

Community and Clinical Pharmacists in Transition Care



AK Mohiuddin*

Department of Pharmacy, World University of Bangladesh, Bangladesh

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***Corresponding author:** AK Mohiuddin, Department of Pharmacy, World University of Bangladesh, Bangladesh

Abstract

Medication-related problems are common among home care patients who take many medications and have complex medical histories and health problems. The goals of home health care services are to help individuals to improve function and live with greater independence; to promote the client's optimal level of well-being; and to assist the patient to remain at home, avoiding hospitalization or admission to long-term care institutions. Home care is a system of care provided by skilled practitioners to patients in their homes under the direction of a physician. Home health care services include nursing care; physical, occupational, and speech-language therapy; and medical social services. Physicians may refer patients for home health care services, or the services may be requested by family members or patients. The range of home health care services a patient can receive at home is limitless. Depending on the individual patient's situation, care can range from nursing care to specialized medical services, such as laboratory workups. Common diagnoses among home health care patients include circulatory disease, heart disease, injury and poisoning, musculoskeletal and connective tissue disease and respiratory disease.

Keywords: Transition Care; Pharmacist; Elderly; Home Care; Collaboration; Patients; Medicines

Abbreviations: MOCH: Medicines Optimization in Care Homes; MRPs: Medication-related problems; RACH: Residential Aged Care Home; MRSA: Methicillin-resistant Staphylococcus aureus; AAFP: American Academy of Family Physicians; IAHP: International Association for Hospice and Palliative Care; CAPC: Center to Advance Palliative Care; PCC: Patient Centered Care; LOS: Length Of Stay; LTC: Length From Admission To Palliative Care Consult; CTD: Consult To Discharge Or Death; NCCN: National Comprehensive Cancer Network; PPC: Pediatric Palliative Care; NHPCO: National Hospice and Palliative Care Organization's; WRHA: Winnipeg Regional Health Authority; PATCH: Pharmacist Advancement of Transitions of Care to Home; HMR: Home Medicines Review; TOC: Transition of Care; COPD: Chronic obstructive pulmonary disease; AECOPD: Acute Exacerbation of COPD; LHL: Low Health Literacy; PILL-CVD: Pharmacist Intervention for Low Literacy in Cardiovascular Disease"; HRQL: Health-Related Quality of Life; HF: Heart failure; Fes: Frequent Exacerbation; EI: Emphysema Index; THA: Total Hip Arthroplasty; TKA: Total Knee Arthroplasty; TJA: Total Joint Arthroplasty

Purpose of The Study: Review of community and clinical pharmacists' roles in transition care.

Findings: The needs of transition care patients who commonly experience acute episodes of chronic conditions may be best addressed by home-based care models such as hospital at home. The large gaps in care that exist for patients and their caregivers during critical transitions can lead to adverse events, unmet needs, low satisfaction with care, and high rehospitalization rates. Along with other allied healthcare providers, pharmacists have a vital role to play here.

Methodology: The review is conducted through secondary data search from several sources from books, technical newsletters, newspapers, journals, and many other sources. The present study was started from the beginning of 2018. Web of Science, Scopus, Embase, ALTAVISTA, PubMed and the Cochrane Central Register of was rigorously searched. The keywords were used to search for different publishers' journals like Elsevier, Springer, Wolters Kluwer and Willey Online Library were extensively followed.

Limitations of the Study: Only pharmacists' role is focused among every healthcare subject matters, although pharmacists are not the sole of these treatment interventions.

Practical Impacts: Pharmacists play an integral role in improving the transitions of care to reduce acute health care utilization. The sole of this review is to highlight the role of pharmacists in transition care. Along with students, researchers and professionals of different background and disciplines, e.g. Pharmacists, marketers, doctors, nurses, hospital authorities and regulatory authorities must acquire much from this article.

Introduction

The scope of pharmacy services available in home-care continues to expand. Pharmacists provide a wide range of medications, along with health and convalescent aids, for

patients at home. Traditionally community pharmacists have been viewed as providers of prescription and nonprescription medications administered orally. Today pharmacists in community and hospital pharmacies across the country have

expanded their services for the homebound patient and provide a variety of sophisticated products and services in the patient's home. Community pharmacists provide home health services including medication reconciliation and teaching. Pharmacists must adapt their communication to address the wide variety of patients' drug-related problems during these home visits and achieve patient-centered communication.

Little is known about the topics discussed during a post-discharge home visit and most studies investigating patient-pharmacist communication focused primarily on one-way pharmacist information provision, e.g. the extent to which pharmacists counsel patients, and their communication style, e.g. tone of voice. Patient-centered communication is associated with increased patients' satisfaction, better recall of information and improved health outcomes and requires active participation of both the pharmacist and the patient. Patients should be encouraged to express their needs and concerns regarding their medication, which pharmacists should address to support patients in making informed decision. Current perspectives to consider in establishing or evaluating clinical pharmacy services offered in a home care setting include staff competency, ideal target patient population, staff safety, use of technology, collaborative relationships with other health care providers, activities performed during a home visit, and pharmacist autonomy.

Gaining insight in the communication during these home visits could be valuable for optimizing these visits; and consequently, to improve patient safety at readmission to primary care. A home visit protocol enables pharmacists:

- a) To address known major challenges during the transition from hospital to primary care
- b) To address patient's dissatisfaction about health care is important as it facilitates patient participation during consultation and acceptance of pharmacists' advices
- c) To discuss patients' medication beliefs and adherence issues more frequently, which might be facilitated by additional pharmacist training and increasing patient engagement

Client Recruitment and Home Visits

Upon admission to the office, any home care customer taking at least nine medications, including over-the-counter and herbal items, is offered a pharmacist home visit. Prior to the home visit, the pharmacist audits the customer's rundown of requested medications and graph notes from other home care clinicians, for example, attendants, word related therapists, and physical therapists. Amid the home visit, the pharmacist examines each drug, including over-the-counter items and herbal enhancements, with the customer and caregiver to evaluate their sign, adequacy, well-being, and consistence, including reasonableness. After the main home visit, the pharmacist contacts the customer's prescriber with any suggestions for upgrading drug therapy. This correspondence is finished by electronic wellbeing record,

phone, or fax. Basic proposals incorporate ceasing pointless or copy therapies or changing medicine portions. Follow-up care is composed by the pharmacist and nurse [1].

Benefits of the Pharmacy Home Visit Program

Although nurses and therapist, depending on client need and orders, assess all a client's needs, the pharmacist can focus primarily on medications. Through the MOCH program, pharmacists and pharmacy technicians working with their health and social care colleagues and care homes staff, patients and their families, can provide several benefits for care homes and their residents including:

- a) Optimizing medicines (stopping inappropriate or unsafe medicines, and ensuring medicines add value to patient's health and well-being)
- b) Patient centered care (shared decision making about which medicines care home residents take and stop)
- c) Creating better medicines systems for care homes to reduce waste and inefficiency
- d) Training and supporting care home staff to enhance safer administration of medicines [2].
- e) Available studies have shown decreased health care utilization, decreased costs to the health system, and improved medication management with pharmacy involvement in home care.
- f) Beneficial patient outcomes of pharmacy practice in home care settings, such as decreased hospital admissions, decreased emergency department visits, improved quality of life, improved compliance, and decreased adverse events, have been described in many developed countries.
- g) Positive effects of pharmacy practice in ambulatory care settings, such as decreased benzodiazepine use, improved anxiety scores, improved cardiac outcomes, and improved compliance.
- h) Most home care pharmacy programs in developed countries provide several services, including comprehensive or targeted medication reviews; education for patients, families, and staff; and provision of drug information [3].

Common MRPs and Success of Pharmacy Visits at Home

Traditionally, nursing homes have been associated with suboptimal drug therapy and MRPs. In contrast, less is known about drug safety in homecare. Significantly more MRPs were detected among patients receiving home nursing care than patients living in nursing homes. While patients living in nursing homes were often undermedicated, documentation discrepancies were more frequent in home-nursing care. MRP categories leading to changes on the medication lists differed between the settings.

a) Untreated conditions: The patient has a medical condition that requires drug therapy but is not receiving a drug for that condition.

b) Drug use without indication: The patient is taking a medication for no medically valid condition or reason. For example, a client may be taking proton-pump inhibitor although he or she does not have a history of gastroesophageal reflux disease or peptic ulcers. Conversely, a client with hypertension and diabetes mellitus may not be taking aspirin, although he or she has an indication for it.

c) Improper drug selection: The patient's medical condition is being treated with the wrong drug or a drug that is not the most appropriate for the patient's special needs.

d) Subtherapeutic dosage: The patient has a medical problem that is being treated with too little of the correct medication.

e) Overdosage: The patient has a medical problem that is being treated with too much of the correct medication.

f) Effectiveness: Effectiveness-related problems occur when a medication dose is too low or when a more effective drug is available. For example, a patient with chronic pain may be taking acetaminophen when an opioid may be more effective.

g) ADRs: The patient has a medical condition that is the result of an adverse drug reaction or adverse effect. In the case of older adults, adverse drug reactions contribute to already existing geriatric problems such as falls, urinary incontinence, constipation, and weight loss.

h) Safety: When a client is taking a medication with a dose that is too high or is taking a medication that causes an adverse drug reaction, he or she is experiencing a safety medication-related problem. For example, a client may not be able to take amitriptyline for insomnia because anticholinergic side effects are too bothersome.

i) Drug interactions: The patient has a medical condition that is the result of a drug interacting negatively with another drug, food, or laboratory test.

j) Compliance: The patient has a medical condition that is the result of not receiving a medication due to economic, psychological, sociological, or pharmaceutical reasons. Compliance-related problems describe instances when a client prefers not to take a medication, does not understand how to use a medication, or cannot afford a medication. A client is experiencing a compliance-related problem if he or she does not understand how to use an inhaler or prefers not to take a medication to treat a condition [1,4,5].

The core of the PATCH service is the ability of pharmacists to provide comprehensive patient-centered care by identifying MRPs and making evidence-based recommendations to providers to optimize medication use. MRPs have been estimated

to cost approximately \$177.4 billion per year and are estimated to be one of the top 5 causes of death in the elderly population. Identifying, resolving, and preventing MRPs can lead to cost savings as well as improved patient outcomes [6]. Traditionally, the availability of clinical pharmacy services has been in the purview of hospitals where increased clinical pharmacy services has been associated with reduced length of stay and mortality. Recognition of the value of the role of the pharmacist has resulted in expansion of clinical services into outpatient settings, including patient homes. For example, the HMR program that was established in Australia in 2001 provides funding for pharmacists to visit patients at home to assess their medication regimens. In Canada, provincial governments are compensating pharmacists for providing medication reviews (MRs) for non-hospitalized patients and authorizing pharmacists to prescribe [7].

Residential Care Pharmacists into Aged Care Homes

Prescribing in the residential aged care population is complex and requires ongoing review to prevent medication misadventure. Integrating an on-site clinical pharmacist into residential care teams is an unexplored opportunity to improve quality use of medicines in this setting. Pharmacist-led medication review is effective in reducing medication-related problems; however, current funding arrangements specifically exclude pharmacists from routinely participating in resident care [8].

Medication Use in Older Adults

Prescribing in the older population is highly complex. Age-related pharmacokinetic and pharmacodynamic changes lead to variations in drug bioavailability, increased drug sensitivity, and decreased regulatory mechanisms, altering the effects of drug usage from those observed in younger populations. In addition, the presence of multiple co-morbidities necessitating multiple medication usage equates to an increased risk of medication misadventure in older adults. Advancing age is positively correlated with increased prevalence of chronic disease, and increased number of co-morbidities correlates with increased medication use [9-13].

Polypharmacy Issues

ADEs can significantly impair occupational and cognitive functioning, and quality of life. All medications have the potential to cause an ADE, particularly in older adults, as a result of pathophysiological decline, inappropriate polypharmacy, and involvement of multiple health providers. This can worsen cognitive impairment, frailty, disability, frequency of falls, and mortality [12,13].

Transitions of Care and ADEs

Transitioning into aged care has been identified as a particularly high-risk point where residents are vulnerable to medication errors and ADEs. Transitions of care for residents

include new admission from the community or hospital to a RACH or returning to the RACH post-discharge from hospital. Poorly executed care transitions and miscommunication can result in interrupted continuity of care and adverse events, which may lead to inappropriate re-admission to hospital or presentation to emergency departments. A study shows Hypertension (nearly 50%) was the highest prevalent chronic disease among the study participants followed by osteoarthritis (35%), diabetes mellitus (more than 25%), respiratory disorders (14%) and cerebro-vascular accidents (11%) in old-age homes of Malaysia. Approximately 20% of residents experience a significant delay in medication administration and missed doses following admission or re-admission to a RACH. Transition-related medication errors are observed in 13–31% of RACH residents, often involve high risk medications, such as warfarin, insulin, psychoactive agents, and opioids, and have greater risk of causing serious harm to the resident [14-17].

Communicable Disease Prevention

Five most common infections in the elderly are UTIs, GI infections, Bacterial pneumonia and influenza. Viral infections like herpes zoster (shingles), pressure ulcers, bacterial or fungal foot infections (which can be more common in those with diabetes), cellulitis, drug-resistant infections like MRSA are common skin infections. More than 60% of seniors over 65 get admitted to hospitals due to pneumonia, reported by AAFP (underlying causes are changes in lung capacity, increased exposure to disease in community settings, and increased susceptibility due to other conditions like cardiopulmonary disease or diabetes). Influenza and pneumonia combined add up to the sixth leading cause of death in America-90% of these in senior adults.

Weakened immunity in the elderly, along with other chronic conditions, increases the risk of developing severe complications from influenza, such as pneumonia. Because influenza is easily transmitted by coughing and sneezing, the risk of infection increases in a closed environment like a nursing home. Cough, chills and fever are the common symptoms, though, again, influenza may present different signs in older adults. Influenza is largely preventable through annual vaccination, and there is enough evidence to support RACH staff vaccination to protect residents from influenza. The rationale for this is to improve accessibility to the vaccination for members of the community who have difficulty accessing the vaccine through their GP or employer, as pharmacies are often open later and on weekends [18-21].

Terminal/Palliative Care

Palliative care in U.S. hospitals increasing every year, according 2018 Palliative Care Growth Snapshot issued by the CAPC. The prevalence of hospitals (50 or more beds) with a palliative care team increased from 658 to 1,831—a 178% increase from 2000 to 2016 [22]. And By 2056, 480,000 Canadian deaths

per year are predicted with 90% of those deaths being eligible for palliative care [23]. Patients diagnosed with a terminal illness often require nonstandard doses that are not available commercially, so pharmacists caring for hospice patients may need to compound products to meet individual patients' unique needs [24,25]. This may include formulating preparations that are flavored to overcome undesirable characteristics or producing dosage forms with alternative ingredients and/or excipients to avoid allergic reactions or progressive intolerances. Pharmacists can often recommend dosing devices that help patients and caregivers deliver the proper dose of highly potent medications. Such devices might not otherwise be readily available to patients in the community.

Medication Dispensing for Terminal/Palliative Care

Most palliative pain medications are controlled substances and are registered among the most highly controlled Schedule II drugs. IAHPC identified 21 symptoms and included 33 essential medications for control of these symptoms. In addition, according to a recent study based on international expert consensus opinion, four essential drugs were used for alleviation of anxiety, dyspnea, nausea and vomiting, pain, and respiratory tract secretions, as well as terminal restlessness. These include morphine, midazolam, haloperidol, and an antimuscarinic, which should be offered in the last 48 hours of life for patients with cancer [26,27]. Futile medication use in management of terminally ill cancer patients has also been reported, one-fifth of cancer patients at the end of their life took futile medications. Statins met futility criteria in 97% of cases, gastric protectors in 50%, antihypertensive agents in 27%, antidiabetic prescriptions in 1%, bisphosphonates in 26%, and antimentia drugs in 100% of patients. Unlike chemotherapy, there is no framework in place to validate halting radiation therapy either in the name of overutilization or futility [28,29].

Non-Traditional Administration Routes

Alternative administration routes for palliative care are vital to providing effective patient care. Many commonly prescribed drugs (eg, promethazine, morphine sulfate) may be used in nontraditional routes [30]. Topical gels containing metoclopramide, diphenhydramine or lorazepam may be found useful for patients with refractory nausea and vomiting [31,32]. Commonly prescribed medications can have nontraditional uses and rectal bioavailability, such as carbamazepine/Topiramate/Lamotrigine tablets or suspension for convulsions; rectal use may allow rapid absorption and partially avoid first-pass metabolism due to rectal venous drain [33]. If necessary, drugs can be compounded into parenterals, solutions, creams, ointments, and transdermal dosage formulations to improve patient adherence and ameliorate AEs, such as constipation, nausea, gastrointestinal issues, and sedation [34]. Various dosage forms, including transdermal patches of scopolamine and depot injections of octreotide, are used to treat specific needs of individual patients [35].

Gastrointestinal Issues

Gastrointestinal issues may develop secondary to many chronic conditions (eg, advanced cancer, neurologic disorders) [36]. Constipation is one of the most common problems patients experience at the end of life. The cause can be as simple as dietary alterations or the inability to ambulate or exercise. Severe discomfort and pain from constipation may cascade into an unrelenting decline in a patient's quality of life, requiring pharmacologic intervention. Privacy issues during toileting and the inability to complete defecation without assistance may progress as a chronic disease worsens, with the proportion of people with severe problems increasing as death approaches [37]. Pharmacists can play an important part in preventing and managing the symptoms of constipation, such as bowel obstruction, dehydration, loss of appetite, mobility issues, and medication AEs. Many non-pharmacologic approaches (e.g., dietary changes, avoidance of negative environmental stimuli, behavioral measures such as relaxation) may assist patients without adding to the pharmacologic burden [38].

Individualized Care or PCC

The point of palliative care is to enhance the personal satisfaction of patients and families through the anticipation and help of anguish. Palliative care in the home is the arrangement of specific palliative consideration in the patient's home, regularly given by attendants as well as doctors with or without association with a doctor's facility or hospice. In a study of 1200 Canadians, more prominent than 70% of respondents wanted to be at home close demise [39]. Since palliative consideration regimens are very individualized to address every patient's issues, coordinating a pharmacist into the interdisciplinary group is fundamental to accomplishing a patient's consideration objectives. Body energy and volume of circulation are changed in patients in end-of-life care.

Role of The Caregivers

Home care clinicians in the WRHA currently rely on community pharmacists for assistance with medication-related issues. According to NCCN "Palliative care specialists and interdisciplinary palliative care teams, including board-certified palliative care physicians, advanced practice nurses, and physician assistants, should be readily available to provide consultative or direct care to patients/families who request or require their expertise," [40]. Pharmacists have an exceptional learning base for improving patient consideration while diminishing AEs and toxicity [23,41]. Palliative care uses a team approach, including physicians, nurses, social workers, chaplains, and pharmacists.

The pharmacist's role within palliative care teams is increasing and initial favorable outcomes have been reported. Analysis of patients with known date of first pharmacist visit found significantly improved LOS, LTC, and CTD for patients with early access to palliative pharmacy (in addition to the other

members of the palliative team) compared to those without early access [42]. Community pharmacies are suggested to consider stocking the five "essential" palliative care drugs: clonazepam 1mg/ml, morphine 10mg/ml, haloperidol 5mg/ml, metoclopramide 10mg/2ml, and Hyoscine butylbromide 20mg/ml [43,44]. Know About Caring for Children According to the Picker Institute and Harvard Medical School has delineated following dimensions of patient-centered care, including:

- a) Respect for the patient's values, preferences, and expressed needs
- b) Information and education
- c) Access to care
- d) Emotional support to relieve fear and anxiety
- e) Involvement of family and friends
- f) Continuity and secure transition between health care settings
- g) Physical comfort
- h) Coordination of care [45]

Clinicians Involved in PPC

Palliative care clinicians are also called to assist with pediatric-aged patients. The PPC team includes multiple disciplines, community-based resources, and family members. Due to advancing technology and medical expertise, children are living longer and with greater medical complexities. Accurate prognostication in pediatrics is complicated by the lack of empirical research and heterogeneous medical experiences. Understanding a family's narrative about their child's illness and their definition of quality of life is essential for effective goals of care discussions. Children are not small adults. Developmental differences among infants, children, and adolescents that affect diagnosis, prognosis, treatment strategies, communication, and decision-making processes present challenges to adult providers who do not have training or experience in caring for children.

Most symptoms for pediatric patients can be managed analogous to that of adult patients; however, complex neurologic symptoms and feeding difficulties are prevalent and distinct in pediatric population. Families of pediatric patients often choose to accept the burdens involved in the use of life-sustaining technology for the benefit of a longer life for their child. Children develop increasing decision-making capacities as they get older and should have increasing roles in healthcare decisions. Their understanding of illness and death evolves over time [46,47]. NHPCO's Quality Partners program utilizes the Standards of Practice as its foundation to provide a framework for quality assessment and performance improvement.

Transition of Care: Issue of Collaboration

Improving medication management during care transitions will require 3 main initiatives. First, the patient must remain the

central focus of care. Second, interprofessional communication and collaboration need to occur among all providers involved in the health care of individual patients. Third, the outcomes of pharmacist involvement during care transitions needs to be evaluated systematically (ideally in controlled trials) to demonstrate a cost-effective improvement in quality and to provide financial justification for investing in pharmacist resources. Collaboration between hospital and community pharmacists can also facilitate patient-centered care. Multiple medication changes during hospitalization can be confusing to patients, caregivers, and providers, and can lead to medication errors.

Hospital pharmacists can provide a reconciled medication list and meet with patients for counseling and education. Typically, the day of discharge is busy, and patients have limited time and attention to discuss important issues. A "hand-off" or pharmacist discharge care plan could facilitate the coordination of medication management between the hospital and community pharmacist. This provides continuity so that the community pharmacist has a list of actual or potential medication-related problems to follow-up on with the patient or other health care providers. It also provides the community pharmacist with patient information that they would not normally have access to [48]. Resources should be targeted toward patient populations at increased risk for readmission, such as patients with heart failure, COPD, asthma, advanced age (discussed earlier), low health literacy, and frequent hospitalizations (FEs).

Heart Failure Management

Community pharmacists who expand their roles and make home visits to heart failure (HF) patients after hospital discharge can improve outcomes. Home health care teams rarely include pharmacists when they provide care to patients undergoing transitions in care. HF affects approximately 6 million adults in the USA, with more than \$30 billion in associated annual costs; by 2030, these figures are expected to rise to more than 8 million adults and more than \$69 billion. From 2012 to 2014, the age-adjusted rate of HF-related deaths per 100,000 people increased from 81.4 to 84.0. The impact of pharmacist intervention was evaluated in a pharmacy-led TOC program for patients with HF from a US hospital.

The goal of TOC is to help recently-discharged patients avoid unnecessary hospital and emergency room re-admissions while ensuring quick healing and recovery right at home. Their primary functions are in-home medical care, collaboration and communication with patient's primary care provider, specialist and discharging hospital, discharge summary review, lab testing & diagnostic imaging, medication reconciliation & adherence etc. Admission medication reconciliation and discharge medication review were performed to monitor for appropriateness and dosing, duplications, omissions, and drug interactions. Pharmacy-led TOC increased compliance with HF core measures (including appropriate medication use) and reduced HF

readmissions, 30-day readmissions, all-cause readmissions, and costs [49-51].

COPD Management

COPD, the fourth leading cause of death worldwide, is also a major cause of chronic morbidity all over the world, particularly in developing countries. In 2016, it was the third leading cause of years of life lost and disability-adjusted life-years in the United States, with an estimated 164 000 deaths. Indeed, in 2012, more than 3 million people worldwide died of COPD, equating to 6% of all deaths globally in that year. In the UK, the costs associated with COPD are estimated to exceed £800 million. In the USA, more than 26 million people are estimated to have COPD, but almost half of these are undiagnosed. The significance of effective COPD exacerbation management is critical to managing healthcare resources. Clinical improvement depends on many factors such as drug selection, patient compliance and control of other risk factors including the environment and nutrition.

Patients at risk for having an exacerbation of COPD should receive self-management strategies. Prompt therapy prior to exacerbations reduces hospital admissions and readmissions, speeds recovery, and slows disease progression. COPD patients tend to have better medication adherence with pharmacist counseling, subsequently improving their quality of life as well as clinical outcomes. Direct education by pharmacists has been shown to be more effective than other teaching methods, including watching videos and providing inhaler pamphlets. With increasing number of COPD patients, individualized counseling for patients is a challenge to the limited number of physicians. Incorrect use of inhalers is very common and subsequently leads to poor control of COPD. Pharmacist-led comprehensive inhaler technique intervention program using an unbiased and simple scoring system can significantly improve the inhaler techniques in COPD patients. A 3-month combined program of transition and long-term self-management support resulted in significantly fewer COPD-related hospitalizations and emergency department visits and better HRQL at 6 months after discharge [52-58].

Exhibit 1. Frequent Hospitalization and Risk of AECOPD [59]

Frequent exacerbations (FEs) mean that the disease is progressing faster, increasing the risk of acute re-exacerbation and mortality. Recent studies showed that ≥ 2 events/year of AECOPD or ≥ 1 event/year of AECOPD leading to hospitalization was the risk factor for future exacerbation events. The COPDgene study showed that wall thickness and emphysema were involved in AECOPD and were independent of airflow limitation. Among others, wall thickness and EI, two imaging features, are well-accepted indicators reflecting the pathological changes of COPD. Exacerbation hospitalizations in the past year and EI were independently associated with hospitalization. A cohort study shows that with the increase in the number of hospitalizations, the risk of acute exacerbation and death increased in turn.

Hip/Knee Arthroplasty

THA and TKA, collectively known as TJA, are beneficial and cost-effective procedures for patients with symptomatic osteoarthritis. The US health care system is the costliest in the world – accounting for 17% of GDP – estimates that percentage will grow to nearly 20% by 2020. TJA is the single largest cost in Medicare, with reports showing a \$13.43 billion annual price tag for THAs, and a \$40.8 billion annual price tag for TKAs. 20% of readmissions occur due to a medication error, 60 % of all medication errors occur during times of care transitions. The most common cause of unplanned readmission at both 30 and 90 days post-THA were joint-specific reasons, including dislocation and joint malfunction.

The second and third most common causes for unplanned readmission, again at both 30 and 90 days, were surgical sequelae and thromboembolic disease, followed by surgical site infection. The pharmacologic intervention directly related to the procedure post-surgery is often limited to pain management (most commonly opioid analgesics). Unlike chronic disease management, the effect of proper pain management tends to be more tangible to the patient. When non-adherent to the pain management regimen, the resulting symptoms tend to be incentive enough for the patient to become adherent until the operative pain is resolved permanently [60-64].

Transitional Care Needs of LHL in Hospitalization

Hospitalization represents a crucial care transition point for patients with exacerbations of chronic disease, in which patient education can aid in improving disease management and reducing negative health outcomes after discharge, such as readmissions and discharge medication errors. Resources may be limited for in-hospital patient education, so triaging by HL level may be necessary for resource-optimization. LHL affects approximately 30% to 60% of adults in the US, Canada, Australia, and the EU. Screening for inadequate health literacy and associated needs may enable hospitals to address these barriers and improve post-discharge outcomes. Health literacy is associated with many factors that may affect successful navigation of care transitions, including doctor-patient communication, understanding of the medication regimen, and self-management.

Research has also demonstrated an association between low health literacy and poor outcomes after hospital discharge (misunderstanding discharge instructions, poor self-rated health, self-efficacy, and decreased use of preventative services), including medication errors, 30-day hospital readmission, and mortality. Potential ADEs are also common and arise from unintentional discrepancies between admission and discharge regimens, such as changes in dose, route, or frequency, and/or introduction of new medications. Transitional care initiatives have begun to incorporate health literacy into patient risk assessments and provide specific attention to low health literacy in interventions to reduce adverse drug events and readmission. Patients – particularly those with limited health

literacy – found a hospital pharmacist-based intervention to be very helpful and empowering. The PILL-CVD study consisting of pharmacist-assisted medication reconciliation, inpatient pharmacist counseling, low-literacy adherence aids, and individualized telephone follow-up, on the number of clinically important medication errors after hospital discharge suggested more involvement of pharmacists and opportunities for better outcome [65-69].

Prevention of Hospital Readmissions

Most common cases of hospital readmissions in US are heart failure, heart attack, and pneumonia, hip and knee replacements, exacerbations of COPD; heart bypass. The penalties were capped at 1% of Medicare reimbursements in 2013, 2% in 2014, and 3% in 2015. The government estimates that the penalties for fiscal year 2015 will total \$424 million and affect 2,638 hospitals, representing an average penalty of more than \$160,000 per hospital. Nearly 20% older adults are readmitted to a hospital within 30 days of discharge. Given that more than half of these readmissions are preventable, the new penalties are compelling hospitals to make the reduction of readmissions a priority.

The community liaison pharmacist provides the missing link between hospital care and the home, as well as among different health care providers, thereby minimizing admission to the hospital due to medication mismanagement and promoting appropriate allocation of health care resources. And community pharmacists, the health care professionals who have the most interaction with patients' post-discharge, are often underutilized. Being an integral part of the transition-of-care process, pharmacists can not only show their value but move the pharmacy profession toward being recognized as comprising health care providers. Community liaison programs clearly help reduce hospital readmissions and other types of harm and wasted resources associated with preventable adverse drug events [70-72].

Conclusion

Community pharmacists are among the most accessible front-line primary care practitioners and are well positioned to affect the care of homebound patients. Pharmacist-directed home medication reviews offer an effective mechanism to address the pharmacotherapy issues of those members of the community who are most in need but may otherwise lack access to pharmacy services. As the general population ages, the demand for such services will undoubtedly increase. Pharmacist-directed home medication reviews could serve to minimize inappropriate use of medication, maximize health care cost savings and expand the scope of pharmacy practice.

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