

Exploring the Feasibility of a Mobile App-Based Mindfulness Intervention

A Scholarly Project presented to the

Department of Nursing

College of Public Health

Temple University

Submitted in partial fulfillment of the requirements

For the degree of

Doctor of Nursing Practice

Peter Kim

Project Advisors: Amy Bieda, PHD, MSN, RN, NNP-Emeritus

May 2026

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Acknowledgements

I would like to acknowledge with gratitude all those who supported and guided me throughout this Doctor of Nursing Practice project.

First, I wish to thank my advisors, Drs. Bernadette Sheeron and Amy Bieda, for mentoring me throughout this journey; Your knowledge and support made this project come to fruition.

Special thanks to Dr. Gillespie and Dr. Jean Lee for their invaluable guidance and collaboration in executing the project. I am so thankful to them for providing critical insights from their Nephrology department perspectives, as well as their resources.

To the Dialysis Clinic Inc. staff, thank you for your participation and enthusiasm while I was conducting this project. Your assistance made this initiative possible and meaningful.

Finally, I would like to express my deepest appreciation to my family—my wife, Thatyana, my parents, Hong An and Chung Hee, and my brother, Abe—for their unwavering love and encouragement. Also, a special thank you to my mother-in-law and Sister, Annette and Marina, who have so happily journeyed with us throughout the way. Without you all, this would not have been possible.

List of Abbreviations

APA	American Psychological Association
BDI	Beck's Depression Inventory
DNP	Doctor of Nursing Practice
ESRD	End Stage Renal Disease
GAD7	Generalized Anxiety Disorder 7
HD	Hemodialysis
KDQOL-SF	Kidney Disease Quality of Life Short Form
MBI	Mindfulness-Based Intervention
PSQI	Pittsburgh Sleep Quality Index
QI	Quality Improvement
QOL	Quality of Life
RCT	Randomized Control Trial
SCS	Self Compassion Scale

Abstract

Background: End Stage Renal Disease (ESRD) can cause many health disorders, including physical and mental health ailments. Hemodialysis (HD) patients experience a range of symptoms. Studies have shown that many mental health symptoms are pronounced in HD patients, such as anxiety. Treatment for both physical and psychological health may be necessary to provide a truly holistic plan of care. Studies have shown that Mindfulness interventions are low-cost, non-invasive, and effective in alleviating some of the mental health symptom burden. Objective: This study aimed to assess the feasibility of a five-session behavioral intervention using a mobile app in a kidney dialysis setting.

Method: The use of technology-assisted intervention of mindfulness delivered via a mobile app. Using the Healthy Minds App™, participants listened to the program for 5 weeks. At the end of the term, participants were surveyed with pre- and post-GAD7 surveys. The feasibility of this study was measured by recruitment rates and adherence to sessions.

Results: A total of seven participants completed the study. The median number of lessons completed was 2 out of 5. GAD7 scores of the pre and post -assessment were analyzed using SPSS (v.29). The Wilcoxon test revealed $Z = -1.604$, $p = .109$, $R = -0.43$, a small to medium negative effect size.

Conclusion: Although many studies showed efficacious results from other countries, the different dynamics did not crossover, especially with a self-motivated mobile app. Since the results were limited, there needs to be a more efficient way to deliver the intervention to this population. In-person therapists showed promising results. Recommendation is for future studies to focus on enhancing those interventions.

Keywords: Hemodialysis, End Stage Renal Disease, Anxiety, Mobile App, GAD7, Callista Roy

Introduction

Chronic disease can cause many health disorders, and treatment for both physical and psychological health may be necessary to provide a truly holistic plan of care (Lee et al., 2016). Many Hemodialysis (HD) patients exhibit mental health disorders, including depression, anxiety, and substance abuse (American Kidney Fund, 2022). Patients with end-stage renal disease (ESRD) on HD suffer from a plethora of symptoms, which can stem from the disease, HD treatment, or other comorbid conditions. These symptoms, if left untreated, lead to decreased quality of life and are associated with an increased risk of hospitalization and mortality (Li et al., 2018).

Mental health symptoms manifest in multiple forms, and many nurses attest to seeing patients exhibit symptoms, but patients remain undiagnosed because they are labeled difficult or needy. There has been much research to validate that mental health disorders such as depression and anxiety are pronounced in chronic HD patients (Huang et al., 2020).

Some of the psychological symptoms found in HD patients are stress, anxiety, depression, and chronic pain (Garel et al., 2023). Common symptoms include sleep deprivation, pain, itching, fatigue, and other psychological problems (Rhee et al., 2022). Benzodiazepines are often given to alleviate anxiety symptoms (Wyne et al., 2011). Many studies have been conducted using nonpharmacological management to address these disorders. Mindfulness meditation has been a strategy used as an alternative for anxiety reduction (Wyne et al., 2011).

A systematic review found that mindfulness interventions were statistically significant in improving sleep, anxiety, and depression after the intervention was performed (Razzera et al., 2022). Adamoli et al. (2024) found high feasibility and retention through their program. The retention for the program was 85%, and the completion rate 75%. Digital interventions, due to

their inherent accessibility and user-friendliness, have facilitated better patient engagement in their care (Yang et al., 2024). A systematic review conducted by Paalimaki -Paakki et al (2022) on digital web-based interventions has shown positive effects on anxiety, depression, treatment adherence, and the clinical indicators related to adherence. The authors found other studies that also showed positive, statistically nonsignificant changes among patients with chronic illnesses. Kim and Cho (2021) confirmed that treatment adherence increased when measured in conjunction with social support and self-care behavior.

Background and Significance

ESRD is a permanent condition in which the kidneys no longer function properly (CMS, 2024). Renal replacement therapy must be initiated for this population to survive. Dialysis is a treatment that replaces the kidneys' work by removing excess fluid and waste products from the blood when the kidneys shut down (Kidney Foundation Inc., 2023). The treatment regimen for most HD patients is three days a week and 3-4 hours per treatment. Patients experience many symptoms, with an estimated average of nine symptoms; at least half of the patients report fatigue (Mehrotra et al., 2023).

Anxiety is defined by the American Psychiatric Association (APA) as a normal response to stress, and can be beneficial in some situations, such as increasing attention and focus. Anxiety disorders are further defined as feelings of anxiousness or nervousness with more intense feelings of fear or anxiety (APA, 2021). There is growing recognition of the frequency and burden of symptoms experienced by individuals undergoing hemodialysis (Mehrotra et al., 2023). Mental health symptoms such as anxiety and depression can go unrecognized in dialysis patients (Mehrotra et al., 2023). Increased anxiety has been associated

with increased non-adherence (Al salmi et al., 2018). Non-adherence has shown consistency of increased morbidity and mortality in HD patients (Fernandes and Dsouza, 2021).

Depression is also prevalent in dialysis patients with an estimation between 13-76% (Tian et al., 2021). Depression has many adverse effects on prognosis and QOL (Tian et al., 2021). Mehrotra et al (2023) advised that there are benefits to early recognition of depression and treatment with pharmacologic or non- pharmacologic interventions.

Pain is a symptom burden recognized as debilitating by Lockwood et al. (2021), in a study that demonstrated that acute pain is estimated to be approximately 80%, and chronic pain ranges up to 90%. The most common pain found in one study was due to bone and joint pain (Senanayake et al., 2017).

Local, National, and Global Statistics

The prevalence of people diagnosed with CKD is approximately 70,000, whereas the actual amount is estimated at 700,000 (National Kidney Foundation, 2025). In the state of Pennsylvania, there are 20,000 people on dialysis (The American Kidney Fund, 2021). There are approximately 35 million Americans who have some form of chronic kidney disease, and around 131,000 have already progressed to ESRD (The American Kidney Fund, 2025). Currently, over 800,000 Americans are living with ESRD, and over 500,000 Americans are on HD (The American Kidney Fund, 2025). Moreover, there are approximately 900,000 people on the transplant waiting list (HRSA, 2024). Around 80% of Americans with ESRD have some form of Medicare coverage (National Kidney Foundation, N.D.). The total expenditure for Americans with ESRD in 2020 was estimated at approximately \$ 51 billion (U.S. Renal Data System [USRDS], 2022). Medicare patients with ESRD spend 33 times more than people without ESRD (Hedt, 2022).

It is estimated globally that 788 million people ages 20 and above have CKD as of 2023 (Yang et al., 2025). Also, CKD was found to be the ninth leading cause of death in 2023 globally

and the 12th leading cause of disease-adjusted life years (Yang et al., 2025). The estimated number of people on hemodialysis worldwide as of 2017 is approximately 3.9 million (Jaeger et al., 2019). Around 80% of patients who are receiving treatment for kidney failure are from affluent countries with large elderly populations and access to universal health care (Jha et al., 2013). Without increased investment in prevention, the total number of patients with kidney failure will likely exceed one million by 2030 (Kidney Foundation Inc, 2022).

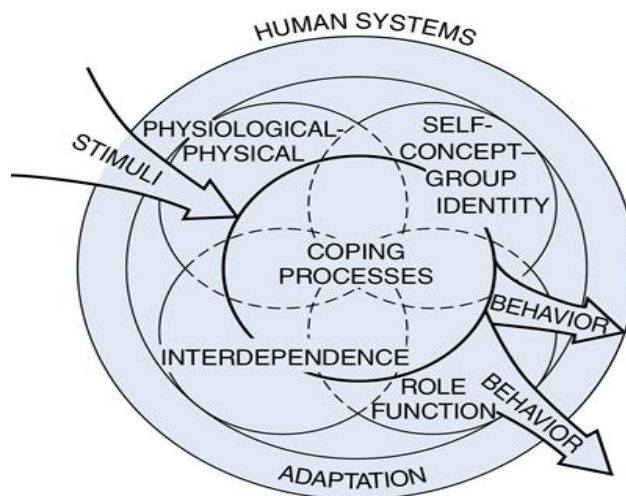
Theoretical Framework

Theories or models are needed because they provide the framework to help guide clinical projects by having an organized plan. (Bonnell and Smith, 2018). For this project, Callista Roy's Adaptation Model (RAM) is used to guide nurses in helping patients maximize their health in their current circumstances (Roy, 1999). Roy (1999) defines adaptation as a process and outcomes using conscious awareness and choice to create human and environmental integration from thinking and feeling persons as individuals or in groups. She organizes adaptation into three life processes: Integrated, compensatory, and compromised life processes, with coping processes that have both innate and acquired mechanisms (Roy, 1999). Functioning of these systems can be observed in four adaptive modes: physiologic, self-concept, role function, and interdependence (Roy, 1999). The physiologic mode is the physical activity of all the components of the body system: cells, tissues, organs, and systems (Roy, 1999). The self-concept mode consists of components of physical self, which include body sensation, image, persona, ideals, and moral-ethical-spiritual self (Roy, 1999). The role function mode operates on the roles within a person in society and groups (Roy, 1999). Lastly, the interdependence mode is categorized as a set of behaviors related to relationships. This mode is made up of interactions related to giving and receiving love, respect, and value (Roy, 1999).

Roy's model sees individuals as part of interrelated systems, maintaining relationships between different stimuli (Roy, 1999). This model encompasses physical and mental health stimuli to maintain a better quality of life. For example, dialysis patients have compromised life processes that need adaptation to reach a better integrated life process. This can be achieved through dialysis, helping to maintain their physiologic state. As well as mindfulness interventions helping their role and interdependence mode.

Figure 1.

Roy's Adaptation Model



Note. Roy, C., & Andrews, H. (1999). *The Roy adaptation model* (2nd ed.). Upper Saddle River, NJ: Pearson

People who are on HD can have high symptom burdens, which include mental health (Mehrotra et al., 2023). Many of the physical symptoms can be adjusted through HD or other non-pharmacological treatments, but many practitioners prescribe benzodiazepines for mental health symptoms such as anxiety (Garel et al., 2023). Mindfulness interventions are an alternative strategy for HD patients to become more self-efficacious and improve their well-

being (Garel et al., 2023). This project will focus on anxiety reduction by measuring anxiety levels through GAD-7 scores. One goal is that indirect outcomes, such as quality of life and compliance with their health regimens, would improve.

This clinical project aimed to help HD patients reduce anxiety from their chronic illnesses, such as ESRD. Moreover, the high symptom burden is associated with going to HD treatments three times a week, and symptoms produced while receiving HD treatments. The literature indicates that anxiety scores can be lowered by utilizing mindfulness apps that offer techniques, including meditation and relaxation (Razzera et al., 2022).

Roy's Adaptation Model follows the systematic nursing process: Person, Environment, Health, and Nursing. This helps integrate the framework for these patients intuitively. In addition, Roy's Model further differentiates adaptation processes that help to stimulate better healing of individuals (Roy, 1999). This model is defined by life processes that emphasize the patients as a holistic being and health promotion as a balance to retain stability within their being (Roy, 1999).

In this framework, the person is defined as a human with kidney disease who can no longer survive without receiving HD treatments. These patients are often categorized into ESRD/HD because of the need for the health regimen three times a week and 3-4 hours a day. The environment would be HD clinics or any location where a person receives HD, i.e., other patients receive HD at home. Health in this framework encompasses physical and mental health. Many patients on HD have an increased symptom burden, whether it is physical, such as pain or fatigue, or mental health issues such as anxiety and depression (Mehrotra et al., 2023). Nursing entails helping patients cope with the stimuli (Roy, 1999). Physical symptoms of HD include

being cold, hypotensive, nauseated, and itchy, which can be alleviated with tangible measures.

The Nursing Aspect

Nursing not only focuses on the patient's medical issues but also on their mental and emotional well-being as a holistic view. Thus, using a Mindfulness app to promote physical, as well as mental health wellness. Studies have shown that this intervention has demonstrated to decrease biomarkers that promote health and QOL, as well as decrease anxiety (Alhawtmeh et al., 2024a).

Roy describes different types of adaptation. In the interdependence mode, the human's focus is on interactions with others. HD providers, whether it be doctors, nurses, or techs, have many opportunities to interact with patients and address issues weekly. Through these interactions, acquired coping mechanisms can be learned (Browning, 2020).

Purpose

The purpose of this (Doctor of Nursing Practice) DNP Project was to determine the feasibility of implementing a mindfulness-based intervention (MBI) to decrease anxiety in dialysis patients. This project aimed to examine the effect of mindfulness interventions in dialysis patients by exploring the use of a mobile app to deliver the intervention. A comparison was conducted to analyze patients' data from pre- and post-Generalized Anxiety Disorder (GAD)-7 scores after the intervention was completed. The goal for this project was for participants to have reduced GAD-7 scores from baseline after 6 weeks of using the mindfulness application. Mental health therapies in conjunction with medication have a magnified success rate in lowering anxiety compared to medication alone. (Garel et al., 2023).

PICOT

The PICOT question that guided this QI Project was: In adult dialysis patients, will using a mindfulness app, compared to the current practice, improve anxiety symptoms over 6 weeks?

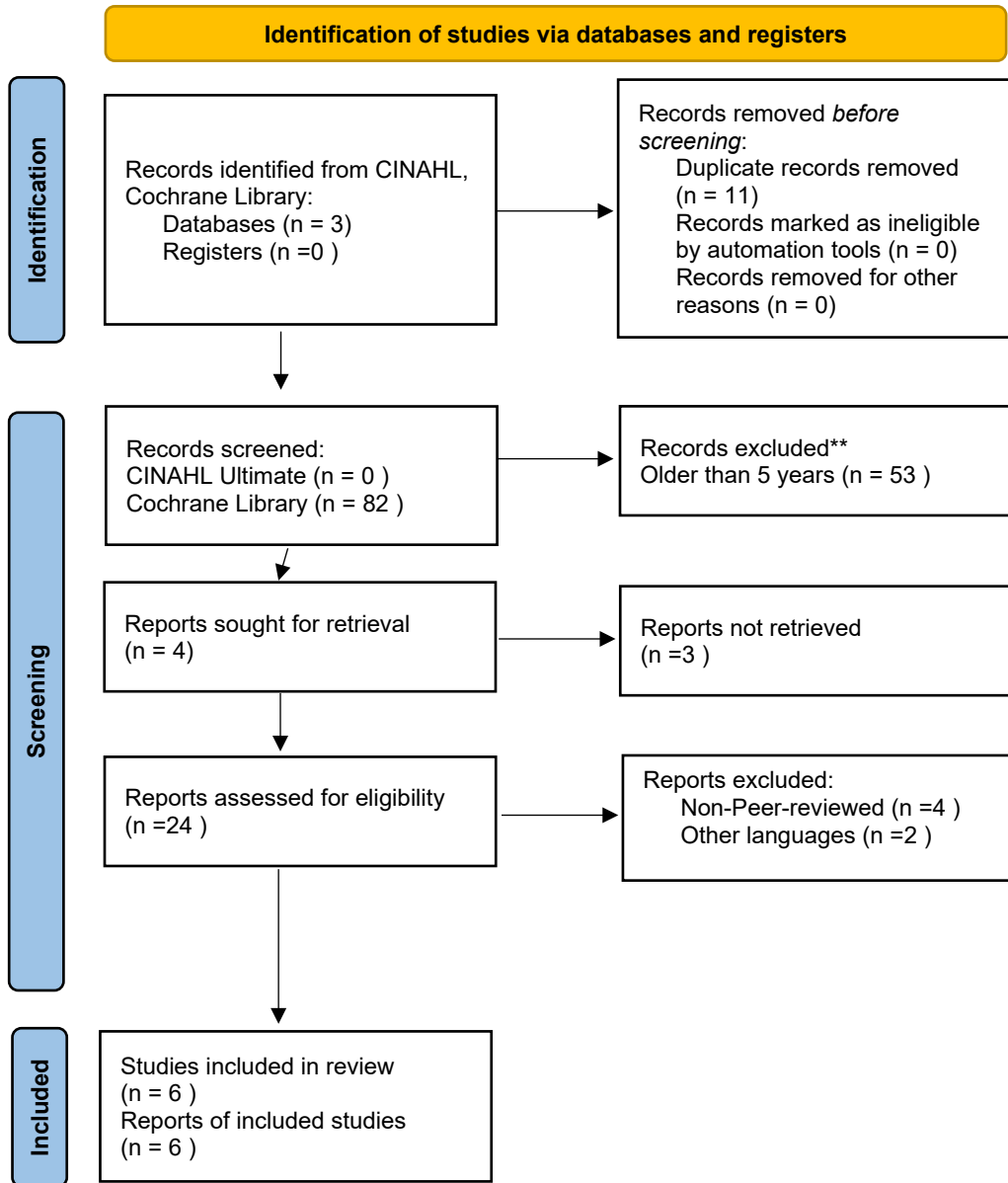
This project sought to address mental health gaps in the dialysis population by assessing for anxiety and intervening with mindfulness. Mindfulness interventions equip patients with skills that enhance their ability to address anxiety. Mindfulness interventions teach people to be more aware, connected, and resilient in certain circumstances (Dahl et al., 2020).

Literature Review

From the 18 articles reviewed, six were randomized controlled trials(RCTs) that showed high-level evidence that mindfulness interventions are a proven tool to utilize for psychosomatic symptoms of HD, especially anxiety. Razzera et al.(2022) conducted a systematic review on this topic earlier in 2020. It reviewed 6 RCTs and found no significant differences in the quantity of time, but when compared to baseline and post-intervention, (p value < 0.05). Moreover, they found that quality of life and satisfaction scores were $P < 0.05$ in their studies (Razzera et al., 2022).

Figure 1.

Prisma Table



Note: PRISMA criteria described in Moher D, Liberati A, Tetzlaff J, et al. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med. 2009 Jul 21;6(7): e1000097. doi:10.1371/journal.pmed1000097

Level two evidence of randomized controlled trials found clinical and/or statistical significance in mindfulness intervention. Igarashi et al.(2021) found that meditation led to an increase in 23% of Beck's depression (BDI) score, indicating a decrease in depressive symptoms. An RCT conducted in an outpatient clinic in Singapore using mindfulness interventions showed significant improvement but found no correlation with the effects of time in the video and therapist-led groups (Aw et al.,2024). These results were shown from a randomized three-arm control, which also showed that the perceived stress scale was statistically significant compared to the control group(Aw et al., 2024). An RCT conducted in a hospital in Northern Jordan showed that mindfulness meditation led to statistically significant reductions in C-reactive protein and tumor necrosis factor in the intervention group (Alhawtmeh et al., 2024b). A hospital in Kuwait also conducted an RCT that found the experimental group had lower perceived stress, higher trait mindfulness, higher emotional regulation, and higher kidney disease-related quality of life over 8 weeks (Alhawtmeh et al., 2022). Another trial conducted in an outpatient dialysis clinic in Jordan, using the Depression, Anxiety, and Stress Scale-21, and the Patient Health Questionnaire-15 (Alhawtmeh et al., 2024a). Rigas et al. (2022) conducted an RCT with patients from four tertiary hospitals in Canada. They found statistical significance (p -value <0.05) with a medium effect size for GAD-7 scores (numerical value not reported) after 6 months. A medical military hospital in China tested Mindfulness meditation and muscle relaxation in sarcopenic patients who require maintenance hemodialysis. Their 12-week trial showed statistically significant differences in the Kidney Disease Quality of Life Short Form Survey(KDQOL-SF) (Wu et al., 2024). The authors also tested certain biomarkers, such as Interleukin-6, high-sensitivity C-reactive protein, prealbumin, and albumin, which also showed statistically significant results pre- and post-intervention (Wu et al., 2024).

Level three evidence of a dialysis center in Brazil conducted a 12-week trial that measured: Self-Compassion Scale (SCS), Pittsburgh Sleep Quality Index (PSQI), Mindful Attention Awareness Scale, and Perceived Stress Scale (Igarashi et al., 2021). Meditation contributed to an average reduction of 0.72 mg/dL in phosphorus levels, a slight reduction in systolic blood pressure, greater than 50 points on the KDQOL, a 23 percent increase from baseline BDI scores, and a 13 percent increase in SCS scores. There were no changes shown in the Pittsburgh Sleep Quality Index (Igarashi et al., 2021). One hospital in Brazil conducted a quasi-experimental research study for 8 weeks with a three-month follow-up (Adamoli et al., 2024). The results reported from this study were descriptive and qualitative statistics, with findings measured an average Likert scale of 8.5 out of 10, and positive comments from interviews; the most common comment was better use of time (Adamoli et al., 2024). One notable case study reported the feasibility and acceptability of MBIs in a limited time frame and resources during the COVID-19 pandemic (Carver & Cheung, 2021).

Many of the studies have different interventions, although they use mindfulness interventions, which consist of many technical modalities. One promising case study has shown that mindfulness was used to replace benzodiazepines for HD anxiety by using Mindfulness-Based Interventions (MBIs) as a complementary strategy in deprescribing addictive psychiatric medication such as Lorazepam (Garel et al., 2023). Other studies were done by in-person trained therapists or other technological advances such as video/audio recordings, or video chat. A pilot study that used Virtual Reality technology to implement mindfulness to decrease anxiety in pediatric patients was presented at a dialysis conference (Dahl and Star-glass, 2019), and is worth mentioning for future interventions, but was excluded from this study.

There are multiple modalities to implement mindfulness interventions. Many of the research studies implemented Mindfulness interventions with video or audio recordings and provided headphones. One research study compared Mindfulness to psychoeducation, which showed that the education aspect helped reduce anxiety, but not as much as mindfulness interventions (Sohn et al., 2018). Another study used the addition of yoga and music therapy. The research trial done for mindfulness via technology vs. in-person both showed a statistically significant p-value <0.001 between phase 1 and 2, and phase 1 and 3 (Aw et al., 2024). A scoping review conducted by Fernandez et al. (2022) suggests that since there is no defining consistency in the intervention of mindfulness, thus, pathways from expert groups are an approach to treating patients until enough research has been done to focus on specific applications.

Many factors were to be measured in conjunction with mental health, such as self-compassion, biomarkers, pain, sleep, HD compliance, time on the HD machine, education level, etc. These measures aid in quality of life(QOL) and physical health. For example, patients with decreased biomarkers showed improvement in QOL (Alhawatmeh et al., 2024b). Wu et al. (2024) also noted multiple dimensions of QOL noted in the factors above. Another study conducted cross-sectional research on which variables can affect treatment adherence. They found that spiritual health, resilience, and psychological well-being can improve adherence to HD treatment regimens (Saedi et al., 2024). The most significant improvement in treatment adherence they found was psychological well-being (Saedi et al., 2024). Self-compassion is a psychological factor that can be attributed to healthy behaviors from positive emotions (Igarashi et al., 2021).

The primary stakeholders were patients who have ESRD and are receiving dialysis, who also have symptoms of anxiety. Helping patients mitigate symptoms or increase mental health wellness helps improve QOL. Patients benefit directly from improving their mental health and overall wellness.

Methodology

PDSA

As a quality improvement initiative, the Plan-Do-Study-Act method was used as a guide for this project. This fits well with Roy's adaptation model because it focuses on nursing as processes and patterns to promote health in persons, groups, and society (Roy, 1999). This framework views the individual as a set of interrelated systems striving to maintain balance (Roy, 1999). For example, patients need treatments for their chronic illness, but the regimens can be arduous, strenuous, and anxiety-provoking. Nursing can help patients adapt by intervening with evidence-based practices. In this case, utilizing mindfulness apps to teach patients techniques that can reduce symptoms of anxiety.

Plan

The Project lead collaborated with the Nephrology associates and Quality Improvement teams to strategize on how to collect data and implement the intervention. Meetings focused on intervention delivery, data collection, sharing, and storage of protected health information (PHI) (Institute for Healthcare Improvement, 2021). Data sharing had been discussed to ensure the protection and privacy of patients who volunteer to participate in this initiative.

Do

During this phase, the implementation began. Using convenience sampling, researchers approached patients to see if they would want to volunteer for the trial of using the mindfulness and wellness app. The staff was educated about the study so that they can help promote or enhance actions from patients (Institute for Healthcare Improvement, 2021). The plan was to have an education session with the staff beforehand, so that they would know what was going on. The staff helped with patient participation and were aware of what the patients were doing.

Study

In this phase, data was collected from participants before and after the intervention using paper surveys. Records were logged as self-reported data on how often the participants use the intervention. Also, monthly QOL scales were collected and assessed, as well as attendance rates for compliance. GAD-7 scales (Appendix B) were collected pre-intervention and after one-week post-intervention (Institute for Healthcare Improvement, 2021).

Act

Each participant received a GAD-7 survey before starting the mindfulness application. Another survey was given to the participants six weeks after using the mindfulness application while at hemodialysis sessions. From the results studied, the team analyzed the study based on the data obtained. Data was analyzed using GAD-7 scores pre- and post-interventions to look for differences. (Institute for Healthcare Improvement, 2021).

There was also buy-in from staff to participate in the project and identify potential participants for the project lead. Educational sessions were held with staff regarding using the mindfulness app, explaining how it helps with anxiety, and identifying who might benefit. Staff were also able to browse the mindfulness app, so they had some knowledge if participants asked

questions about the app. This helped with recruitment for this project. The initial goal for recruitment was 30 participants within four weeks. After participants completed 37 days of using the mindfulness application, a follow-up GAD-7 survey was completed.

Project Site and Population

This project was conducted at an inner-city dialysis clinic in North Philadelphia. The population consisted mostly of dialysis-dependent end-stage renal disease patients. The age group ranges from adults 18 years of age and older. There were 35 Dialysis chairs in the Clinic with two shifts.

Inclusion and Exclusion Criteria

The inclusion criteria for this project are participants who are in renal failure and dialysis dependent who attend the dialysis center 3 days a week. The patients must be established patients at the center. Patients must be receiving Hemodialysis for a minimum of one year. The participants' age ranges will be from 18 to 70 years; they must speak and understand English and have access to a smartphone. Only patients without a diagnosis of anxiety or depression were included. Participants must be able to demonstrate the technology capability to use the mindfulness app. Exclusion criteria for this project included:

- No active or severe cognitive deficits
- Those with active psychosis or who have severe anxiety and depression
- Patients who are on medication for depression and anxiety
- Prisoners

Instruments

GAD-7 Anxiety Scale

For this project, the GAD-7 Anxiety Scale was used. It is called the Generalized Anxiety Scale and is composed of 7 questions. This instrument measures the severity of anxiety in patients. There are seven questions, and scores range from 0 to 21. A score of 10 or greater prompts referral. The GAD-7 scale was developed as a brief scale to identify probable cases of generalized anxiety and to assess symptom severity (Spitzer et al., 2006). The initial questions were gathered from the Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM4), as well as some from GAD questionnaires (Spitzer et al., 2006). Out of the 13 questions from the original GAD scale, seven questions were chosen with the highest rank correlation from the data analysis of their study (Spitzer et al., 2006). The first three questions capture the core criteria from the DSM4, and six out of seven items have the greatest divergent validity of GAD (Spitzer et al., 2006). This survey is a screening tool used in psychiatry (Williams 2014). It can also be used to screen other anxiety disorders, such as panic disorder, social anxiety disorder, and post-traumatic stress disorder, which also have high sensitivity and specificity (Williams 2014).

Reliability and Validity

For this project, the GAD-7 Anxiety Scale was used. This tool has an internal consistency score ranging from Cronbach's alpha of 0.79–0.91 (Williams, 2014). Moreover, the GAD-7 has a sensitivity score of 89% and a specificity score of 82% for generalized anxiety disorder (Williams 2014).

Healthy Minds App

Several mobile apps have been researched to reduce anxiety, but none have been tested with the population. Research studies from other countries have been done on the effectiveness of using mobile apps in the pediatric population, specifically regarding kidney care and education, with success (Hadad and Mourani, 2019). The name of the app is Healthy Minds™. The app is free. There was data collected from the app itself; only the utility of the app was used. Mindfulness interventions can reduce anxiety. Thus, the five topics are, along with the different meditations associated with the topics. Moreover, this project was making a general claim about reducing anxiety and is not making any claims about what the app can and cannot do. Data was collected from self-reports and a GAD-7 survey. Therefore, permission is not warranted for use.

Healthy Minds™ is a popular mind-body strategy to reduce negative associated systems and can range from procedures or techniques focusing primarily on the connections between the mind, body, and behavior and their resultant effects on one's health. It involves being aware and taking in the present moment non-judgmentally. It is a mind-body therapy that helps one develop dispositional mindfulness. This is defined as a process of paying attention, with awareness, to one's moment-to-moment experience through an open lens of equanimity and acceptance. The Mindfulness app uses five topics to help train the mind. The topics are foundations, awareness, insight, connection, and purpose. The tools developed in the app help guide the thought process into healthy, positive thoughts through prerecorded meditations and educational audio files.

Awareness is defined by an increased and flexible attention to perceptual impressions in one's environment, which include internal cues such as body sensations, thoughts, and emotions (Dahl et al., 2020). Insight is self-knowledge on matters that concern emotions, thoughts, and

beliefs that shape one's experience. Thus, this reflects one's own experience of psychological processes, and these dynamics influence the process (Dahl et al., 2020). Connection in this context refers to the promotion of supportive relationships gained from a subjective sense of care and kinship toward other people (Dahl et al., 2020). Purpose refers to gaining a sense of clarity concerning personally meaningful goals and values that one can apply in daily life (Dahl et al., 2020).

Budget

The research fee conducted at the center is \$200, waived as this is a quality improvement project. The cost for this project included the following. Printing out forms and surveys costs \$32 for a printer ink cartridge, and two packs of 500 sheets of paper cost \$24. A 20-pack of clipboards for participants to write on is \$13. A pack of 100 pens is \$7 for participants to fill out surveys. Headphones for participants to listen to the app through their phone: Three packs of 10 audio headphones, \$40. Also, they needed to acquire adjustable adapters to convert their phones for \$17. Donuts will be brought as incentives to eat while listening to the in-service, for \$20. The total cost for the project is estimated at roughly \$153 (Barton and Jones, 2020)

Table 2

Cost

Item	Paper & Pens	Ink Cartridge	Clip Boards	Headphones & Adapters	Donuts	Total
Cost	\$31	\$32	\$13	\$57	\$20	\$153

Note. This table displays the individual and total costs of various office supplies and food items.

Data Management

Patients remained anonymous in this research project. The participants were de-identified using numeric codes. Only the Project lead had access to survey data. Data collected to be analyzed was stored on a password-protected computer to which only the Project lead had access. The surveys collected from patients remained with the project lead. Surveys were stored in a locked cabinet that only the Project lead has access to. The data was decoded in an Excel file and was sent to a mentor, preceptor, and statistician for review and analysis. Data will be destroyed one year after the completion of this project.

Protection of Human Subjects

This project followed all the ethical standards for the protection of participants' welfare and rights. Data was collected with unique identifiers. No personal identifiers were collected on the GAD7 surveys. Papers collected were stored in a locked cabinet and will be destroyed after one year. Data was stored in a password-protected database that was only accessible to the project lead. The study protocol was reviewed and approved by the Institutional Review Board at Temple University (Appendix B). The consent form (Appendix C) was developed by the project lead based on the IRB template. Consent forms were given and read to each participant by the Project lead. Patients were informed that participation in this project was voluntary and that they could drop out at any time. Participants were informed of the minimal risks of this project. It would not affect the care they received.

Recruitment Procedure

The setting facilitators were dialysis nurses and techs, and physicians who promoted the project at this unit. The Project lead educated staff and participants about the wellness app. The

Project lead collected surveys of GAD-7 and demographic information. Participation occurred during patients' dialysis treatment days. The total recruitment period was one month for a total of 70 patients. Participants were approached individually during their HD sessions. If they were interested in the research project, they were given the consent forms. The consent forms were then signed in the office by participants and the project lead. Any questions were answered in the office as well.

Implementation

This project was conducted over three months. It took place in Dialysis Clinic Inc. (DCI), in the northern section of Philadelphia. The intervention involved assessing the feasibility of utilizing a mindfulness app to lower the general anxiety of hemodialysis patients. This app was downloaded onto patients' smartphones for use during the clinic and in their free time. On the first day of the study, participants took the GAD7 baseline survey and filled out a demographic survey, which included age, gender, and ethnic background. Participants then proceeded to scan the QR code with their smartphones, which showed them a link to download the app. The DNP lead showed them how to navigate and utilize the app. Headphones were given to those who needed them for their phone.

After the initial setup phase, the DNP lead followed up with participants every week and obtained feedback on their thoughts about the app. This process totaled six weeks. The first five weeks were to encourage participants to progress to the next topic, which included five. The sixth week was to re-evaluate participants' GAD-7 scores by conducting another survey.

Interprofessional collaboration

Collaboration for this trial involved getting buy-in from the providers and staff. The project lead approached the providers to be able to conduct this trial at their facility. Afterward, the project lead shadowed providers as they met with patients and discussed the project. Also, the project lead spoke with the staff about the project. Breakfast food was provided as incentives during initial conversations. A total of three providers were shadowed to meet the Monday, Wednesday, and Friday patients, as well as the Tuesday, Thursday, and Saturday patients.

Findings

To evaluate the impact of a mindfulness intervention at Dialysis Clinic Inc.—a local dialysis center in North Philadelphia—this project revisited the question: What is the feasibility of delivering a mindfulness intervention via mobile app, over six weeks? This section presents the data analysis conducted to assess changes in GAD7 scores and completion of the program. The results provide insight into the project's effectiveness and feasibility over the time frame.

Data Analysis

A pre-screening of the GAD-7 scores was measured before introducing the app, as well as basic demographic information such as age, gender, and ethnicity. A post-GAD-7 score was also conducted after the sixth week. A bar graph was made to contrast the anxiety scores pre- and post-intervention to measure clinical significance. A paired sample t-test was conducted using SPSS to compare symptom severity scores before and after the intervention. A Shapiro-Wilk test indicated that the differences between the conditions were not normally distributed, $W = .013(7)$. This indicated a Wilcoxon test rather than a paired sample t-test. The Wilcoxon signed-rank test revealed that stigma scores were the same after the intervention (Mdn = 2.0, $n = 7$) compared to before (Mdn = 2.0, $n = 7$). The Wilcoxon test revealed $Z = -1.604$, p

=.109, $R = -0.43$, with a small to medium negative effect size. The scores were found to be stable, and the difference was found to be statistically nonsignificant

Table 3.

Demographics

Characteristics							
Gender	n	%	Age	Range	n	Ethnicity	n
Male	3	(33.3%)		30-39	1	African American	7
Female	6	(66.7%)		40-49	1	Caucasian	0
				50-59	2	Asian	1
				60-69	3	Other	1
				70-79	2		

The demographic table above shows that there were 9 participants. There were twice as many females as males. Most of the participants identified as black or African American. Most of the participants' ages ranged from 50 to 70 years old. Two of the males could not partake in the last survey because they did not show up to their HD sessions. The intervention table below shows how many participants were able to complete the topics. None of the participants completed the intervention. One participant almost completed all the interventions in four out of the five topics. Most participants completed two topics.

Table 4.

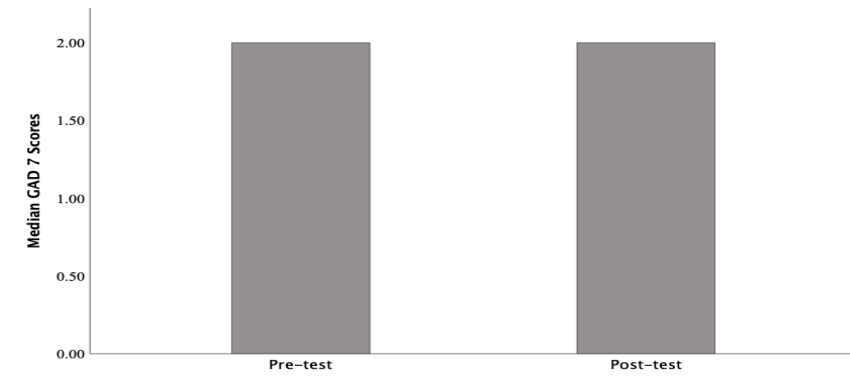
Intervention Completion Rates per Participant

Participant	1	2	3	4	5	6	7
Completion	2/5	2/5	1/5	2/5	1/5	4/5	2/5

Note. This table displays the number of completed sessions out of the total five sessions for each of the seven participants.

Figure 2.

Median GAD-7 Scores for Pre-test and Post-test



Note. This table shows the median GAD7 scores from the pre- and Post-test. The GAD-7 scores range from 0-21.

A bar graph was shown to illustrate the contrast before and after the intervention. The pretest showed that the average median GAD-7 scores were two. The Post test also shows that the average median score was two. There were no changes in median GAD-7 scores. The GAD-7 scores were low at the start and remained low after the intervention.

Table 5.

Wilcoxon Signed Ranks Test Statistics for GAD-7 Scores

Test Statistic	Post-test – Pre-test
Z	-1.60 ^a

Asymp. Sig. (2-tailed) .109

Note. This table displays the results of the Wilcoxon signed-rank test comparing baseline and post-intervention scores.

^a Based on positive ranks.

The Wilcoxon Signed Rank test was conducted and did not show statistical significance ($p = .109$). The Z score was a negative number, showing that the average was below the mean.

Discussion

The primary goal for this project was to assess the feasibility of using a mobile app to deliver mindfulness interventions. Quantitative data show that the results were not statistically significant ($p=.109$). Moreover, none of the participants finished the entire intervention. Qualitative data were collected from one-on-one interviews with those who completed the trial. Participants stated that they would fall asleep during HD sessions, or the intervention would put them to sleep. Some patients were accustomed to research at this clinic and stated they were not motivated due to a lack of incentives. All the participants stated that they liked the app and wanted to keep it for future use. The results indicate that while many of the participants were interested in the interventions, they didn't have the motivation and follow-up to gain momentum. These findings did not align with Razzera et al. (2022), who conducted systematic reviews and found high retention rates and feasibility with in-person intervention trials. Moreover, many of the trials were done in other countries. Also, having an in-person therapist conducting the intervention compared to delivering the intervention via mobile app likely contributes to the lack of retention.

Limitations

There were many barriers associated with this project. There is a negative stigma regarding people who require mental health wellness (Corrigan et al., 2014). Some of the patients in the clinic stated they had no problems with anxiety or could pull themselves away from it. People were reluctant to download technology onto their phones due to increased fraudulent activity. Moreover, it is estimated that non-adherence to HD sessions can range from

50% nationally (Snyder et al., 2020) and ranges from 7-32% (Ibrahim et al., 2015). This can be problematic because participants may cut their treatments short before intervention can begin or may not make it to their treatment session during research days. There were increased dropout rates on dialysis. Short staffing at the clinic may have made the atmosphere more challenging to help promote quality improvement or involvement from staff.

Some participants were averse to technological devices and applications. One issue at the clinic was that there were certain areas where the data plan or Wi-Fi was not as accessible (dead zones), and people had trouble logging into their app. Some patients had trouble seeing or initiating the app. Time and resources were another limitation. Many of the previous research trials had more funding, time, and manpower to conduct their research. This project was done in a total of 16 weeks. Furthermore, the sample size was small ($N=7$). The initial recruitment was 23 participants, but many dropped out, stating they had no time to do the intervention or had no desire. A larger cohort may have provided better results. Also, the project was conducted at a single institution. Although it is an urban area, it may not be diverse enough to reflect practice settings elsewhere, which limits its applicability to other healthcare environments.

Implications for Nursing Practice

There are many trials that have shown this intervention as a potential tool for enhancing physical health (Razzera et al., 2022). Mindfulness meditation is an easy, practical, and efficient stress-reduction therapy that counteracts the pro-inflammatory effects of stress (Alhawatmeh et al., 2024b) and improves the mindfulness trait, emotional regulation, and health-related quality of life (Alhawatmeh et al., 2022). Furthermore, findings have indicated that an increase in self-compassion and mindfulness is correlated with enabling hemodialysis patients to exhibit fewer

depressive symptoms and a slight decrease in blood pressure values (Igarashi et al., 2021). In terms of feasibility, these techniques can be taught in less than 30 minutes (Alhawatmeh et al., 2022). Even in restrictive circumstances such as the COVID-19 pandemic, patients participated in an electronically delivered yogic breathing/mindfulness meditation intervention aimed at reducing symptom burden and improving quality of life (Carver and Cheung, 2021).

Mindfulness intervention is a potential adjunctive behavioral intervention for symptom management (Garel et al., 2023). This helps depressive patients, especially those who cannot take psychiatric medications due to physical ailments or failed pharmacological treatment (Sohn et al., 2018). In addition, there are studies that show that it can help reduce pain-related suffering (Adamoli et al., 2024).

The recommendation is to integrate these interventions as complementary therapy into hospital policies and care plans for patients undergoing hemodialysis (Alhawatmeh et al., 2024b). Also, collaborating with interdisciplinary teams such as mental health professionals trained in mindfulness meditation can enhance patient outcomes and provide a holistic approach to care (Alhawatmeh et al., 2024b). There is an additional benefit of having a non-pharmacological and cost-effective strategy to improve patient well-being and potentially reduce the risk of complications (Alhawatmeh et al., 2024a).

Implications for future projects

Future web-based interventions and resources may also be advantageous as they require minimal staffing time, allow privacy, and increase accessibility (Fernandez et al., 2022). They can address the gap in the literature, such as predominant factors of self-efficacy and mindfulness traits (Aw et al., 2024). More long-term studies with follow-up are needed. (Rigas

et al., 2022). There needs to be a larger sample size to measure the effect size and validate future findings (Wu et al, 2022).

Conclusion

As ESRD continues to trend up in America, so does treatment in HD. Many patients receiving HD suffer from undiagnosed mental health disorders, including anxiety. MBI's such as meditation, relaxation, and music have been utilized to decrease symptoms of anxiety (Shu Wen et al., 2021). A health information technology quality initiative project aimed at reducing anxiety in a vulnerable population in an urban setting was introduced. The intervention included a Mindfulness intervention delivered via a mobile app. The goal of this project was to deliver optimized care and reduce cost in healthcare spending and resources by decreasing the mental health gap in this population. This initiative empowered HD patients so that they had resources to alleviate anxiety. This is in the greater hope of increasing HD adherence and ultimately decreasing morbidity and mortality in ESRD patients. In addition, improving compliance has been indirectly associated with cost reduction.

Although the evidence is limited, the reviews indicate that MBIs may offer a promising, safe, and non-invasive complementary therapy for patients with CKD on hemodialysis, specifically, for mental health, quality of life, and the physical aspects of the disease. The implementation of these interventions must specify the details of the protocols to ensure their reliability and reproducibility. The potential impacts of MBIs on people with CKD require studies with higher methodological quality, clarifying the feasibility of different formats of interventions presented, and long-term follow-up evaluations.

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Appendices

Appendix A

GAD-7 Survey

Over the <u>last two weeks</u> , how often have you been bothered by the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious, or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid, as if something awful might happen	0	1	2	3

Column totals _____ + _____ + _____ + _____ =

Total score _____

If you checked any problems, how difficult have they made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all

Somewhat difficult

Very difficult

Extremely difficult

Source: Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PRIME-MD-PHQ). The PHQ was developed by Drs. Robert L. Spitzer, Janet B.W. Williams, Kurt Kroenke, and colleagues. For research information, contact Dr. Spitzer at ris8@columbia.edu. PRIME-MD® is a trademark of Pfizer Inc. Copyright© 1999 Pfizer Inc. All rights reserved.

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Appendix B



Research Integrity & Compliance Institutional Review Board

Student Faculty Center

Phone: (215) 707-3390

3340 N. Broad Street, Suite 304 Fax: (215) 204-4609



Philadelphia PA 19140 e-mail: irb@temple.edu

Approval for a Project Involving Human Subjects Research that Does Not Require Continuing
Review

Date: 30-Oct-2025

Protocol Number: 32624

PI: AMELIA BIEDA

Review Type: EXPEDITED

Approved On: 30-Oct-2025

Risk: Minimal risk

Committee: A2

Sponsor: NO EXTERNAL SPONSOR

Project Title: Mindfulness Intervention in Hemodialysis
patients

The IRB approved the protocol 32624.

The study was approved under Expedited review. The IRB determined that the research does not require a continuing review, consequently there is not an IRB approval period.

If applicable to your study, you can access your IRB-approved, stamped consent document or consent script through ERA. Open the Attachments tab and open the stamped documents by clicking the View link next to each document. The stamped documents are labeled as such. Copies of the IRB approved stamped consent document or consent script must be used in obtaining consent.

Note that all applicable Institutional approvals must also be secured before study implementation.

These approvals include, but are not limited to, Medical Radiation Committee (“MRC”); Radiation Safety Committee (“RSC”); Institutional Biosafety Committee (“IBC”); and Temple University Survey Coordinating Committee (“TUSCC”). Please visit these Committees’ websites for further information.

Finally, in conducting this research, you are obligated to submit the following:

- Amendments - All changes to the research must be reviewed and approved by the IRB. Changes requiring approval include, but are not limited to, changes in the design or focus of the research project, revisions to the consent document(s) for participants, addition of new measures or instruments, increasing the subject number, changes to the research funding, and changes to the personnel. Changes made to eliminate apparent immediate hazards to subjects and implemented prior to IRB approval must be promptly reported to the IRB.

- Reportable New Information - Using the Reportable New Information e-form, report new information items such as those described in HRP - 071 Policy - Prompt Reporting Requirements to the IRB within 5 days.
- Closure report - Using a closure e-form, submit when the study is permanently closed to enrollment; all subjects have completed all protocol related interventions and interactions; collection of private identifiable information is complete; and analysis of private identifiable information is complete.

For the complete list of investigator responsibilities, please see the HRP-070 Policy – Investigator Obligations, the Investigator Manual (HRP-910), and other Policies and Procedures found on the Temple University IRB website: <https://research.temple.edu/irb-forms-standard-operating-procedures>.

Please contact the IRB at (215) 707-3390 if you have any questions.

If you would like to tell us how we are doing, please complete this 5-minute

Satisfaction Survey:

<https://forms.gle/9EcgYGDEEANnvMw37>

Appendix C

RESEARCH SUBJECT CONSENT FORM

Title: Mindfulness intervention for hemodialysis patients

Protocol No.: Temple protocol number 32624

Investigator: Name: Amy Bieda, PhD, MSN, APRN, NNP-BC

Peter Kim, BSN, RN, FNP (DNP student and Project Lead)

Temple University College of Public Health

Department of Nursing

Paley Hall Office 260D

1210 W. Berks St

Philadelphia, PA, 19122-6088

Country

Email: Tuo82682@temple.edu

amy.bieda@temple.edu

Daytime Phone Number: 610-247-9680

RESEARCH CONSENT SUMMARY

This section summarizes a research study you are being invited to participate in. We want you to have the key information up front so you may decide if participating is right for you.

More details are provided later.

KEY INFORMATION

Purpose: The purpose of the study is to utilize a mental health wellness app for people who are on hemodialysis and may be experiencing anxiety.

Procedures: If you choose to participate, you will be asked to use a mindfulness app on your smartphone. The app has many meditations

Duration: This study will take approximately 6 weeks

Risks: The potential risks or discomfort from this research are minimal, confidentiality risk

Benefits: The potential benefits to you from this research will be improving your mental health and wellness. It may also help other dialysis patients.

Joining this research is your choice. If you have any questions before making your decision, please feel free to ask. You can change your mind at any time.

RESEARCH CONSENT This is an invitation to take part in a research study. People who join this research are called research subjects or participants.

This research has key things you should know:

Someone will explain this research to you. This consent form should match that explanation.

If you don't understand something, ask questions.

You're in control. It's totally up to you if you want to join and volunteer to be in this study.

There is no penalty for saying no. Declining, now or later, will not negatively affect you in any way.

Can you change your mind later? Yes, you can always say no, even after saying yes.

Do not hesitate to ask all your questions before deciding.

Why are we doing this research?

This research will help us learn more about mental health awareness for hemodialysis patients. The overall goal is to help hemodialysis patients with both their physical wellness and mental health. The purpose of this study is to see a decrease in anxiety by using the information on the meditation app.

How long will the research take?

Participants will be in the project for six (6) weeks. Remember, you can stop being in this research at any time.

What will happen if you join this project?

After initial consent, you will be asked to fill out a survey at the chair side, before starting the app. Your name and demographic information will be obtained from you in person by the project lead. You will be given instructions on how to download the Healthy Minds™ app on your mobile device by the project lead. Headphones will be given to you to use during the meditations. Weekly follow-up conversations will be held with the project lead beside your dialysis chair. We want your opinion on the app and its usage. This will be done weekly for a total of 5 weeks. The sessions are estimated to take 10-15 minutes. A follow-up survey will be conducted a week after the project is done. Your name and surveys will be de-identified. After completion of the study, you will continue to have access to the app if you want to use it.

What is your responsibility if you join the research?

If you decide to participate in this research, you will be expected to:

Download the Healthy Minds™ app on your mobile device

Fill out demographic information about yourself

Fill out a survey before using the app and after completion of the meditations on the app.

Are there any risks?

There are no physical or psychological risks that are identified in mindfulness interventions

Confidentiality risk: there is minimal risk of loss of confidentiality

Will it cost you money to be in this study?

There will be no cost to be included in this project.

Will this research benefit you?

We cannot promise any benefits to you or others for taking part in this research.

However, possible direct benefits to you may include helping other people who are on hemodialysis.

This study may directly benefit you. However, the research might contribute to scientific knowledge, or benefit others or future generations by understanding mental health awareness among the hemodialysis population.

Are there other choices instead of being in this research?

This study is not meant to diagnose, treat, or prevent any illness. You can choose not to participate.

What if I get hurt from being in this research?

If you get hurt or sick because of this research study, tell the research team right away so they can get you medical care quickly. Temple University, Temple University Health System, and its subsidiaries do not promise to pay you money or provide free medical care if you are hurt because of the study.

Who will see the information that you give?

This project will collect some private information about you. We will only share your information with people who need it for this research and will take steps to protect your privacy. However, we cannot promise complete secrecy.

It is important to know that by agreeing to join this research, your identifiable information may be shared with people who are running or overseeing the research, including The Institutional Review Board (IRB) that approved the research Individuals from Temple University and Temple University Health System, and its affiliates, who oversee research

We will not collect any data from the Healthy Minds™ app for the purpose of this research.

Although this is not the purpose of this research, we are required by law to report instances of child abuse and/or neglect to the relevant university and law enforcement agencies.

We may have to break confidentiality if the researchers believe you pose an immediate danger to yourself (e.g., suicidal thoughts) or someone else.

We may publish the results of this research, but we will not include your name or any other information that could identify you.

We will make every effort to safeguard your data, but as with anything online, we cannot guarantee the security of data obtained via the Internet. The Healthy Minds app used in this study has its Terms of Service and Privacy policies

The Healthy Minds™ Privacy Policy is located on the app.

We may use or share de-identified data (i.e., data that does not contain your identifiers) or samples from this for future research studies. We may share de-identified data or samples with other researchers for future research without asking for your separate consent.

Who can answer your questions about this research?

If you have any questions, concerns, or complaints about the research or you think this research has hurt you or made you sick, you can contact the research team at the phone number or email listed on the first page.

This research is overseen by an IRB, an independent committee that reviews research studies. You can contact the IRB at (215) 707-3390 or irb@temple.edu if:

You have questions, concerns, or complaints that are not being answered by the research team.

You are not getting answers from the research team.

You cannot reach the research team.

You want to talk to someone else about the research.

You have questions about your rights as a research subject.

Can you be removed from this research without your permission?

You can be removed from the research without your permission. Here are some reasons why this might happen:

It is not in your best interest

You are unable to keep your scheduled appointments

You are unable to comply with your research assignments

