique; identification of medication-related problems; medication adherence; provision of written and oral education materials; smoking cessation [143] Figure 5.
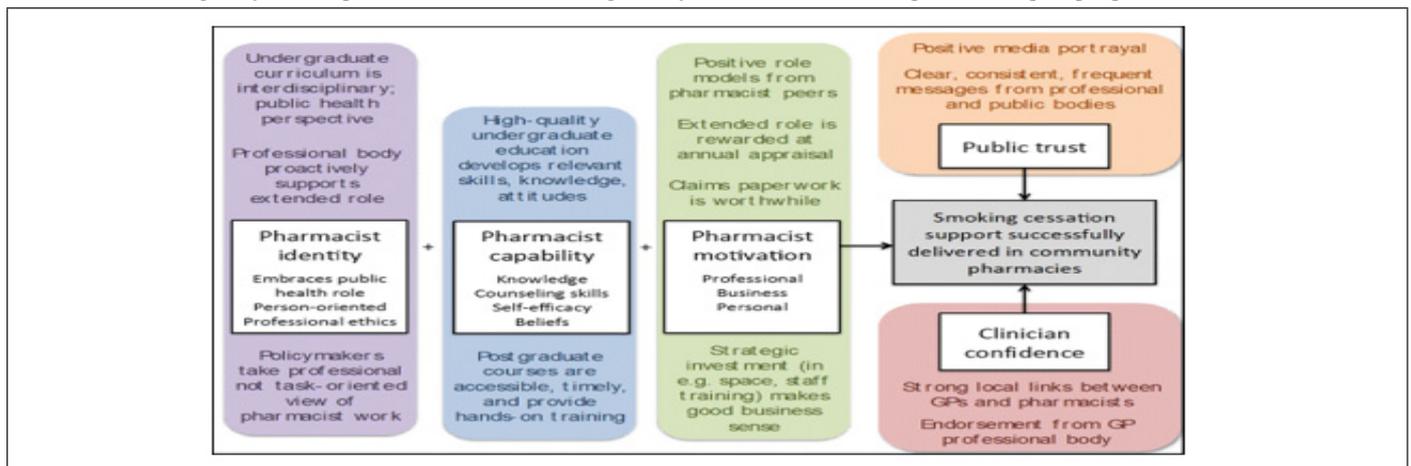

Figure 5: Unifying models showing key influences on successful delivery of smoking cessation support by pharmacists [144].

Osteoporosis

Around the world, it is evaluated that 1 of every 3 women over the age of 50 will encounter osteoporotic fractures, just as 1 out of 5 men [145]. The predominance of osteoporosis is anticipated to ascend in the US from around 10 million individuals to in excess of 14 million individuals by 2020 [146]. In 2015, direct medical costs totaled $637.5 million for lethal fall injuries and $31.3 billion for nonfatal fall injuries. During that year, hospitalizations cost a normal of $30,550 per fall affirmation, totaling $17.8 billion. By 2025, the expense of fractures in the US is relied upon to surpass

$25 billion every year to treat in excess of 3,000,000 anticipated fractures [147]. Like other chronic diseases, osteoporosis has struggled with prescription non-adherence, bringing about an expanded danger of fractures and all-cause mortality. The gaps in osteoporosis management are all well-documented: (a) most patients at high chance for break are not recognized for treatment, and (b) adherence to osteoporosis pharmacotherapy is imperfect [148]. About half osteoporosis patients are non-disciple to

medications. Besides, around 50-70% of the patients stop their osteoporosis medications inside the main year of commencement, which results in expanded horribleness and mortality [149]. In October 2010, the US FDA issued a safety communication regarding the risks of atypical fractures of the femur, with bisphosphonates drugs, the safety communication appeared to have influenced osteoporosis utilization in Medicaid recipients [150] Figure 6.
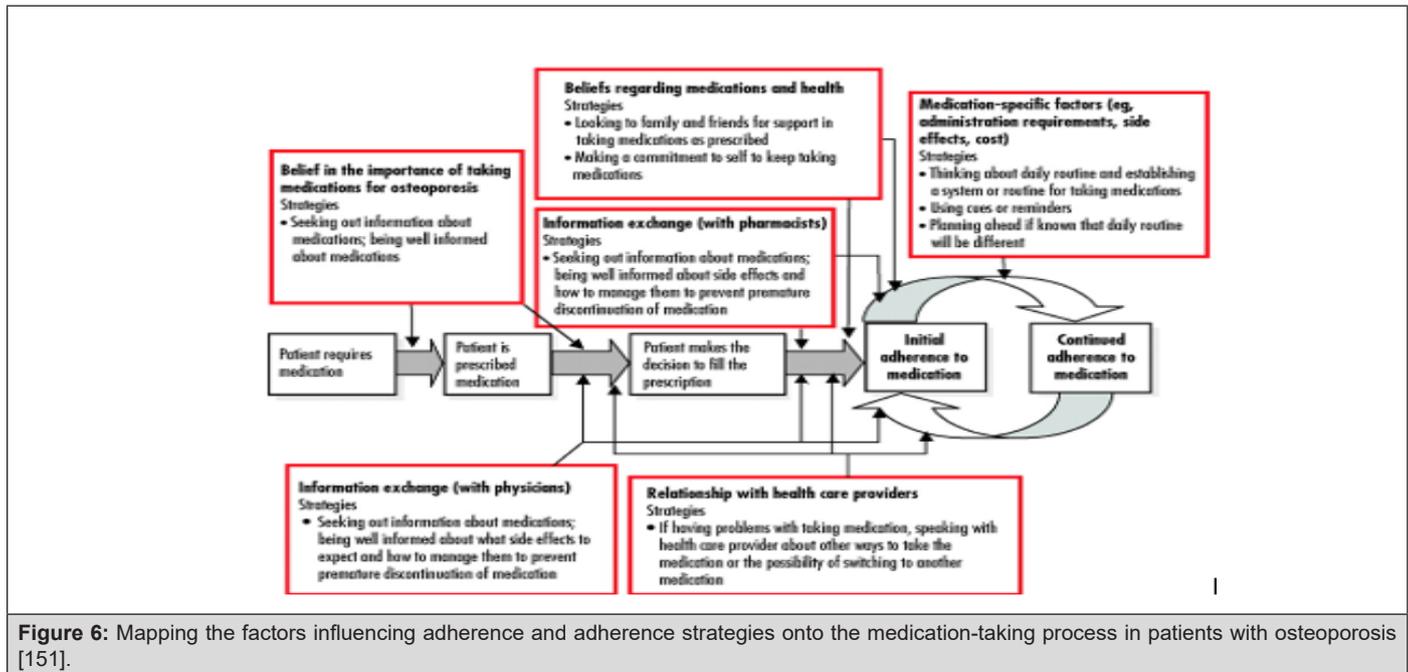

Figure 6: Mapping the factors influencing adherence and adherence strategies onto the medication-taking process in patients with osteoporosis [151].

High patient cost and safety concerns are barriers for nearly 60% patients [152]. Improved osteoporosis medication adherence can reduce osteoporosis-related health care costs by preventing fractures. Persistent pharmacotherapy for osteoporosis is necessary to prevent osteoporotic fractures and to reduce osteoporosis related health care costs [153]. Treatment strategies of osteoporosis include non-pharmacological treatment diet rich of calcium and vitamin D, healthy lifestyle, proper exercise plan, and pharmacological therapy [154]. BMD monitoring after initiating anti-osteoporosis therapy in the routine clinical practice setting [155]. Hypercalciuria, malabsorption of calcium, hyperparathyroidism, vitamin D deficiency, hyperthyroidism, Cushing's disease, and hypocalciuric hypercalcemia attributed to secondary causes to more than 30% women. Disorders of calcium metabolism and hyperparathyroidism contributed to nearly 80% of the secondary causes [156]. Hormone replacement therapy (HRT) is not first-line therapy position for osteoporosis but is best for prevention of osteoporosis [157]. However, different types of estrogen or progestogen, as well as different formulations, doses, timing of initiation, durations of therapy, and patient characteristics, may play different roles in the effects of HRT [158]. Pharmacist-physician collaboration is associated with higher treatment rates of osteoporosis [159]. Physicians and pharmacist should invest time to educate patients about the potential side effects and box warnings of estrogen use. Routine women wellness exams should

also be focused on the development of any malignancies or adverse effects of hormone replacement therapy given a positive history. The pharmacist can play an important role at multiple levels: supporting patients in treatment, by providing information on the disease, its treatment, proper use of medication, adherence and persistence, as well as raising awareness for the prevention of osteoporosis and identifying patients at risk [160]. The counseling should include educating and assessing the patient for proper use of estrogen medication therapies as they may be prescribed in many various preparations of oral, transdermal, vaginal insert, and topic vaginal creams for positive patient compliance and adherence to therapy [147].

Inflammatory Bowel Disease (IBD)

Inflammatory bowel disease (IBD) is a group of inflammatory conditions of the colon and small intestine. The two most common diseases are ulcerative colitis and Crohn's disease (CD). Crohn's disease can cause inflammation in any part of the digestive tract. Ulcerative colitis (UC) is an idiopathic inflammatory condition of the colon which results in diffuse friability and superficial erosions on the colonic wall associated with bleeding [161]. Although these diseases have undetermined etiology, research advances have outlined some of the pathways by which they occur: a) genetic predisposition associated with the environment induces a disruption of the intestinal microbial flora, b) the epithelial cells

and the immune system of the intestine itself determine the risk of developing the disease [162]. Treatment of both, IBD and IBD associated pain is challenging. The mainstay of IBD treatment includes systemic immunosuppressive medications, such as corticosteroids, anti-tumor TNF antibodies or immunomodulators. Furthermore, the management of an acute flare differs from the strategies for maintenance of remission [163]. A total of about 66,000 US residents with a new IBD diagnosis each year, since 2015

[164]. Direct costs (including consultations, drugs, hospitalization and surgery) of UC amount to \$3.4-\$8.6 billion in the US and €5.4-€12.6 billion in EU [165]. The prevalent populations of patients with CD or UC in the UC in 2016 are expected to incur lifetime total costs of \$498 billion and \$377 billion, respectively [166]. IBD is a relapsing-remitting condition that causes inflammation and ulceration in the bowels, affecting approximately 500,000 people in the UK [167] Figure 7.
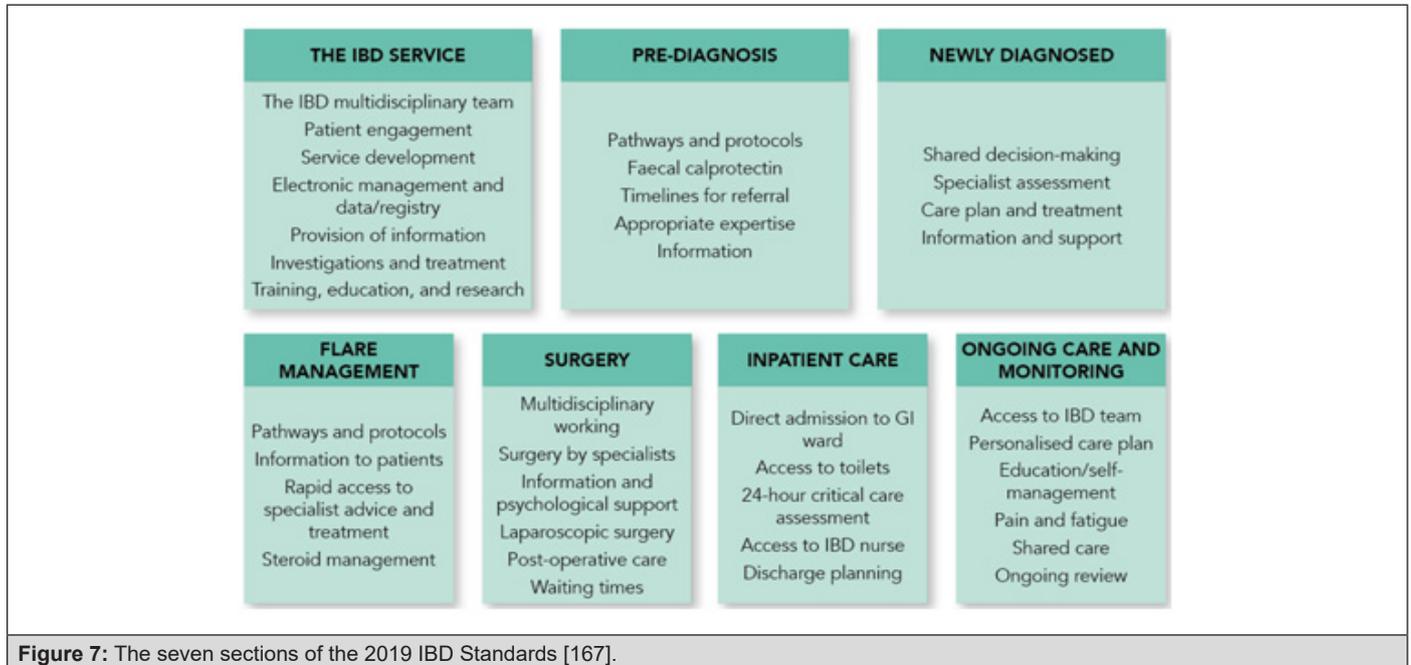

Figure 7: The seven sections of the 2019 IBD Standards [167].

The increasing incidence of IBD in developing countries parallels the westernization of diet, which includes higher calorie intake, especially from sugar, refined carbohydrates, animal proteins and ultra-processed foods and a lesser intake of fiber and fruits [168,169]. Incidence rate of IBD is stabilizing in some developed countries; however, the incidence rate is increasing in developing countries such as Asia and Eastern Europe [170]. Anxiety and depression are the most common psychological disorders in patients with IBD [171]. IBD is associated with significantly increased MI compared with non-IBD patients [172]. Patients with IBD are also at risk for asthma or COPD and bronchiectasis [173,174]. Sacroiliitis, an inflammatory arthropathy associated with ankylosing spondylitis, is found in patients with IBD but may go undiagnosed [175]. IBD patients showed increased risk for lymphoma and biliary cancer [176]. The general objectives of treatment are to instigate and maintain remission, limit intricacies and sickness manifestations, and improve overall QoL. Customized IBD pharmacist adherence counseling, considering the Health Beliefs Model of prescription recognition, may expand drug adherence. Instruction utilizing pamphlets and ad hoc physician training improved information yet not adherence [177]. IBD patients, fundamentally those having UC, need medications for a mind-blowing duration with periodic dosing and occasionally, enemas and infusions may likewise be required. Treatment without adherence is exceptionally viewed as

the noteworthy factor for relapse occurrence [178].

Prescription nonadherence in IBD can be improved through a solitary customized counseling session by IBD pharmacist adherence counseling (IPAC) intervention, and the advantage was sturdy for a long time [179]. In addition to the ailment, these patients are likewise dealt with powerful medications like steroids and biological agents, which have a large group of adverse effects. Along these lines, the significance of the pharmacist who ought to be alert for any adverse reaction [180]. Pharmacist-led drug monitoring clinics measure thioguanine nucleotides and thiopurine methyltransferase levels four weeks after treatment with thiopurines is started to optimize outcomes [181]. If insurance coverage can't be acquired for the chose biologic response modifiers, the pharmacist recognizes and talks about elective alternatives with the GI team; a portion of these choices may incorporate changing to another model operator or selecting patients in medicine assistance programs. When insurance coverage of the medicine is verified, the pharmacist teaches the patient on self-administration, stability and storage prerequisites, and potential adverse effects. Additionally, the pharmacist features the noteworthiness of consistence with laboratory monitoring and reviews the significance of speaking with the GI team in the event of potential infection, exacerbating sickness control, or issues getting or utilizing the medicine.

The IBD pharmacist has a key job in the administration of IBD patients contributing not exclusively to drug monitoring, recommending, and wellbeing yet in addition allowing more prominent limit in the physician's, frequently profoundly stretched IBD clinics [182]. Past drug therapy coordination from start to finish, the pharmacist assumes a functioning job in helping with medicine reconciliation and guaranteeing patients are present on essential immunizations [183]. 40% of patients with CD do not respond to treatment with biologics, 30%-50% achieve complete remission after six months and 30% of patients maintain the response for 12months with continual treatment. Current strategies to overcome loss of response involve increasing the dose, decreasing the interval between administrations or switching to an alternative agent [181].

Conclusion

The pharmacist's fundamental obligation is to augment positive results of drug therapy and limit drug misadventures. Patient therapy should bring about the achievement of definite results that improve the patient's QoL. Until now, various examinations have discovered an expanded pace of clinic admission rates optional to medicine rebelliousness as well as adverse drug reactions. The genuine number of DRPs requiring clinic admission might be higher than revealed because of absence of documentation, further underestimating the issue. Initially, gathering and deciphering pertinent patient information, identifying patient social insurance needs, and planning a DRP rundown might challenge for the pharmacist. Preventive or chronic consideration is a challenge that ought to be embraced by social insurance suppliers in all training settings. Pharmacists should "seize the moment" to teach and insight patients with respect to these different points when the open doors emerge. Clinical pharmacists use populace wellbeing techniques to create chronic infection the management referrals for patients with uncontrolled chronic conditions. Open doors for pharmacists to help realize consciousness of recommendations and hazard factors for the development of disease and instruct patients with regards to the advantages of prevention, happen every day. It is significant for the pharmacists on the "bleeding edge" to have a general comprehension of ebb and flow recommendations for screening and sickness prevention with the goal that they can give proper counseling and care to their patients. Also, pediatric clinical pharmacists have evolved over the last 2 decades and have proven to be a key player in the multidisciplinary team. Although, there are ample of evidences of positive impact on clinical, humanistic and economic outcomes and the benefits of clinical pharmacists managing chronic conditions have been extensively published, their involvement in the multidisciplinary team providing care to patients with chronic cases, more high-quality research is warranted.

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