



A Review of Interventions to Improve Medication Adherence of Patients with Chronic Diseases in Asia

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Abstract

Enhancing medication adherence of patients can lead to lowering the morbidity, mortality, and the healthcare cost. Throughout the years of research, multiple interventions were created to help improve the medication adherence of the patients. However, it is still difficult for some developing countries, including the Philippines, that need further guidance to strengthen their healthcare system. The goal of this review article is to gather information on the different interventions to improve medication adherence of patients with chronic diseases around Asia. Results should focus and suggest ways on improving the healthcare system of the Philippines in dealing patient with chronic diseases.

Introduction

Interventions on medication adherence are intended and designed strategies that were created to contribute in improving and having better outcomes to the treatment of the patient, particularly with chronic diseases [1]. The adherence in taking medications reflects the range of the patient's behavior which can be measured through self – report, using monitoring devices and via indirect methods like their refills of their prescriptions and assessment of the clinic to the patient [2]. Due to long – term treatment of patients with chronic diseases, the common problem that patients face is an inadequate adherence to medication which sometimes led to slow progress of therapy and even increased the expenditure [3]. For years, this health issue became significant and multiple researches were conducted to know the different factors that affect medication adherence, specifically to patients with chronic diseases.

Medication adherence is essential as it is one of the basic patient care planning primary with chronic diseases and this contributes to efficacy of treatment [4]. It is also one of the public priorities to lessen the economic and reduced health burdens mainly, the healthcare cost, the rate of mortality and morbidity [5]. However, improving medication adherence is complicated as it depends on the patient to patient, patient to medication or the patient to certain conditions [6]. There is also a need for deeper understanding about the factors that are involved and exact knowledge of medication adherence itself [7]. According to WHO, poor drug adherence can be caused by a number of variables, most of which fall into one of five categories: socioeconomic factors, therapy-related factors, patient-related factors, and condition-related factors. and lastly, health care system related factors [8]. For these reasons, appropriate medication adherence is essential particularly for patients with chronic diseases as non – adherence to their medication would only exacerbate the treatment and lead to undesirable effects [9].

Chronic diseases also called non - communicable diseases are one of the major healthcare issues all over the world and every year, there are over 40 million patients and 8.5 million from the Asian countries [10]. Chronic diseases are the major cause of deaths and the most common chronic diseases are cancer, cardiovascular diseases, stroke, and diabetes [11]. These diseases were developed mainly because of these four reasons: alcohol consumption, tobacco use, lack of physical activity and their unhealthy diet [12]. Managing these diseases is significantly challenging as it takes a long duration of observation and needs best and suitable primary care for the patient, particularly countries with low and middle income [13]. Countries like the Philippines that scarce resources are having more difficulties in facing such health issues which leads to four out of five deaths from countries with low to middle income and most of them are around middle age people [14].

Over several years, multiple studies were conducted regarding the medication adherence, the interventions to patient's medication and the effect of the medication adherence on patients with chronic diseases. Despite all the studies conducted, it remained challenging to implement the changes and suggestions for the effectiveness and lessen the inadequate medication adherence [15]. The aim of this study is (1) to compare and explore studies related interventions to medication adherence for patients with chronic diseases in Asia and (2) to identify and analyze what are changes that can be applied in the healthcare system of the Philippines to develop a better healthcare system.

Methodology

In finding reliable and high-quality articles and were limited to those publications that were evaluated by the group of researchers to their relevant field of study. This review of Interventions to Improve Medication Adherence of Patients with Chronic Diseases in Asia was conducted and managed through the use of search engines such as PubMed, JSTOR, ResearchGate, International Journal of Medicine Students and Google Scholar associated with the specific journal document from the year January 2012 up to the year 2022.

Results and Discussion

Cancer

Cancer is one of the leading causes of mortality in many Asian countries. According to the study of Claros, Messa, and Perdomo (2019), the number of cancer-related deaths is expected to increase annually from 14 million in 2012 to 22 million after two decades [16]. In 2020, a study have shown that lung cancer is the most commonly diagnosed cancer in Asia, with 13.8% cases, breast cancer comes second, with 10.8% cases, followed by colon cancer with 10.6% cases, stomach cancer with 8.6% cases and lastly liver cancer with 6.9% cases [17]. Men are more likely to develop lung, stomach, liver, colon/rectum, and esophageal cancers, while women are more likely to develop breast, lung, stomach, colon/rectum, and liver cancers [18]. Moreover, a study of Huang et al. (2022) also stated that the increase in urbanization, westernization, globalization, and common lifestyle habits, such as smoking, high-cholesterol foods, and alcohol consumption, are contributing factors to the burden of cancer in different countries of Asia [17]. According to Sankaranarayanan et al. (2014) the emerging cases of this chronic disease requires utmost recognition, particularly from the government as it is also considered an important public health problem in Asia [18].

TABLE 1. Interventions for patient with cancer disease

Interventions	Results
Oral Therapy	Studies have found that aside from conventional treatments including surgery, chemotherapy, and radiation therapy, electronic and online interventions are also used to improve medication adherence for the treatment of cancer around Asia. According to Bassan et al (2013) the usage of oral cancer treatments also known as “oral therapy” has been increasingly used as a cancer treatment since 1990 until today [19]. This treatment appears to have fewer side effects and provides convenience; however, this requires proper dosage on time and willingness of the patient to adhere to medication [20].
Mobile Health Intervention	Moreso, for patients who received long-term oral therapy, mobile health interventions like text message reminders, mobile applications, and automated calls are starting to grow methods to enhance prescription adherence [21].
Oral Chemotherapy	According to Dr. Jorge Ignacio of the Philippine Society of Medical Oncology, oral chemotherapy is considered to be three times more effective than conventional chemotherapy, but it is expected to cost 90 000 to 120 000 a month. A study in India stated that in most low-income countries anti-cancer medications cost has a significant impact on the accessibility and use of patients (Kolasani et al 2016). Moreover, Salmasi et al. (2017) conducted a study on the variations in anti-cancer medicine expenses in high-, middle-, and low-income locations in South-East Asia, the Western Pacific, and the Eastern Mediterranean [22]. This is to assist policymakers of a country to compare anti-cancer drug prices with its neighboring countries and develop policies that ensure the availability and affordability of anti-cancer drugs to its citizens.
Electronic health literacy	Furthermore, electronic health literacy is a key factor in overall health and well-being, as the use of Internet technology continues to grow worldwide. According to Zhang et al (2022), many cancer patients turn to the internet for health-related information as well as emotional or financial support through posting on social media [23]. Another study has stated that cancer patients and caregivers often use the internet and web-based tools to help with their cancer-related condition or task [24]. Moreover, Fridriksdottir (2017) found that there is potential for web-based interventions to help manage cancer symptoms, but further testing is necessary [25]. According to McAlpine et al (2014), WebChoice, an online health communication application, has a positive effect on cancer patients. This study discovered that a cancer patient's complaints, quality of life, support services, self-efficacy, and mood are all improved by an Internet-based health communication tool [26]. This platform allows the patient to monitor the symptoms and receive tailored information and self-management support through virtual communication with nurses and online forums with other patients.
Conventional Treatments	Additionally, conventional treatments for cancer patients are often supplemented by other complementary and alternative therapies in China [27]. Based on a Russian study, the About Herbs website of the Memorial Sloan Kettering Cancer Center's would provide trustworthy and unbiased information about 284 dietary supplements, which would include herbs, vitamins, and minerals that cancer patients frequently utilize.

The various interventions mentioned have the potential to reduce the burden of cancer in different countries of Asia. Online interventions such as mobile phones, Webchoice and Memorial Sloan Kettering Cancer Center's About Herbs website would greatly help in providing and educating people with cancer including health information, herbs usage and effects, and emotional support virtually. Hence, these enable the patients to seek guidance, monitor medication, and express feelings that could ease their struggles and burden. Moreover, comparative research on cancer-related treatments and information on neighboring countries can also be a tool to improve and ensure medication adherence of cancer patients in their country.

Cardiovascular Disease

Cardiovascular Disease (CVD) is the leading cause of death worldwide, accounting for an estimated 17.5 million deaths in 2012 [28]. Half of the cases of cardiovascular disease are expected to occur in Asia [29]. According to the study of Akeroyd et al. (2015), south asia is home to roughly one-fifth of the world's population, and patients face a disproportionately high rate of CVD-related morbidity and mortality [28]. The World Health Organization (WHO) stated that more than 60% of patients with cardiovascular disease have been documented to have drug non-adherence. Morbidity, mortality, and healthcare expenses are all associated with poor adherence to medication and persistence, along with increased rates of readmission to health facilities [30]. Moreover, CVD is identified as a risk factor contributing to adverse cardiac events. Death rates for cardiovascular disease have decreased in several high-income countries but increased in low and middle-income countries, which account for 50% of total CVD deaths worldwide [31]. More than a quarter, 28% of all-cause mortality in India is attributed to cardiovascular disease, where ischemic heart disease constitutes the majority, accounting for 83% [32]. As stated in the National Statistic Office Survey, cardiovascular disease ranked first among the Top 10 causes of death in the Philippines, followed by diabetes and malignant neoplasm [33]. According to the most recent Global Burden of Disease study, there are 422.7 million common occurrences of CVD, and it causes one-third of all fatalities. By 2030, there will be over 23 million deaths from CVD, according to the World Heart Federation, and many CVD cases can be avoided by addressing behavioral risk factors. Furthermore, research points to greater age-adjusted CVD mortality in Asian nations. The cause of 39.5% of all fatalities in Singapore in 2016 was cardiovascular disease [34]. It is evident that medication adherence is a crucial component in the use of appropriate medications to manage CVD risk. All drug regimens must be followed closely in order to make progress, but medications for chronic health conditions demand much more attention.

In China, due to the massive patient population and severe access inequities in the area, coronary heart disease is a worldwide health concern. Coronary Heart Disease is the second leading cause of death in China, accounting for over 1.5 million deaths yearly [35]. Local primary healthcare clinics are not always the first port of call for treatment. Patients with severe illnesses like CHD prefer to be treated in a hospital. As a result, several in 100 million CHD patients received prescriptions and medication-related information only in hospitals, with no primary care clinician to monitor the treatment [36]. According to the "Report on Cardiovascular Health and Diseases in China 2020", the preponderance of cardiovascular diseases in China continues to rise, where there are 330 million patients, which is 23.6% of the population, with 11.39 million coronary heart disease patients, or a total of 0.8% of the population [37]. In patients with CHD, poor medication adherence can result in poor clinical outcomes. As stated in the study of Zhao et al., (2019), only 75% of all hospitalized patients take all prescribed prescriptions within 120 days of being released, which limits treatment effectiveness and results in less favorable outcomes at a large cost towards the patient as well as the healthcare system. [38]. In the Philippines, as stated in the study of Encabo et al. (2017), one of the most significant risk factors for cardiovascular problems such coronary heart disease, stroke, heart failure, and end-stage renal disease is hypertension. [33].

Heart Failure is the final phase in the progression of many cardiovascular diseases. The global prevalence of heart failure is estimated to be more than 23 million people [39]. In the last two decades, mortality from ischemic heart disease and stroke has decreased significantly, while mortality of heart failure has increased gradually. With approximately 1 million people suffering from heart failure, it is a serious health problem in Asia. Moreover, the number of heart failure patients is higher in Southeastern Asia countries than in the rest of the world. In the study by Sen et al. (2020), it was stated that cardiovascular disease has rapidly increased in prevalence and mortality in Vietnam. It is estimated that between 0.3 and 1.6 million people suffer from heart failure [40]. Treatment adherence was low in heart failure patients in Vietnam. According to one study, 37% of patients with heart failure failed to take their medication as prescribed, and 10% did not consistently monitor their symptoms. Management of heart failure tends to require a variety of health behavior adjustments, including particular attention to nutrition, exercise, and cardiovascular drugs. Poor drug adherence is linked to higher rates of mortality, morbidity, hospitalization, and medical expenses. Approximately 50% of patients do not follow their chronic medication regimens [40].

TABLE 2. Interventions for patient with cardiovascular disease

Interventions	Results
Cardioprotective Medications	Cardioprotective medications, such as antiplatelet drugs, beta-blockers, calcium channel blockers, statins, and ACE inhibitors, are an important treatment option for CHD. A systematic review discovered that several studies investigated various interventions to improve adherence to cardioprotective medications among CHD patients. Follow-up phone calls, educational lectures, booklets, and reminder cards have all been shown to be effective in improving medication adherence. All interventions must include education and reminders [35].

Mobile Health	<p>Furthermore, mobile health (mHealth) is a tool that is gaining popularity. In recent years, the use of cell phones, particularly smartphones, has increased. Previous research has looked at how mHealth can be used to improve medication adherence in patients with a variety of chronic medical conditions. A recent systematic review of controlled trials and observational studies concluded that mHealth technologies have the potential to improve adherence to chronic disease management. However, additional information is expected to justify that mHealth applications are effective. [30].</p> <p>Based on the most recent recent research, mHealth applications may assist patients with cardiovascular disease adhere better to their treatment plans. However, to enhance the field and justify use in general treatment, high-quality clinical trials of sufficient size and duration are needed [30]. Notwithstanding the feasibility of the mHealth intervention and its potential to improve clinical health outcomes, there are limitations [36].</p>
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Similar findings indicates that although medication adherence strategies used a variety of techniques, education and reminders were essential components in each and every intervention. More extended follow-up periods and objective medical adherence measurements are needed in future studies to determine whether higher medical adherence in the intervention group equates to better clinical outcomes [38]. Furthermore, the best way to improve treatment compliance among cardiovascular disease patients is to focus on health education to broaden their knowledge and understanding.

Stroke

Stroke is the leading cause of vascular death and disability worldwide, including in Asia. Higher stroke incidence is a result of Asian traits that are distinct from Western traits. Studies on the epidemiology of stroke in Asia have revealed a wide range of mortality, incidence, prevalence, and disease burden. In Asia, hypertension is the most common risk factor. Systolic blood pressure, diastolic blood pressure, and blood pressure variability are all positively correlated with the likelihood of having a stroke, in addition to ethnicity, which is associated with that likelihood. Post-stroke cognitive impairment is one of the sequelae that affect one-third Even though it is becoming more common, stroke is a serious public health issue that is frequently disregarded. As a result, it is crucial to treat the stroke as best as possible in order to prevent recurrence. Raising public awareness of and adherence to treatment for hypertension—the main risk factor for stroke—has evolved into the primary goal in several Asian countries. The financial cost of stroke is high and variable in Asia [41]. According to Chun et al. (2021), the average annual cost per person in China for stroke patients at high risk was estimated to be \$517.8 in 2010 [42]. Variable costs were, respectively, \$ 135.55 per daycare (3.88% of GDP per capita), \$ 227.53 per daycare (2.11% of GDP per capita), and \$ 366.76 per daycare (0.65% of GDP per capita), according to a 2019 review comparing the costs of stroke in Indonesia, Malaysia, and Singapore (Wijaya et al., 2019). It is crucial to pay more attention to stroke and to plan healthcare more effectively, especially in terms of primary and secondary prevention and early disease detection, given the significant financial burden. Understanding the relationship between stroke and hypertension in Asia is crucial due to the financial cost of stroke and the link between blood pressure and stroke (Kario et al., 2019). It is obvious that medication adherence, defined as "the extent to which the patient's actions match the agreed recommendations," is suboptimal in stroke survivors despite the effectiveness of medications for risk factor control of cardiovascular conditions like hypertension and hyperlipidemia [43].

Stroke can have both fatal and life-altering effects [44]. Stroke was acknowledged as the second-leading cause of death globally in 2013 [45] Stroke is the first causes of mortality and the second major causes of death in the Philippines. The prevalence of stroke is 0.9%, with ischemic strokes making up 70% of cases and hemorrhagic strokes 30%. According to the latest available WHO data, the Philippines had 87,402 stroke deaths in 2017, or 14.12% of all deaths. The Philippines are ranked 29th in the world with a death rate of 134.74 per 100,000 inhabitants when age is taken into account. In an effort to increase medication adherence, numerous attempts have been made to intervene. Sadly, the majority of interventions aimed at improving stroke survivors' medication adherence have only had modest success [46]. The ability of stroke patients to take their medications on a regular basis is hampered by a variety of factors. Stroke survivors may experience physical or cognitive limitations that prevent them from being able to self-administer medication. Personal beliefs and preferences may also impact adherence. Adherence is also impacted by drug-related factors. Anticoagulants, for example, frequently have lower adherence rates than antiplatelets, and drug costs may also be significant. Lack of access to healthcare and poor communication with healthcare providers are the two main causes of healthcare system failure [47]. Several studies have looked into what prevents people from taking their medications as prescribed after a stroke. Stroke patients cited worries about prescribed medications and ignorance of the benefits of treatment as the main causes of non-adherence [48]. The rate of stroke recurrence is high after recovery; one in four strokes is a recurrence, which carries a higher risk of death than the initial stroke. Given that recurrent stroke can be prevented, taking steps to learn about risk factors and altering one's lifestyle modification are crucial for successful prevention. Those who have had a stroke must effectively manage their risk factors because, without prompt treatment and a reduction in their modifiable risk factors, their 30-day risk of having another stroke is 5-12% [49]. A total of 1683 stroke rehabilitation records in the Philippines were audited. Brain infarcts predominated in the majority of patients, then cerebral hemorrhage. The average length of stay was 7 days, with hemorrhagic strokes having longer stays [50].

TABLE 3. Interventions for patient prone to Stroke	
Interventions	Results

Secondary Medication	Preventative	There are now established evidence-based secondary stroke prevention strategies. However, the outcomes of earlier intervention studies Lager et al. (2014) and Wessol et al. (2017) reflect the difficulty of measuring adherence and the variability in reasons for non-adherence [46, 51]. Secondary preventative medication non-adherence is relatively common following a stroke and is associated with worse outcome [47]. This makes it difficult to determine whether the intervention components are really focusing on the real factors that affect medication adherence and whether adherence is being measured correctly [43]. Al-Shaikh et al. (2016) state that there are many patient, disease, medication, and institutional factors that contribute to non-adherence. Incentives for medication adherence are a promising but understudied intervention; evidence suggests that they can be very successful [47]. To improve stroke patients' medication compliance, a meta-analysis of community-based trials of home blood pressure monitoring was carried out [52].
Theoretical Framework (TDF)	Domains	There are many behavioral theories that can guide the creation of interventions [53]. Theoretical Domains Framework (TDF) development provides a comprehensive model of behavior to support the development of interventions [54]. The TDF was created by consensus among experts. Behavior change specialists identified the following 14 critical domains: knowledge, skills, social/professional role and identity, optimism, belief in the consequences of one's actions, belief in one's own abilities, reinforcement, intentions, goals, memory, attention, and decision processes, environmental context and resources, social influences, emotions, and behavioral regulation. [55].
Behaviour Change Wheel (BCW)	Change Wheel	The Behaviour Change Wheel (BCW) is a tool for developing interventions that offers a systematic and structured approach [56]. The BCW recommends systematically mapping underlying behavioral determinants to BCTs that are thought to best target and influence these determinants. Additionally, BCTs have been improved into a taxonomy of 93 BCTs, providing a uniform vocabulary to use and a resource to access a comprehensive list of BCTs when developing interventions [57].
Affordability, Effectiveness, Side effects, Equity (APEASE)	Practicality, Acceptability,	People can follow prescriptions for drugs with the additional support of a combination of measures, such as more convenient treatment, reminders, reinforcement, and self-monitoring [58]. These interventions also include application of literature, consideration of the context in which the intervention will be delivered, and use of APEASE. Empirical research has been used to develop prevention measures for secondary strokes. However, the outcomes of earlier intervention studies Lager et al. (2014) and Wessol et al. (2017) reflect the difficulty of measuring adherence and the variability in reasons for non-adherence [46, 51].

APEASE (Affordability, Practicality, Effectiveness, Acceptability, Side Effects, Equity), incentive-based medication adherence interventions, Theoretical Domains Framework (TDF), Behaviour Change Wheel (BCW), home blood pressure monitoring, and a combination of convenient care, reminders, reinforcement, and self-monitoring are a few examples of interventions. Compliance in treating stroke patients is influenced by controllable factors like perceptions of medication necessity and doctor-patient communication. When offering support to those people, rehabilitation and return-to-work programs should also take into account these variables [59]. Other interventions are still being researched and have limitations. The creation of long-term interventions that are cost-effective and sustainable represents a significant challenge for research in this field.

Diabetes

Diabetes is a chronic condition with an ever-increasing prevalence, drawing the attention of the medical community to the need for efficient diabetes management programs [60]. By 2030, the Philippines is expected to have one of the top 10 countries with the highest rates of type 2 diabetes (type 2 DM). According to the Philippine Food and Nutrition Research Institute's routine epidemiological surveys, the prevalence of "new" type 2 DM, as determined by a single fasting blood glucose, increased from 3.4% in 2003 to 4.8% in 2008, and the prevalence of recognized diabetes grew from 2.6% to 4%. [61]. As stated in the information provided by the International Diabetes Federation in 2015, the prevalence of diabetes mellitus among adults in the Philippines aged 20 to 79 was 6.1%, and the disease was responsible for 51,127 deaths overall [62]. This rise in diabetes is extremely concerning because the morbidity of those with diabetes is 11 times higher than that of the overall population [63]. Its mortality rate has sharply increased over the last decades. One of the elements taken into account to enhance the health status of diabetic patients is adherence to a therapeutic regimen. Poor adherence is also another major factor contributing to the rising mortality rates [64].

In accordance with the WHO, the average level of adherence among patients suffering from chronic illnesses in developed nations is approximately 50%. Since pharmaceutical nonadherence results in suboptimal health outcomes and higher healthcare expenses, this is considered as a crucial public health issue [65]. Furthermore, poor medication adherence is believed to be one of the key contributors to poorly managed diabetes [66]. According to studies conducted in Indonesia, medication adherence has a lower percentage, ranging from 38% to 41% in the Middle East region. Diabetes patients who do not really take their prescriptions as directed have a higher risk of complications, higher mortality rates, more health service utilization, higher treatment costs, lower quality of life, and even a higher fiscal burden on the country [67]. Furthermore, Huang et al. (2019) report that one-third to half of people with diabetes are still not taking their medicine despite the initiatives to promote medication adherence [68]. Diabetes medication noncompliance leads to inadequate glycemic control, which raises the risk of diabetes-related complications, resulting in increased hospitalizations and emergency department visits. In primary care settings, there is a continual need to monitor the amount of adherence to medicine for diabetic patients, as

well as the factors associated with nonadherence to medication. This would make it easier for health care practitioners to identify patients with low medication adherence and thereby design interventions to enhance medication adherence [69].

TABLE 3. Interventions for patient with Diabetes	
Interventions	Results
Digital Health Technologies	Studies have shown that the use of mobile phones or any digital devices can be used to improve medication adherence, such as phone calls, messaging, emails, pagers, or video calls. According to Prinjha et al. (2020), digital health technologies have the capability to deliver low-cost interventions aimed at supporting better lifestyles and disease self-management [70]. In recent years, smartphone apps have become more popular as a complementary tool for diabetes self-management (including medication management) [68].
Diabetes self-management education and support (DSMES)	According to Nkhoma et al. (2021), diabetes self-management education and support (DSMES) delivery via m-health (mobile health) technologies may increase patient convenience and coverage by sending automatic reminders and notifications, as well as simplify medication and prescription management [71].
Interactive Voice Response System (IVRS)	Furthermore, a pilot study from Italy examined whether an interactive voice response (IVR) system could aid with drug adherence. After patients have given their demographic, telephone, and medication information to an IVR system, this automated IVR system phones them and reminds them to take their medication or refill their prescriptions [72].
Telemedicine	Kesavadev et al. (2015) stated that telemedicine has become common in the fields of radiology, ophthalmology, cardiology, etc. for the transmission of videos, pictures, and other data from distant locations [73]. The use of telemedicine can also help patients and doctors who are geographically apart communicate more easily. In addition, a study from the Philippines stated that the use of telemedicine offers long-term cost-effectiveness for patients who can utilize it, and it also helps to decrease routine visits to hospitals and clinics to meet with medical professionals and other health workers. The advent of telemedicine as a new method of health consultation may provide opportunities for diabetes patients to monitor their health condition with their medical doctors not only in Koronadal City but also in other parts of the Philippines and developing countries [74].
Pharmacist – led Interventions	Aside from the use of digital devices to improve medication adherence, pharmacist-led interventions are also a contributor to patient adherence to therapy. According to Kandasamy and Rajagopal (2019), diabetes is an illness that requires more pharmacist engagement. Several studies have found that patient counseling and lifestyle changes enhance illness awareness, lower blood glucose levels, and lower the risk of complications, all of which improve health outcomes [75]. Furthermore, according to Presley et al. (2019), patients' medication adherence can be improved, leading to better treatment outcomes, by broadening the pharmacist's responsibility that included counseling, monitoring treatment goals, adherence, and drug-related problem evaluation [76].

In the Philippines, diabetes is one of the main causes of death. In 2012, the World Health Organization ranked it as the fourth highest cause of mortality in the country. It is a national health issue that requires careful monitoring and management because it has resulted in significant economic losses for citizens, health systems, and national economies due to medical costs and lost work and pay [62]. Medication nonadherence, on the other hand, is a significant issue in which patients do not adhere to therapy, which can lead to poor health outcomes and an increased mortality risk. The above-mentioned digital health interventions would make it easier for both the patient and the physician to communicate with one another, and the patients would not have to travel large distances to get to the hospital. Aside from the use of digital interventions, pharmacist-led interventions also help improve patient health outcomes by doing patient counseling about their disease and make them understand the importance of their medications. With these interventions, it may improve patient adherence to therapy, ultimately improving the healthcare system and lowering mortality rates in the Philippines.

Conclusion

Multiple studies and interventions were based to improve medication adherence of patients with chronic diseases around Asia. Despite having these interventions, all it leads to is the patient's willingness to adhere and follow the instructions of health professionals, without it these interventions and therapies are still ineffective. For patients with Cancer diseases, other than chemotherapy and surgery, the following are interventions that are used in dealing patients with Cancers: "oral therapy", mobile health interventions, oral chemotherapy, electronic health literacy and the use of online health communication. Then, for patient cardiovascular diseases, the use of oral medicine is essential to control the disease, therefore, people developed a mobile health tool that helps patients to monitor their condition. The patients that are prone to strokes, adapting the "Theoretical Domains Framework" (TDF) can help determine the interventions that can help improve the condition of patients. In addition to Stroke disease, Behavior Change Wheel (BCW) is another tool that can help develop interventions and last, the use of APEASE, it is similar to TDF and BCW, another tool that can help interventions to help patients prone to stroke. Lastly, dealing with patients with Diabetes, these are interventions that can help patients with their condition: Mobile health tool, Interactive voice response (IVR), the use of telemedicine and pharmacist - led interventions. In a world of modernization, multiple technologies develop and studies conducted to help improve the world. The interventions that were mentioned above could possibly be applied

to the Healthcare system of the Philippines as it does not require big technologies to help patients improve. Most of the interventions mentioned are more on mobile applications, online communication and behavioral tests which can easily be implemented if the healthcare system of the Philippines would allow and support it.

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