Cultivating Wellness and Curbing Costs: A Systematic Paradigm for Enhancing The U

Siriust Ling¹

¹Carlmont

September 20, 2023

Abstract

Each year, Americans spend increasingly significant amounts of money on healthcare costs. The American Medical Association estimates that U.S. healthcare spending grew 2.7 percent in 2021, reaching $4.3 trillion or 18.3% of the nation’s Gross Domestic Product. Despite these statistics, healthcare quality and accessibility remain problematic. Many approaches have been suggested and implemented in response to these major shortcomings. Some of these remedies have included the proliferation of mid-tier healthcare providers such as nurse practitioners and physician’s assistants to alleviate the strain on doctors. However, there is sufficient evidence that patient education can critically impact the efficacy of the healthcare system and merits serious consideration for better patient outcomes and potentially reducing healthcare costs. This paper describes challenges and opportunities to patient education based on extensive research and practical insights from various disciplines. Furthermore, this paper sets forth recommendations for promoting a comprehensive, cohesive, and evolving patient education framework.
Cultivating Wellness and Curbing Costs:
A Systematic Paradigm for Enhancing
The U.S. Healthcare System through Patient Education

Siriust Ling
September 2023
# Table of Contents

Abstract 2  
Introduction 2  
1. Scope of Patient Education 4  
2. Changing Roles of Patients in The U.S. Healthcare System 5  
3. General Health Literacy and Patient Education 6  
   3.1. K-12 Educational Settings 6  
   3.2. Adult Education 7  
   3.3. Online Resources 7  
   3.4. Patient Advocacy Groups 8  
   3.5. Public Outreach and Public Service Announcements 9  
   3.6. Hospitals and Clinics 9  
   3.7. Primary Care Providers 9  
   3.8. Specialists 10  
4. The Need for Improved Patient Education 10  
   4.1. Limitations in Healthcare Availability 10  
   4.2. Low Healthcare Literacy 11  
   4.3. Constraints on Patient Education (Logistical Issues) 12  
   4.4. Convoluted Informed Consent Documentation 12  
   4.5. Patient Diversity 13  
   4.6. Mounting Public Healthcare Costs 13  
5. Benefits of Patient Education 14  
   5.1. Preventive Care 14  
   5.2. Curative Care 17  
   5.3. Economic Benefits 18  
   5.4. Systematic Analysis: Effectiveness of Patient Education by Randomized Clinical Trials 18  
6. Outlining a Comprehensive, Cohesive, and Constantly Evolving Framework for Patient Education 20  
   6.1 Strengthening Health Literacy as the Foundation of Patient Education 21  
   6.2. Enforcing Patient-Centered Education in Hospitals and Clinics 21  
   6.3. Enhancing Patient Education Efforts by Insurance Providers 22  
   6.4. Using Online Resources to Promote and Enhance Patient Education 23  
Conclusion 23  
References 24  
Appendix: Systematic Analysis: Effectiveness of Patient Education by Randomized Clinical Trials 37
**Abstract**

Each year, Americans spend increasingly significant amounts of money on healthcare costs. The American Medical Association estimates that U.S. healthcare spending grew 2.7 percent in 2021, reaching $4.3 trillion or 18.3% of the nation’s Gross Domestic Product. Despite these statistics, healthcare quality and accessibility remain problematic. Many approaches have been suggested and implemented in response to these major shortcomings. Some of these remedies have included the proliferation of mid-tier healthcare providers such as nurse practitioners and physician’s assistants to alleviate the strain on doctors. However, there is sufficient evidence that patient education can critically impact the efficacy of the healthcare system and merits serious consideration for better patient outcomes and potentially reducing healthcare costs. This paper describes challenges and opportunities to patient education based on extensive research and practical insights from various disciplines. Furthermore, this paper sets forth recommendations for promoting a comprehensive, cohesive, and evolving patient education framework.

Keywords: U.S. healthcare, patient education, patient-centered care, health literacy

**Introduction**

“Each patient carries his own doctor inside him. They come to us not knowing that truth. We are at our best when we give the doctor who resides within each patient a chance to go to work.”
- Albert Schweitzer (1875-1965)

Albert Schweitzer, winner of the 1952 Nobel Peace Prize, was a physician, philosopher, theologian, and medical missionary. He suggested that people have an innate ability to heal themselves, which he metaphorically referred to as their “doctor within” (*The Nobel Peace Prize 1952*, n.d.). Over time, his quote has acquired new interpretations. One such understanding pertains to the central role of patients in healthcare to promote the philosophy that medical decisions and interventions shall align with, motivate, and support their own goals. In order to spur the doctor inside each patient to take action, patients need to understand basic health
information. In essence, the key to empowering one’s “doctor within” is through patient education: the process of influencing patient behavior and producing the changes in knowledge, attitudes, and skills necessary to maintain or improve health (Am Fam Physician, 2000).

Despite high and ever-increasing healthcare spending, Americans tend to die younger and be less healthy than residents of other high-income countries (Tikkanen and Abrams, 2020). U.S. National Health Expenditure (NHE) grew 2.7% to $4.3 trillion in 2021, or $12,914 per person, and accounted for 18.3% of Gross Domestic Product (GDP) (NHE Fact Sheet CMS, n.d.). Moreover, average growth in the U.S. NHE (5.4%) from 2022-2031 is projected to outpace that of average GDP growth (4.6%), resulting in an increase in the health spending share of GDP from 18.3% in 2021 to 19.6% in 2031. In comparison to the average OECD (Organization for Economic Co-operation and Development) country, U.S. consumers tend to spend nearly twice as much as a share of their economy (OECD Statistics, 2022). In spite of higher healthcare costs, in 2020, the U.S. had a relatively low average life expectancy (77.0 years in the U.S; 80.4 years in OECD) and relatively high rates of avoidable deaths per 100,000 people (336 in the U.S.; 225 in OECD average) among high-income countries (OECD, 2021; Commonwealth Fund International Health Policy Survey, 2020). Adults in the U.S. are the most likely demographic to have multiple chronic conditions (30.4% in the U.S. versus 17.0-25.9% in 10 other comparatively wealthy OECD countries) (Gunja et al., 2022).

In the light of escalating healthcare costs and worsening future cost projections, there exists an immense potential to curtail healthcare expenditures and improve health outcomes by prioritizing patient education, an integral element of healthcare. Previous studies suggest that nearly half of the U.S.’ health burden is attributable to a list of 84 modifiable risk factors (The U.S. Burden of Disease Collaborators, 2018). U.S. healthcare spending attributable to modifiable risk factors was estimated to be 27.0% of total healthcare spending. It was also estimated that every dollar spent on patient education that fueled health-promoting behaviors is projected to save as much as $3-4 dollars in healthcare costs (Bolnick et al., 2020). This paper thereby aims to delineate challenges and opportunities in patient education from multiple perspectives and recommend the following comprehensive strategy to improve patient education:
- **Scope of patient education:** The goal is to explore the vast and intricate landscape of patient education to identify the role of current key stakeholders. This would also include identifying evolving trends in patient education affected by social, economic, and technological advancements.
- **Identify the need for more effective patient education:** This includes accounting for the complexity of the healthcare system, rapidly advancing technologies, and limits within public education to promote health education for adults and children.
- **Research evidence of patient education benefits:** Provide rationale and research evidence on the health and economic benefits of effective patient education.
- **Identify goals for patient education and suggest approaches to overcome obstacles to reach these goals:** This includes understanding research or policy initiatives, interventions, or collaborations that would promote patient education.

### 1. Scope of Patient Education

Patient education can be defined as the process of influencing patient behavior and producing changes in knowledge, attitudes, and skills necessary to maintain or improve health (Am Fam Physician, 2000). The ultimate goal of patient education is to instill a sense of autonomy in patients and equip them with the knowledge necessary to make their own healthcare decisions. With this concept in mind, Figure 1 illustrates an understanding of patient education as an interactive learning system where knowledge flows within multiple channels as individuals interact with the healthcare system, public health and education system, insurance, patient advocacy groups, and others. As the “knowledge” (health information) is received by patients in an effective and interactive way, it can help patients achieve better communication with healthcare providers. This, in turn, can lead to better decisions regarding their lifestyle, health management, and compliance with treatment. All these factors may ultimately contribute to better health outcomes and reduced long-term healthcare costs.
2. Changing Roles of Patients in The U.S. Healthcare System

Before further exploring patient education, it is important to understand the evolving role of patients in the U.S. healthcare system. The patient-provider relationship has undergone much revision from traditional “doctor is always right” attitudes. In the 1950s, “patient-centered care” was initially introduced as a concept by Carl Rogers, an American psychologist, who used the term to describe building a relationship of trust between therapist and patient to enable patients to fulfill their potential in life (Rogers, 1951). The idea was further developed in the 1970s by U.S. psychiatrist George Engel, who introduced the concept of the biopsychosocial model of health as an alternative to the traditional model (Latimer et al., 2017).

In contemporary times, the role of the patient as an active partner in healthcare tends to be more widely recognized and appreciated (Finset, 2007). Current philosophies in this regard emphasize the alignment of the healthcare provider’s mission and quality-improvement initiatives with patient-centered goals (NEJM Catalyst, 2017). Indeed, one of the most important elements of patient-centered care is shared decision making. Shared decision making means that both patients and providers can discuss and agree on plans of action for treatment based on not only recommendations from a clinical perspective, but also the patient’s individual needs. In
order for this shared decision making to be as effective as possible, the patient should have sufficient capabilities to understand the health information provided. This basic literacy background is commonly known as health literacy, which places emphasis on patients’ ability to understand and make use of health information as well as their ability to make informed decisions (CDC, 2023).

3. General Health Literacy and Patient Education

Health literacy is defined as “The degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions” (Parker & Ratzan, 2010). With an overall shift towards greater patient involvement in the healthcare and treatment process, there should be an accompanying improvement in the health literacy of patients to ensure that they can understand important aspects regarding their health and act in their own interest. Indeed, health literacy is considered a foundational cornerstone of effective patient education. Avenues of obtaining general health literacy for the average person include schooling, online resources, and patient advocacy groups.

3.1. K-12 Educational Settings

One of the primary methods for many people to obtain health literacy, especially general preventive care knowledge, is through the K-12 education system. National Health Education Standards (NHES) have been developed to promote and support student health-enhancing behaviors from Pre-K through 12th grade (Standards for Health Education | Healthy Schools | CDC, 2023). Current academic standards in California aim to “...improve academic achievement and health literacy for all students…” and help students become “…critical thinkers and problem solvers when confronting health problems and issues, self-directed learners who have the competence to use basic health information and services in health-enhancing ways, [and] effective communicators who organize and convey beliefs, ideas, and information about health issues” (Health Education Content Standards for California Public Schools, Kindergarten Through Grade Twelve, 2009). Health education in K-12 settings attempts to provide all students with a base level of knowledge regarding healthcare to allow them to better navigate health
concerns which may arise. These health education standards cover some very important areas about the benefits of patient education, namely the ability to understand and make use of health information and the ability to properly communicate with health providers. Many studies have provided evidence that school health education programs can improve critical health knowledge, attitudes, and skills among elementary and secondary school students. Furthermore, researchers have found that school health programs can improve health behaviors and health outcomes (Kolbe et al., 1997). While health education equips students with necessary health-related knowledge, basic literacy is equally essential to full health literacy. This observation is exemplified by difficulties that adults with low overall literacy levels experience with respect to understanding health-related literature. In general, K-12 education is a critical foundation of health literacy.

3.2. Adult Education

According to a 2019 report by the U.S. Department of Education, 54% of U.S. adults aged 16- to 74-years-old possess an English literacy level below sixth grade (Mamedova and Pawlowski, 2019). Adult education constitutes an important resource for such individuals to improve their English proficiency. A major source of support for American adult education programs in literacy is the U.S. Adult Basic Education and Literacy (ABEL) programs, which currently serve millions of Americans. There are also ESL (English as Second Language) classes serving people who do not speak English as a native language. Gaining advanced English language skills can ultimately help these adults better comprehend healthcare-related information.

3.3. Online Resources

Another rising avenue for patients to obtain health knowledge is through online resources. The rise and growing prevalence of the Internet has massively transformed the ways in which people access information. In 2021, some 97 percent of 3- to 18-year-olds had home internet access, according to The American Community Survey (ACS) (COE - Children’s Internet Access at Home, 2023). The existence of plentiful online health resources has allowed
patients to gain much more knowledge about their conditions as well as adopt a proactive role in their own healthcare. A plethora of online health resources is made available by local hospitals, clinics, government agencies (such as The National Institutes of Health and Centers for Disease Control and Prevention), patient advocacy groups, and commercial websites (e.g., WebMD).

Online healthcare resources are currently used by many Americans. According to the National Telecommunications and Information Administration’s November 2019 Internet Use Survey, 42% of American households used the internet to research health information (Cao and Goldberg, 2020). In addition, the National Health Interview Survey from 2009 found that “...among adults aged 18 and over, women were more likely than men to have used the Internet for health information, among adults aged 18–64, non-Hispanic white persons were almost twice as likely as Hispanic persons to have used the Internet for health information, [and] adults aged 18-64 with higher incomes were more likely to have used the Internet for health information than adults with lower incomes…” (Cohen and Adams, 2019). Indeed, socioeconomic and sociodemographic factors may impact whether or not people are able to – or choose to – utilize the internet to access health information (Chagpar, 2022).

3.4. Patient Advocacy Groups

Patient advocacy groups play an important role in patient education as well. Patient advocacy groups are generally considered to have their roots in the patient rights movements of the 1970s (Gonzalez, 2018). These organizations often aim to use education and advocacy to improve awareness of patients’ plights both in general and scientific communities (Zimmerman et al., 2005). These groups are essential to providing patients with support and knowledge by organizing people according to health conditions that they have in common. For example, the National Psoriasis Foundation (NPF) receives nearly half a million requests for information about this condition (Zimmerman et al., 2005). NPF strives to meet patients’ needs by providing a comprehensive website, educational booklets, community education meetings, and an annual national conference. Patient advocacy is especially important and effective in reaching potential patients who may have rare diseases. These efforts allow such patients to connect with relevant
3.5. Public Outreach and Public Service Announcements

Public outreach and public service announcements are also important components of patient education (Davis, 2000). They include a variety of activities by research institutes, government agencies aimed at promoting public awareness and understanding of certain health issues. These agencies use a large variety of outreach tools including newsletters, leaflets, advertising stalls and displays, and dedicated events and activities. These initiatives are extremely powerful in reaching a large population of people and have significant impacts regarding major avoidable conditions and diseases (Kumar and Preetha, 2012). Some effective examples include cigarette smoking, child immunization, and alcohol use public service announcements.

3.6. Hospitals and Clinics

While patients’ own learning about healthcare issues is certainly important, it may not be sufficiently comprehensive. This is where education from patients’ provider care teams in hospitals and clinics can be vital. Patient-centered care means that patients should not only be informed but also be an integral part of the decisions that are made regarding their care. For example, patients’ provider teams may be able to explain not only the need for taking certain medications but how these interventions can help patients manage their conditions.

3.7. Primary Care Providers

Primary care providers are healthcare professionals who provide patients with day-to-day care and often act as the first healthcare professional that a patient visits. Primary care providers will usually have scheduled annual or biannual appointments with their patients and interact with their patients more than other types of healthcare professionals. Primary care providers are also essential in providing preventive care in the forms of health promotion, disease prevention, and
health maintenance. Due to their high level of interaction, primary care providers are responsible for much of the education and information that patients receive.

3.8. Specialists

In contrast to primary care providers, specialists have a more specific field in which they provide care. Much of the time, patients visit specialists after being referred by a primary care doctor. When compared to primary care providers, specialists tend to perform more curative care than preventive care. While this may seem to indicate that specialists are not an important asset in providing patient education, this is not the case. Specialists are usually responsible for more involved care (e.g., surgery, advanced medications, etc.). This often means that patients will need to make important decisions about treatment plans and assume responsibilities in post-treatment self-management.

4. The Need for Improved Patient Education

The need for improved patient education is the result of a convergence of multiple perspectives: maintaining the normal functioning of the healthcare system, containing healthcare costs, and improving the health of Americans.

4.1. Limitations in Healthcare Availability

Despite the importance of healthcare, access to medical care in the U.S. generally remains inadequate. According to the most recent statistics from the World Health Organization (WHO), there were only 35.55 physicians per 10,000 people in the U.S. in 2020. According to the 2019 National Ambulatory Medical Care Survey (NAMCS), the average American visits a doctor approximately 3.2 times per year – with each of these appointments being approximately 18 minutes long (Neprash et al., 2021). This means that the average patient spends a mere 57.6 minutes with doctors in a year. This limited patient-provider interaction time demonstrates that there is little opportunity for patients to inquire about their health or for providers to talk to patients about their health. This places much of the responsibility for diagnosis and prevention
on the patient. Since patients must be the ones to notify their providers of any potential signs of illness, they must understand warning indicators and proactively inform their providers of any important developments in their condition. It is critical that patients are well educated to effectively implement their healthcare roles (Fereidouni et al., 2019).

4.2. Low Healthcare Literacy

The advancement of modern healthcare also places an increasing number of sophisticated demands on patients. These demands include seeking health and treatment information, understanding rights and responsibilities, and making health decisions for themselves and dependents. Navigating the healthcare system can be a widespread challenge. In a significant population-level study of health literacy skills conducted to date, the U.S. Department of Education’s National Assessment of Adult Literacy (NAAL) documented that only 12% of U.S. adults are proficient enough in health literacy to understand and use health information effectively (“Panel 1,” 2006).

While the current U.S. healthcare system functions on the basis that all patients have sufficient health literacy skills and can advocate for themselves, the reality is that there is a significant gap between what messages providers intend to communicate to patients and what patients actually understand (Paasche-Orlow et al., 2006). One article describes a “...cycle of costly crisis care...” in which poor patient education by healthcare providers in conjunction with poor health literacy leads to repeated failures to obtain proper care (Koh et al., 2012). Confusing instructions combined with inadequate patient knowledge can yield a cycle of crisis care. Essentially, a lack of proper health literacy is partially responsible for many poor treatment outcomes.

Consequently, patient care costs tend to increase in order to cover the expenses of treating avoidable health conditions caused by low literacy. In a study of 92,749 veterans with healthcare service utilization from 2007-2009, average per patient costs for those with inadequate and marginal health literacy was significantly higher ($31,581 [95% CI: $30,186 - $32,975]; $23,508 [95% CI: $22,749 - $24,268]) than for patients with adequate health literacy ($17,033
4.3. Constraints on Patient Education (Logistical Issues)

Even though they are key sources of patient education, physicians in the U.S. often face an abnormally high patient workload and little time to communicate with their patients (Neprash et al., 2021). From an insurance standpoint, there is typically a lack of reimbursement for physicians’ time spent on patient education (Freeman et al., 2021). In addition, many providers might not possess proper training in the provision of patient education. In fact, many educational methods utilized by health professionals are clinician-centered instead of patient-centered.

In some cases, physicians do not have appropriate health educational materials developed for the populations they serve. The American Medical Association (AMA) and National Institutes of Health (NIH) recommend that online education resources be written on a reading level between 3rd- and 7th-grade (Weiss, 2003). Based on a research study of online patient education articles, the majority of articles were written above recommended grade reading level guidelines (Eltorai et al., 2014). Furthermore, research showed that healthcare articles from Google searches tend to be written at a mean grade reading level of 11.75 ± 2.72. Only 12% of articles were written below a 9th-grade level and only 3% met recommended criteria. The articles found via Wikipedia, WebMD, AAPOS, and AOA also had average grade reading levels above the recommended guidelines (John et al., 2015). Despite online health-related resources becoming more available and accessible, the majority of them are written at a grade level in which it can be difficult for the majority of the U.S. general population to understand and make use of the information (Bourdache et al., 2023).

4.4. Convoluted Informed Consent Documentation

Important components of patient-centered care include shared decision making and informed consent. Informed consent is the process by which patients are to be educated by their
providers about the benefits and costs of undergoing a medical procedure (Shah et al., 2023). Signing an informed consent form is meant to indicate that patients fully understand both the benefits and risks of their choice. However, studies have shown that “...clients rarely comprehend or recall even a small amount of what they have been taught in anticipation of informed consent…” (Hall et al., 2012). While both providers and patients may attempt to respectively teach and understand important information, a lack of readable patient education materials proves to be an obstacle. Little material available is actually appropriate for reading levels of the general public (Freda, 2004). This means that, despite signing a form indicating that they have made a properly informed decision, many patients may have not actually done so.

4.5. Patient Diversity

In the current U.S. healthcare system, there is underrepresentation of cultural, gender, and ethnic diversity (Nair and Adetayo, 2019). The U.S. population contains millions of people with different beliefs, customs, and values. In addition to 211 million Americans of European descent, the 2000 U.S. Census identified approximately 70 million people from 19 other ethnic and cultural groups (U.S. Census Bureau, 2000). This multicultural milieu mandates that, while delivering patient education, providers need to be conscientious about patients’ cultural backgrounds and unique languages (Stubbe, 2020). These factors play important roles in communication to ensure mutual understanding between patients and healthcare providers. The U.S. Department of Health and Human Services’ (HHS) National Standards for Culturally and Linguistically Appropriate Services (CLAS) state that “…healthcare organizations must make available easily understood patient-related materials in the languages of commonly encountered groups” (Health Literacy: A Prescription to End Confusion., 2004).

4.6. Mounting Public Healthcare Costs

The U.S. government spends an estimated $3.6 trillion annually on healthcare, but less than 3 percent of that spending is directed toward public health and prevention (Guinta and Allegrante, 1992; Himmelstein and Woolhandler, 2016). Total public health expenditures rose from 1.36% in 1960 to 3.18% in 2002, but then fell to 2.65% in 2014; they are projected to fall to
2.40% in 2023. Even though prevention is recognized as critical, public health programs have received less attention and far less funding than personal medical services (Kinner and Pellegrini, 2009). Federal, state, and local governments cover about half of the nation’s healthcare spending (Figure 2). Yet only a tiny fraction of national healthcare spending is allocated to health education (Guinta and Allegrante, 1992). This continues to be a critical limitation toward realizing the full potential of patient education, especially for preventive care.

![Pie chart showing national health expenditures by funding source, 2021](image)

Figure 2. National Health Expenditures by Funding Sources, 2021 (graphed with information extracted from National Health Expenditure Data collected by Centers for Medicare and Medicaid Services)

5. Benefits of Patient Education

Enhanced patient education leads to improvements in health outcomes and reduces healthcare costs. Even though the benefits of patient education are generally understood and accepted, solid research evidence is required to draw the attention of stakeholders and justify budgets for patient education initiatives. In turn, an increasing number of studies have been conducted to demonstrate the positive impacts of better patient education.

5.1. Preventive Care

Patient education can significantly improve preventive care. U.S. consumers tend to spend large sums of money every year on treatment for conditions that can be avoided. Research
suggests that nearly half of all health burdens in the U.S. is attributable to a list of 84 modifiable risk factors including high cholesterol, high blood pressure, smoking, diabetes, obesity, physical inactivity, and poor nutrition (Galea and Maani, 2020; The U.S. Burden of Disease Collaborators, 2018). In 2016, U.S. healthcare spending attributable to modifiable risk factors was $730.4 billion, which corresponds to 27.0% of total healthcare spending. These expenses were largely due to five risk factors: high body-mass index, high systolic blood pressure, high fasting plasma glucose, dietary risks, and tobacco smoke.

It is vital to offer patients tools and knowledge to lower their risks for contracting or developing certain health conditions. Moreover, it is important for patients to understand when it might be prudent for them to contact their healthcare team in order to proactively diagnose or avoid health issues. In the history of the U.S. there have been many examples of effective and ineffective preventive education. One such prominent example is in the realm of sex education. The U.S. ranks high among developed nations in rates of both teenage pregnancy and sexually transmitted diseases (Darroch et al., 2001). Historically, sex education in the U.S. has been focused on an “abstinence only” curriculum. Such a model emphasizes not engaging in sexual activity rather than providing students with important comprehensive information about undertaking safe sexual activity. Despite the relatively strict and clear message of “abstinence only” sex education, studies have demonstrated that states with such sex education programs have significantly higher teen pregnancy rates (73.24 (±2.58) teen pregnancies per 1,000 girls aged 14–19) than states that adopt a more comprehensive sex education curriculum (56.36 (±3.94)) (Stanger-Hall and Hall, 2011). The apparent inability of “abstinence only” sex education to effectively lower teen pregnancy rates demonstrates that despite clear messaging, ideas without sufficient explanation and elaboration can fail to take root in their target audiences. As a result of improved sex education, the overall U.S. teen birth rate and that of California has dramatically decreased since 1990 (Figure 3). Interestingly, a stall in this trajectory occurred during 2000-2005, which coincided with a federal policy change promoting “abstinence only” sex education.
Healthcare-related communications should not only teach patients about the intricacies of preventive care but provide a proper rationale about such care for them. This is especially important for preventive care habits that may be difficult for patients to implement. For example, a provider may recommend that patients consume less sugary and fatty foods in order to lower their risk of contracting heart disease or diabetes. Indeed, consistent research evidence demonstrates that a healthy dietary pattern is associated with beneficial outcomes for many chronic diseases: cardiovascular disease, obesity, and type 2 diabetes, among others (Dietary Guidelines for Americans, 2020; Joshipura et al., 2001; Steinmetz and Potter, 1996; Zhao et al., 2011). While this message is clear, it can be difficult for a patient to enact given the allure of many unhealthy foods. To help ensure compliance, physicians can demonstrate for patients the physical effects of overconsumption of unhealthy foods (through blood vessel clogging demonstrations, etc.). Moreover, physicians can explain that there may be no need for patients to completely abstain from consuming these unhealthy foods but to consume them in safe portions and moderate amounts. Thus, patients can receive a wealth of information that helps them formulate an informed assessment and course of action.

Preventive education assists in detecting early symptoms as well. Patients need to be educated about the warning signs of conditions for which they may be at risk. This is especially
important for conditions wherein receiving care as soon as possible can drastically increase the chances of a positive treatment outcome. For example, an educated patient may be able to recognize an abnormal skin mole and notify a provider about a potential tumor. On the other hand, a lack of knowledge can be problematic. One illustration of this is when a patient complies with self-care behavior such as daily self-weighing and recording of weight without knowing the medical conditions such data might indicate – such as heart failure (Jaarsma et al., 2021). Data from various populations suggest that up to 50% of patients hospitalized due to heart failure are readmitted within six months (Desai and Stevenson, 2012). In addition, knowledge of genetic conditions is important since some diseases can be hereditary. For patients at high risk, genetic testing or screening is offered to determine the extent to which they are carriers of hereditary disorders. This is vital information for people who plan to have children or possess a family history of inherited diseases (Haga et al., 2013).

5.2. Curative Care

Besides being valuable for preventive care, patient education can greatly improve healthcare outcomes in curative care. For example, proper patient education regarding self-care regimens for people with chronic conditions have been shown to result in greater compliance with care plans. A study of 100 patients with rheumatoid arthritis placed patients into two groups, one of which received information regarding the types of drugs used to treat rheumatoid arthritis as well as home preventive care strategies (Gold and McClung, 2006). Despite both groups receiving written information regarding their designated treatment, only one group received verbal education. Compliance in the group that received verbal education was 85% compared to the control group which had a compliance rate of 55%. This suggests that patients who verbally received information about not just their care regimens but about their treatment plans had significantly increased compliance when compared with patients who had not received such knowledge. While one could argue that there is no need for patients to understand the complex inner-workings of their treatment, studies have shown that offering patients access to higher level information about their treatments has not negatively affected patient compliance.
5.3. Economic Benefits

From an economic perspective, reduction of preventable conditions would substantially reduce net healthcare costs. In the U.S., the cost of preventable or treatable illnesses was estimated at $730.4 billion, which was 27.0% of total healthcare spending in 2016 (Galea and Maani, 2020). Improved patient education in both preventive and curative care can have massive impacts on the economics of healthcare. While improved patient education frameworks and curricula may have an initial cost to implement, the return on better health outcomes and reduction in healthcare costs clearly outweigh the investment.

Diabetes is among the most expensive chronic conditions nationwide, with $327 billion total annual costs (American Diabetes Association, 2018). Current estimates show that one in three Americans will develop diabetes sometime in their lifetime (Koyama et al., 2022). Diabetes impacts how the body turns food into energy and results in excessive sugar in the bloodstream. There are three main types of diabetes: type 1 (T1D, 5-10%), type 2 (T2D, 90-95%), and gestational diabetes (diabetes while pregnant). Over time, diabetes can cause serious health problems and damage vital organs. Many diabetic patients have a shorter life expectancy than people without this disease. Fortunately, there are a number of effective diabetes prevention and management strategies. In one study, the cost-effectiveness of self-management programs for type 2 diabetes was evaluated using a mathematical simulation model to estimate the long-term effects of self-management interventions (Brownson et al., 2009; Zhou et al., 2020). Researchers found that the programs were cost-effective when taking into account cost savings due to reductions in long-term complications. This finding can justify the increased effort and cost in patient education to promote effective self-management programs.

5.4. Systematic Analysis: Effectiveness of Patient Education by Randomized Clinical Trials

As discussed above, many patient education interventions have been utilized in diabetes care and show promise in improved health outcomes and cost reduction. To further understand these benefits of patient education, this report presents a related systematic analysis. To qualify for acceptance into this analysis, the following criteria needed to be fulfilled: 1. Researchers
conducted a randomized controlled clinical trial; 2. Clear patient education protocol was presented; 3. A placebo control group was included; 4. A statistical analysis was included; 5. The data was published in a peer-reviewed article. Research articles for this study were identified through a search of the National Library of Medicine Pubmed Database (https://pubmed.ncbi.nlm.nih.gov/). A keyword search of “diabetes,” “education,” and “cost” yielded 190 articles from 1970-2023. The selection process was refined to yield 38 articles, focusing on studies that included randomized clinical trials. Further review of article content yielded a final 19 studies, which contain well-designed trials with thorough data analysis performed in U.S. and European countries (Appendix) (Basarir et al., 2016; Carey et al., 2014; Egede et al., 2021; Gillespie et al., 2014; Gillett et al., 2010; González et al., 2015; Heller et al., 1988; Hermanns et al., 2017; Iovane et al., 2018; Jansà et al., 2006; Leal et al., 2017; Odnoletkova et al., 2016; Philis-Tsimikas et al., 2011; Piatt et al., 2018; Prezio et al., 2014; Rickheim et al., 2002; Vos et al., 2019; Windrum et al., 2016; Ye et al., 2021).

Out of the 19 studies, there are five trials conducted in the U.S., seven in the United Kingdom, two in Spain, one in Germany, one in Italy, one in the Netherlands, one in Belgium, and one in Ireland (Table 1). The studies covered three main diabetic conditions: pre-diabetes (one study), type I diabetes (three studies), and type II diabetes (15 studies) with study duration of six months to three years. There are four studies carried out in the U.S. in defined minority ethnicity groups: three studies in Mexican Americans and one study in African Americans. Interventions included group education by specialists, telephone-delivered structured therapeutic education programs, education by trained non-healthcare professionals (such as community health workers), and ethnicity-tailored education. Clinical trial outcomes are diabetic control as well as incremental costs, quality-adjusted life years gained, and cost-effectiveness (in nine out of the 19 studies).

A majority of the patient education interventions correlated with improved health outcomes as demonstrated by better glycemic control and overall health. Furthermore, cost-effectiveness also confirms an overall reduction in long-term healthcare costs over a 20-40 year horizon. There are also some interesting findings that patient education delivered by non-healthcare professionals (e.g., trained patient peers) can be comparably effective as well.
These non-healthcare professionals can potentially be part of a solution to deal with the shortage of physicians available for patient education.

<table>
<thead>
<tr>
<th></th>
<th>Prediabetic</th>
<th>T1D</th>
<th>T2D</th>
<th>Minority Ethnicity Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S.</td>
<td></td>
<td>5</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>U.K.</td>
<td>1</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Germany</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2</strong></td>
<td><strong>3</strong></td>
<td><strong>14</strong></td>
<td><strong>5</strong></td>
</tr>
</tbody>
</table>

*Table 1: Patient Population Summary of Diabetic Patient Education Trials Included in the Systematic Analysis of This Report*

6. Outlining a Comprehensive, Cohesive, and Constantly Evolving Framework for Patient Education

As mentioned previously, patient education can be modeled as a system for health knowledge flowing through multiple channels. In this paradigm, the primary sources are academic and medical knowledge being transmitted to patients. Patients are then motivated and educated to take relevant action. Society needs to adopt a comprehensive, cohesive, and constantly evolving framework for patient education which enables people to have the ability to obtain, interpret, and use health information appropriately. To achieve this goal, an array of stakeholders are required to facilitate health-promoting actions via patient education. These
stakeholders include healthcare providers, public health officials, educators, insurance companies, and patient advocate groups, among others.

6.1 Strengthening Health Literacy as the Foundation of Patient Education

Since health literacy is a vital component of patient education, great emphasis should be placed on its improvement. The content and efficacy of health literacy education in the K-12 education system should be constantly reviewed and updated. For example, after years of increases from 1970 to 1990, the teen pregnancy rate has declined relatively steadily at least partly due to successes in revised school sex education curricula (Figure 3). In contrast, there is now an alarming trend of teen e-cigarette smoking over the last decade. Based on the 2022 National Youth Tobacco Survey, more than 2.5 million U.S. middle and high school students currently use e-cigarettes (Park-Lee et al., 2022; FDA, 2023). Clearly, tobacco prevention education with updated health information about e-cigarettes needs to be included in school health education curricula. Training relevant educators about this issue should also occur to ensure that they accurately disseminate such information.

While a certain degree of direct medical education for patients can be effective, especially for preventive care, it is unreasonable to assume that patients can be taught about every aspect of healthcare. Thus, health literacy focuses less on specific health and medical knowledge but the ability to understand and make use of patient education resources. In turn, patient education should focus on equipping people with tools to understand educational materials. In conjunction with better literacy, a greater variety of materials (both in understandability level as well as scope and medium) can help address this issue from multiple angles.

6.2. Enforcing Patient-Centered Education in Hospitals and Clinics

In hospitals and clinical settings, education should be tailored toward patients’ individual needs. Since different patients have varying educational backgrounds, cultures, and ages, they need to be treated individually. A patient-centered approach has been proven to have positive effects on patient engagement and health outcomes. On the contrary, clinicians without
awareness of their patients’ educational needs and learning capabilities can potentially lead to poor patient outcomes.

To this end, a framework for clinicians to use can be adopted to ensure that effective patient education can be implemented in day-to-day practice (Coulter and Ellins, 2007). Furthermore, relevant assessments can be instituted to ensure that clinicians possess the proper skills for patient education as well (Hyrkas and Wiggins, 2014). During their initial visits, patients should be evaluated with respect to their health education-based needs. This is critical for determining how patient education can be designed. Key information to explore in this regard may include patients’ existing knowledge, understanding/perceptions about their condition, expectations related to treatment management, and how they envision their own roles in this process.

In addition, clinicians should be required to implement such assessments in their routine practice. A thorough assessment is the start of a long journey of patient education. In follow-up visits, patients need to be assessed regularly regarding their learning progress and recognition of barriers to effective education. This interactive teach-back approach generates dialogue between the patient and health professional. It also allows the professional to correct and reinforce health messages. In light of the increasing limitation of time available for patient care by doctors, it should be recognized that mid-level health providers are more likely to be part of this approach to patient education.

Besides spending sufficient time on patient education, providers need to be educated and trained to deliver patient education effectively. The curriculum of medical education programs must include specific instruction in skills to communicate with patients. This is especially true of the legally required treatment consent process. Fully involving patients in clinical decisions is a challenging task, and little training exists on the practice of effective informed decision making.

6.3. Enhancing Patient Education Efforts by Insurance Providers

Insurance providers are typically motivated by monetary incentives. Fortunately, the moral obligation of patient education is aligned with such incentives. By educating their
customers preventatively, insurance companies may reduce the cost of more expensive curative care. In the process, customers will likely gain better healthcare experiences and outcomes. Currently, many insurance companies provide free annual medical examinations and some amount of lifestyle coaching. Going forward, insurance companies should also pay for the time invested by healthcare professionals in patient education – especially for mid-tier providers. This course of action can both increase the effectiveness of patient education and alleviate the issue of insufficient time spent between patients and physicians.

6.4. Using Online Resources to Promote and Enhance Patient Education

One of the most effective functions of online resources is raising public awareness about issues. Providing accurate and easily available knowledge is a very powerful function of such resources. In turn, they can be effective in raising public awareness about the importance of patient education. The increased prevalence of online medical resources has alleviated some health literacy issues, specifically in the areas of general accessibility to reasonably accurate health information. Yet it cannot be argued that this medium can fully replace direct interaction with healthcare providers regarding patient education.

Conclusion

In light of escalating healthcare costs and alarming health trends nationwide, it is critical to prioritize patient education. This often overlooked domain can substantially enhance general well-being and curtail burgeoning healthcare expenses. Since the landscape of patient education is intricate, it is important to involve numerous stakeholders within an evolving interconnected framework. The strategies detailed in this report represent pivotal steps to advance this multifaceted approach to patient education. By conscientiously directing attention and resources toward patient education, a transformative shift can occur. Ultimately, fostering a well-informed patient populace can yield numerous benefits, not only in terms of improved health outcomes but also in the realm of cost containment. Although navigating the complexities of this journey can be arduous, the potential payoffs are too substantial to ignore. Embarking on this path with determination, collaboration, and innovative solutions can pave the way for an economically sustainable future with healthier and more knowledgeable patients.
References


Chagpar, A. B. (2022). Sociodemographic factors affecting telemedicine access:


https://doi.org/10.1016/j.surg.2021.08.059

*COE - Children’s Internet Access at Home.* (n.d.). Retrieved September 2, 2023, from

https://nces.ed.gov/programs/coe/indicator/cch/home-internet-access


https://doi.org/10.1136/bmj.39246.581169.80


https://doi.org/10.18865/ed.31.2.217

Website. *Archives of Trauma Research, 3*(2), e18161. https://doi.org/10.5812/atr.18161


*Health Education Content Standards for California Public Schools, Kindergarten Through Grade Twelve.* (2009).


More than Half of American Households Used the Internet for Health-Related Activities in 2019.


Plastic and Reconstructive Surgery Global Open, 7(5), e2219.
https://doi.org/10.1097/GOX.0000000000002219

https://doi.org/10.1056/CAT.17.0559


https://www.ncbi.nlm.nih.gov/books/NBK44260/


https://doi.org/10.1080/10810730.2010.501094


https://doi.org/10.15585/mmwr.mm7145a1

Patient engagement and involvement in rare disease research. (2023). *Communications Medicine, 3*(1), Article 1. https://doi.org/10.1038/s43856-023-00251-7


### Appendix:

**Systematic Analysis: Effectiveness of Patient Education by Randomized Clinical Trials**

<table>
<thead>
<tr>
<th>Author and Publication Year</th>
<th>Study Patient Group and Duration</th>
<th>Intervention</th>
<th>Outcome and Data Analysis</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heller et al., 1988</td>
<td>UK, newly diagnosed obese T2D, n=75, 1 year</td>
<td>Five 90-min group education by diabetes specialist nurses and a dietitian during the first 6 months after diagnosis</td>
<td>Weight and HbA1c at 6, 12 months</td>
<td>At 6 months, more weight loss and better diabetic control, less difference at 1 year</td>
</tr>
<tr>
<td>Rickheim et al., 2002</td>
<td>UK, T2D, n=170, 6 months</td>
<td>Group (4-8 people) or individual (one-on-one) educational settings</td>
<td>Changes in knowledge, self-management behaviors, weight, BMI, HbA1c, health-related quality of life, patient attitudes, and medication regimen at 6 months</td>
<td>Equally effective at providing equivalent improvements in glycemic control</td>
</tr>
<tr>
<td>Jansa et al., 2006</td>
<td>Spain, T1D, n=40, 6 months</td>
<td>Telecare in a structured therapeutic education program</td>
<td>Metabolic control, self-management, and quality of life at 0, 6 (end of study) and 12 months; cost analysis at study end</td>
<td>Intensive telematic follow-up achieves similar results as face-to-face follow-up with lower patient costs</td>
</tr>
<tr>
<td>Gillett et al., 2010</td>
<td>UK, newly diagnosed T2D, n=824, 12 months</td>
<td>A 6-hour structured group education program delivered in the community by two professional healthcare educators</td>
<td>Sheffield type 2 diabetes model for long-term outcomes based on trial data at 12 months; incremental costs and quality adjusted life years (QALYs) gained</td>
<td>Incremental costs and quality adjusted life years (QALYs) gained; intervention is likely to be cost-effective compared with usual care</td>
</tr>
<tr>
<td>Author and Publication Year</td>
<td>Study Patient Group and Duration</td>
<td>Intervention</td>
<td>Outcome and Data Analysis</td>
<td>Results</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------------</td>
<td>--------------</td>
<td>--------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Philis-Tsimikas et al., 2011</td>
<td>US, T2D, Mexican-American HbA1c &gt;8%, n=207, 10 months</td>
<td>Project Dulce peer intervention, culturally sensitive, peer-led education</td>
<td>HbA1c, diastolic blood pressure</td>
<td>Improvement in glucose and metabolic control</td>
</tr>
<tr>
<td>Gillespie et al., 2014</td>
<td>Ireland. adults T1D, n=437</td>
<td>Group vs Individual follow-up post-DAFNE (Dose Adjustment for Normal Eating) T1D structured education</td>
<td>Incremental costs, quality-adjusted life years (QALYs) gained, and cost effectiveness were estimated at 18 months</td>
<td>The results do not support implementation of group follow-up as the sole means of follow-up post-DAFNE</td>
</tr>
<tr>
<td>Carey et al., 2014</td>
<td>UK, T2D diagnosed within the previous 12 months, n=260</td>
<td>Diabetes Education and Self-Management for Ongoing and Newly Diagnosed Type 2 diabetes (DESMOND) course, delivered in standard format by two trained healthcare educators (control group) or by one trained lay educator and one professional educator (intervention group)</td>
<td>Primary outcome is change in illness coherence score (derived from the Diabetes Illness Perception Questionnaire-Revised) at 4 months; secondary outcomes include change in HbA1c level</td>
<td>Equivalent positive change in coherence scores and education of HbA1c levels; diabetes education delivered jointly by a trained lay person and a healthcare professional educator with the same educator role can provide equivalent patient benefits</td>
</tr>
<tr>
<td>Prezio et al., 2014</td>
<td>US, T2D, uninsured Mexican Americans, n=180, 12 months</td>
<td>Diabetes education and management intervention led by community health workers</td>
<td>Changes of HbA1c over 12 months and costs from RCT; simulation modeling was used to estimate long-term (20-year) cost and health outcomes using the validated Archimedes Model</td>
<td>Community health worker-led diabetes intervention is a cost-effective way to reduce diabetes-related complications for uninsured Mexican Americans during a 20-year horizon in comparison to usual medical care</td>
</tr>
<tr>
<td>Author and Publication Year</td>
<td>Study Patient Group and Duration</td>
<td>Intervention</td>
<td>Outcome and Data Analysis</td>
<td>Results</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------------------------</td>
<td>--------------</td>
<td>---------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>González et al., 2015</td>
<td>Spain, T2D, n=199, 1 year</td>
<td>Education by a team of professional educators (traditional education) versus education and support delivered by trained peers with diabetes</td>
<td>Changes of HbA1c; direct education cost per unit decrease (%) in HbA1c at 1 year</td>
<td>Education of T2D through peers as a complement to control and treatment of the disease is cost-effective compared to traditional education</td>
</tr>
<tr>
<td>Basarir et al., 2016</td>
<td>UK, T1D, pediatric diabetes, n=480, 2-year follow-up</td>
<td>Kids in Control OF Food (KICk-OFF) is a 5-day structured education program for 11- to 16-year-olds with T1DM, who are using multiple daily insulin injections</td>
<td>HbA1c, severe hypoglycemia, and diabetic ketoacidosis (DKA) were collected over a 2-year follow-up period; long-term cost-effectiveness evaluation using Sheffield Type 1 Diabetes Policy Model</td>
<td>In the high baseline HbA1c sub-group, KICk-OFF arm was better than the usual care arm; however, in the whole study population, the cost-effectiveness of KICk-OFF depends on the assumption for treatment effect duration</td>
</tr>
<tr>
<td>Windrum et al., 2016</td>
<td>UK, T2D, n=203, 12 months</td>
<td>Didactic program vs. patient-centered program</td>
<td>Improvements in glycemic control (HbA1c) at 12 months</td>
<td>Different patients are sensitive to different categories of education programs; the optimal, cost-effective design of preventive programs for patients with chronic conditions needs to account for the different impact in different patient categories</td>
</tr>
<tr>
<td>Author and Publication Year</td>
<td>Study Patient Group and Duration</td>
<td>Intervention</td>
<td>Outcome and Data Analysis</td>
<td>Results</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----------------------------------</td>
<td>--------------</td>
<td>---------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Odnoletkova et al., 2016</td>
<td>Belgium, T2D, n= 574, 18 months</td>
<td>COACH Program, a risk factor target-driven telephone counseling intervention delivered by specially-trained diabetes nurse educators, five telephone sessions of 30 minutes on average, spread over 6 months</td>
<td>Incremental cost-effectiveness ratio (ICER), Life Expectancy, Quality Adjusted Life Years (QALYs) and cost of diabetes and its complications, Markov simulation model with a time horizon of 40 years was populated with patient-level data from a 18-months</td>
<td>Nurse-led telecoaching of people with type 2 diabetes may be considered highly cost-effective</td>
</tr>
<tr>
<td>Leal et al., 2017</td>
<td>UK, prediabetes patients, n=880, 3 years</td>
<td>6-hour group-structured education program (Let’s Prevent) targeting lifestyle and behavior changes</td>
<td>Incremental cost utility from the UK National Health Service (NHS) perspective; quality of life and resource use measured from baseline and during the 36 months follow-up using the EuroQol EQ-5D and 15D instruments and an economic questionnaire</td>
<td>Incremental cost utility from the UK National Health Service (NHS) perspective; quality of life and resource use measured from baseline and during the 36 months follow-up using the EuroQol EQ-5D and 15D instruments and an economic questionnaire</td>
</tr>
<tr>
<td>Hermanns et al., 2017</td>
<td>Germany, T2D, who are on a non-intensive insulin treatment regimen n=182, 6 months</td>
<td>Self-management-oriented education programme (MEDIAS 2 BSC)</td>
<td>Primary outcome is glycaemic control (HbA1c); secondary outcomes included the incidence of severe hypoglycaemia, hypoglycemia unawareness, diabetes-related distress, diabetes knowledge, quality of life and self-care behavior</td>
<td>MEDIAS 2 BSC was more effective in lowering HbA1c than the control condition</td>
</tr>
<tr>
<td>Author and Publication Year</td>
<td>Study Patient Group and Duration</td>
<td>Intervention</td>
<td>Outcome and Data Analysis</td>
<td>Results</td>
</tr>
<tr>
<td>----------------------------</td>
<td>----------------------------------</td>
<td>--------------</td>
<td>---------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Iovane et al., 2018</td>
<td>Italy, &lt;10 years of age children of ethnic minority (Group 1, N=19) were compared with autochthonous peers (Group 2, n=21) T1D, n=40, 12 months</td>
<td>Tailored medical support for minority children</td>
<td>Glycaemic control (HbA1c) up to 12 months</td>
<td>Children from EM families can achieve the same positive metabolic control of autochthonous peers with T1D</td>
</tr>
<tr>
<td>Piatt et al., 2018</td>
<td>US, T2D, n=221, 12 months</td>
<td>Peer leader-led (PL) diabetes self-management support (DSMS) group</td>
<td>Data were collected at baseline, 6 weeks, 6 months and after telephonic DSMS (12 months); improvements in A1C, self-monitoring of blood glucose (SMBG), and diabetes distress</td>
<td>PL DSMS is as effective as traditional DSMS in helping participants to maintain glycemic control and self-monitoring of blood glucose (SMBG) and more effective at improving distress</td>
</tr>
<tr>
<td>Vos et al., 2019</td>
<td>Netherlands, T2D up to 5 years’ duration N=108, 2.5 years</td>
<td>Beyond Good Intentions (BGI), a 12-week group-based, nurse-led self-management program in terms of cardiovascular risk factors, self-management and quality of life, after 2.5 years of follow-up</td>
<td>HbA1c, systolic blood pressure and LDL cholesterol at 2.5 years of follow-up</td>
<td>No significant effect; in contrast to the first BGI study, did not observe significant effects of the BGI intervention, despite pre-selection of individuals</td>
</tr>
<tr>
<td>Author and Publication Year</td>
<td>Study Patient Group and Duration</td>
<td>Intervention</td>
<td>Outcome and Data Analysis</td>
<td>Results</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------------</td>
<td>--------------</td>
<td>--------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Egede et al. 2021</td>
<td>U.S., African American adults, T2D, not meeting glycemic targets for diabetes, n=255, 12 months</td>
<td>Telephone-delivered education and behavioral skills intervention</td>
<td>Primary clinical outcome was HbA1c measured at 12-months; total cost per patient and clinical outcomes were used to estimate an incremental cost-effectiveness ratio (ICER)</td>
<td>The combined intervention ICER for HbA1c is comparable to other education programs and the ICER to reduce the probability of complications falls below previously recommended long-term cut-off of $100,000, suggesting cost-effectiveness in an African American population</td>
</tr>
<tr>
<td>Ye et al., 2021</td>
<td>U.S., Latino adults with T2D n=222, 12 months</td>
<td>Peer leader (PL)-led diabetes self-management support (DSMS) program following a structured community health worker (CHW)-led diabetes self-management education (DSME) program</td>
<td>The primary outcome measure was the incremental cost-effectiveness ratio (ICER); empirical data from the trial and the validated Michigan Model for Diabetes were used to estimate cost and health outcomes over a 20-year time horizon</td>
<td>CHW + PL-led DSME/DSMS intervention improved health and provided value compared with EUC intervention; the 6-month CHW-led DSME intervention without post-intervention support was not cost effective in Latino adults with T2D</td>
</tr>
</tbody>
</table>