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Utilizing mHealth to increase follow-up in Latinx adults with hyperlipidemia.

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Utilizing mHealth to Increase Follow-up in Latinx Adults with Hyperlipidemia

by

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UTILIZING MHEALTH TO INCREASE FOLLOW-UP

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Content

UTILIZING MHEALTH TO INCREASE FOLLOW-UP

Abstract

Background: Management of hyperlipidemia (HLD) is crucial to the prevention and management of cardiovascular disease cardiovascular disease (CVD), a leading cause of death in the United States (US) and Latinx adults (Centers for Disease Control and Prevention (CDC), 2019). The main difficulty affecting monitoring of lipid levels in patients diagnosed with HLD is lack of adherence to follow-up appointments.

Purpose: The purpose of this Quality Improvement (QI) project is to evaluate the impact of culturally competent translated short message service (SMS) texts to increase adherence follow-up on a Latinx population served at the Kentucky Racing Services Health Center (KRSHC).

Intervention: This project utilized the rapid plan, do, study, act (PDSA) cycle for quality improvement to evaluate the impact of culturally competent SMS texts appointment reminders. A retrospective review identified patients requiring intervention. Rate of change and two proportion z test was used to calculate follow-up rates and statistical significance between pre- and post-intervention groups.

Results: Although not statistically significant, the rate of change was 2.7%. More than 50% of patients in both groups were male. Gender assigned at birth and age distribution were similar between both groups.

Discussion: SMS text reminders are a quick and cost-effective method to communicate with Latinx patients. mHealth as a form of communication may prove to be a more effective means of communication as the population becomes more familiar with it.

Keywords: mHealth, Latinx adults, Hyperlipidemia, Cardiovascular disease, and patient follow-up.

Utilizing mHealth to Increase Follow-up in Latinx Adults with Hyperlipidemia

Introduction

The death rate disparity among minority groups is still at a large scale (Center for Disease Control and Prevention (CDC), 2019). Some of the contributors to increased mortality among minority populations are the prevalence of chronic preventable disease and higher levels of cardiovascular risk factors (CDC, 2021). As is the case in Latinx communities, hyperlipidemia (HLD) is one of the modifiable cardiovascular biomarkers that burden this minority population (CDC, 2021). The term *Latinx* is a gender-neutral term used to describe people from South American countries such as Mexico, Cuba, Puerto Rico, etc. (Charter School in Houston, TX., n.d.). From the year 2015 to 2018 the prevalence of high total cholesterol (TC) was 10.9% in the Latinx population; with the highest levels seen in the 40- to 59-year-old age group (Carroll & Fryar, 2020). In addition, the Latinx population also had the highest prevalence of low high-density lipoprotein-cholesterol (HDL-C) (21.9%) compared to non-Hispanics whites (16.6%), non-Hispanic Black people (11.9%) and non-Hispanic Asians (15.8%) (Carroll & Fryar, 2020). Both Hispanic men (31.9%) and women (12.3%) had the highest prevalence of low HDL-C, compared to any other race/ethnic group (Carroll & Fryar, 2020). Rodriguez et. al (2014) explored the different types of dyslipidemia among some of the Latinx subgroups. Overall, authors found that among Latinx groups, Cubans and Central Americans had the highest triglyceride levels. These two groups had abnormal triglycerides/HDL-C ratios more frequently than any other group. There were also higher prevalence rates of dyslipidemia among Latinx with lower educational level, lower income, and a Spanish language preference (Rodriguez et. al, 2014).

UTILIZING MHEALTH TO INCREASE FOLLOW-UP

Problem Statement

HLD is one of the most impactful factors for developing heart disease, which is the number one killer of Americans and the second leading cause of death in Latinx population in the United States (US) (Heron, 2019). In the state of Kentucky, cardiovascular disease (CVD) was the leading cause of death in 2018 (CDC, 2021). Latinx subgroups have been shown to have the highest prevalence of any type of dyslipidemia, and that have disproportionally higher risk of developing heart disease, diabetes, hypertension, and many other risk factors that result in higher rates of cardiovascular deaths in the US (CDC, 2019). A needs assessment and interview were conducted at the Kentucky Racing Health Services Center (KRSHC). The KRHSC serves primarily a Latinx population (85%) (Kentucky Racing Health and Welfare Fund, Inc., 2022). A major issue identified in the needs assessment by the advance practice nurses (APRNs) at the center was a loss to follow-up, especially in patients with HLD. Increasing follow-up visit compliance within this population can be impactful in reducing rates of HLD. Several barriers were identified that prevent this patient population from attending follow-up visits in a timely manner or even on an annual basis. The barriers identified in the needs assessment at KRSHC include the migrant nature of the population, low literacy, low health literacy, and limited English language skills. In addition, the population has transportation issues and suffers from a lack of distrust of the government and healthcare providers in general.

Definition of Terms

mHealth. The National Institute of Health, (n.d.) defined *mHealth* as the use of mobile/wireless devices to improve health outcomes, research and services provided by healthcare institutions.

Telehealth. Telehealth is the use of telecommunication devices (phone, tablets, etc.) to establish communication between patient and providers via short message service (SMS) texts, remote patient monitoring and phone/video calls regardless of location and distance (U.S. Department of Health & Human Services, n.d.).

Doximity. Health Insurance Portability and Accountability Act (HIPPA) compliant mHealth application that allows providers to communicate with patients via SMS texts, without requiring patients to download the app on their phone (Whaley et al., 2021).

Latinx. Gender-neutral term used to describe people from South American countries such as Mexico, Cuba, Puerto Rico, etc. Other terms found in literature includes Hispanics, Latinos, Latin. (Charter School in Houston, TX., n.d.)

Environment:

The chosen site for this quality improvement (QI) project is the KRHSC, a primary care center funded by the Kentucky Racing Health & Welfare Fund Inc (KRHWF), which provides comprehensive health care for a $10 co-pay to the backside workers of the Kentucky thoroughbred racing industry and their families; of whom 85% are of Latinx origin. This non-profit, charitable corporation founded in 1978, provides funding towards the payment of medical, hospital, dental, vision and funeral expenses for eligible individuals (Kentucky Racing Health and Welfare Fund, Inc., 2022).

In 2005, the KRHSC and KRHWF entered into an agreement with the University of Louisville School of Nursing (ULSON). The ULSON faculty APRNs staff and manage the KRHSC by providing family centered care, that is culturally appropriate and sensitive to the patient population. KRHSC offers primary care, acute care visits, women's health, and

psychiatric mental health services. In 2021, the KRHSC provided treatment or medical services to 933 patients (KRHWF, inc., 2022). The center provides access to primary care services, education, encourages healthier lifestyle choices, and offers referrals to other services to improve and maintain clients' physical, mental, and emotional health. The staff recognizes the socioeconomic barriers experienced by their patient population and are motivated to develop interventions and adaptations to meet the health needs of their patients. These principles could help underserved/minority populations meet national standards for primary and secondary prevention of CVD and other chronic conditions.

Population:

The population chosen for this DNP QI project are the patients who utilize the KRHSC. These are workers in the Kentucky horse racing industry who work on the backsides of tracks. The occupations include horse groomers, hot walkers, exercise riders, horse stall cleaners and maintenance. Most of these workers are from Central and South America, which includes people from Mexico, Ecuador, Guatemala, Honduras, Venezuela, and Puerto Rico. The patient population served at the clinic is unique in that they belong to a minority group (Latinx), have limited literacy and English proficiency, and are migrant workers that travel throughout the country all year round to horse racing circuits. This population also faces socioeconomic difficulties and lack of access to resources.

Significance

Interventions that are culturally relevant, aimed to improve diet, physical activity and overall lifestyle modifications are most effective in minority groups (Cameron et al., 2017). The intervention implemented targeted areas of QI at the KRHSC. One of the main difficulties

affecting continuity of care and monitoring of lipid levels in patients diagnosed with HLD at the

KRSHC is lack of adherence to follow-up appointments. The APRNs and clinic director

hypothesize that SMS texts with appointment reminders may be an effective way to

communicate with patients to ensure they schedule their follow-up appointments; even when

they are not within the state of Kentucky at the time of contact. This method of communication is

safe, HIPPA compliant, cost efficient, feasible and convenient for providers and patients,

optimizing the use of time and resources. The outcome of this project supported the purpose of

this organization and clinic by providing culturally appropriate interventions that improved the

health of its patient population (KRHSC - School of Nursing, n.d.).

Compliance with follow-up appointments is instrumental in the reduction of CVD risk

factors, improves medication compliance, promotes the adoption of healthier lifestyle choices,

and strengthens the patient-provider relationship (Carleton, 2019). Patients who can maintain

compliance with their healthcare regimen and appointment follow-up could have better health

outcomes than those who do not (Carleton, 2019). Patients who are either socioeconomically

challenged, from immigrant populations, and/or from minorities groups are at increased risk of

lower compliance rates and receiving lower quality of care, which could be some of the factors

affecting the rate of chronic disease in these populations (CDC, 2019).

Health policy changes and adaptations are crucial to the adoption of mobile health and

telehealth services. There are differences within state's reimbursement laws and policies. QI

projects that use mobile/telehealth to improve patient outcomes in a variety of healthcare

settings, could influence state regulations and insurance programs allowing reimbursement for

these types of services. Funding and support from regulatory bodies will be needed to promote

the use of technological advances in healthcare settings, which can benefit patients in a vast

number of ways (Contreras et al., 2020).

Stakeholders

Stakeholders include KRHSC staff, patients, KRHWF and Churchill Downs. This QI

project and its results could help APRNs improve communication and continuity of care with

patients. This intervention could help optimize resources to help the APRNs promote adherence,

track missing appointments, and prioritize those patients in greater need of follow-up. For

patients, appointment reminders could be a way to help them prioritize their weekly or monthly

schedule. SMS texts in their native language could be a source of comfort and motivation to

follow-up with their providers. The more involved patients and providers become with their

health and progress, the greater the chance of having a positive impact in their trust and

familiarity with the healthcare system. This all could result in reduction of complications of

HLD, such as increased risk for stroke, cardiovascular events, hospitalizations, and disability.

Interventions that benefit the wellbeing of populations, including minority groups, have a

wider impact on the stability and progress of the organizations that employ them. Healthier

workers can be more efficient, mindful, resilient, and energetic, therefore more productive in

their work tasks. One of the organizations that benefits from this project intervention in the long

term is Churchill Downs, along with many other racetrack establishments. The physically

demanding nature of the jobs of racetrack workers can be taxing on their health. Ensuring

patients are judicious and mindful of their health by following up with their primary care

providers, can help them control their glucose, lipid levels, blood pressure and many other

cardiovascular risk factors directly affecting their everyday health and ability to work. Lastly, the

KRHWF will financially benefit from a healthier, more engaged, and informed Latinx population

since it will reinforce their purpose and main goal as an organization. One of KRHWF's goals is

to provide family-centered, comprehensive care to racetrack workers. A substantial portion of the

racetrack workers belong to a historically disadvantaged minority population that would not have

healthcare access otherwise. Implementing small- and large-scale interventions to improve

minority health can result in long-term cost savings related to complications of poorly managed

chronic disease such as CVD and HLD.

Facilitators and Barriers:

Facilitators for implementing this QI intervention included support from the KRHSC

director, executive director of KRHWF, and cooperation of the center's staff with project

implementation. Another facilitator is the bilingual DNP student project lead who will assist with

translation of SMS texts. The KRHSC APRNs have identified that the patient population served

has responded well in the past to the use of electronic devices for communication, which

coincides with the current literature (Luong et al., 2021; Santo et al., 2018). The HIPPA

compliant SMS texts application, *Doximity*, will be used to communicate with patients and does

not require a subscription fee.

Barriers for this project could include low health literacy, confirmation that SMS texts

were received, cost to KRHSC, cost to the patient and access to care. Although the text

messaging application used in the project can show if the text was received or read, some

patients may be unable to read or understand the SMS texts due to that this population has low

health/low literacy rates. In addition, it is not possible to verify that the SMS texts were delivered

to a cellular device from the provider's end. SMS texts might cause additional charges for

patients depending on their mobile plans, assuming they own a phone. A sizable portion of

patients use burner phones, which may not have enough data to accept a SMS text. In addition,

their phone numbers change frequently, and the number provided in the electronic medical record (EMR) at the time of contact might be incorrect. Lack of transportation, and being located outside of town, might prevent patients from attending the center, which might affect their willingness to schedule the appointment.

Feasibility and Sustainability

This project is feasible by virtue of the increased use of mobile and telehealth technologies over the course of the coronavirus pandemic to meet healthcare needs of patients (Kronenfeld & Penedo, 2019; Patel et al., 2021; Contreras et al., 2020). Providers in general, as well as patients, have become accustomed to this method of delivering care and communication. This heightened awareness could facilitate the channeling of resources needed at the center to continue with similar interventions. The outcomes of this intervention could help establish a more efficient avenue for effective communication between patients and providers at the center.

This project is sustainable since Doximity required minimal time to communicate with patients, and all communication remains documented for future reference. Doximity is user-friendly and could be a sustainable means of ongoing communication with patients for other health related issues. Future SMS texts could contain information about chronic disease, prompts/reminders to increase medication, diet, and lifestyle adherence. This same intervention could be used for patients with other chronic disease diagnosis. Appointment reminders could also be used with other patient populations that require strict follow-up visits such as women's health and mental health appointments.

Future implications

The purpose of this intervention is to improve clinical attendance in patients diagnosed with hyperlipidemia. A significant improvement in follow-up rates may be accompanied by increased lifestyle adherence, and consequently a decrease in LDL-C and TC levels. This could expand the purpose and outcome measures of this QI intervention to include measurement of patient's lipid panels 6 months to a year after intervention to detect any change in these two variables.

Literature Review

Summary/Synthesis

A review of the literature was conducted to evaluate the use of SMS texts and its impact on follow-up rates, lifestyle modification, and changes in TC and LDL-C in at risk populations. The literature on this subject overall supported that SMS texts remainders are an effective way to increase follow-up visits and improve healthy lifestyle adherence (Luong et al., 2021). The frequency of SMS texts sent, and how close the SMS texts were from the appointment time could have also influenced outcome results. Interventions tailored to increase follow-up appointments have been conducted in studies in a variety of healthcare settings and patient populations (Schwebel et al., 2018). Studies included in this review, such as Beratarrechea et al. (2019) sent a minimum of 2 SMS texts and was effective in increasing medication compliance and clinical attendance rates as secondary outcomes. Others like Wolff et al. (2016) and Muller et al. (2017) sent a total of 3 to 4 messages either monthly or weekly and were effective in increasing follow-up rates in their respective populations. Deng et al. (2017) sent SMS texts daily before patients' follow-up appointments, for a total of 9 messages, and had significant reduction in appointment cancellation and increased compliance. A combination of telephone calls and SMS texts was used in the study conducted by Porto-Ferreira et al. (2017)

which resulted in increased follow-up as well. However, in this study, phone calls were more effective than SMS texts. Although there is limited literature regarding the effectiveness on the frequency of SMS texts, Deng et al. (2017) points out that for their study the ideal time to wait before sending SMS texts was between 1 to 2 weeks. SMS texts that were sent more often than 4 days could be perceived as bothersome and irritating by some patients (Deng et al., 2017). However, Deng et al. (2017) quote other articles such as Boker et al. (2012) which found that sending SMS text for longer than 2 weeks might cause patients to desensitize and ignore SMS texts. Overall, in most of these interventions like in Wolff et al. (2016) patients found the SMS texts were acceptable and helpful, even those that used a high number of SMS texts in a brief period such as Deng et al. (2017).

Cameron et al. (2017) acknowledged the lack of access to clinic-based interventions for lifestyle modifications and health promotion in Latinx communities. Using *mHealth* to reach this population could prove crucial and cost-efficient. In previous studies, the use of community health workers (CHW) fluent in Latin language and culture, had a positive impact on behavioral change and improvement of CVD risk factors among low income, low literacy Latinx adults (Carrasquillo et al., 2017; Koniak-Griffin et al., 2015; Pérez-Escamilla et al., 2015; Krantz et al., 2017). However, CHW are not easily accessible for every community or healthcare setting, and this could be costly and labor intensive. Using SMS texts interventions to influence patient behavior, lifestyle changes, such as adhering to medication regimens, healthy dietary choices, systolic blood pressure (SBP) control, maintaining a healthy body max index (BMI), glycemic control, among other modifiable risk factors were shown to have a positive impact in LDL-C and TC reduction (Santo et al., 2018).

Inclusion of family in these *mHealth* interventions was a frequent theme utilized to influence these behavioral changes and CVD risk factors. Burner et al. (2018) and Ramirez & Wu (2017) considered the cultural values of familism by including participants' family and friends in one of their intervention groups. This was associated with increased social support and perception of social support. These studies had favorable results in their study outcomes, which included physical activity (Burner et al., 2018; Ramirez & Wu (2017), decrease in Hemoglobin A1c, glucose self-monitoring, motivation, accountability, and relationships (Burner et al., 2018). Acknowledging the family role in Latin American cultures and the importance of relying on social support was crucial to the success of these interventions. This could help reduce one of the social barriers Latinx participants in the US face in not having enough social support to maintain lifestyle modifications -as also mentioned by Cameron et al. (2017).

Another common theme found within articles that addressed behavioral change, was the use of theoretical frameworks/theories. For example, Cameron et.al (2017) used the Self-determination theory to support their interventions; Social support model was used by Burner et al. (2018); Social Cognitive theory (SCT) by Ramirez & Wu (2017) and Varleta et al. (2017); and the Transtheoretical Model (also known as the Stages of Change) and Health Belief model was used by Rubinstein et al. (2016). The theoretical frameworks that guided these SMS texts, may have been a factor in the success of these studies for improving lifestyle behavior. In addition to the outcomes mentioned above, increased medication adherence and mean blood pressure (BP) reduction was seen in Varleta et al. (2017). Rubinstein et al. (2016) did not see a change in SBP, however participants in this study showed a decrease in weight and improvement in dietary changes. Patients aware of the barriers preventing them from adopting and maintaining a healthier lifestyle and who can communicate these barriers to their providers, have a better

chance of benefiting from these types of interventions (Varleta et al., 2017). SMS texts designed

to meet the unique and specific needs for each population, which are culturally appropriate and

relevant, have a better chance to produce their desired impact.

There were also studies focused on the use of SMS texts interventions to influence CVD

risk which included LDL and TC as outcome variables. The content of the SMS texts in these

studies was semi-personalized, and included education about behavioral adaptation, information

about CVD, and encouraged physical activity, dietary changes, and medication adherence. Chow

et al. (2016) and Párraga -Martinez et al. (2018) included both LDL-C and TC as primary and

secondary measures, these studies showed a significant decrease in both these measures after

their SMS texts interventions. Additionally, Huo et al. (2019) and Liu et al. (2015) measured

LDL-C, but they did not observe any reduction after follow-up. However, Liu et al. (2015),

demonstrated a significant improvement in TC, along with other CVD risk factors at 12 months.

The follow-up time for these studies varied, with most studies having a minimum of 2 months

(Párraga -Martinez et al., 2018); 6 months (Huo et al., 2019; Párraga -Martinez et al., 2018;

Chow et al., 2015), 12 months (Liu et al., 2015; Párraga -Martinez et al., 2018), and up to 2 years

(Párraga -Martinez et al., 2018). The frequency of SMS texts ranged from 6 times a week (Huo

et al., 2019) to once a month (Liu et al., 2015). Sample size was adequate in all studies selected

and included a diverse population and culture (Australia, Spain, and China), which could help

with generalizability of the findings.

Limitations/Gaps:

One of the limitations that were found across several studies for behavioral change was a

lack of examples of Spanish SMS texts used for their intervention (Ramirez & Wu, 2017; Burner

et al., 2018). After considering some of the articles that did explain the process and translation of

the SMS texts to Spanish, like Cameron et al. (2017) and Dies-Canseco et al. (2015), the importance of assessing the appropriateness and tone of these messages became even more pertinent. The use of CHW in Beratarrechea et al. (2019) might affect the generalizability and applicability of this intervention and results, as other healthcare settings might not have these options available. Although studies with frequent and higher number of SMS texts such as Deng et al (2015), Wolff et al. (2016) had better outcomes, this might not be feasible for other settings and populations, especially for QI projects requiring shorter follow-up times after intervention. Confidentiality of SMS texts is another limitation for some of the studies that included family and friends in their intervention such as Burner et al. (2018) and Ramirez & Wu (2017). Although family plays a crucial role in Latinx patients' care, QI projects requiring HIPPA compliant SMS text applications might not be able to include them as part of the intervention. An alternative way of applying the concepts of familism would be to include family members in patient education about lifestyle modification during the follow-up visit, after obtaining patients' approval.

Problem

In the US, the prevalence of CVD is 49.2% in adults 20 years and older, increasing with age in both males and females. Kentucky is among the 5 states that have the lowest health-adjusted life expectancy at birth when it comes to cardiovascular health. The annual average cost for CVD was estimated at $363.4 billion from 2016 to 2017 (Virani et al., 2021). TC, HDL-C and LDL-C are modifiable risk factors that contribute to the development of CVD (Grundy et al., 2019). Data from the National Health and Nutrition Examination Survey (NHANES), shows that 11.4% of US adults had high TC during the period of 2015 to 2018. There was no significant difference between men and women, or among different ethnicities in the incidence of high TC

among US adults. Latinx people had the highest prevalence of low HDL-C compared to any other races (Carroll & Fryar, 2020). A clinic-based cohort in California from 2008 to 2011 showed similar findings where Mexican American men (66%) and women (57%) had higher prevalence of high LDL-C compared to non-Latinx whites (Pu et al., 2016). Several other studies such as the Hispanic Community Health Study (HCHS)/Study of Latinos (SOL) shared data representing higher prevalence of high LDL-C among Central American men (55%) and Puerto Rican women (41%) (Pu et al., 2016).

High cholesterol levels early in life increase the risk of CVD: young adults that had LDL-C levels > 100 mg/dl are more likely to develop CVD than those with LDL-C levels < 100 mg/dl. Initiation of statin treatment from an early age, especially among individuals with familial hypercholesterolemia, can decrease the likelihood of cardiovascular events and atherosclerosis (Virani et al., 2021). One of the ways to contribute to improving the health of the US population, including ethnic groups, is to ensure patients follow prescribed medications and treatment. Appointment follow-up is a way to ensure this, as well as assisting providers identify those patients at risk for developing CVD. A large cross-sectional study, done by Shimotsu, et al. (2016), showed that Latinx adults were two times more likely to miss appointments compared to non-Latinx whites. Factors that affect the health Latinx population include language/cultural barriers, lack of access to preventive care, and the lack of health insurance (Office of Minority Health, 2021).

Primary care providers strive to understand and adapt to the needs of diverse groups/populations. To reduce healthcare disparities among underserved groups, providers need to find innovative ways to encourage behavioral change to improve the health of their patients, while addressing patients' unique struggles and needs on a social, cultural, and economic level.

The use of technology, such as SMS texts to increase the number of follow-up appointments for treatment effectiveness, is a promising strategy that can help patients and families to achieve these goals.

Intervention

The intervention for this QI project consisted of sending SMS texts with appointment reminders via Doximity to those patients with a diagnosis of HLD. Eligible patients were identified after conducting a retrospective review in the EMR for patients that visited the clinic between fall 2021 and fall 2022, and spring 2022 and spring 2023. Inclusion criteria were patients 18 and older, identified as Latinx, and had a diagnosis of HLD; exclusion criteria were patients younger than 18, did not have a diagnosis of HLD, and were not Latinx. The convenience sample included patients that attended the clinic on fall 2021 and needed a follow-up appointment in spring 2022. To select patients for the post-intervention group, another review of the EMR was conducted with the same inclusion and exclusion criteria for patients that visited the clinic in fall 2022, in addition to having a phone number documented in the chart. SMS texts were sent once a week for two consecutive weeks in the month of April 2023. The project lead then determined if there was a percentage change in the number of scheduled appointments compared to the previous year (spring 2022).

Summary/Justification

The review of the literature indicates that SMS texts were effective in increasing follow-up appointments, as well as behavioral change and consequently decreasing CVD risk factors. Beratarrechea et al. (2019), Wolff et al. (2016), Muller et al. (2017), Deng et al. (2017), Porto-Ferreira et al. (2017) were effective in increasing follow-up visits in diverse patient populations,

healthcare settings and disease processes by using SMS texts. Studies in this literature review implemented SMS texts interventions focusing on education and guidance to promote healthy dietary changes (Rubinstein et al., 2016), increase medication adherence (Beratarrechea et al., 2019; Varleta et al., 2017), glycemic control (Burner et al., 2018), BP reduction (Rubinstein et al., 2016; Varleta et al., 2017), and other modifiable risk factors for CVD. For this QI project, two SMS texts for appointment reminders were sent to patients, which was the minimum number of SMS texts used in most studies that had favorable outcomes. Time constraints related to project implementation, follow-up time, data collection and analysis guided this decision. These studies provide evidence that cost-effective, feasible, acceptable, culturally tailored communication such as SMS texts could be a useful way of enhancing continuity of care and positively impact minority populations' health.

Purpose and Specific Aims

The purpose of this DNP QI project was to evaluate the impact of using culturally competent SMS texts to increase follow-up, and its subsequent impact on cardiovascular health on Latinx patients seen at the KRSHC with HLD. This project aimed to increase adherence to follow-up appointments of Latinx patients diagnosed with HLD by using SMS texts (translated to Spanish). Rate of change was used to assess if patients receiving text reminders demonstrated a higher follow-up compliance in spring 2023 compared to spring 2022. The long-term goal of this QI project was to reduce CVD risk in Latinx populations by promoting adherence to healthy lifestyles and improving continuity of care with primary care providers.

Conceptual Model

The chosen conceptual framework for this project was the Plan Do Study Act (PDSA) cycle by Edward Deming, which has four steps. This conceptual framework is particularly helpful for QI projects that have time limitations. It focuses on continuous improvement since the cycle can be repeated as many times as necessary until desired outcomes are achieved (Bonnel and Smith, 2018). The first step of the PDSA cycle consists of determining project objectives, areas of improvement, resources needed to implement the intervention, and how to measure outcomes. The second step consists of implementation of initial plan/intervention. The third step is one of the most important steps, since the results of the intervention are analyzed, strengths and weaknesses are identified, and clinicians can use this evidence to summarize the results. In the last step of the cycle, the data gathered and analyzed will be repeated at a larger scale or modified if needed depending on the effectiveness of the cycle. If the intervention was not effective, the PDSA cycle begins again (Deming, 1952).

For the theoretical framework, self-determination theory (SDT) was used to create the SMS texts in Spanish, as well as guiding the implementation steps. SDT was first presented in 1985 by Deci and Ryan; it is an organismic metatheory comprising of several mini theories, which explores principles related to human intrinsic motivation and personality. SDT is particularly useful for this QI project since its main principles of autonomy, competence, and relatedness to promote long term behavioral change correlates with the main objectives of our intervention (Deci & Ryan, 1985). Autonomy is the need to manage one's own life; it is promoted by applying strategies that focus on providing choices, acknowledging feelings, and providing patients the option to engage in self-determined and desired behaviors. Competence, when accompanied by autonomy, is a basic need that defines a person's ability to engage in intrinsic, self-determined behaviors. Lastly, the third basic need from SDT is relatedness, which

is described as the need to engage in close relationships based on trust and security. SDT

hypothesizes that situations in which these three psychological needs are met are more likely to

promote long-term, lasting self-motivated behaviors (Flannery, 2017). Each of these principles

was incorporated within some of the steps of the PDSA cycle and the elaboration of the SMS

texts used for the project's intervention.

The PDSA cycle and SDT theory for this project correlated as follows:

1. Plan: The primary objective of this QI project was to increase adherence to follow-up

    appointments utilizing SMS texts for patients diagnosed with HLD. To achieve this

    goal, SMS texts were created reminding patients diagnosed with HLD to schedule a

    follow-up appointment to recheck their lipid levels. In addition to performing a needs

    assessment in the past, and a review of literature for the most appropriate intervention

    for the problem, the project lead conducted a retrospective chart review in the EMR,

    identified patients with HLD using International Classification of Disease-10 (ICD-

    10) codes (E78 pure hypercholesterolemia, unspecified; E78.01 Familial

    hypercholesterolemia; E78.1 pure hyperglyceridemia; E78.2 mixed HLD; E78.49

    other HLD; and E78.5 HLD, unspecified). These texts were translated to Spanish to

    accommodate the needs of this specific population. Guided by SDT, translating the

    text messages to the participants native language could increase the relatedness of the

    intervention. This could enhance patients' feelings of belonging, which could aid with

    developing a more secure, trustworthy, therapeutic patient-provider relationship at the

    KRSHC.

2. Do: The SMS texts were sent out to patients in April 2023. Patients received one

    reminder a week for 2 weeks, for a total of two reminder texts. In the following 11

weeks a chart review was performed to determine if the number of appointments

scheduled increased compared to the previous year (spring 2022). Sending the SMS

texts with appointment reminders a week apart promoted the needs of autonomy and

competence, by providing enough time and information for patients to take the

initiative to manage their own health.

3. Study: Determine if the electronic reminders were effective in increasing scheduled

   follow-up appointments by performing the appropriate statistical analysis. After

   evaluating the effectiveness of the SMS texts, the project lead identified further

   improvement areas, summarized project results, and compared project outcomes

   against desired initial goals. The relatedness of the messages could have been a key

   factor in determining if the intervention was effective or not. This was achieved by

   ensuring the messages have a friendly, encouraging tone, in addition to being

   translated to this population's native language.

4. Act: Project results were presented in a poster presentation. After evaluating the

   effectiveness of electronic reminders, the PDSA cycle was evaluated for areas of

   improvement. In the case of these reminders having a significant increase in follow-

   up appointments, they could be introduced to different patient populations. The

   content of SMS texts could also include links to educational material or other health

   reminders to improve lifestyle modification and medication adherence.

The use of the PDSA cycle for this project facilitated navigation through intervention

stages and QI efforts. It provided the project lead a way to be more efficient, consistent, and

organized throughout the various phases and project timeline (Bonnel and Smith, 2018). SDT

was included and guided the steps of the PDSA cycle to help meet the basic human needs of

autonomy, competence and relatedness required to influence patients' intrinsic behavior. The use

of these theoretical frameworks could help the sustainability of this intervention since it focuses

on maintaining long-term behavioral change. See Appendix C.

Methods

Context

This QI project utilized the PDSA cycle to conduct a chart review in the Electronic

Medical Record (EMR). Patients with HLD diagnoses were identified necessitating a follow-up

appointment. The ICD-10 Codes that were used to identify the patients with HLD were E78 pure

hypercholesterolemia, unspecified; E78.01 Familial hypercholesterolemia; E78.1 pure

hyperglyceridemia; E78.2 mixed HLD; E78.49 other HLD; and E78.5 HLD, unspecified. SMS

texts reminders were sent to those patients. Rate of change of follow-up appointment compliance

was evaluated. Selected patients' demographic data was collected, such as age and gender.

Gender was defined as that assigned at birth. Demographic data was then evaluated.

Setting

The intervention took place at the KRHSC located in Louisville, Kentucky. This non-

profit clinic provides comprehensive services for acute conditions, management of chronic

conditions, preventive care visits and pediatric services to backside workers of the Kentucky

thoroughbred racing industry and their families; of whom 85% are of Latinx origin and do not

speak English. (Kentucky Racing Health and Welfare Fund, inc., 2022). This intervention is

appropriate for this site since it will give providers the opportunity to contact patients in a cost-

effective, feasible way to ensure timely follow-up care.

Sample

The convenience sample for this project included patients who were seen at the KRHSC during fall 2021 (from September 1 thru December 30) and had a follow-up appointment spring 2022 (April 1 thru June 30th) who did not receive a SMS reminder intervention. Again, in fall 2022 (September 1 thru December 31st) and had a follow-up Spring 2023 (April 1 thru June 30th) and received a SMS reminder. Inclusion criteria included participants had an ICD-10 code with a diagnosis of HLD identified as E78 pure hypercholesterolemia, unspecified; E78.01 Familial hypercholesterolemia; E78.1 pure hyperglyceridemia; E78.2 mixed HLD; E78.49 other HLD; and E78.5 HLD, unspecified (ICD-10), identify as Latinx and Spanish as their primary language.

Procedure/Intervention Implementation

Data collection

A retrospective chart review was performed u the EMR to identify subjects for the convenience sample. KRHSC utilizes an EMR called Practice Fusion (PF). PF allows for sorting and analyzing patient data, including specific diagnoses and number of encounters. Exclusion criteria included those under the age of 18, did not have cellular device documented in the EMR, did not identify as Latinx, did not have any ICD-10 codes related to HLD diagnosis.

Demographic data collected included patients' age and gender. The patient's EMR number in PF was used to protect confidentiality and converted to a number beginning with the number one. Patients selected included those who were seen at the KRHSC during fall 2021, had a diagnosis of HLD, and identified in the EMR as Latinx. The ICD-10 codes were used to identify the diagnosis of HLD. Further inclusion and exclusion criteria of the project participants included age (>18 years), and ICD-10 previously mentioned. Patients who followed up in spring

2022 were selected and then determined how many of them scheduled follow-up appointments after they were initially seen in fall 2021.

Participants for the post-intervention group were selected by performing a retrospective chart review in the same manner as the initial sample. The same ICD-10 codes were used for patients seen at the KRHSC in fall 2022. Inclusion and exclusion criteria remained constant, with the addition of having documented a visit during the period of interest, and cellular phone in the EMR. Subjects for this intervention were those patients that were identified as having a need for a follow-up appointment. Rate of change was compared by using the follow-up rates from spring 2022 of patients (pre-intervention) who did not receive SMS texts reminders, compared to the follow-up rates from spring 2023 (post-intervention) of patients who did receive SMS text reminders.

Intervention

For the intervention, the DNP project lead, whose native language is Spanish, developed and transcribed SMS texts in Spanish guided by SDT to ensure relatedness and autonomy of the SMS text context, for example: English version: "Hello Mr.(s) H, this is Dr. H from the clinic. Please feel free to contact our office at (502-636-2900) extension number 2, we can assist you with scheduling a follow-up appointment to have your labs and cholesterol levels checked. Thank you.". *Spanish version: "Hola Sr.(ra) H, soy la Dra. H de la clínica. Por favor no dude en contactar nuestra oficina al (502-636-2900) extensión número 2, podemos asistirle a programar una cita para chequear sus exámenes de laboratorio y sus niveles de colesterol. Gracias."* This message was also verified by an administrative interpreter in the KRHWF office, Erika Lowe. Erika Lowe has been a steady employee at the KRHWF for 20 years and is also a

native Spanish speaker. She provides oversite to the KRHSC interpreters. She is also perceived

as a trustworthy person which is very valuable to this population.

After receiving the SMS texts' approval by Erika Lowe, the messages were sent to the

phone numbers provided in the EMR using a secure mobile health app for healthcare providers

(Doximity). Doximity is a HIPPA compliant mHealth application that allows providers to

communicate with patients via their personal cellphone while maintaining patient and providers'

confidentiality. Patients do not need to download the app (Whaley et al., 2021). Patients received

a total of 2 SMS texts containing the same information from an unspecified number, which was

modified to the center's office number. The first wave of SMS texts containing appointment

reminders to each of the selected patients was sent on the first week of April 2023, and the

second wave of SMS texts was sent the second week of April 2023.

From May 2023 to June 2023 the DNP project lead collected data on the patients that

returned to the follow-up appointment in PF. This patient list was compared to the fall 2022

sample. By June 2023, the DNP project lead analyzed the number of patients diagnosed with

HLD in fall 2022 that needed a follow-up appointment, and number of patients that returned in

spring 2023.

Measures

The primary outcome measure of the project is the rate of change in follow-up visits

between patients who did not get an SMS text reminder (from fall 2021 to spring 2022) and

follow-up visits of patients who did get an SMS text reminder (between Fall of 2022 to Spring of

2023). Data was collected by performing a review of the EMR in PF and reassigning the

patient's EMR number with an assigned numeric identification (beginning with the number "1")

to maintain confidentiality. Data was collected pre-intervention, and then 11 weeks after the last

SMS texts were sent. Data collection was conducted from April 2023 to June 2023. Additionally,

demographic information including age and gender assigned at birth was collected.

Data analysis

Microsoft Excel (Version 2305 Build 16.0.16501.20074) was used for statistical analysis.

Rate of change was calculated to evaluate the effectiveness of the SMS messaging intervention

for follow-up adherence. The formula for rate of change used was C = *100* * *(x2 – x1)/x1*. The

variables correlated as follows: C = relative rate of change, x1 = number of follow-ups between

fall 2021 to spring 2022, and x2= number of follow-ups between fall of 2022 to spring of 2023.

Two proportion z-test was used to compare proportions of these two groups and determine

significance of the results. Other variables such as age and gender assigned at birth will be

calculated as frequencies, counts, and compared using simple descriptive statistics. Relationships

between age and gender and follow-up were calculated using the Chi-square test.

Ethical considerations

The proposal for this project was submitted and approved by the University of Louisville

Internal Review Board (IRB) for review as a QI project. A letter of support from the KRHWF

Executive Director was obtained. Appendix A

Results

There was a total of 79 patients selected for the pre-intervention group that had a

diagnosis of HLD using the ICD-10 codes. The pre-intervention group had a documented

encounter Fall 2021 and required a follow-up appointment scheduled in Spring 2022. Three

patients were excluded since they did not identify as Latinx, with a total sample size of *n*=76

patients remaining. The mean age in this group was 49 years, with a standard deviation (*SD*) of 11.6, the median age was 48 years old; age range was 26 to 77 years. Of this group, 24 (32%) patients identified as female and 52 (68%) as male. The percentage of patients that followed up in this group was 48.68% (37) and 51% (39) did not have a documented follow-up appointment.

The post-intervention group sample *n*=60. Initially, 79 patients met inclusion criteria for the intervention. Of these, 10 patients were no longer living in town, or were no longer patients at the center. Three were not Latinx. Six patients had proactively scheduled a follow-up appointment before the intervention and data collection period (April 2023 to June 2023). The mean age for this group was 48 years (SD=11.7), the median age was 46 years, ages ranged from 25 to 78 years. The post-intervention group had 38 (63%) males and 22 (37%) females. Overall, gender rates and age were similar between the two groups. See Table 1 for patient characteristics. Two sample t-test was used to determine any statistical difference between the variable age *p*= 0.53 (CI 95%, *p*= 0.05). The age range between the pre- and post-intervention group was not significantly different.

A total of 60 SMS texts were sent between the first and second week of April 2023 as described. One message was labeled as "failed to deliver", potentially due to an outdated phone number provided in the EMR. After the SMS intervention, 50% (*n*=30) followed up, compared to 48.68% in the pre-intervention group. A percentage change was calculated and demonstrated an increase of 2.7% in the post-intervention group for follow-up appointments. To determine the significance of these two proportions of patients that followed up in the pre- and post-intervention groups, the two-proportion z-test was utilized. This demonstrated no statistical significance in rate of change between the pre- and post-intervention groups (*t*=-0.15*; p*= 0.88). Statistical significance was set as alpha=0.05. See table 2 for follow-up rates.

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Table 1

Patient characteristics for Pre- and Post-intervention group

Variable	Pre-Intervention (n=70)		Post-Intervention (n=60)	
	n	%	n	%
Gender				
Male	52	68	38	63
Female	24	32	22	37
Age Range				
25-34	8		8	
35-44	21		16	
45-54	18		14	
55-64	19		17	
65-74	9		4	
75-84	1		1	
Total	76		60	

Table 2

Follow-up rates Pre- and Post-intervention

Variable	Pre-intervention group (n=76)		Post-intervention group (n=60)		Total (Pre- and Post-intervention groups)
	n	%	n	%	n
Follow-up	37	49	30	50	67
No follow-up	39	51	30	50	69
Total	76	100	60	100	136

Discussion

Key findings

The QI intervention demonstrated that the use of SMS texts did not significantly improve the follow-up rate among patients diagnosed with HLD at the KRHSC. Overall, half of the patients attended and or scheduled a follow-up appointment within the data collection period after the SMS texts were sent. Of those that did not attend or scheduled an appointment, one did not receive the SMS text, and 2 of the patients were seen for an acute chief complaint not related to their HLD diagnosis. Additionally, a second test for significance was made to adjust for the cofounding variables, and it did not show any impact on significance of follow-up rate. After the data collection period was finished, 2 more patients attended or scheduled a follow-up appointment, which could suggest the need for a longer data collection period to increase the chances of noticing any significant increase in the follow-up rate. Some studies such as Beratarrechea et al (2019), Deng et al. (2015), and Muller et al. (2017) who had a primary or secondary outcome of increasing follow-up visits had a longer period 6-12 months for data collection. These same studies, that also use message reminders to communicate with their study participants sent 4 to 6 messages over a longer period (2-4 months).

Interpretation

Age

There were similarities between the follow-up rate and age of the participants in both pre- and post-intervention groups. For example, in both groups most patients were between the ages of 35-65, which emphasizes the importance of early screening, detection and treatment of patients with higher risk of CVD event due to HLD, as well as encouraging healthier lifestyle as

early as possible to prevent any further deterioration of health. There was no relationship

between age range (25-44, 45-64, and 65-84) and follow-up rates in the pre- and post-

intervention groups ($p=0.15$; $p=0.72$). Previous studies aimed to decrease metabolic markers that

contributed to CVD such as LDL-C, HDL-C, TC, triglycerides, Hgb A1c, BP, waist

circumference, BMI, and others had a similar age distribution and mean age in their study

samples (Chow et al., (2015); Parraga-Martinez et al. (2017); Huo et al. (2019).

Gender

More than 60% of the patients on both groups were male, which could be representative

of the gender distribution at the project site, however further QI intervention aimed at treatment

and medication adherence among males could prove beneficial. There was no relationship

between gender and follow-up in the pre- and post-intervention groups ($p=0.7$; $p=1$). Pu et al.

(2015) showed similar gender distribution among Ethnic groups that included Latinx individuals,

where a higher proportion of Central American, Mexican American men had higher prevalence

rates of high LDL-C, low HDL-C. Other studies focused on reducing CVD risk factors such as

Huo et al. (2019); Chow et al. (2015) had also a larger proportion of men enrolled in their study

sample.

Limitations

The primary limitation of the study was primarily the small sample size of the post-

intervention group, which affects generalizability of the results. This was limited by phone

availability in the chart, incorrect phone numbers listed and the timeframe of the project. Some

of the patients with HLD diagnoses listed in the chart, had already attended the clinic for a

follow-up appointment outside the intervention and data collection period. Several patients that

attended the clinic during this period had other chief complaints, with acute conditions more pertinent to their visit at the time. Future QI interventions with a longer period for data collection (12 months for example), could prove more convenient and effective for this type of intervention.

Even though the provider was able to see if the SMS messages were sent or failed to deliver through the Doximity app, there was no way to assess if the patients were able to understand the messages. The Latinx population at KRHSC historically has low health and low literacy rates. Some of the SMS texts were flagged as "read," and there were others that were only able to be seen as "sent," which makes it even harder to confirm if the message was retrieved. The type of mobile device used by patients could have had an impact on the ability of the Doximity app to confirm if the messages were read, which limits the reliability of the SMS text intervention. The PDSA cycle design for this QI project did not include interviewing the patients' perception of the SMS text intervention, which could have been an additional way to confirm SMS text receival and acceptability among this population. And lastly, the length of the QI project intervention could have been a limiting factor for reaching a larger sample. An increase in the number of SMS texts over a longer time could prove useful and more effective in increasing patient response and follow-up appointments.

Another important issue with this population is mistrust of the healthcare system. The patients did not know they would be getting an SMS text and may not have thought the message was authentic. If the providers communicated to the patient in the fall that they would receive a message in the spring, this may also impact the outcomes of this type of QI intervention.

Implication for Nursing Practice

The use of SMS texts in primary care practice could prove useful for increasing follow-up care with patients with other diagnoses and other areas of care, such as women's health appointments and mental health services. It is a sustainable intervention since it represented zero cost for the project lead and the providers at the clinic, as well as adhering to HIPPA regulations. SMS text reminders could also offer a way for providers to provide patient education about their diagnoses and management, with the goal of increasing medication and lifestyle adherence.

Next steps

Future QI interventions with a longer period for data collection (12 months for example), could prove more convenient and effective to track follow-up rates. An increase in the number of SMS texts over a longer period could prove useful and more effective in increasing patient response and follow-up. This intervention could prove even more useful for those patients that had a statin listed as their current treatment regimen, since it could facilitate addressing the need for medication refills and ensure compliance.

This QI intervention, regardless of statistical significance, did result in a slight increase in follow-up rate (2.7%) for the intervention group. It does suggest that mHealth may be an effective alternative form of communication for this Latinx population. Since this form of communication is new for the patients at KRHSC, additional continued exposure may result in better outcomes of the use of mHealth. Additional PDSA cycles could be conducted to evaluate the true effectiveness of this intervention. Due to the time limitations of the DNP leads program of study, only one PDSA cycle was completed. In addition, an increase in the frequency of SMS texts may have increased the follow-up rate.

Conclusions

CVD is one of the leading causes of death for U.S. adults and minority populations (CDC, 2019). HLD is one of the modifiable risk factors in preventing CVD development, affecting many Latinx subgroups (Pu et al., 2015). The use of SMS texts with appointment reminders was a useful, cost-effective method of communicating with patients at the KRHSC. After the SMS texts intervention, 50% of patients who received SMS texts reminders scheduled and attended a follow-up visit during the data collection period of 11 weeks (about 2 and a half months). This was a slight increase from the previous year (2.7%); however, it was not statistically significant. Culturally relevant interventions aimed at increasing follow-up among Latinx populations are beneficial for improving medication adherence, healthy lifestyle and enhancing patient-provider relationship and communication.

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    609.e3. https://doi.org/10.1016/j.annemergmed.2015.10.022

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    A., & Krumholz, H. M.. (2019). Effect of Text Messaging on Risk Factor Management in

Patients With Coronary Heart Disease. *Circulation: Cardiovascular Quality and Outcomes*, *12*(4). https://doi.org/10.1161/circoutcomes.119.005616

Appendix A

To: Richard Riedel, Executive Director
Kentucky Racing Health Services Center

From: Jessica Raymond Richards, DNP student
University of Louisville School of Nursing

Hello….my name is Jessica Raymond Richards. I am a Doctor of Nursing Practice

Student (DNP) student at the University of Louisville School of Nursing. I am writing to request

permission to conduct my DNP project at the Kentucky Racing Health Services Center

(KRHSC). My project aims to increase follow up in Latinx adults with hyperlipidemia that visit

the center. The intervention for this project consists of sending text reminders to patients and

prompting them to schedule their follow-up appointments. To measure the secondary outcome,

patient's low-density lipoprotein (LDL) and total cholesterol from year 2021 vs. 2022 will be

compared. This will be achieved by performing a chart review of those patients with a

hyperlipidemia diagnosis Patients' EMR number in Practice Fusion will be used to protect

patients' confidentiality. I will be working under the supervision of Dedra Hayden, DNP, APRN,

the center's director. The intent is that this intervention will have a positive impact in the health

of this population by helping improve continuity of care and decrease cardiovascular risk factors.

Best regards,
Jessica Raymond Richards

As a sign of support, please sign here: _____ Date: 2/9/22

UTILIZING MHEALTH TO INCREASE FOLLOW-UP

Appendix B.

University of Louisville

Human Subjects Protection Program Office
300 East Market Street, Suite 380
Louisville, Ky 40202
P: 502. 852.5188 E: hsppofc@louisville.edu

DATE:	July 25, 2022
TO:	Dedra M Hayden
FROM:	The University of Louisville Institutional Review Board
IRB NUMBER:	22.0538
STUDY TITLE:	**Utilizing mHealth to Increase Follow-up in Latinx Adults with Hyperlipidemia**
REFERENCE #:	748435
DATE OF REVIEW:	07/25/2022
CONTACT FOR QUESTIONS:	Sherry Block 852-2163 slbloc04@louisville.edu

The IRB Chair/Vice-Chair (or An IRB member) has reviewed your submission. The project described does not meet the "Common Rule" definition of human subjects' research. The IRB has classified this project as Non-Human Subjects Research (NHSR). The project can proceed.

This submission has been determined to be quality improvement, and not human subjects research, based on the goal(s) stated in the protocol.

Institutional policies and guidelines on participant privacy must be followed. If you are using protected health information, the HIPAA Privacy rules still apply.

Any changes to this project or the focus of the investigation must be submitted to the IRB to ensure that the IRB determination above still applies.

Amendments for personnel changes or study closures are not required.

Thank you,

Paula Radmacher, Ph.D., Vice Chair,
Biomedical Institutional Review Board
PR/slb

We value your feedback; let us know how we are doing: https://www.surveymonkey.com/r/CCLHXRP

UTILIZING MHEALTH TO INCREASE FOLLOW-UP

Appendix C

Project Timeline

GANTT Chart. Potential Timeline for Project Completion

Project Activity	Jan - April 2022	May 2022	Aug - Nov 2022	Dec 2022 - Jan 2023	April- Jun 2023	May- Jun 2023	June - Aug 2023
Proposal development	X						
DNP Project committee proposal approval		X					
DNP Project proposal defense		X					
IRB Submission & approval		X	X				
EMR review/Data collection				X			
Send SMS-text reminders					X		
Data analysis					X	X	
Prepare final report						X	
Develop final poster						X	X
Disseminate - Poster session							X

Appendix D

Literature matrix

Citation	Rationale for Inclusion (Background, concept, practice change example, literature review	Evaluation Method John Hopkins/ Rigor From Equator.net Criteria/Rigor Grade	Study Design	Summary of Findings	Analysis
Cameron, L. D., Durazo, A., Ramírez, A. S., Corona, R., Ultreras, M., & Piva, S. (2017). Cultural and Linguistic Adaptation of a Healthy Diet Text Message Intervention for Hispanic Adults Living in the United States. *Journal of health communication*, *22*(3), 262–273. https://doi.org/10.1080/10810730.2016.1276985	Practice change	LEVEL II CONSORT	Mixed methods Quasi-experimental Translating HealthyYouTXT to a culturally and linguistically appropriate Spanish version. Then assess the texts' acceptability, efficacy, and effectiveness among Spanish speakers. Self-regulation and self-determination (STD) theories (Williams et al., 2015) were used to develop the messages. However, the values of familism, fatalism and destiny were adapted to better fit Hispanic culture	HealthyYouTXT is a phone messaging system developed to encourage a healthy diet. There were 109 participants and 101 (93%) completed the follow-up survey. Surveys included the STD Questionnaire-Diet Version (Williams et al., 2015), with subscales for autonomous motivation, controlled motivation, and amotivation. Follow-up survey measures included HealthyYouTXT interest and perceived efficacy after 1 week.	STRENGTHS: The sample population, a minority group, which wer speakers and had limited resources, was appropriat measures. It showed acceptability of in Spanish speaking patien cultural values specific and Hispanics patients and fam identified common barrier of this population to adop lifestyle. It is important to a message, but deliver it n that those we are trying to moved, inspired, encourag respected by what we are This is one of the beginnin we can began expecting b from those we are trying t WEAKNESSES: • LIMITATIONS: Population was mostly descent, not generalizab Spanish subgroups. Ther woman than men in the internal consistency wit

					and amotivation, which affected measures such efficacy • GAPS: Did not measure any pa improvement related to messages implementati care settings.
Burner, E., Lam, C. N., DeRoss, R., Kagawa-Singer, M., Menchine, M., & Arora, S. (2018). Using Mobile Health to Improve Social Support for Low- Income Latino Patients with Diabetes: A Mixed- Methods Analysis of the Feasibility Trial of TExT- MED + FANS. *Diabet es technology & therapeutics*, *20*(1), 39–48. https://doi.org/10.1 089/dia.2017.0198	Practice change	LEVEL I CONSORT	Parallel nonblinded RCT Evaluating the acceptability, feasibility and efficacy adding a social support module to TExT- MED, a text- message-based automated mHealth intervention to improve diabetes knowledge and self-care among Hispanic patients discharged from the ED with limited access to primary care. These messages were sent to both the patients and family members synchronously to encourage discussion.	Conducted in the ED of Los Angeles County + University of Southern California Medical Center (LAC + USC). 44 Spanish speaking Latinos with low-income patients total divided in 2 groups with 3 months follow-up, only 33 patients left at this time. After intervention there was: improvement of HbA1 by a 0.8% decrease. Improved glucose self- monitoring Increase in physical activity. There was also improved motivation, behavior, accountability, and relationships	STRENGTHS: Inclusion of family membe support (FANS messages) MED intervention versus u intervention had high acce patients and families, as w be engaging and enjoyable >80% WEAKNESSES: LIMITATIONS: small group Lack of generalizability of others Spanish subgroup. Impact of the intervention be quite limited due to the for patients and families t being part of the eligibility limits the number of patie enroll in the study. Supporters follow-up was months mark There is limited external v patients in the study samp higher-than-average level than the general populatio GAPS: there is no exampl messages showing Spanish process. There is a lack of measure variable/outcome for qual of patient/supporter comm

	Practice change		RCT		STRENGTHS
Ramirez, M., & Wu, S. (2017). Phone Messaging to Prompt Physical Activity and Social Support Among Low-Income Latino Patients With Type 2 Diabetes: A Randomized Pilot Study. *JMIR diabetes*, *2*(1), e8. https://doi.org/10.2196/diabetes.7063		LEVEL I CONSORT	12-week pilot RCT with 42 participants. 3 groups: control, phone message (PF) and phone messages with family and friends (PM+FF). Participants received short text or voice phone messages that prompt them to set personal goals for to increase physical activity, reminders to maintain review and maintain these goals as well as health education. The PM+FF included messages to participant's support group with suggestions on how to help the loved one achieve their goals.	These interventions had good feasibility and usefulness. Patients increased physical activity in 6 and 12 weeks, increase social support by friends and family members at 6 weeks, with PM+FF group showing increase perception of social support in 12 weeks	The study showed approp and produce desired beha the intervention groups. Patients in the study foun messages and self-regulat as useful. Study showed that interve potentially improve partic social support by includin friends as part of the inter WEAKNESSES LIMITATIONS: Small sample size prevent generalizability of findings Text messages samples in not available in the article helpful to determine appr cultural competency of th Potential social desirability participants rated the inte useful. Perception of social supp social support was measur which might represent bia participants since they we family and friends were er study. GAPS: Unable to determine if an Hispanic principles were a messages.
Rubinstein, A., Miranda, J. J., Beratarrechea, A., Diez-Canseco, F., Kanter, R., Gutierrez, L., Bernabé-Ortiz, A.,	Practice change	LEVEL I CONSORT	RCT Parallel group, masked RCT conducted in low resource urban settings in	No change in SBP or DBP in 12 months. There was significant reduction on body weight and improvement on dietary changes such as decrease in high fat/sugar intake	STRENGTHS: Multi-country and cross-cu design across Latin Americ the needs of several partic socio-economic status in 3 countries, each one with t

Irazola, V., Fernandez, A., Letona, P., Martínez, H., Ramirez-Zea, M., & GISMAL group (2016). Effectiveness of an mHealth intervention to improve the cardiometabolic profile of people with prehypertension in low-resource urban settings in Latin America: a randomized controlled trial. *The lancet. Diabetes & endocrinology*, *4*(1), 52–63. https://doi.org/10.1016/S2213-8587(15)00381-2			**Argentina, Guatemala, and Peru**. Total of 637 participants. Intervention consisted of 12 months of monthly motivational calls and weekly mobile text messages with information about diet and physical activity (PA). Primary outcomes: decrease in mean DBP and SBP. Secondary outcomes: weight, waist circumference and personal target behaviors	and increase intake of fruits and vegetables compared to the control group. Individuals from Peru had the greatest weight loss compared to those from Argentina and Guatemala. Argentina had the greatest attrition rate	cultural background, show of mobile health and text reach patients in low incor resource communities. Use of theories and mode intervention such as the c text messages and influen change WEAKNESSES/LIMITATION Findings of the study are r among variables/outcome were not adjusted for mul comparisons, therefore we determine association bet The intervention in the stu than predicted fidelity, wh affected the findings regar BP and inability to determ dose of the intervention. There was a relapse in we the participants in the inte at 12 months, which migh need to reassess readines change at 6 months in add baseline. Some self-reported secon might have been affected bias
Varleta, P., Acevedo, M., Akel, C., Salinas, C., Navarrete, C., García, A., Echegoyen, C., Rodriguez, D., Gramusset, L., Leon, S., Cofré, P., Retamal, R., & Romero, K. (2017). Mobile phone text	Practice change LEVEL I CONSORT		Blinded RCT Conducted in Chile. 314 participants from 12 different clinics in areas with different socioeconomic demographics. 6 months follow-up. Social Cognitive Theory (SCT) used	Medication adherence was the main variable measured by the Morisky-Green-Levine (MGL) Questionnaire validated in Spanish. Medication adherence increased significantly in the intervention group receiving SMS.	STRENGTHS: use of SCT to messages by healthcare te experience of direct patier Focus on behavioral chang healthy lifestyle modificat Researchers were able to that mobile technologies i intermediate socioeconon Hispanics in Latin America positive impact in lifestyle and CVD risk factors, speci

messaging improves antihypertensive drug adherence in the community. *Journal of clinical hypertension (Greenwich, Conn.), 19*(12), 1276–1284. https://doi.org/10.1111/jch.13098			to develop the text messages by several members of the healthcare team. Outcomes of the study included antihypertensive medication adherence and BP reductions.	Mean BP reduction was higher in the intervention group compared to the control group, however there was not enough power to statistically compare these findings.	medication adherence in h Latinos. WEAKNESSES: Limitations: there was a d BP in the intervention grou to attrition there was not statistical power to compa group Lack of statistical power to intervention was effective subgroups within the stud The fact that the was no o requirement for an in pers months follow-up prevent to obtain BP measuremen substantial portion of the survey was done by phone in loss of statistical power significant changes in BP n The study was unable to o to measure adherence, wh accurate measurement th questionnaire Gaps: even though Spanis language in Chile, it is imp that there are differences diet and healthcare access this patient population an living in the US, especially subgroups. Acculturation t life it is a key factor to con developing and applying s interventions to Latinos re
Huo, X., Krumholz, H. M., Bai, X., Spatz, E. S., Ding, Q., Horak, P., Zhao, W., Gong, Q., Zhang, H., Yan, X., Sun, Y., Liu, J., Wu, X., Guan, W., Wang, X., Li, J., Li, X., Spertus, J. A., Masoudi, F. A., &	Practice change	LEVEL I CONSORT	Parallel single blind RCT Conducted in China 502 participants diagnosed with CVD *and* DM. IG 251. CHAT-DM study. Follow-up 6 months. Received 6 messages per week	Primary outcome HbA1c reduction was significantly greater when compared to control group (-0.2% vs 0.1%, p=0.003). Secondary outcomes: Change in proportion of patients achieving HbA1c	STRENGTHS: simple, low-c text messaging program. N improved glycemic contro objective outcome measu C. Theory driven and cultu text messages to the Chin undergoing a comprehens process. Patients found pe messages as useful, appro read. Acceptability of inter

| Zheng, X.. (2019). Effects of Mobile Text Messaging on Glycemic Control in Patients With Coronary Heart Disease and Diabetes Mellitus. *Circulation: Cardiovascular Quality and Outcomes, 12*(9). https://doi.org/10.1161/circoutcomes.119.005805 | | | in addition to usual care. messages contained educational and motivational information on glucose monitoring, blood pressure control, medication adherence, physical activity, and lifestyle.

Primary outcome: Hemoglobin A1c (HbA1c) reduction.

Secondary outcome: Proportion of HbA1c < 7%, SBP, LDL-C, physical activity, and health status, FBG BMI | <7% (69.3% vs 52.6%; p=0.004).

SBP, LDL-C, self-reported physical activity and health status did not differ between groups. Messages did not address cholesterol control. | good. Explored efficacy of messaging in a high-risk p CVD and DM in a low- or n country. It was a large stud 34 hospitals across a geog diverse country making it generalizable

WEAKNESSES:

Texts not addressing chol which may explain lack of LDL-C. Potential recall and desirability bias related to outcomes (medication adh physical activity) and meas methods. Unable to follow longer than 6 months (i.e. collect information about (type I vs type II). Low per women enrolled in the stu recall bis

LIMITATIONS/GAPS:

Messages were tailored to patients; they might not b generalizable. There was measurement indicator a effectiveness of the int lifestyle changes |
| Chow, C. K., Redfern, J., Hillis, G. S., Thakkar, J., Santo, K., Hackett, M. L., Jan, S., Graves, N., De Keizer, L., Barry, T., Bompoint, S., Stepien, S., Whittaker, R., Rodgers, A., & Thiagalingam, A. (2015). Effect of Lifestyle-Focused Text Messaging on Risk Factor Modification in | Practice change

LEVEL I

CONSORT | | Parallel design, single-blind, RCT

Sample size 710. Done in Australia. Intervention:

Tobacco, Exercise and Diet Messages (TEXT ME).

Semipersonalized text messages delivered 4 times/week, contained info about advice, motivation, and | Primary outcome: LDL-C was significantly lower in intervention group at 6-month follow-up.

Secondary outcomes:

SBP, BMI were significantly lower at 6-month in intervention group.

Intervention group participants were more likely to exercise regularly, control their BP] and become non-smokers. | STRENGHT: significant d LDL-C level, systolic bloc BMI in patients with CHD objective outcome measur text messages quickly at lo address this gap in eviden delivery of secondary prev is possible, effective, and a Feasibly and acceptable to Targets multiple risk facto follow-up time.

WEAKNESS: study size t determine the effectivenes intervention on clinical ou might not be generalizable conducted from a single la referral center hospital. Se |

			information that aimed to improve diet, increase physical activity, and encourage smoking cessation (if relevant). Follow-up 6 months at the clinic. Primary outcome: LDL-C Secondary outcomes: SBP, BMI, TC, HR, physical activity, waist circumference, smoking status, proportion achieving guideline levels of modifiable risk factors.	Proportion of patients achieving multiple guideline target levels of risk factors (triglycerides, TC, etc.) were higher in the intervention group. There were no differences in the proportion taking secondary prevention medications in the intervention vs the control groups	measures used in secondar as physical activity. Study completely blinded due to intervention. LIMITATIONS/GAP: me delivered in English, some the study might not have b speaker.
Patients With Coronary Heart Disease. *JAMA*, *314*(12), 1255. https://doi.org/10.1001/jama.2015.10945					
Párraga-Martínez, I., Escobar-Rabadán, F., Rabanales-Sotos, J., Lago-Deibe, F., Téllez-Lapeira, J. M., Villena-Ferrer, A., Blasco-Valle, M., Ferreras-Amez, J. M., Morena-Rayo, S., Del Campo-Del Campo, J. M., Ayuso-Raya, M. C., & Pérez-Pascual, J. J. (2018). Efficacy of a Combined Strategy to Improve Low-density Lipoprotein Cholesterol Control Among Patients with Hypercholesterolemia: A Randomized Clinical Trial. *Revista Española de*	Practice change	LEVEL I CONSORT	Multicenter, parallel group, RCT. Done in Spain. 358 adults diagnosed with hypercholesterolemia Follow-up in 2, 6, 12, 18, and 24 months. Intervention:1) written information on the disease and its treatment; 2) text messages with summaries of recommendations, reminders of new appointments and reschedule	Primary: The proportion of individuals who achieved an LDL-C reduction was significantly higher in the intervention group at 1 year and 2 years. The proportion of individuals with adequate LDL-C control was significantly higher in the intervention group at 1 year but not at 2 years. Greater mean reduction in LDL-C and TC in the intervention group at both 1 year and 2 years. Secondary:	STRENGTHS: combined int (written material, text me completed registration ca associated with a greater C and improved adherenc lowering therapy and exer recommendations at 2 yea had a larger sample size, l multicenter trial and inter a variety of strategies as m above. Intervention could to include cholesterol con WEAKNESSES: unable to u blinding techniques. Self-r outcomes such as medicat could have introduced bia in the study possibly alter of both the physicians and and explains the improver the control group (Hawtho LIIMINATIONS/GAP: novel done in a variety of setting

			appointment if missed, and 3) self-completed registration cards on adherence to recommendations **Primary outcome:** Proportion of participants who achieved LDL-C target values, and measurements of lipid panel. **Secondary:** Medication and lifestyle adherence, physical activity, dietary habits, and adverse events such as stroke, peripheral arterial disease (PAD), SBP and DBP, smoking, CVR score	Adherence to statin therapy was significantly higher in the intervention group at both 1 year and 2 years Adherence to statin therapy was significantly higher in the intervention group at both 1 and 2 years. There was also greater adherence to exercise recommendations in this group at 1 year and 2 years. Other variables not significantly changed between groups	longer follow-up times. Th determine the effectivene intervention in reducing ca events, in different CVR gr moderate, and high). Also evaluate new strategies to adherence to medication, and dietary/exercise recom
Cardiologia (English ed.), 71(1), 33–41. https://doi.org/10.1 016/j.rec.2017.05.0 29					
Liu, Z., Chen, S., Zhang, G., & Lin, A. (2015). Mobile Phone-Based Lifestyle Intervention for Reducing Overall Cardiovascular Disease Risk in Guangzhou, China: A Pilot Study. International journal of environmental research and public health, 12(12), 15993–16004. https://doi.org/10.3 390/ijerph12121503 7	Practice change	LEVEL I CONSORT	Cluster RCT Done in China 406 participants. Follow-up 12 months. Intervention: 1) Computerized CVD risk evaluation, which included: overall (in 10 years), average and optimal risk factors (at same age), physical exam index, unhealthy lifestyle, and	Primary outcome: Decrease 10-year-CVD risk (BMI, TC, DM, SBP, CHD, stroke, smoking) risk at 12 months. Secondary outcomes: DBP, triglyceride (TG), HDL-C, LDL-C, fasting plasma glucose (FPG), and waist hip ratio (WHR). Results: *10-year risk of CVD*: mean risk decrease was not significant in the intervention group, however all components (SBP, TC, etc.) changed	STRENGHTS: Showed evid intervention can be benef disease prevention, since statistically significant red systolic and diastolic bloo BMI, fasting plasma glucos ratio for the intervention and cost effective in a low income society. One of the interventions using change an outcome, showing that intervention could effectiv the increased predicted CV Enrolled patients at all lev Improvement of BP, TC, FP WHR. Were statistically si intervention group

| | | | personalized interventions. 2) follow-up phone calls (4-8 minutes long) and 3) Follow-up text messages. Frequency depended on CVD 10-year risk, ranging from 1/month (CVD risk <5%) to once/week (CVD risk >40%). | significantly in the direction of decreased risk. *DBP, FPG and WHR* decreased significantly in the intervention group. *TG, HDL-C, and LDL-C* were not statistically significant. | WEAKNESSESS: Interventi significant effect on the pr (Decrease 10-year-CVD ris LIMITATIONS/GAPS: Limite generalizability of findings randomization may have i possibility of unmeasured variables. Participants in t received much less inform normal in the follow-up ch could explain the favorabl intervention group. Study 27.5% of participants were up, though the missing val impact on primary outcom determined by sensitivity |
| Porto-Ferreira, F. A., de Almeida-Neto, C., Murphy, E. L., Montebello, S. C., Nogueira, F. A., Koga da Silva, E. M., MacFarland, W., & Custer, B. (2017). A randomized trial to evaluate the use of text messaging, letter, and telephone call reminders to improve return of blood donors with reactive serologic tests. *Transfusion*, *57*(1), 102–107. https://doi.org/10.1111/trf.13882 | Practice change | LEVEL I CONSORT | RCT, single blind Done in Brazil 484 donors with reactive screening tests: 169 received text, 154 a letter, and 161 a telephone call. Intervention: Phone calls, text, and letter reminders 15 days after second standard notification letter. Primary outcome: test the effectiveness of different reminders for non-responding first-time donors with reactive serologic screening results | Odds of return were better for phone call than text message but not better than letter. The odds of return for text message compared to letter were also not significantly different. | STRENGHT: telephone call more personal interaction first-time donors. Able to older donors were more r blood center recall than y Straight forward design, st development and impleme therefore easy to apply in and answer different rese WEAKNESS: Sending letter feasible for every populati violation concern. There a differences between Brazi generalizability of the stud other countries. Research to determine if the text m read and understood. Sho period (one month) LIMITATION/GAPS: This st study follow-up rates, it ha patient population. The se the content contained in t calls, messages, and letter played a factor in the resp |

Deng, X., Wang, Y., Zhu, T., Zhang, W., Yin, Y., & Ye, L. (2015). Short message service (SMS) can enhance compliance and reduce cancellations in a sedation gastrointestinal endoscopy center: a prospective randomized controlled trial. *Journal of medical systems*, *39*(1), 169. https://doi.org/10.1007/s10916-014-0169-z			RCT Done in China 2297 participants recruited. The aim of the study was to investigate whether short message service (SMS) can improve patients' compliance and reduce cancellation rates. Intervention: short message reminders (appointment date and time) after scheduling the procedure until the day before the procedure, for a total number of 9 messages. Messages contained information about the procedure, instructions on how to manage hypertension before procedure and any other health issues, following fasting requirement, wearing flat shoes to avoid tripping, etc.)	Primary outcome: reduce the number of cancellations. Results: There was a reduction in the rate of cancellation by doctor for patients in the SMS group in seven continuous 4-week periods (p<0.001). Patients in the SMS group were 40 % less likely to be cancelled by the doctor than patients in the control group. The number of patients who were cancelled due to severe hypertension was lower in the SMS group than in the control group The number of patients who were cancelled due to severe hypertension was lower in the SMS group than in the control group The compliance score was significantly higher in the SMS group than in the control group (p=0.023, p<0.001, respectively)	STRENTHS: SMS has impr compliance and reduced c rates. Text messages were easy for patients to save a guidance about procedure cancellations means time savings for patients and cl as well as more efficient u resources and hospital sta was cost-saving and cost-e present study showed tha between 1 and 2 weeks (4 associated with better cor SMS group compared to a less than 4 days or beyonc WEAKNESS: For patients w is 3 days or less, the numb (9 total, 3 per day) might b result in desensitization, a anxiety regarding the proc aspect of text reminders is privacy since other person patient might have had ac health information withou approval. Researcher was there might be biased esti reported compliance. Una patient's feedback about t because the large volume was a huge burden to the LIMITATIONS/GAPS: text r not be as feasible among t compared to the younger to visual impairment and f the functions of messages 50-year SMS did not have support. Other modes of c might need to be applied t population, such as voice r
Beratarrechea, A., Abrahams-Gessel,	Practice change	LEVEL I	Cluster RCT	Primary outcomes:	STRENGHTS: This interven (CHW and *mHeath* tool fo

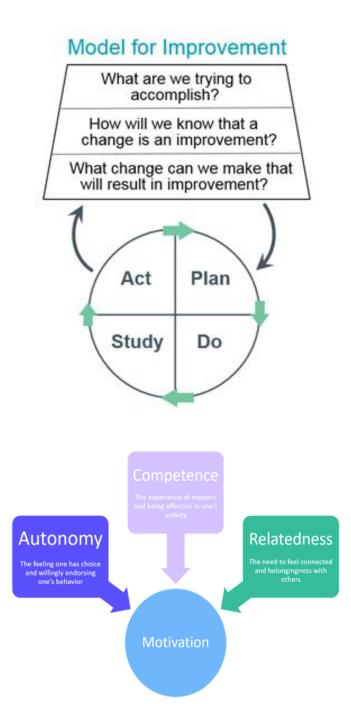|					
S., Irazola, V., Gutierrez, L., Moyano, D., & Gaziano, T. A. (2019). Using mHealth Tools to Improve Access and Coverage of People with Public Health Insurance and High Cardiovascular Disease Risk in Argentina: A Pragmatic Cluster Randomized Trial. *Journal of the American Heart Association*, *8*(8), e011799. https://doi.org/10.1161/JAHA.118.011799		CONSORT	Argentina 755 participants, 6 month follow-up Aim: Assessed whether community health workers' use of an integrated mHealth tool encourages patients to attend visits at primary care clinics to improve CVD risk management Intervention: CHW at home visits to calculate CVD risk, if CVD>10%, appointment was scheduled using electronic scheduling system and SMS was within 5 minutes and 24 hours before the appointment containing, date, time, clinic, and name of physician. Additionally, participants received 1-way short text messages to promote follow-up and continuity with treatment during the 6- month follow-up period.	1) proportion of participants classified as having a 10-year CVD risk ≥10% who successfully completed the baseline (first) visit to a PCC within 6 weeks of screening. 2) proportion of these participants who had successfully completed at least 1 follow-up visit after the baseline visit to a PCC within 4 months of the CHW screening. Secondary outcomes: Medication compliance (antihypertensives, statins and antidiabetics if appropriate) Clinical attendance (attending at least 1 clinical appointment during study period) Mean number of visits during study period. Results: Participants in the intervention group were significantly more likely to attend a recommended first and follow-up visit with a primary care physician at the PCC. Number of clinic visits was nearly 3 times as high in the intervention group	screening and appointment (and reminder) increased av patients with moderate to This is also an effective str management of CVD in lov income countries. The mH allowed CHW to be more (screening and scheduling a the knowledge that text m reminders are an effective reduce non-attendance ra WEAKNESSESS: Failed to ir treatment of chronic cond assess the factors in the h that might have affected t implementation and patie the intervention to identif more likely to benefit. No significant difference in th appropriate medications i intervention group, howev increased rate of appropri prescriptions in the interv LIMITATIONS/GAPS: CHW feasible for every healthca as facilities with limited st prove a challenge followin when there is an increased interventions that promot and can accommodate pat remotely. Future studies v follow-up times are neede the increase rate in follow well as decreased non-atte meaningful reductions of r as blood pressure and HLD

| | | | | Clinical attendance rate was significantly higher in the intervention group, 59.8%, compared with the control group, 22.4%

No significant difference observed on proportion at participants who were on appropriate medication | |
|---|---|---|---|---|---|
| Muller, C. J., Robinson, R. F., Smith, J. J., Jernigan, M. A., Hiratsuka, V., Dillard, D. A., & Buchwald, D. (2017). Text message reminders increased colorectal cancer screening in a randomized trial with Alaska Native and American Indian people. *Cancer*, *123*(8), 1382–1389. https://doi.org/10.1002/cncr.30499 | Practice change | LEVEL I

CONSORT | RCT

Done in Alaska, USA.

2386 total participants.

Intervention:

Written consent was obtained to enroll in text messages, participants had the chance to opt out after each message. A total of 3 messages sent over a 2-month period, one message a month. Queries for screening status performed at 3 and 6 months after last text message was sent. | Primary outcome:

Colorectal cancer (CRC) screening was defined by fecal immunochemical

testing (FIT) or fecal occult blood testing (FOBT), Flexible sigmoidoscopy or colonoscopy documented on EMR.

Results:

Colonoscopy was the primary screening method, accounting for >90% of procedures.

Increased CRC screening by 42% compared with usual care

in a clinical population of AN/AIs aged 50 to 75 years,

and by 24% for those aged 40 to 49 years.

The intervention was only effective for women (69% and 37% higher screening rates, respectively, for those aged 50-75 years and 40-49 years), with | STRENGHTS: A straightforw message intervention was CRC screening rates amon population. This intervent inexpensive means of reac who do not require intens be screened. The study wa a clinic that did not require costs for screening and tha records available. Interver sustainable across a variet underfunded health care s

WEAKNESSES: no access to data to distinguish particip likely would undertake scr additional interventions fr require additional interver of mobile phones among f family could present a con issue. Unable to assess po contamination between th and control groups (sharir among participants)

LIMITATION/GAPS: limited generalizability, more stuc performed with other ethr limited to a single health c to patients who possessed participate in the research text-enabled phones |

				no apparent effect observed in men.	
Wolff, M., Balamuth, F., Sampayo, E., & Mollen, C. (2016). Improving Adolescent Pelvic Inflammatory Disease Follow-up from the Emergency Department: Randomized Controlled Trial with Text Messages. *Annals of Emergency Medicine*, *67*(5), 602–609.e3. https://doi.org/10.1016/j.annemergmed.2015.10.022	Practice change	LEVEL I CONSORT	Single blind RCT Done in Pennsylvania, USA 92 participants Consent signed Intervention: The intervention group received a total of 4 text Messages on days 2, 3, 4, and 5 after discharge to remind them to schedule and attend a follow-up appointment. Text messages contained first name, primary care provider name, primary care provider telephone number, and recommended period for follow-up.	Primary outcome: Follow-up within 72 hours of ED discharge. Results: Post-ED follow-up rate was 43.5% (20/46) in the text message group compared with 15.2% (7/46) in the control group Patients receiving text message reminders were more likely to follow-up compared with the standard group	STRENGHTS: Majority of p text message reminders c helpful. Appointments we before discharge from ED, intervention results more other settings which do n capability. The text messa reminder to schedule an a to make the appointment WEAKNESSES: non-English participants were exclude study, limiting generalizab intervention results to diff populations. Due to the se urgency of a pelvic inflamm appointments were requir schedule under a brief pe discharge, limiting the win up to less than a week, an as generalizable to other c conditions. LIMITATIONS/GAPS: Study limited to girls aged 15 yea Participant receiving $5 gi time of discharge could ha bias. There was a low base rate in the study, which m of intervention not genera communities with higher f

UTILIZING MHEALTH TO INCREASE FOLLOW-UP

Appendix E

Conceptual Model and Theoretical Framework

Institute for Healthcare Improvement PDSA Cycle and SDT Theory

Appendix F

Logic Model

Logic Model

Goal: Increase number of patients with scheduled follow up appointments by 35% six weeks after sending SMS texts

INPUT	OUTPUTS		OUTCOMES		
Program Investments	**Activities**	**Participants**	**Short-term**	**Intermediate**	**Long-term**

SITUATION:

A significant amount of migrant Latinx patients at the KRHSC clinic diagnosed with hyperlipidemia are lost to follow up

Program Investments
- Time dedicated to perform chart review by project lead
- Time and resources translating texts in Spanish in a way that is culturally competent and appropriate for this population
- Literature reviews

Activities
- Retrospective chart review of patients diagnosed with HDL
- Sending out SMS text reminders to selected patients
- Performing a second chart review to determine efficacy of reminder text messages

Participants
- UofL School of nursing
- Project lead
- KRHSC staff
- APRNs working at the clinic

Short-term

Increase the numbers of patients diagnosed with hyperlipemia that scheduled follow-up appointments within in Spring 2023 compared to Spring 2022

Intermediate

Have an impact in LDL reduction among patients with elevated levels

Long-term

Decreasing rates of cardiovascular disease in underserved, minority population by increasing their adherence to healthy lifestyle modifications and medication regimen

ASUMPTIONS:
The use of text reminders will increase appointments follow-up in patients diagnosed with hyperlipidemia, resulting in LDL decrease as a secondary outcome.

EXTERNAL FACTORS:
Socioeconomic barriers that prevent patients to arrive at the appointment; language and cultural barriers that hinder adherence; patients might migrate to other states/cities before scheduled appointments.