UNIVERSITY OF NAIROBI

COLLEGE OF BIOLOGICAL AND PHYSICAL SCIENCE

SCHOOL OF COMPUTING AND INFORMATICS

TELEPSYCHIATRY FOR THE TREATMENT OF DEPRESSIVE DISORDERS IN KENYA

BY

LUCILLE OKELO-ODONGO P51/11484/2018

SUPERVISOR

PROF. PETER WAIGANJO WAGACHA

A research project submitted to the School of Computing and Informatics in partial fulfillment of the requirement for the award of the degree of Master of Science in Applied Computing

DECLARATION

I declare that this project is my original work and has not been submitted to any institution for award of any degree.

Student

Name: **Lucille Okelo-Odongo**

Registration number: P51/11484/2018

Date: ……

Signature……..……

I do hereby certify that this project proposal has been presented for examination with my approval as the Supervisor.

Supervisor

Name: **Prof. Peter Waiganjo Wagacha**

School of Computing and Informatics,

University of Nairobi.

Date……..…

Signature……..

DEDICATION

I dedicate this research project to my late father Prof. W. Okelo-Odongo and my late grandmother Carolyn Okelo-Odongo.

ACKNOWLEDGEMENT

I thank the Almighty God for providing me with the ability to take this journey as well as for his guidance, strength and provision of necessities to complete it.

I thank my supervisor, Prof. P. W. Wagacha for his much appreciated advice and encouragement, and his insightful guidance throughout this research.

I am grateful for the assistance given to me by the teaching and non-teaching staff of the University of Nairobi, School of Computing and Informatics.

Special appreciation goes to Dr. S. Ruhiu, Dr. L. Njue, my aunt Juliet and my friend Chiharo for their advice and contributions. Finally, I thank my family and friends who have always encouraged and supported me throughout my research.

Abstract

Averagely 450,000,000 people globally suffer from either a mental or behavioral disorder or in some cases both with approximately 1,000,000 people taking their own lives annually and in every four families, at least one member suffers from a form of mental disorder and four of the six leading causes of years lived with disability (YLD) are as a result of neuropsychiatric disorders (WHO 2018). Mental health is an area that has been widely neglected globally. Very little is put into this field in terms of funding, infrastructure and awareness. This is a field where even medical practitioners shy away from, with the number of medical personnel falling way below the recommended standards.

Depression is a common mental illness affecting close to 264 million people globally with almost 800,000 lives lost yearly as a result of the illness (WHO 2018). In Kenya 75-85% of the population is not able to receive the mental healthcare they need due to barriers faced such as limited human and/or financial resources and few mental health facilities amongst others (KNCHR 2011). There are less than 100 psychiatrists in the entire country with majority of them concentrated in urban areas. There is also limited availability of services in the community and primary healthcare facilities and as a result mental healthcare is provided from district level upwards only leaving a gap in the provision of services at the lower levels.

Currently, the total internet subscription in Kenya stands at 39.3 million (CAK 2020). Availability, reduced costs and ease of access to internet enabled devices has led to this impressive growth in internet subscription which has in turn led to the rapid growth of use of social networking sites in facilitating sociocultural, scholarly, economical and political debates. With the massive growth and uptake of technology and the integration of this technology in various fields including the medical field, services such as telemedicine can be used in bridging these existing gaps in mental healthcare in Kenya where it has not been well utilized yet.

This study aimed to bring forth the current situation in the mental healthcare in Kenya as well as provide a means of using existing technology, which in this case is telemedicine, to bridge the gap of access and availability of mental healthcare services. A telepsychiatric prototype system was designed and developed after a review was done on literature and existing models and a preliminary survey carried out on psychiatrists in the country. The literature review and results of

the preliminary survey were used in determining the design of the prototype system. The system is an online web-based chat system that provides a platform for interaction between the clinician and the client. It allows for video calls and chatting between clinician and client and has a note pad where the clinician can take down personal notes. The note pad is not visible to the client. The system also includes the three most commonly used assessment tools according to the preliminary study results and it is able to compute the score of the assessment test, give the level of severity of depression and recommend the action to take. The clinician is also able to access reports to be able to monitor a client's progress and view scheduled appointments. The prototype system was then tested by experts by availing it to them to interact with and a usability test carried out to determine if the system had indeed met the user needs. The results were analyzed and showed that the prototype system indeed provided a platform where access to mental healthcare can be accorded efficiently. The healthcare providers were able to interact with the clients through chat and video, assess the clients and provide needed treatment remotely, as well as store and retrieve client files easily.

The covid-19 pandemic posed a challenge in data collection but it also brought forth the necessity of such a system in delivering mental healthcare services remotely. Further research can be done to utilize the same concept in the treatment of other mental disorders.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

ADHD- Attention Deficit Hyperactivity Disorder

APA- American Psychology Association

CBT- Cognitive Behavioral Therapy

CDC- Center for Disease Control

CHW- Community Health Workers

DSM-5-Diagnostic and Statistical Manual version 5

ECT- Electroconvulsive Therapy

HIV/AIDS- Human Immunodeficiency Virus, Acquired Immunodeficiency Syndrome

ICTs- Information Communication Technologies

IHP-Informal Health Practitioners

ISDN- Integrated Services Digital Network

KMHP- Kenya Mental Health Policy

KNCHR- Kenya National Commission on Human Rights

MDD- Major Depressive Disorder

PAHO- Pan American Health Organization

PTSD- Post Traumatic Stress Disorder

SAT- Structured Association Technique

THF- Traditional Faith Healers

YLD- Years Lived with Disability

WHO- World Health Organization

CHAPTER 1: INTRODUCTION

1.1 Background

WHO defines mental health as a condition of well-being whereby a person is able to go about their normal lives, carrying out whatever activities they are required to and can do so productively thereby contributing to the community (WHO 2013). Mental health is a vital part of overall health and well-being of a person and includes our psychological, emotional and social well-being affecting how we feel, act, think, handle stressful or unexpected situations, relate to others and make healthy choices (CDC).

A person's health may change over time due to various reasons and as a result the person is referred to as being mentally ill. Morin A. 2019, defines mental illness as a condition that has a negative effect on the way a person feels, behaves or thinks. It can be caused by various factors and may take many forms and it could be occasional or chronic. WHO lists the determinants of mental health as; Social and economic factors (unemployment, high illiteracy levels, homelessness and general poverty), demographic factors (gender and age), major physical diseases such as HIV/AIDS and cancer can contribute to mental disorders due to anxiety and stress, environmental factors in relation to families (bereavement, failure, family breakups also play a part in mental disorders), conflicts and disasters. Mental health just like physical health is very important for our overall health. It can escalate the chances of other chronic illnesses such as type 2 diabetes, stroke and also heart disease. Equally, chronic conditions are capable of increasing the risk of mental illness (CDC).

Over 200 classified types of mental disorders exist with the main categories listed by the world health organization as; **schizophrenia and other psychoses, depression, dementia, bipolar disorder and developmental disorders such as autism (**WHO**).**

1.2 Psychiatry

The branch in the medical field that deals with the cause finding, working out prevention techniques and the actual diagnosis, treatment and management of mental illness is defined as psychiatry (Trivedi J. K. et al 2006). Despite the terms psychiatry and psychology often being used interchangeably, there is a distinction between the two and the practitioners who study them.

Psychiatry is practiced by psychiatrists; medical doctors who are trained on how to assess mental disorders by evaluating clients from a biopsychosocial view before prescribing medication for treatment. Disordered behavior is influenced by multiple aspects of life hence the psychiatrist needs to have the knowledge on the normal development processes across the lifecycle which are: psychological, social and biological and how these processes influence behavior and functionality. On the other hand, psychology, practiced by psychologists, specializes in understanding and helping those with mental disorders. Psychologists possess extensive postgraduate training in mental health, psychological assessment and psychosocial interventions as well as psychotherapy. Psychology is basically concerned with normal everyday behavior as much as mental illness (Trivedi J. K. et al 2006).

Whereas psychiatrists might claim exclusive experience in medication-based interventions and also the general medical context, clinical psychologists might claim explicit expertise in psychosocial interventions and also the general psychosocial context. Psychologists unlike psychiatrists start with a general psychological training rather than general medical training before going onto postgraduate courses and they are generally not authorized to prescribe medication though they may study the effects of drugs or other chemical agents on the brain. Simply put, a psychiatrist evaluates the social and psychological aspects of a person in respect to the biological knowledge available whereas a psychologist does not necessarily consider the biological aspects associated with psychiatric disorders. It is however recommended that both psychologists and psychiatrists work in tandem.

Another contributing member of the mental healthcare team is the counselor who traditionally works in a community setting. Counseling is a master's level practice-oriented profession. Instead of counseling education being specific to social work, psychology or medicine, it builds on theory and study of behavioral science. Mental health counselors' practice takes a similar outlook to science by way of practice by being built on skeptical, cautious, and evidentially-based judgment. It actually, comprises of the implementation of science, that is, reflects local and individualistic study with each client. Having information about behavior science and being trained to specialize on the strengths, development and also the holistic multiple faced features of on-going mental health, counselors utilize scientific processes to strengthen or rehabilitate clients' psychological

state. They are concerned with health and with the wide circumstantial variations, socially and individually, that can diminish or obstruct the functioning of a person's life (Carole M. P. 2001).

The diagnosis process of a mental illness patient is complex in that it constitutes much more than just identifying a disorder. Not only should the positive aspect such as personal and social assets as well as quality of life be described, but the diagnosis should also incorporate a standardized diagnostic formula with a personalized diagnostic formula that includes a combination of the clinician, patient and family perspectives displayed in natural language. The standardized formula must gel with the personalized and socialized formula to make an accurate diagnosis (Trivedi J. K. et al 2006).

1.3 Mental Health Problems

Mental Health problems are societal problems that can affect just about anyone but unfortunately the risk is higher among the poor, unemployed, refugees, children and adolescents, abused women and men and the elderly (WHO 2003). As it stands at the moment, less than 60% of countries globally have mental health policies, less than 70% have mental health programs and about 25% have no legislation governing mental health. About 33% of the countries globally allocate less than 1% of their overall health budget to mental healthcare and another approximate 33% spend only 1% of their budgets on mental healthcare. Half the countries world-wide have only one psychiatrist for every 100,000 patients and 40% of the countries have a deficit of beds where one bed is expected to serve 10,000 mental ill patients (WHO 2001).

Mental health is a field of study that many shy away from. In Canada in 1962, the recommended ratio of psychiatrists to population was set at 1:10,000. However, over the years this ratio that was adopted by the American Psychiatric Association has been found to be inadequate by both Canada and the United States of America and as a result Canada advocated for a ratio of 1:6,500 while recommending 1:8,000 for the future. The Royal Australian and New Zealand College of Psychiatrists however recently proposed that the ratio fall between 1:7,500 and 1:10,000 (Burvill P.W. 1992). Despite this recommended ratio, in 2014-2016, WHO estimated the number of psychiatrists and psychiatric nurses in low-income countries at 0.1 and 0.3 respectively per 100,000 people. In high income countries it is 120 times greater for psychiatrists and 75 times greater for nurses (WHO).

Mental illnesses can effectively be managed through medication or psychological interventions though only a few of those suffering from the same are able to receive even the most basic form of treatment (WHO 2003). Even in developed countries that boast of well systematized health care systems, 44%-70% of clients needing treatment are unable to receive it in any given year and when it comes to developing countries, the number rises to close to 90% (WHO 2003).

Kenya, like any other low and middle income country, has a very under-resourced mental health care system. Mathari National Referral hospital aside, mental healthcare services can only be accessed at 28 of the 284 hospitals that fall in Level 4 and over of the national referral chain, representing merely 10% of the total facilities in Level 4 and above and 0.7% of the 3,956 government-owned health facilities (KNCHR 2011 and Bitta et al 2017). As a result, clients seeking assistance at all health facilities in levels 3 and below, and in the 255 facilities that fall in level 4 and beyond of the referral chain cannot access these mental healthcare services. Between 20-25% of outpatients seeking medical attention suffer from mental illnesses ranging from depression, panic disorder, post traumatic stress disorder, generalized anxiety disorder, alcohol dependence to obsessive compulsive disorder (KNCHR 2011).The rising cases of unexplained violence, suicides and homicides seen in the country can also be attributed to mental disorders (KMHP 2015). Traumatic events such as rape, combat and disasters amongst many others are seen to have played a significant role in the development of post traumatic stress disorder (PTSD), depression and anxiety (KMHP 2015 and Fortney J. et al 2015).

1.4 Depression

Depression (Major Depressive Disorder) is a common mental disorder affecting close to 322million people globally. Depression varies from the normal mood fluctuations and emotional reactions to daily challenges faced. It can become serious if long-standing regardless of intensity. Depression can strike at any time of an individual's life but is commonly known to appear first during the late teens to mid-20s. Nearly 800,000 lives are lost yearly due to depression-induced suicide and women are found to be more prone to experiencing depression than men (APA and WHO).

Between 76% and 85% of individuals in low and middle-income countries are unable to receive treatment for their illnesses, despite there being known and effective treatment for mental disorders. Depression is regarded as one of the most responsive to treatment of mental illnesses

with 80%-90% of patients responding well to treatment. Barriers to effective care include a lack of resources, lack of trained health-care providers, social stigma associated with mental disorders and inaccurate assessment or misdiagnosis (APA and WHO).

1.5 Concept of Telemedicine

Telemedicine is a technological aspect that provides a bridge of access to medical services by eliminating distance barriers, thus exposing those without direct access to healthcare to medical personnel from anywhere in the world (Okoroafor J et al 2016). Long distances to health facilities, underfunding, under qualified clinicians and limited medical workforce, health unawareness, and high illiteracy levels in parts of the population are listed as some of the barriers that limit access to quality healthcare (Acharibasam J. et al 2018).

Telemental health is an umbrella term used for all mental health technological interventions used in providing care to patients with mental disorders by clinicians from a distance (Chakrabarti et al 2016). The American Psychology Association defines telepsychiatry as a subset of telemedicine that provides mental healthcare services such as psychiatric evaluations, patient education and medication management and therapy (individual, group or family). Telepsychiatry encompasses supporting primary care givers of mentally ill clients with consultation and expertise services but can also involve direct interaction between client and psychiatrist.

Mental healthcare can be availed via live interaction communication but it can also involve recording medical information via images, videos and other methods and relaying them to experts for viewing or reviewing. Telepsychiatry is usable in a variety of settings including; private practice, outpatient clinics, hospitals, correctional facilities, schools, nursing homes, and military treatment facilities. Though telepsychiatry has the drawback of the client and clinician being in different vicinities, it produces increased feelings of safety, security and privacy for several clients. Telepsychiatry has been found to be effective among psychiatrics, other professionals and clients among all age groups. For people with autism, anxiety disorders and physical limitations, remote treatment has been found to be particularly useful and actually preferable to in-person care. It has also been found to be rather effective in the treatment of Post Traumatic Stress Disorder (PTSD), depression and Attention Deficit Hyperactivity Disorder (ADHD) (APA).

1.6 Problem Statement

Globally as many as 450 million people suffer from a mental or behavioral disorder with nearly 1 million people taking their own lives yearly; one in every four families has at least one member suffering from a form of mental illness and four of the six leading causes of years lived with disability (YLD) are due to neuropsychiatric disorders (depression, alcohol-use disorders, schizophrenia and bipolar disorder) (WHO 2018). The total number of people globally suffering from depression is 322 million, 354 million suffer from PTSD and about 264 million people live with anxiety disorders (WHO 2018, WHO 2010, Hoppen T. H. et al 2019). Unfortunately, majority of the patients who suffer from mental disorders have no access to efficient and quality health care due to limited human and/or financial resources and few mental health facilities. For Kenya, 75-85% of the population does not receive the mental healthcare they need. There are less than 100 psychiatrists in the country expected to treat the entire population and because of the shortage of medical personnel, a large number of the population is unable to get access to mental health care. Affordability of services is another issue, with patients at Kenya's mental referral hospital- Mathari Hospital for example, being charged Ksh 200, Ksh 400 or Ksh. 1,800 daily depending on the type of accommodation; and private health insurance for psychiatric treatment is pegged at a certain cost per year which is barely enough to cater for all expenses (KNCHR 2011).

1.7 The Gap

A gap exists between the mental health needs of the Kenyan population and the currently existing mental health services provided at all health care delivery system levels. An optimal mental healthcare services mix model developed by WHO emphasizes the integration of primary mental health care, backed up by promotion, prevention, care and treatment in hospitals and in the community. There is limited availability of services in the community and primary healthcare facilities and as a result mental healthcare is provided from district level upwards only. The concentration of these services at the higher levels has left a wide gap in the provision of healthcare in the lower levels thereby limiting the access to mental healthcare at the community level. Availability of information about mental health services is also lacking thereby inhibiting accessibility. For example it is not well known which health facilities offer mental health services

in Kenya and as a result clients would rather travel to Mathari Referral Hospital for treatment because it is well known other than seek treatment around their homes (KNCHR 2011).

1.8 Research Objectives

1.8.1 Main Objective

To determine the feasibility of the use of telemedicine in providing healthcare for mental illness and develop and validate a prototype that will guide the use of telemedicine in the diagnosis, treatment and management of depressive disorders in Kenya.

1.8.1.1 Specific Objectives

1. To review the challenges faced by patients suffering from depression and their caretakers.
2. To determine the feasibility of telemedicine for treatment of depression in Kenya.
3. To develop an architecture for the use of telemedicine in the treatment of depression.
4. To design, develop and test a prototype of telemedicine solution.

1.8.1.2 Research Questions

1. What are the challenges faced by patients suffering from depression and their caretakers?
2. What are the current measures put in place to aid in the treatment of depression?
3. What are the features of a model that can assist in the treatment of depression?
4. How can telemedicine be used as a solution to improve access to mental healthcare?

1.9 Significance

This project is expected to improve the availability of mental healthcare by bridging the barriers experienced by mentally ill patients and mental health workers. The project will be used by the mental health medical personnel, community health workers, patients and patients' caregivers in cases where they exist. The project is expected to assist;

1. Mentally ill outpatients who have no access to mental health facilities due to distance be able to access the healthcare they need.
2. Medics in the mental health space who are overburden with workloads due to their limited number.
3. People who need mental health care but are afraid to go seek it due to stigmatization.

4. The Ministry of Health in helping to deal with mental diseases thus having a healthier nation.

1.10 Justification

A major traumatic event faced by Kenya as a country was the post-election violence in 2007/2008.Consequences can still be felt heavily across the country and they included; loss of land and forced displacements, interruption of schooling and working activities, human rights violations, household politically-motivated violence and sexual violence that resulted in sexually transmitted diseases, physical abuse, anxiety and depression as well as stigmatization. As a result of these traumatic events, a study by Ndetei D. et al 2014 revealed that Kenyan adults were found to have traits of Major Depressive Disorder (MDD) and PTSD, increased substance abuse and suicide ideations and attempts with women increasingly likely to report MDD in comparison to men. 36.8% of the study respondents said they did not have adequate access to mental healthcare with reported barriers to the much needed mental healthcare including; access to healthcare facilities, costs, fear of stigma and privacy concerns.

The researchers highlighted that mental state disorders, like MDD, PTSD, suicidality, and substance use are vital issues that need attention in Kenya. Counseling was established as the most essential service sought out by the respondents and future mental health programming ought to address the reported obstacles to seeking psychological health care such as stigmatization, privacy, fees and access that are current issues in the mental healthcare space. Though there is proof to support the integration of mental healthcare services with primary healthcare services in Kenya, there is conjointly a desire for specialized and acute mental healthcare services, particularly following periods of violence with it largely applying to groups such as ex-military personnel who face similar traumas and have no access to mental healthcare on their return home (Ndetei et al 2014). A study done by Matilda O. 2015 revealed that traumatic effects can lead to alcoholism and drug abuse particularly in the initial and progressive stages but not so much in the relapse stages. The users indulge in these vices in a bid to cope with traumatic events in their lives some of which include, marital issues, loss of loved ones, employment issues, financial constrains, physical and psychological abuse, depression and maladies. Because traumatic events are unpreventable and continue to occur in our daily lives as can be seen in the raising cases of

homicides and suicides that are currently happening in our country, it is necessary that we find a positive way to deal with the effects it has on the affected.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Those suffering from mental and psychological disorders are vulnerable due to the treatment they face from society. Most times they face stigmatization and discrimination daily and are highly exposed to physical and sexual victimization sometimes even by family members. Stigma has devastating effects on people living with psychiatric disorders, their families and care takers. Mental illness associated stigma includes: stereotyping about, and subsequently acting against particular people endorsed by large social groups (public stigma), loss of self-esteem and self-efficacy brought about by internalizing public stigma (self-stigma) and belief that mental illness is a mode of punishment for wrong doing and as such society members, especially women, are discouraged from associating with individuals afflicted by mental illness (label avoidance). Supernatural beliefs, magic and religious beliefs play a role in stigmatization of the mentally ill. 12-18% of the population in Kenya believes that those with mental illnesses have been bewitched or that the illness is a mode of punishment for wrong doing and that those affected should atone for their sins. This behavior prevents the mentally ill from seeking much needed mental healthcare. Mentally ill patients often face restrictions in their exercising of political and civil rights and their ability to take part in public matters as well as attending school and finding employment. Access to essential and social care, emergency services included, is not readily available for them too and they are regularly excluded from development programs despite the fact that the goal of development is to reach the most vulnerable groups. These factors place mentally ill people at a position where they are more likely to experience disability and premature death as compared to the general population (WHO, Ana-Claire Meyer and David Ndetei 2015).

A study by Ndetei D. et al 2009 was carried out across 10 health centers across Kenya whose aim was to evaluate the prevalence of common psychiatric disorders in adults 18 years and above. Out of a total of 2770 males and females that were tested, the study revealed that 42% of the target population had mild or severe depression. The health facilities in the study included; Kenyatta National Hospital which is a national teaching and referral hospital, Embu provincial hospital, Kiambu and Kajiado district hospitals, Naivasha and Makindu subdistrict hospitals and Kibera and Karuri health centers, a faith-based hospital in Kikuyu as well as a private medical institutional in Magadi. With the exception of the health centers, all the facilities offer both

inpatient and outpatient services. Out of the total 2770, only 4.1% subjects had an existing file or working diagnosis of a psychiatric situation, falling under bipolar mood disorder, schizophrenia, psychosis and depression. Using Beck Depression Inventory (BDI), an instrument for assisted diagnosis; it was found out that the prevalence rate for depressive symptoms ranged between 42.3% and 66.2% in different facilities. The study concluded that there are many cases of mental illnesses that are undiagnosed and therefore unmanaged. Some of the reasons for this can be attributed to the low number of psychiatric health workers.

Additionally, a study carried out by Kamaru-Kwobah E. W. 2013 on adherence in mental disorder patients reported that 33.7% of the participants missed their medication since their previous visit to the health facility and 22.8% missed a clinic in the previous year. Some of the reasons given for non adherence included not knowing the illness they suffered from, not knowing the names of their prescribed drugs, lack of faith in the medicine, feeling better hence not seeing the need to continue taking medication as well as feeling the need to take a break from the medication, fear of stigmatization, carelessness, lack of awareness about medication featured strongly as a reason for missed medication. Negative attitudes towards medication, lack of awareness, stigma, poor social support, use of herbal medication, high cost of medication and drug adverse effects were associated with non adherence.

2.1.1 Risk Factors for Depression

Factors that play a role in depression include; biochemistry (differences in certain chemicals in the brain), genetics (depression can run in families. For example, in twins, if one is depressed there is a 70% chance the other will be too at some point of their lives), personality (individuals who suffer from low self-esteem, who get stressed easily, or who are pessimistic by nature) and environmental factors (regular subjection to violence, neglect, abuse or poverty) (APA).

2.1.2 Types and symptoms

Depressive disorders can be classified as mild, moderate or severe. They can also be categories between patients who have or do not have a history of manic episodes.

Recurrent depressive disorder: This disorder involves repeated episodes of depressive nature where the individual undergoes loss of interest in activities previously enjoyed, depressed moods

and recreased energy resulting in diminished activity for a period of at least two weeks. Anxiety symptoms, feelings of guilt and low self worth, poor concentration, improper sleeping patterns and lack of appetite may also be present.

Depressive episodes are categorized as mild, moderate or severe depending on the symptom numbers and the severity. With severe depressive episodes the individual may cease participating in work, domestic or social activities but with mild depressive episodes the individual may only experience difficulty in carrying on with their work or social activities but they usually will not halt functioning completely.

Bipolar affective disorder: An individual suffering from this type of depression experiences depressive and manic episodes separated by periods of normality. The individual experiences decreased need for sleep, over-activity, pressure of speech, elevated or irritable moods and inflated self-esteem.

2.1.3 Treatment of Depression

A diagnostic evaluation, built on an interview and a physical examination, if needed, is conducted before diagnosis or treatment of the disorder is given. This evaluation seeks to determine the individual's medical and family history, cultural and environmental factors that may influence the mental state and identify the specific symptoms displayed by the individual. After evaluation the individual may be treated by:

Medication: For cases where the brain chemistry contributes to depression, antidepressants may be given to modify the brain chemistry. Improvement can be seen within a week or two of use but full benefits may be visible after two to three months. However, it is recommended that intake of medication continues for 6 or more months after improvement of symptoms of even long-term for certain people at high risk to decrease the risk of future episodes. If no improvement is noticed, the psychiatrist can alter or substitute the medication.

Electroconvulsive Therapy: This type of therapy involves electrical brain stimulation briefly while the patient is under anesthesia. This treatment is used on patients who suffer from severe major depression or bipolar disorder and whose response to other treatments has not been satisfactory. The patient receives ECT 2 or 3 times weekly for a total of 6 to 12 treatments and a

psychiatrist, anesthesiologist and a nurse comprise of the team that are associated with this treatment. It has been used since the 1940s and has been improved since its conception.

Psychotherapy: Also known as “talk therapy” is sometimes used on its own for mild depression treatment. For moderate to severe depression, it is combined with antidepressants. Cognitive behavioral therapy (CBT), a mode of therapy that focuses on the present and problem solving, is known to be effective in depression treatment. It helps an individual recognize distorted thinking and change their thinking and behaviors. Psychotherapy can be used for individual or group treatment for example; group therapy that involves people with similar illnesses or couples therapy that involves helping couples address issues in their relationships. Duration of treatment varies depending on the severity of the depression but in many cases improvement can made in 10-15sessions.

2.1.3.1 Types of Psychotherapy

Psychotherapy involves more than just sitting in a room and talking to a psychotherapist. The psychotherapists engage in various techniques that are employed to help individuals recover from mental illnesses, create desired changes in their lives and resolve personal issues. Psychotherapy can be effective in treatment of depression as it can assist an individual burrow into the root reasons for the depression and take up new coping skills. Many types of therapy exist and therapy used depends on the person’s individual therapy goals, severity of the symptoms and your own personal preferences. Psychotherapy can be provided in numerous of ways and may at times incorporate more than one form. Common formats include; individual therapy (involves one-on-one work between a therapist and client), family therapy (works for family settings), group therapy (generally involves between three to fifteen people), couples therapy (geared between married couples) (Schimelpfening, N. 2020).

Types of psychotherapies include; Cognitive therapy (individuals learn to identify common patterns of negative thoughts and how to turn them into positive thoughts thus improving the individual’s mood), behavior therapy (entails assisting individuals to take part in activities that enhance feeling of well-being), cognitive-behavioral therapy (this is a combination of behavioral therapy and cognitive therapy that focuses on addressing negative thought patterns as well as behaviors that contribute to depression and learning new thinking patterns and ways of

responding), dialectical behavior therapy (this is a type of cognitive behavioral therapy that teaches clients how to cope with stress, improve relationships with others and regulate emotions), psychodynamic therapy (helps the client become more aware of their full range of emotions and help them bear with these feelings and put them into a more useful perspective) and interpersonal therapy (involves examining social relationships with people in the client's life and finding ways of resolving existing conflicts) (Schimelpfening, N. 2020).

2.2 ICT in Kenya

Since the launch of the internet in 1990s in Kenya, the ICT sector has massively grown and Kenya is currently being referred to as the silicon savannah. Kenya's dynamic ICT sector has led to the development and growth of applications such as Mpesa an Ushahidi that are recognized globally. As at March 2020 the total internet subscription was at 39.3 million in Kenya (CAK 2020). The availability and ease of access to internet enabled devices has led to this growth in internet subscription which has in turn led to the rapid growth of use of social networking sites. Social media sites and apps have opened doors to numerous opportunities for people to get and stay connected. Social networking sites have become essential in creating content, sharing ideas, distribution of materials expressing opinion and use of information and knowledge. Interaction via social media has become has become a daily habit for many (SIMElab 2020).

2.2.1 Social media trends in Kenya

A vast majority of Kenyans use Whatsapp and Facebook with the percentages standing at 89% and 81.7% respectively. Third most used social media site is Youtube (51.6%). With the COVID-19 pandemic, video conferencing and web conferencing platforms such as zoom have become more popular and so have social sites such as TikTok, Likee, and IMO.

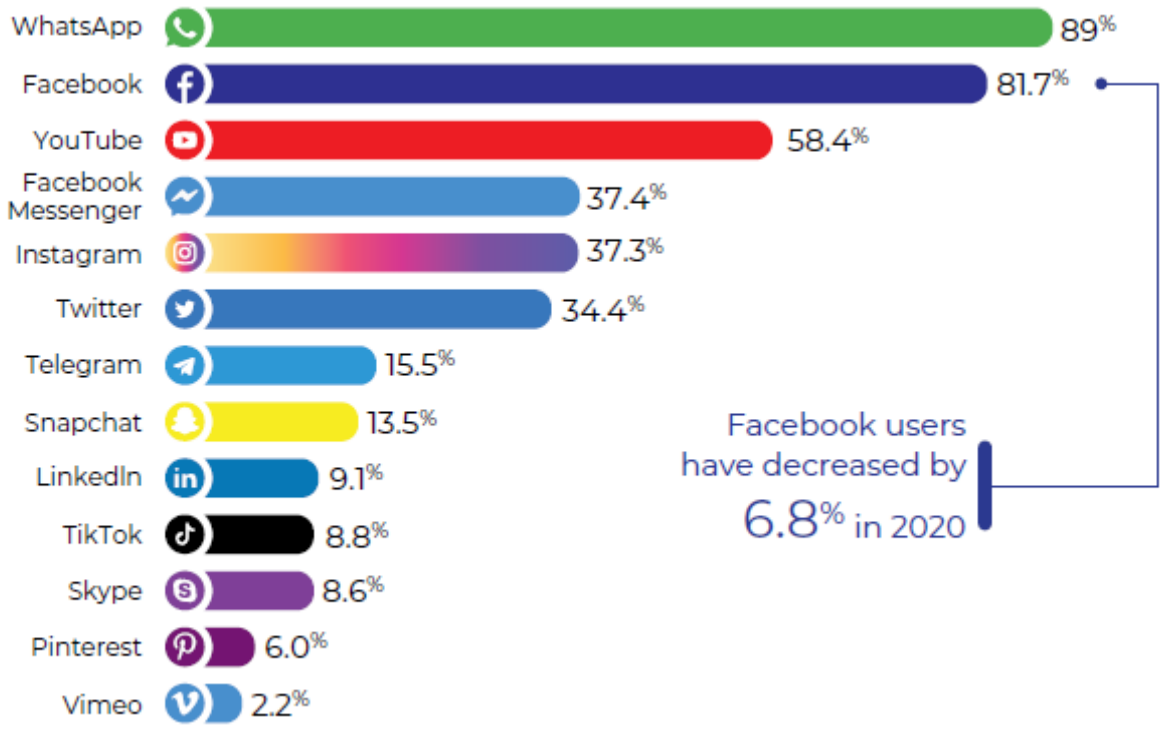


Fig 1: Use of social media (source: SIMElab 2020)

The most active age group on social media in 2020 is those who fall between 21-25 years. Users in the age bracket of 26-35 are more active on professional websites LinkedIn, Skype and Twitter and those between 36 and above mostly use Facebook and Whatsapp (SIMElab 2020).

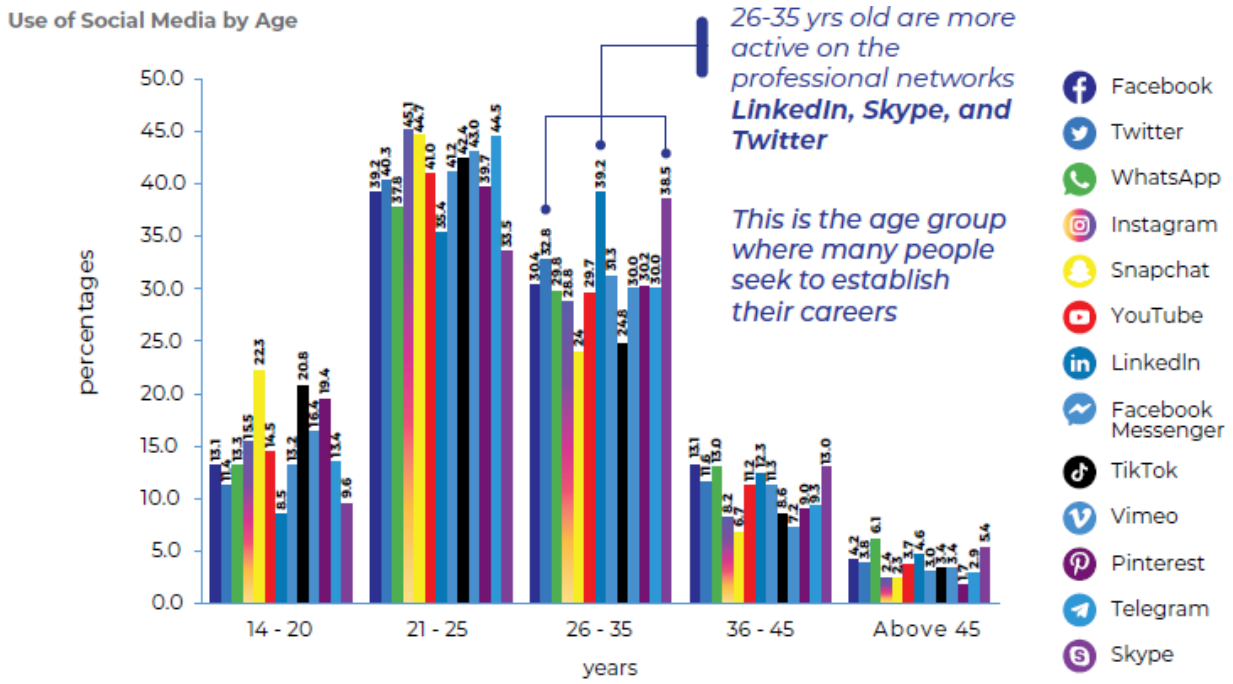


Fig 2: Use of social media by age (source: SIMElab 2020)

Social media is mostly used to acquire information, for entertainment and social interactions, personal identity, a mental break and escaping social realities. Facebook messenger, telegram and Whatsapp are used for social interactions with family members, friends and to connect with the outside world while LinkedIn, Pinterest and Twitter are mostly used to acquire information.

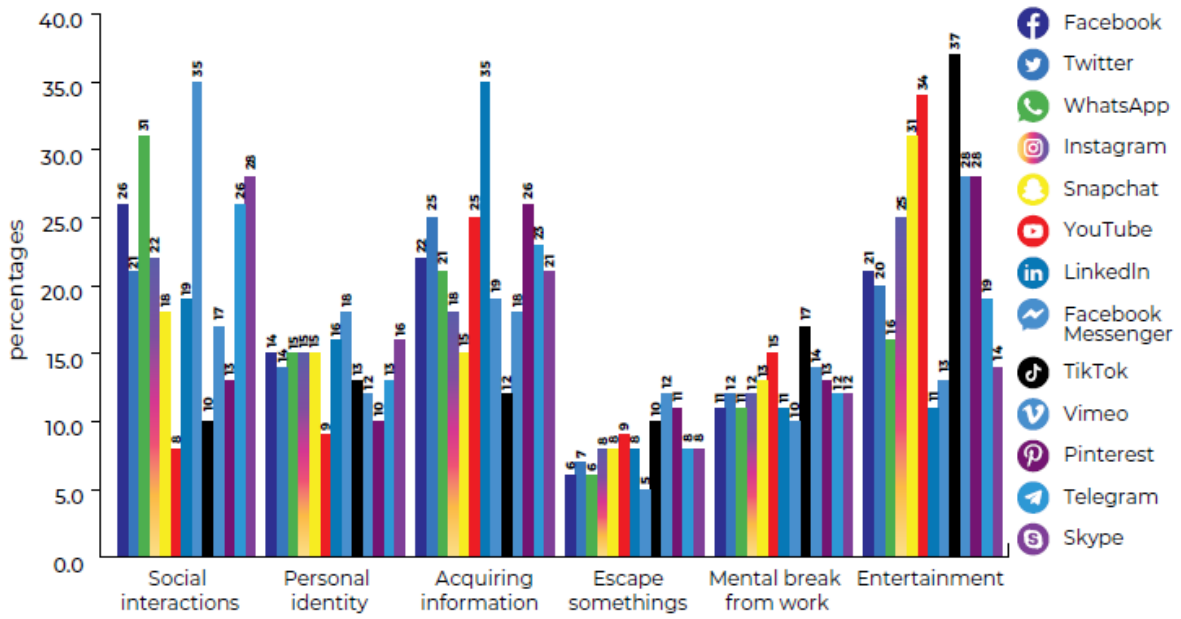


Fig 3: Motivation for using specific social media (source: SIMElab 2020)

This report highlights the fact that Kenyan's use of the internet and social media specifically is widespread and it cuts across all different social statuses and ages with chat sites being the most popular for various reasons. As a result, the benefits of social media can be utilized with respect to the characteristics of the population in other aspects of our lives such as healthcare.

2.3 Telemedicine

The history of telemedicine is dated back to the mid to late 19th century with one of the initial accounts that have been published occurring in the early 20th century where electrocardiography data was conveyed via telephone wires. Modernly and largely driven by the military and space technology sectors, telemedicine began in the 1960s. Primary uses of telemedicine consist of the use of television to enable consultations take place between a psychiatric institute and general practitioners in a state mental facility and also the provision of expert medical advice from a major teaching hospital to a medical center in an airport. Over the past decades, the largest drivers of telemedicine technology have been attributed to availability and utilization of ICTs by the common population as well as advancements in the telemedical field. Developing countries have not been left behind in these advancements. The change to digital forms of communication in addition to the swift decrease in the market prices of ICTs has greatly inspired the growth of telemedicine amongst healthcare providers (WHO 2010).

WHO classifies telemedicine applications into two categories; store and forward and real-time. Classification is based on the timing of the information being transmitted and the interaction between the involved individuals whether they are health professionals or a health professional and a client. Store and forward involves the exchange of prerecorded data while real-time involves immediate exchange of information thus individuals need to be present at the same time. For both cases, information may be transmitted between different parties via various forms of media such as text, audio, video or images (WHO 2010).

Telemedicine adoption is highest in Europe, America, and South-East Asia, while Africa and the Eastern Mediterranean have the slowest uptake (Wilson L. et al 2015). In the 1990s, the development of telemedicine was faced with challenges such as limited telecommunications infrastructure and costly peripheral devices at the time. Now, it is used in various clinical arenas for many clinical specialties such as; in the exchange and transmission of diagnostic x-ray and other images (teleradiology); both clinical laboratory and the management of records and electronic clinical history (telepathology); provision of videoconferencing and image transmission in dermatology (teledermatology); providing psychiatric clients with consultations and treatment by means of videoconferences and chats (telepsychiatry); the treatment and management of cardiovascular illnesses (telecardiology). In addition to this, telemedical resources and virtual reality, robotics and artificial intelligence resources are utilized in tandem in the supporting and monitoring of surgical procedures and even increasingly to perform surgery remotely (telesurgery) (PAHO 2016).

Telemedicine offers great opportunities but the benefits can be felt even more in developing countries where access to healthcare is a huge concern. According to WHO, telemedicine has bettered the quality and accessibility of medical care by providing a platform for evaluation, diagnosis, treatment and follow-up of clients in undeveloped countries despite the distances faced. Early diagnosis and timely treatment can be administered therefore improving the quality of life of the clients as well as following up to ensure adherence to medication (WHO 2010).

Despite the field of telemedicine having a lot of potential to bridge the distance of access to healthcare amongst other immerse benefits of the technology, and in the long term enhance the

overall quality of health care, various factors contribute to the lack of adoption of telemedicine in developing countries. Factors from a study of various literatures that affect the adoption of telemedicine include; Technical factors, Human factors, Organizational factors, social factors and reinforcement factors (Suraya M. et al, 2015). In addition, issues of dissatisfaction among health care providers arising from doubts about the usefulness of telemedicine for mental health care and its ease of use, unawareness and unfamiliarity about technological aspects, as well as concerns about increased workload also play a role in its lack of adoption (Chakarbarti et al 2016).

2.3.1 Telemedicine in Africa

Mbarika V. et al 2016 list various success stories regarding the use of telemedicine in developing countries particularly in the sub-Saharan Africa; In Dakar Senegal, the is a scenario where three healthcare facilities are connected by ISDN, allowing for transmission of medical information including images; in Ethiopia telemedicine has been utilized for consultative and referral services ensuring clients don't have to travel long distances and end up not seeing a physician; Telemedicine has been used to disseminate information to many doctors as was seen in a case in Zambia as a responsive measure to a cholera epidemic where a librarian was able to receive literature from partner library at the University of Florida and relay the same to the medical personnel; in Ghana Malaria researchers at a distant site in the north and the London school of Hygiene and Tropical Medicine as well as the Tropical Disease Research Center in Geneva were able to exchange information using telemedicine services; Consultants at Luigi Sacco University Hospital in Italy use a clinical management system that allows for treatment diagnosis and follow-ups for patients at the health center at Pointe Noire in Congo (Mbarika V. et al, 2006).

Though the use of telemedicine in Kenya is quite below par, there is a slow but growing rise in the use of technology to facilitate the spread of healthcare especially to hard to reach regions. In a study by Amuomo N. O. and Wagacha P. W. on the use of telediagnostic for automated medical diagnosis, telemedicine is used to reduce diagnosis time and get proper diagnoses of malaria, skin disease, tuberculosis, cholera and others by development of a prototype that comprises of an online image matching and retrieval application. Sample images are uploaded to the application, analyzed and then feedback relayed via an SMS gateway server to the registered user who in this case would be the community health workers who possess minimal knowledge of pathological procedures. The prototype results showed that telediagnosis is viable in that; the system allows

access to healthcare for people residing in remote areas through the community healthcare workers. It is also quite a cost effective system as the prices of mobile phones continue to go down and is generally cost effective for the client in terms of transport fees, laboratory fees and time.

2.3.2 Telemedicine in Mental Healthcare

Over the past few years, a lot of research has been put into mental healthcare interventions globally. There are three areas where complex interactivity and a more elaborate technical environment can be regarded as grounds for obtaining high impact clinical benefits. These are listed as intensive care, emergency medicine and general mental health care. Under mental health the process of consultation takes place between the health care provider and the client. The consultations can be difficult without telemedical intervention as healthcare givers and clients are often separated by distance and these same clients do not go to the health facilities because they face stigma associated with visiting these mental health care institutions (Chakrabarti et al 2016).

A study carried out by Langarizadeh M. et al, indicates that the utilization of telemental healthcare for psychotherapy and other mental conditions both reduces the cost of care and improves clients' satisfaction. Additionally, technologies like videoconference, messaging systems, web-based interventions, mobile phone technology, social media interventions, simulations and video presentations for mental health care purposes and internet games are seen to motivate patients, promote therapy and have the potential to change less than normal behaviors. The researchers list the capabilities of telemental health care in; imaging and behavioral analysis, evaluating people's physical and mental conditions, evaluating speech and language disorders to diagnose mental conditions, acoustic analysis to determine people's emotional and psychological state and using existing data to improve evaluation and diagnostic methods. Other capabilities are; online information exchange, psychiatric consultation in both emergency rooms and primary care and home care interventions (Langarizah M. et al 2017).

Studies done have showed that telemental health interventions for example, computerized occupational therapy, videoconferencing, SMSs, audiovisual aids and telephone calling follow-up exhibit successful contributions to symptom improvements of patients suffering from Alzheimer's, dementia, depression, obsessive-compulsive disorders, aggression and psychiatric-

related physical conditions. Telemental decision-support technologies exhibit improved clinical mental assessment and diagnosis and that they are quite feasible. With a few exceptions, the studies revealed a high level of satisfaction from the clinicians with the accuracy levels, assessment time efficiency and level of diagnostic concordance as compared to traditional forms of assessment (Acharibasam J. et al 2018).

It is quite evident that telepsychiatric services, whose origin was to meet the mental health care needs of people suffering from mental disorders and had trouble accessing health facilities, have grown over time both in scope and reach from being preponderantly a north-American and European phenomenon in the 1990s to being established in numerous countries globally (Chakrabarti et al 2016). The expansion of telepsychiatry can be attributed to rapid advances in technology, reduced costs of ICTs, and improved access to the Internet-based platforms and advances in research. There are three growth phases in telepsychiatric research; The primary phase consisted of descriptions of novel programmes, reliability of assessments done through telepsychiatric, preliminary research on clinical outcomes and cost-effectiveness, and satisfaction in conjunction with acceptance among users; the second part consists of randomized controlled outcome trials with larger samples and improved designs with growth in realism and the possibility of better evaluation of effectiveness and the third phase witnesses a more critical appraisal of the proof, development of each of the models and guidelines for optimum care, as well as additional advanced research on aspects such as costs and funding, ethical and regulatory issues, and dissemination and sustainability of telepsychiatric services. The growth in terms of services and research-evidence clearly suggests that telepsychiatric services have matured to a degree that they can be looked at as being feasible for mental health care delivery (Chakrabarti et al 2016).

A number of studies look at the employment of telepsychiatry for case management and care giving plans, crisis intervention, neuropsychological testing, legal aid, forensic evaluations, liaison services, and on administrative concepts like record-keeping and academic uses. These studies have been conducted across a variety of variables including majority of commonly occurring mental disorders; clients of varying ages, ethnical backgrounds and cultures and different settings like military settings, correctional settings, clinical, residential and community from which numerous results have been developed including reliability, efficacy, effectiveness,

ease of access, acceptance, cost effectiveness, sustainability and feasibility of telepsychiatry. From these studies, Telepsychiatry-based diagnostic assessments including structured interviews, scales, neuropsychiatric, neuropsychological, and forensic assessments have proven to be as reliable and accurate as face-to-face evaluations. The researchers say that randomized controlled trials have been conducted in anxiety and depressive disorders, post traumatic stress disorders, eating disorders, schizophrenia, substance abuse and suicide prevention among adults, children and the elderly, and among other client populations and the research has been complemented by vast research on videoconferencing, Internet, computer or Web-based psychotherapy mainly CBT, which has shown that psychotherapy delivered by means of telepsychiatric is as effective as in-person therapy. Client satisfaction with telepsychiatric assessments and treatment including psychotherapy has also been found to be consistently high in most studies, and there's unequivocal evidence that telepsychiatry increases access to high-quality psychological health care and reduces inequities in provision of care (Chakarbarti et al 2016).

2.3.3 Benefits of Telemedicine

Benefits of telemedicine include better adherence to appointments and medication thereby reducing loss to follow-up, overcoming social isolation brought about by stigmatization, access to contextual patient information in case of future need of use, improved client and healthcare giver safety, removal of stigma fears, improved access to mental healthcare, reduced costs, increased room for flexibility and comfort and increased interactive sessions between clients and clinicians (Wilson L. et al 2015 and Langarizah M. et al 2017).

2.3.4 Limitations of Telemedicine

Langarizah et al found that there exist a number of key concerns brought about telemental health care. These are limitation of necessary skills to be able use the technological interventions by both the clinicians and clients, unavailability of ready necessary investment for establishing the equipment and maintenance in form of periodic upgrades, issues of access to internet services especially for those in very remote areas and regular evaluation of the service and its efficacy. Additional concerns are whether the service is covered by insurance, which directly impacts the physicians' revenue that may lead to bias against some clients, unclear quality control and standards, clinician's reluctance to adopt the technologies and general technophobia and the risk of having patients' and clinician's data exposed (Langarizah M. et al 2017).

2.4 Existing Interventions

In many Sub-Saharan countries, Kenya included, traditional and faith healers (THF) have been embraced as an alternative for provision of health care and especially mental healthcare. THFs are considered a cheaper alternative as poor clients are able to receive treatment and then pay later. They were also found to be easily available and accessible as their number surpasses the number of mental health practitioners and they can be found in remote areas and thirdly, they are able to monitor drug adherence, treat common mental disorders, provide psycho-education and detect and refer clients. There is increased effort to include TFHs into primary health care in Kenya and in Sub-Saharan Africa and positive results have been seen in facing challenges such as malaria, HIV/AIDS, tuberculosis, hearing impairment, cancer and mental illnesses such as depression, PTSD, dementia and alcohol use disorders (Meyer A. et al 2015).

Ndetei et al 2017 published a report on informal health practitioners (IHP) that revealed that the IHPs are better accepted in the community and are normally the first to be consulted in the community setting. This group includes the community health workers (CHWs) and the THFs and they are normally trained and involved in task sharing initiatives for better provision of medical services. Though CHWs have only recently begun to address mental disorders, THFs have frequently been used for the same. The role of the CHWs in providing community-based services like awareness and strengthening linkage between the locals and health care facilities and also the widespread use and integration of practitioners has been well recognized by the National Health Sector Strategic Plan II (NHSSP II) and has been found to be effective and culturally sensitive. Furthermore, the Traditional health practitioners bill that recognizes and regulates the practice of traditional medicine has been approved in many African countries, Kenya included, as was advocated in 2002 by WHO.

Task-sharing is a powerful method to tackle mental health issues and the TFHs are found to be willing to join forces with formal practitioners but they are often stigmatized by the biomedical practitioners leading to the failure of many projects including training. Additionally, IHPs are faced with challenges such as mistrust from clients, cultural misunderstanding and stigma, clients' lack of adherence to treatment, shortcomings of the referral system in that the IHPs face responsibilities beyond their roles, post referral treatment infrastructure issues and resource barriers in form of finances and time (Ndetei D et al 2017).

2.4.1 Existing Interventions in Other Countries

The Friendship Bench - Zimbabwe AIDS Prevention Project, University of Zimbabwe (Implementation: Zimbabwe)

The friendship bench lay health workers also known as grandmothers provide low-cost therapy and alleviate depression and other mental illness symptoms in HIV positive and other regular patients. The grandmothers deliver CBT in a comfortable environment on wooden benches within clinic grounds upon referral by clinicians. The client undergoes six counseling sessions of 45-minutes each, including a home visit and referral to other health or social services and income-generating activities where need be. Specialist support is made available through the use of mobile phones and tablets and a cloud-based platform serves to integrate training, screening client referrals and follow-up.

Social, emotional and economic empowerment through Group Support Psychotherapy - Makerere University (Implementation: Uganda)

Depression is treated through social encouragement which includes educating on effective coping skills and creating income-generating capabilities. The group-support psychotherapy reported a success of 85% recovery in depression and greater increase in functionality, self esteem and social support six months post treatment.

"Frugal Innovations" for promoting mental health among adults and children - Centre for Applied Research in Mental Health and Addictions / Simon Fraser University (Implementation: Vietnam)

This project provides telephone-based coaching and encouragement to families with children who suffer from behavioral difficulties and trains CHWs to assist patients in coping with depression and anxiety. Mental health disorders constitute 16% of the disease burden in Vietnam exceeding the global average with depression, anxiety and alcohol abuse being the most prevalent. With 1.7 psychiatrists and 11.5 psychosocial care providers per 100,000 population, the project seeks to fill this service gap by training CHWs to treat anxiety and depression stricken adults and by providing telephone based coaching and encouragement to behavioral affected children's families. A two year trial research successfully demonstrated the approach screening 1,300 people

out of whom 127 currently receive help for depressive disorders. The adult depression program will be scaled up building on that success.

Promoting a community-based mental health model in rural Haiti and building a national scale-up plan - Zanmi Lasante (Implementation: Haiti)

With only one psychiatric hospital and a health center in Port au Prince, neuropsychiatric disorders often go undiagnosed or untreated in Haiti. The Novel project helps to reach the most needy mental illness patients while working to assist the country build a national mental health care plan. With inspiration from community-based approaches used to manage illnesses such as HIV and tuberculosis, a 5X5 model was developed to treat people suffering from depression, psychosis, epilepsy, bipolar disorders and child and adolescent disorders. Health care is delivered by both professional and lay workers in the existing system and supervised across four pathways. In a 3-year pilot phase, 10,000 people were able to receive treatment and one-third have experienced improved clinical outcomes.

2.5 Text Based Dialogue Systems

There are diverse modes of delivering mental healthcare services. Web-based technologies provide ways for delivering mental healthcare effectively (Hoermann, S. et al 2017). The one-to-one conversation (chat) also known as synchronous text-based intervention is one form. Previously there has been poor take up of synchronous text-based interventions, however with research and new technologies, particularly the penetration of mobile phone technologies and improvements in artificial intelligence and natural language processing techniques, numerous start-up companies have ventured into this sector and released a variety of products for the provision of mental healthcare services using these emerging technologies. Chat-based texting may be in form of an SMS service, a mobile app or embedded within a website and they allow for one-on-one contact with a peer, therapist or automated relational agents (chatbots). Some may also allow for activity or sleep tracking. The researchers established that web-based chat services have the potential to provide mental healthcare to geographically dispersed populations, thereby reducing the barrier of seeking help and motivating them to seek one-on-one professional assistance, and that it is a preferred mode of service delivery. A major advantage noted in their study was the availability of support and its timeliness as users may need or want immediate

support. For these reasons it was found that synchronous text-based solutions between healthcare providers and clients are feasible and acceptable across a wide variety of users.

2.6 Existing Models

AbleTo

AbleTo is a technologically enabled intervention that is used in the delivery of behavioral therapy to individuals with behavioral health conditions remotely via video or phone and supported by digital tools. Health care is delivered by trained and supervised therapists and behavior coaches to clients identified either by outbound engagement via telephone or by referral from community or health plan providers. Initial consultation involves a full behavioral health clinic evaluation and risk assessment including assigning a provisional DSM-5 diagnosis via telephone. Individuals thought to be too risky and whom in-person community-based resources are seen to be more appropriate are deemed ineligible and are referred to a community health care provider. The intervention uses strict protocols to manage acute or imminent suicide risks and severe mental illness so as to ensure safety of the patient and others who may be at risk.

After the initial consultation, 15 modular sessions are delivered over a span of about 8weeks. These sessions alternate between behavioral coaching and psychotherapy sessions. The patient is attached to a program that matches his or her specific condition including self-reported life challenges, behavioral health conditions and acute and chronic medical conditions such as chronic pain, gastrointestinal conditions, diabetes, respiratory conditions and cancer. The program assignment is based on the client's primary concerns and complaints, symptom presentation, general medical and psychiatric diagnoses, and the therapist's assessment and recommendation at initial consultation. Treatment modes are based upon empirical research integrating standard and third-wave cognitive-behavioral therapy models and the session content is standardized and focused on identified areas for behavior change, but each client's experience is individualized to identify and address barriers and target goals.

The program spans across the Northeast, Southeast, Midwest and west of the United States and is predominantly used by females and addresses the barriers of patient identification, proactive engagement, access to health care and quality assured health care delivery. The AbleTo model is

meant to spot individuals at a time of increased risk for psychological comorbidity and to avail outreach to coordinate enrollment into a remotely delivered standardized therapy program tailored to fulfil individual clinical requirements. The program is able to reach people who did not report a history of diagnosed depression in their lifetime and is standardized with modular design allowing for dynamic adjustments to be made to meet individual treatment and care of each client while retaining an evidence-based protocol. Satisfaction has been recorded with high levels of reduction in depression. This model focuses on the treatment of behavioral health symptoms as a mode to reinforce adherence to general medical treatment and overall physical health outcomes and reduce cost of health care. An innovative behavioral health care model of this nature stands to benefit a variety of health care stakeholders, from clients to employers and payers (Dent L. et al 2018).

Digital SAT

SAT (Structured Associated Technique) method is an interview styled counseling and therapy technique that uses visual stimuli obtained by viewing images to identify unrecognized real feelings and desires by functioning associations, inspiration and intuition (Kamita, T. et al 2019). It differs from traditional counseling methods that use language stimuli obtained via interchange sessions with a counselor. SAT method consists of diverse techniques including; techniques to clarify the matter, characteristics of the person and to motivate them to unravel the issue including temperament coaching method, emotional clarification method and health coaching method. Stress reducing and problem solving techniques include; SAT imagery method which has emotional stabilization therapy, problem solving therapy and behavioral modification therapy. In this method the counselor reviews the client's main symptom, psychological characteristics, stress conditions and progress and effectiveness of counseling, selecting and administering appropriate techniques. Digital SAT is based on emotional stabilization therapy and can be administered to oneself upon prior training. The counselor asks the client a set of structured questions and the client then replies or enhances their image in their mind and goes on with the treatment. It begins by the client being made to recall a stressful situation therefore triggering a sense of discomfort in the body. Attention is then shifted to the body discomfort and a picture of mild warm lights printed on paper media from which the client is allowed to choose a cushy image and recall an image of the light that is surrounded and healed by the body discomfort (the light imaging method). Images of smiling faces symbolizing delight are also availed, allowing the patient to select the images they like, and enabling a recall to the feeling of security and safety that they

need. It is possible to achieve self-affirmation and stress reduction through encouragement of the client's own endurance and captivity, changing sense of discernment to vary the meaning and translation of the matter at hand and allowing the client to look forward to a constructive perception for solving the matter (the surrogate representation imaging method). The medical care giver checks the effects of the provided treatment from their conversations with the client, their face color and their gestures. The care giver then returns to pre-used procedures if the effect is found to be below par. Digital-SAT facilitates the SAT method without the need for a counselor. The procedures are classified into three categories; Assessment (clarification of problem and characteristics of patient and motivation to patient to solve the problem), Solution part (problem solving and stress reducing) and learning part (to get to know the psychological knowledge for maintaining mental health and increase resilience. With the SAT method, repeated stimulation of smile face images can better the improvement of mental state and also the frequent repetition is very important. However fall-out in users is the ultimate problem in conventional self-mental care method.

CBT-I Coach

Cognitive behavioral therapy for insomnia (CBT-I) is a data-driven psychotherapy that leads to significant decreases in symptoms of insomnia and improvement in sleep efficiency, sleep fragmentation, and sleep onset latency thereby deeming it effective in treating chronic insomnia. The effects of the therapy are found to be durable long after treatment is complete.

Sessions are delivered by a licensed mental health clinician and last approximately 6 hours on a weekly basis. However treatment can be completed in a shorter period if sufficient improvement is noted and relapse prevention strategies are discussed. The first session consists of a comprehensive assessment that guides an individualized case conceptualization which informs what treatment components are to be delivered and in what order. Daily sleep monitoring takes place via a consensus sleep diary that is used for assessing baseline sleep patterns, tracking change over time and adjusting and setting time spent in bed. The 4 major therapy components include sleep restriction (involves initially reducing time spent in bed and then gradually increasing it), stimulus control (consists of 5 guidelines aimed at strengthening the association between the sleep environment and sleeping that include: not going to bed unless sleepy, waking up at the same time every day, getting out of bed if unable to sleep, minimizing non-sleep

activities in the bed and limiting napping), sleep-focused cognitive therapy (used to address thoughts and beliefs that interfere with sleep or adherence to the behavioral recommendations) and methods to reduce arousal in bed (relaxation techniques, creating a pre-sleep buffer to allow for unwinding before going to bed, and techniques to address intrusive thoughts in bed). Also provided is tailored sleep education and sleep hygiene education (involves recommendations about consumption of contraindicated substances, diet, exercise, and changing the sleep environment).

CBT-I coach offers comprehensive sleep educational materials and an overview of CBT-I and related topics, including functions of sleep, sleep regulators, sleep apnea, stages of sleep and substances and medications that impact sleep. Also included is information on napping, winding down, eating, caffeine use, exercise, and alcohol use.

Users of CBT-I coach are provided with dynamic checklists that can be tailored to their interests, with ideas for encouraging adherence to stimulus control guidelines and sleep hygiene recommendations. For example, within the “Go to Bed Only When Sleepy” section, users can scroll through an inventory of suggestions to assist them keep awake until their prescribed bedtime and choose those they find most helpful, which is then able to appear as primary suggestions when the user returns to the current section. Additional sections also provide dynamic checklists to encourage users to urge out of bed if and when they cannot sleep, get out of bed at their prescribed time, set up an optimal sleep environment and reduce caffeine intake.

CBT-I Coach also includes a relapse prevention section in the form of a checklist. This tool helps patients identify CBT-I tools they can use should insomnia re-emerge and also avails guidelines for when patients should seek professional assistance. In addition to guidelines concerning re-emergence of insomnia, the tool provides information about symptoms of common sleep problems other than insomnia (for instance, sleep apnea and restless leg syndrome) so that patients are aware of when to seek help.

Despite the program being a success, there is still room for improvement as nearly a quarter of patients drop out of treatment prematurely or do not attend sessions regularly. It is not intended to replace clinician-delivered CBT-I; nonetheless, the app can be used as an educational awareness resource.

Additionally, CBT-I protocol uses paper diaries which can be difficult for some patients to remember to complete accurately and bring to sessions. It also requires calculations of variables from collected information which can be time consuming for the therapist. Two common instances of common entry mistakes include: entering an earlier sleep initiation time than time in bed, leading to a negative calculated sleep onset latency time and AM/PM confusion, which can in turn lead to unusually short or long time in bed or total sleep time.

Lastly, CBT-I Coach does not automatically transmit data from the mobile device. However, some users can email their sleep diary and ISI data to themselves so they can print it out and share it with their CBT-I clinician. However this applies to users of iOS version only. Having such capacity, via a clinician-facing app or a web-based dashboard, would be a major step towards increasing the efficiency of this data-intensive treatment protocol. Dashboards could additionally provide advanced analytics, geared towards a good richer understanding of sleep behaviors than is currently available through the essential calculations required in standard treatment.

RuralHub Telepsych System

This is a telepsychology-service for care delivery for elderly depressed veterans developed in South Carolina. It provides behavioral activation therapy through home-based telehealth services. Therapists and clients work in tandem to recognize value-based activities, existing obstacles preventing activities from being carried out and ways to overcome these obstacles. These value-based behaviors are scheduled by the clients and they proactively keep track of their successful completion using valued activity lists, daily planners and lists of strategies to overcome obstacles. Sessions are 60 minutes long, on a weekly basis for duration of 8 weeks using in-home videoconferencing technology typically on a tablet or computer.

Summary of features of existing models

The models above have different features that work in the treatment of different mental disorders depression included. Some features are found in more than one model while some may have features that other models do not have. The table below gives a summary of the technological characteristics found in these existing models of systems. The features existing in the different models will help inform the design of the prototype for this study.

Model	Psychotherapy Treatment	Access to therapist	Dynamic	Video/Phone	Allow for Referrals	Self treatment
AbleTo	CBT	✓	✓	✓	✓	×
Digital SAT	SAT	×	×	✓	×	✓
CBT-I Coach	CBT-I	×	✓	✓	✓	×
RuralHub Telepsych System	Behavioral activation therapy	✓	✓	✓	✓	×

Table 1: Summary of features

✓ - Feature exists

× - Feature does not exist

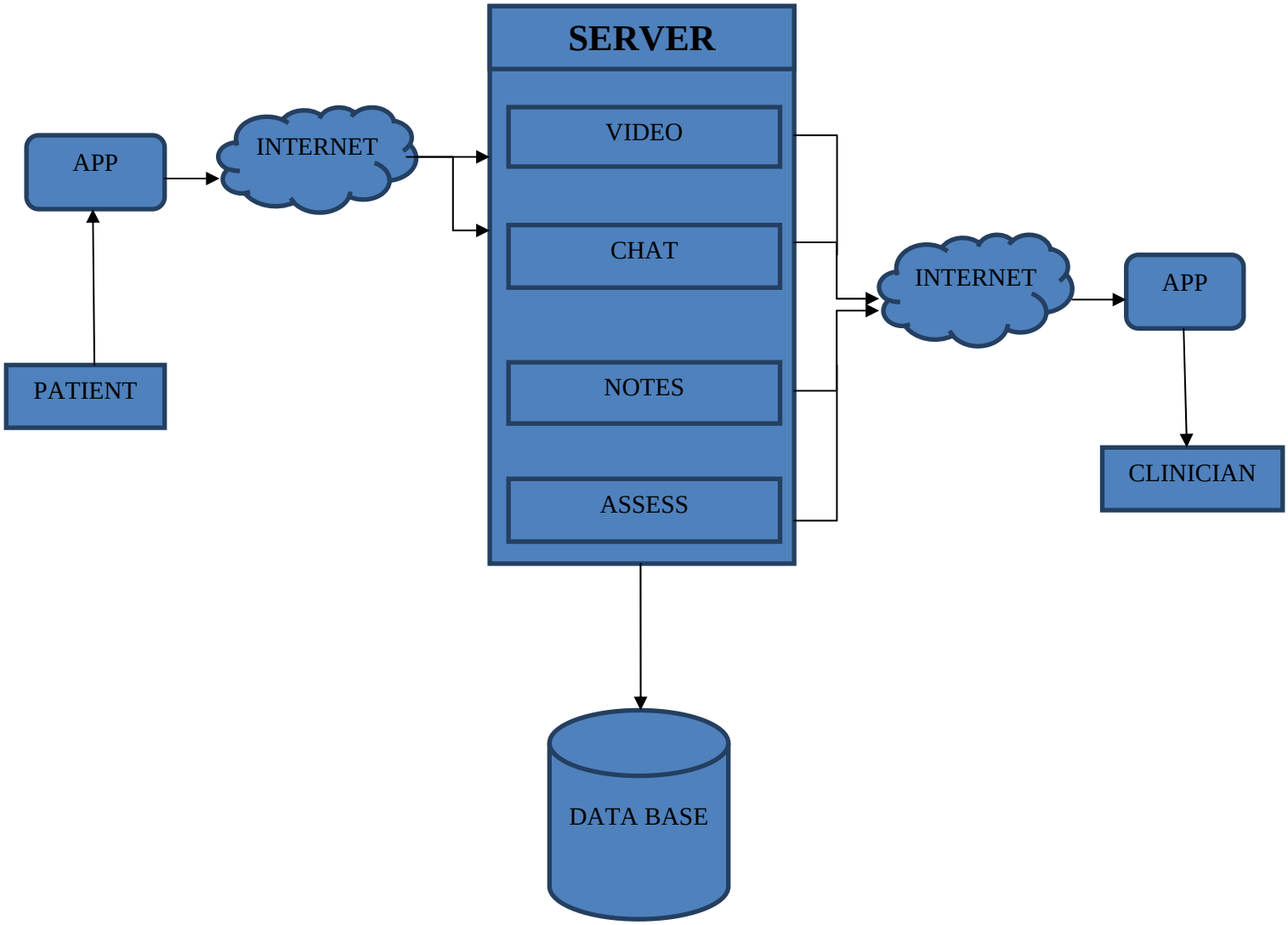
While the various models above allow for access to mental healthcare provision through chat the one thing that is constant is that they do not have video integrated into the systems that can allow for the clinician and client to see each other. This ability to see the client is vital in providing mental healthcare to the client as a large part of treating the client involves studying the body language of the client.

Summary

Based on the reviewed literature, reasons why individuals do not seek mental healthcare or complete their medication include; fear of stigmatization, lack of access, lack of financial resources and traditional and personal beliefs. The use of technology can help combat some of these barriers therefore improving access to mental healthcare and the well-being of depressed patients in the long run. The use of technology in mental healthcare in Kenya is lacking and a well designed web-based chat application would ensure access to the limited number of psychiatrists, allow for diagnosis, treatment and referral where needed, follow-up to improve adherence and encourage more people suffering from depression to seek help due to anonymity.

2.7 Conceptual Diagram

Below is a diagram of the conceptual architecture of the proposed system.



CHAPTER 3: METHODOLOGY

3.1 Research Methodology

This seeks to explain the methods that are used in the research process of the study. It elaborates how information is gathered, how it is analyzed and the results. This study comprised of; information gathering based upon the perception of the use of ICTs for treatment of depressive disorders, the designing and development of a prototype system and finally the testing of the prototype system.

3.1.1 Information Gathering

Information was gathered regarding the perception of use of telemedicine for the diagnosis, treatment and management of depression in Kenya. The aim of the research was to test a hypothesis that telepsychiatry can be used in the treatment of depressive disorders in Kenya. This information gathering was done by reviewing already existing works and also by carrying out a preliminary study using a questionnaire after which a prototype was designed and tested and feedback collected.

3.1.2 Population and Sampling

Population

The target population for the preliminary study comprised of psychiatrists who practice in various counties in Kenya as listed in the Master Registry of the Kenya Medical Practitioners and Dentists Council Registers. The Master Registry is officially recognized and it gives a list of all registered medical practitioners in the country. The option of using the Master Registry is so as to eliminate grounds for practitioners who may be unregistered or not fit to practice for one reason or another.

Sample size

The sample research study size for the psychiatrists was calculated with reference to Yamane's formula (Yamane, 1967). This dictates that;

$$n = \frac{N}{1 + N(e)^2}$$

Where; *n* = the sample size

N = the population size (73)

e = the level of precision (±5%)

The sample size will be 62.

3.2 Data Collection

Two forms of data collection were used in this study in order to determine the perception of the use of telemedicine in treatment of depressive disorders; understanding existing systems already in use in Kenya and in other jurisdictions through document reviews as well as performing a survey to understand the needs of the clinicians and what strategies they already have in place, and what their views are on the use of technology for the treatment of depressive disorders.

3.2.1 Document reviews

Reviews of existing published documents and information websites were able to inform on the current state of the mental health care in Kenya, what strategies are in place, what works and what does not and what is still lacking. The review of various documents was also able to determine what has been done in other similar countries and the pros and cons of the strategies in place in these other jurisdictions and if and how these strategies can be implemented in Kenya. Existing models were also reviewed and the features of these models that made them a success were also studied. This review helped in the designing of the proposed prototype system.

3.2.2 Questionnaires

For the preliminary study, questionnaires were used to gather information on the current situation and state of mental healthcare in the country, the perception of the use of technology in improving access to mental healthcare and what is currently in use. Reposes from the questionnaire also helped to inform the design of the prototype.

For the testing phase of the prototype, questionnaires were used to conduct a survey to inquire whether the prototype system met the user requirement needs, whether it is user friendly and gauge the intended uptake of the prototype.

The questionnaires were administered online using the Google forms platform.

3.3 Data Analysis

The data that was analyzed was from the responses from the preliminary study survey and also from the survey carried out after the testing phase of the prototype system. The analysis from the preliminary study survey contributed to the design of the prototype system. Collected data from both the preliminary study questionnaire and the testing questionnaire was analyzed using Google forms and represented in tables and charts.

3.4 Testing of the prototype

This involves testing the working of the prototype system. Once the prototype system was designed, it was built and then underwent testing. The mode of testing was expert testing where the system was handed to field experts to interact with and use. The experts then filled a questionnaire rating the different aspects of the system in their opinion. The results were then analyzed.

3.5 Ethical Issues

Mental health is a very sensitive issue as it touches on people's health. Because of this, the study will not involve collection of in-depth client data but will look into the overview of the psychiatrist's perception of the client gained from experience instead. Consent will be acquired from the respondents before the survey is carried out and a detailed explanation will be given focusing on the anonymity of the respondents. A permit from the school will be presented for verification purposes as well.

CHAPTER 4: SYSTEM ANALYSIS, DESIGN AND IMPLEMENTATION

4.1 Preliminary Study Results

A sample of 30 participants was contacted and 9 respondents participated in the study. The respondents consisted of both males and females or various ages from different counties across Kenya. The respondents also came from different health institutions, both public and private; hence they practice both privately and generally.

Variable	Attribute	No of respondents	Percentage of respondents
Gender	Male	4	44.4
	Female	5	55.6
Age	25-30	0	0
	31-40	4	44.4
	41-50	3	33.3
	51-60	2	22.2
	61-70	0	0
	>70	0	0
Area of practice	Private	3	33.3
	General	4	44.4
	Both	2	22.2

Table 2: Demographic characteristics of the respondents

Of the 9 respondents, 4 said they practiced in Nairobi County exclusively while 1 said they practiced in Nairobi, Kakamega and Machakos counties. 1 other respondent said they practiced in Uasin Gichu County. 3 responses were considered invalid.

County of practice	No of respondents	% of responses
Nairobi	4	44.4
Kakamega, Nairobi, Machakos	1	11.1
Uasin Gichu	1	11.1

Table 3: County of practice

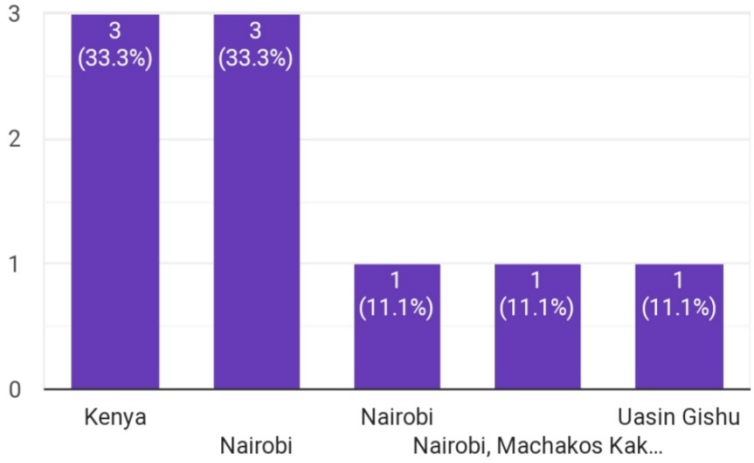


Fig 4: Counties of practice

1 respondent listed three institutions they work in which are in different counties. 2 respondents stated they practice at Mathari National Teaching and Referral Hospital and 1 respondent practices at Strathmore University.

Institution	**No of respondents**
Strathmore University	1
Psychiatry clinic	1
Gertrudes Children's hospital	1
Mathari National Teaching and Referral Hospital	2
CARE hospital	1
One Health Bishop Kioko Hospital Mumias	1
NSH	1
Moi Teaching and Referral Hospital	1

Table 4: Institutions of practice

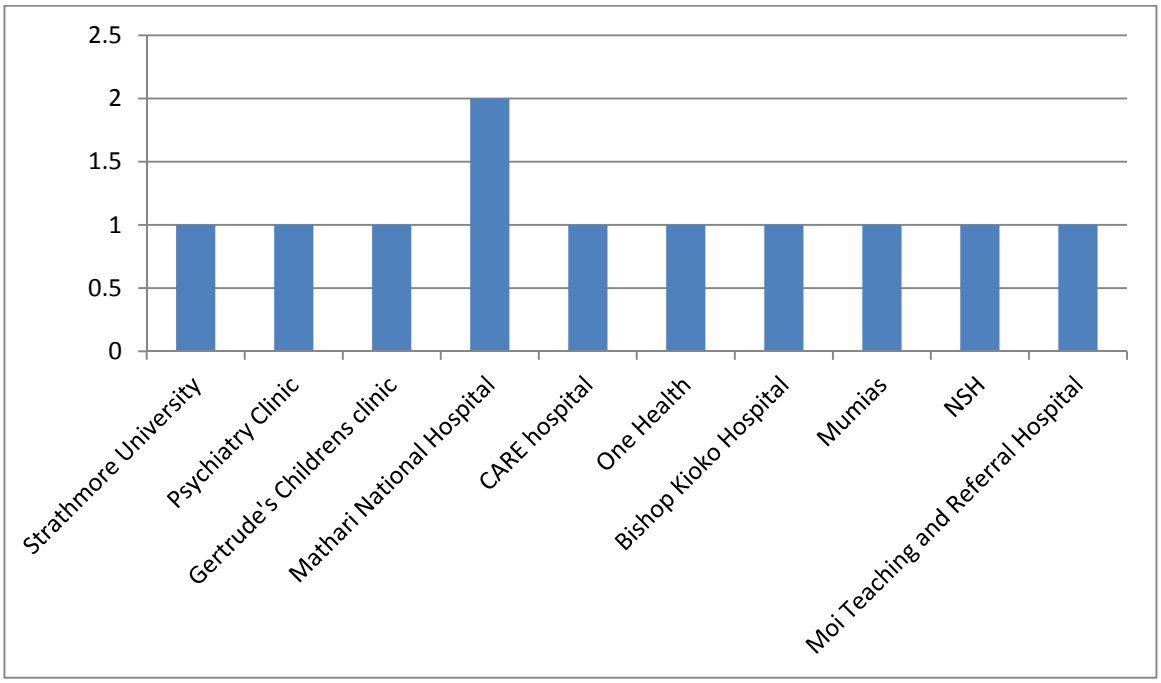


Fig5: Institutions of practice

All respondent stated that they provide treatment services while 88.9% offered assessments, diagnoses, follow-ups and referrals only. 11.1% offered other services that were not given in the options and which where stated as CME (continuing medical education).

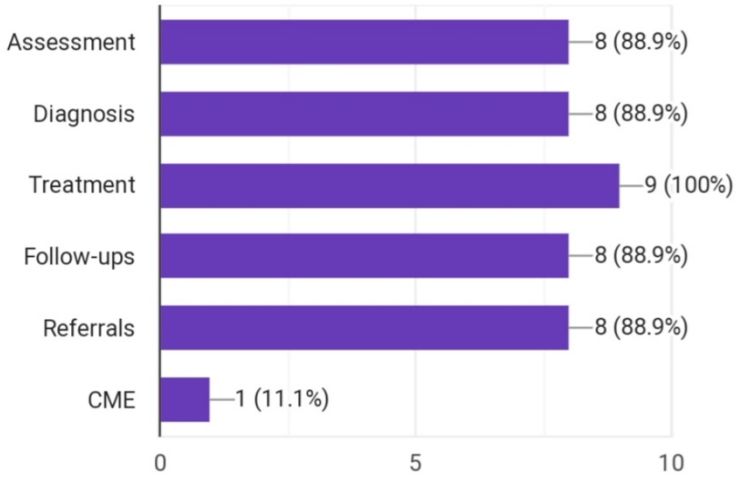


Fig 6: Services provided

33.3% of the respondents mainly get their clients by referrals from clinicians. 22.2% get most of their clients through referrals from other professionals and 11.1% get their clients via self-referrals, learning institutions or referrals from other clients. 11.1% also stated other means of getting clients as walk-ins.

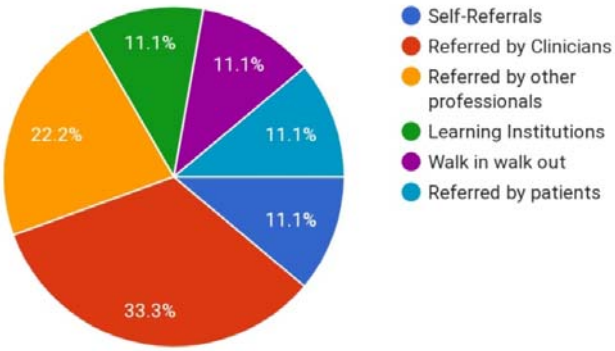


Fig 7: How psychiatrists get clients

66.7% of the respondents said they use assessment tools while 33.3% do not use assessment tools as shown on figure 13. The patient health questionnaire 9 (phq9) assessment tool was listed as the most used at 77.8%, followed by the beck depression inventory tool at 66.7%. The Hamilton depression rating scale was the third most popular at 33.3%. 1 respondent gave an alternative option of assessment as clinical judgment from the DSM5 manual.

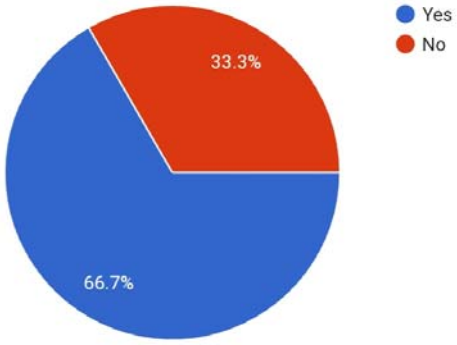


Fig8: Use of assessment tools

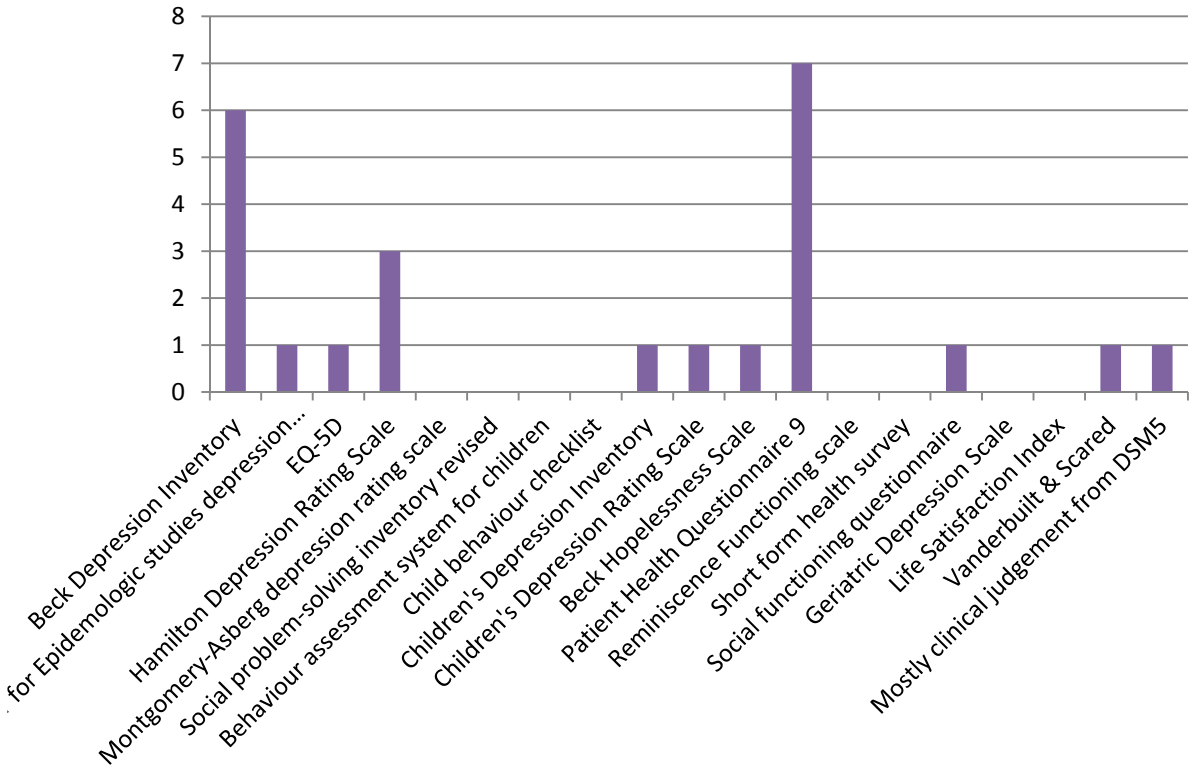


Fig 9: Assessment tools commonly used

77.8% of the respondents said they preferred listening to their clients speak without interruption as opposed to 22.2% who preferred asking the clients questions.

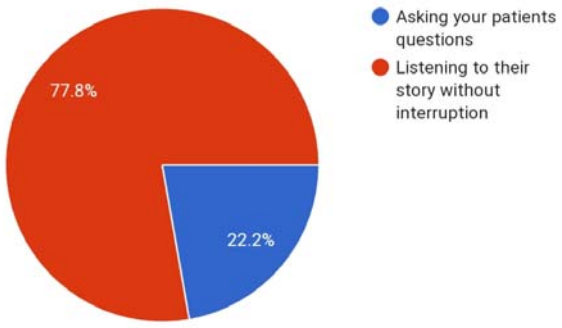


Fig 10: Preferred mode of session

When asked the diagnosis criteria of choice, DSM5 was constant across all respondents in the survey.

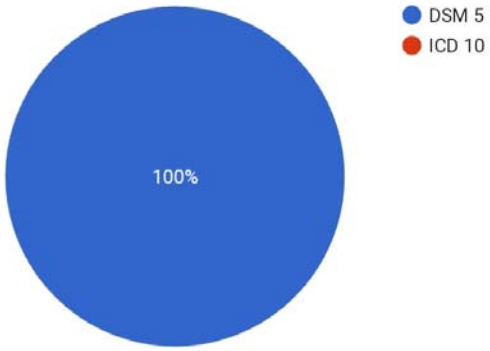


Fig 11: Diagnosis Criteria of choice

55.6% of the respondents rated loss of follow-up at 0-25% . With financial difficulties at 77.8%; perception of feeling better, poor social support and shame and stigma were given as the major reasons for loss of follow up.

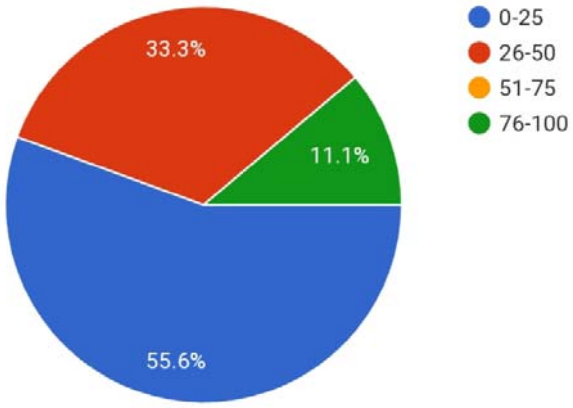


Fig 12: Rate of loss of follow-up

Reason	No of Respondents	% of respondents
Shame and fear or stigma	3	33.3
Financial difficulties	7	77.8
Change of provider	2	22.2
Limited availability of resources	0	0
Perception of feeling better	6	66.7
Lack of faith in medical practices	1	11.1
Carelessness and personal choices	1	11.1
Poor social support	4	44.4
Lack of awareness of medication	0	0
Drug adverse effects	0	0
Other (transport problems & poverty	1	11.1

Table 5: Reasons for loss of follow-up

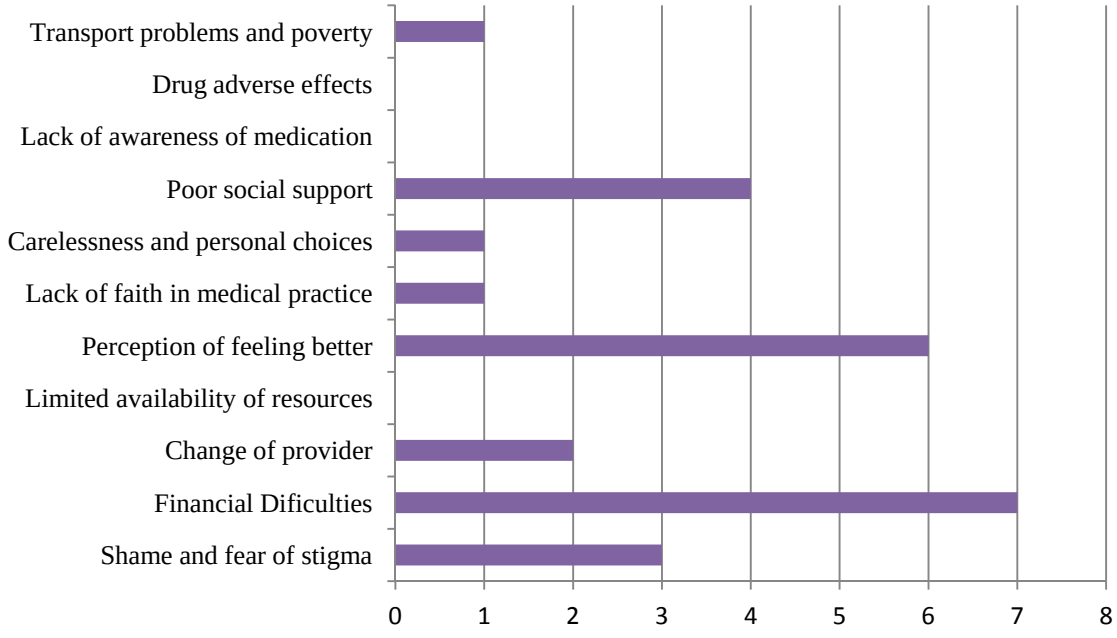


Fig 13: Reasons for loss of follow up

When asked their level of satisfaction with the current mental healthcare system in the country, 44.4% of the respondents rated it at 3 out of 5.

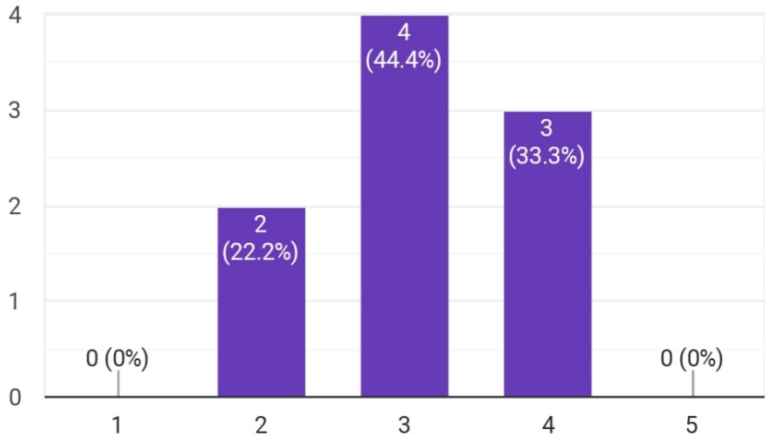


Fig 14: Level of satisfaction with current mental healthcare system

When asked how they think mental healthcare can be improved, 88.9% of the participants said integrating mental healthcare to regular healthcare would improve access and 77.8% said the use of telepsychiatric services would improve access. 11.1% said building more hospitals is a needed intervention. Other responses were also given.

Intervention	**No of respondents**	**% of respondents**
Building more hospitals	1	11.1
Integrating mental healthcare to regular healthcare	8	88.9
Use of telepsychiatric services	7	77.8
Use of community health workers	1	11.1
Other (Educating the population)	1	11.1
Other (Overhaul physical infrastructure, equipment and services upgrade)	1	11.1
Other (Regular sustained media awareness)	1	11.1

Table 6: How to improve mental healthcare system

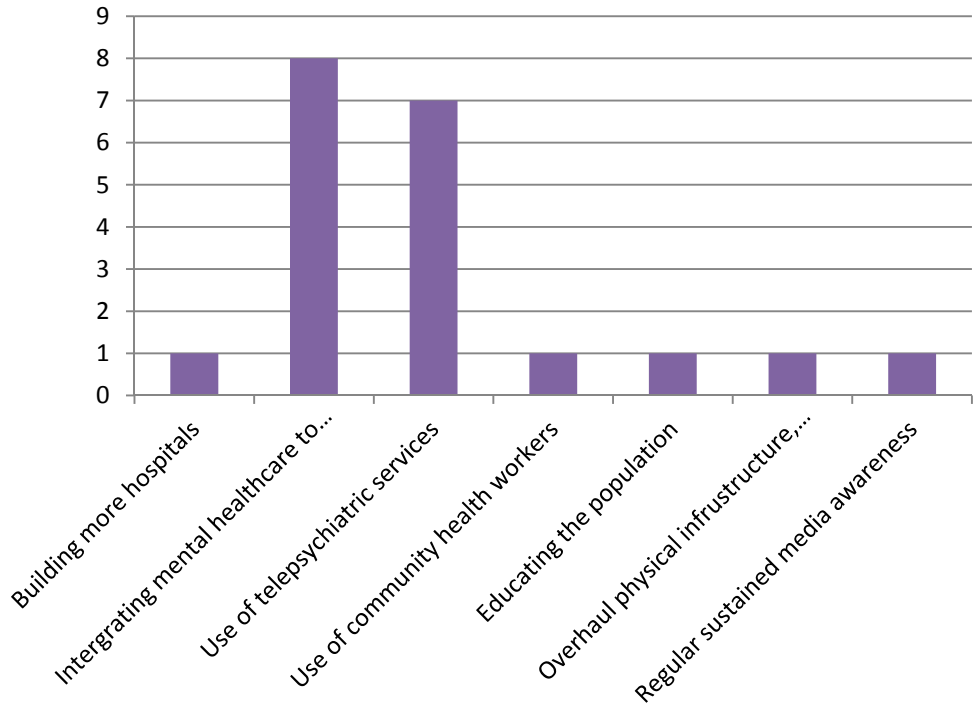


Fig 15: How to improve mental healthcare system

66.7% of the respondents agreed that anonymity would help clients in seeking mental healthcare while 22.2% disagreed with the statement.

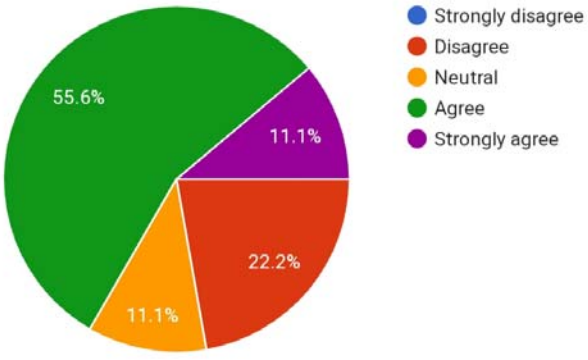


Fig 16: Position of anonymity in seeking mental healthcare

The survey also aimed to find out how the psychiatrists currently store their client files. 55.6% of the respondents said they store their files manually, 33.3% electronically and 11.1% said they

store the files both manually and electronically. Those who store client files electronically gave various software they use as shown in table 7.

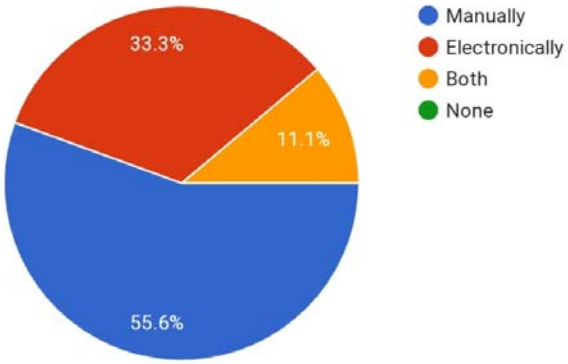


Fig 17: client files storage method

Software used	**No of respondents**
In-house developed application	1
Kranium	1
Not applicable	2
Plain word documents	1
Customized software	1

Table 7: Software used in storing client files

All the participants in the survey supported the integration of technology into the mental healthcare field (fig. 22) with 88.9% already using various technology mediums such as e-mail, whatsapp and sms for consultations and prescriptions.

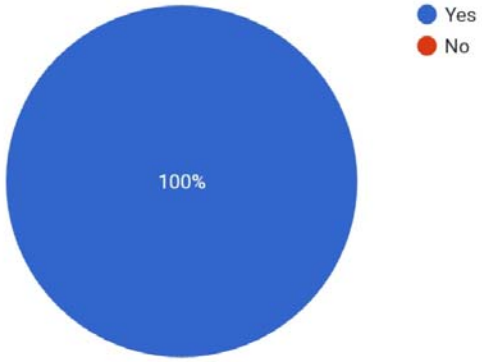


Fig 18: Support for integration of technology in mental healthcare

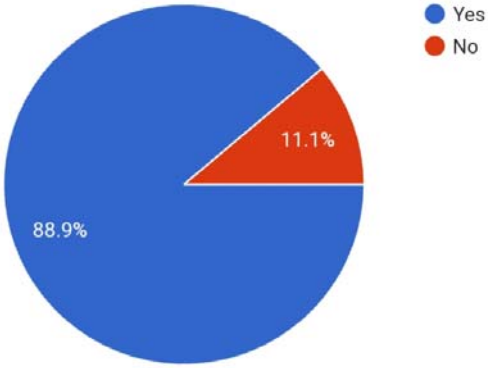


Fig 19: Use of technology for consultation

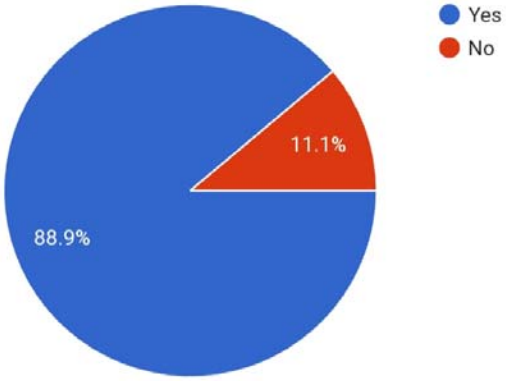


Fig 20: Use of technology for prescriptions

Discussion

From the results of the survey, it was noted that there are psychiatrists who practice in different institutions in different counties across Kenya. This can be attributed to the limited number of psychiatrists in the country. The psychiatrists are forced to practice in different counties in order to provide mental healthcare to the entire population across the country.

Also noted is a significant loss of follow-up amongst clients as stated by the psychiatrists. Most clients do not continue with their treatment because of financial restraints, perception of feeling better, poor social support and shame and fear of stigmatization amongst other reasons, which in line with other studies that have been done.

Additionally, the survey showed that integration of mental healthcare into the primary healthcare system and the use of telepsychiatry services are considered to be the most preferred ways to improve mental healthcare in Kenya and most respondents agreed that anonymity, which telespychiatry can offer, would also help with clients seeking mental healthcare. This is because some clients and their families face stigmatization. Anonymity will play a role in providing confidence for those who fear this stigma or those who actually face it.

Although most respondents currently store client files manually, all of them supported the integration of technology into mental healthcare with 88.9% of respondents already using various modes of technology in their practice such as Whatsapp, E-mail and SMS.

The table below highlights the existing gaps and how telepsychiatry in the form of an online web chat system can bridge these gaps.

Aspect	**Gap**	**Design implementation**
Psychiatrists having to travel to different counties	Distance barrier	Opportunity to use telepsychiatry (online access)
Significant loss of follow up	Follow-up	Opportunity to use telepsychiatry (online access)
Financial difficulties	Affordability	Opportunity to use telepsychiatry

		(online access)
Shame and fear of stigmatization	Anonymity	Opportunity to use telepsychiatry (online chat)
Improving mental healthcare	Accessibility	Opportunity to use telepsychiatry (online access)
Manual client file storage and retrieval	Efficiency	Opportunity to use telepsychiatry (database)

Table 8: The use of telepsychiatry services

4.2 System Design

The developmental objective of the study is to design and build a prototype that will enable improved access to mental healthcare by eliminating distance barrier, reducing costs and increasing availability. The preferred methodology for the development of the prototype is the Rapid Application Development.

The fixation of the Rapid Application development is on gathering client requirements, prompt user testing of the prototype using iterative concept, reutilization of the existing prototypes elements, continuous integration and rapid delivery.

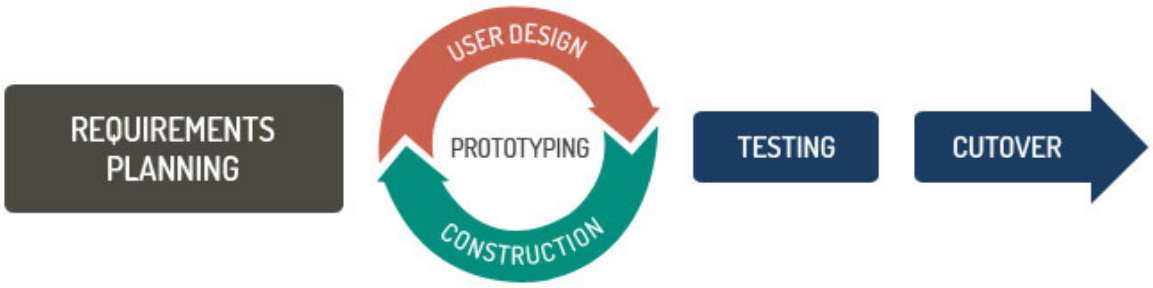


Fig 21: Rapid Application Development Phases (source: tatvasoft.com)

Phase One: Requirement Planning

This stage includes:

- Studying the problem
- Defining project requirements and specifications
- Consent of the requirements by stakeholders
- Evaluation of the targets and expectations for the project and weighing in

Phase Two: User Design and Prototypes

The main goal during this phase is to develop the client requirements and wireframes applying the main user design deliverables and finalize the design version through various prototype iterations.

Phase Three: Rapid Construction

Phase three entails:

- Preparation for swift construction
- Program and application development
- Coding
- Unit, integration, and system testing

This phase is crucial as it is the point at which the client has the opportunity to give their input. Changes and ideas can be suggested which can assist in solving problems when they arise.

Phase Four: Cutover

It is at this stage that the finalized product is launched.

Vital areas of this phase include;

- Conversion of data
- Testing
- Receiving responses from users
- Finalizing the product

4.3 Prototype Design

The current system of mental healthcare treatment in Kenya is manual and involves physically walking into a mental healthcare facility for treatment. Below is the process flow;

Registration ⟶ Assessment ⟶ Diagnosis ⟶ Treatment

The proposed solution will allow the processes to be done on a chat-online web system remotely. The system will enable;

- Online registration- Registration of new clients and assigning client numbers
- Database management of client information
- Chat-option between client and medical provider
- Allow for video calling
- Allow for continuity- Retrieval of data of continuing clients.

System overview

The system is designed to provide a platform for treatment for patients suffering from depressive disorders remotely. It is designed to be able to register clients, assess clients, perform video calls, allow for chatting between client and mental health provider and store and retrieve client information. The review of various previously written works as well as of existing models in addition to the responses received from the questionnaire handed out to various psychiatrists is what informs the design of the system.

- Register clients- Record demographic details of the client

  A new client is registered on the system and a client number is assigned to them. Information that is collected includes names, age, gender, physical location, details of next of kin and medical history of the client. The information is added into the database and the system generated client number is sent to the individual via E-mail.

- Assess clients- Allow for assessment using relevant assessment tools

  The system has internationally recognized assessment tools that are used to assess the level of depression of a client. Once a series of questions are asked that are dependent on the assessment tool, a score is given which is in reference to the international guidelines of the assessment tools. The tools used in the system are the PHQ9, Hamilton Depression Rating Scale and the Beck's Depression Inventory which according to the responses given by the psychiatrists are the most commonly used.

- Treat patients

  The system provides a video calling option where the healthcare provider is able to see the client and study their body language. The results from the preliminary study survey showed that most psychiatrists opt to listen to their clients tell their story without interruption. The system allows for this through the video calling and the healthcare provider is able to take personal notes. These notes are not visible to the client. For sessions or instances where the video is unavailable or not necessarily needed, chatting option between client and healthcare provider is available .The chat history and notes are stored in the database as well and are retrievable in follow up sessions.

- Report generation

  The healthcare provider is able to generate reports on clients' files through the system. This enables the clinician to be able to look through the sessions had with a client so as to be able to monitor the progress of the client. Other reports that can be generated include; daily or weekly appointments schedules, as well as severity of depression for different clients, for cases where, for instance the clinician may want to study trends.

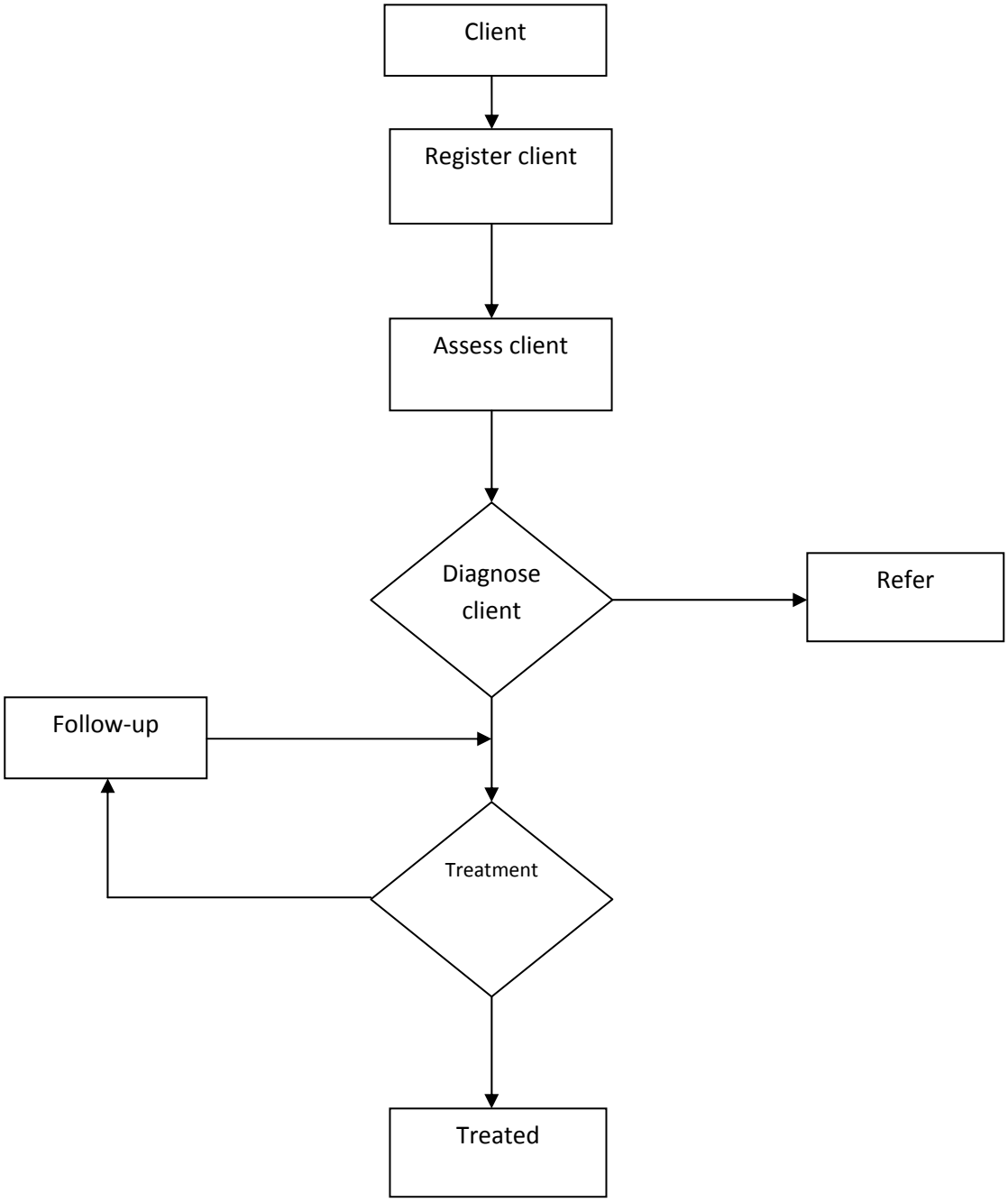
4.4 Implementation tools

The system implementation tools include;

- MySQL- this is for building the database where information will be stored
- Programming languages- PHP, HTML, CSS, jQuery, javascript and ajax
- WebRTC- this is for enabling the video and audio features

4.5 System flowchart diagram

The flow chat diagram shows the process from when the client is registered to when they are treated.



CHAPTER 5: RESULTS AND DISCUSSION

A survey was carried out on the use of a telepsychiatry system for the treatment of depression. The respondents included 5 psychiatrists who practiced in different institutions both public and private namely; Gertrude's Children's Hospital, Kenyatta National Hospital, Mathare National Teaching and Referral Hospital and Psychiatric clinic all in Nairobi. 60% of the respondents were female while 40% of were male. 20% of them fell in the age group of 31-40, 60% were of age group 51-60 and 20% were in the 61-70 age bracket. All the respondents provided assessment, diagnosis, treatment, follow-up and referral services. The respondents interacted with the system and used it after which they filled in a post-hoc questionnaire to validate the prototype system's usability. Below are the results of the survey.

Overall I am satisfied with how easy it is to use the system

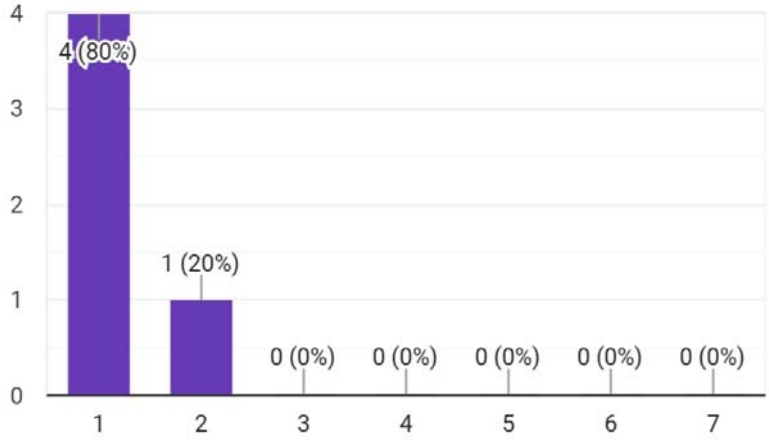


Fig 22: Satisfaction with ease of use

I was able to complete the tasks and scenarios quickly using this system

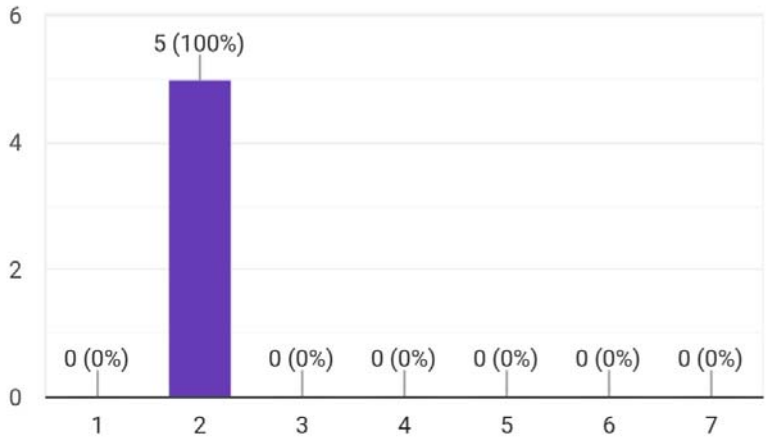


Fig 23: Ability to complete tasks quickly

I felt comfortable using this system

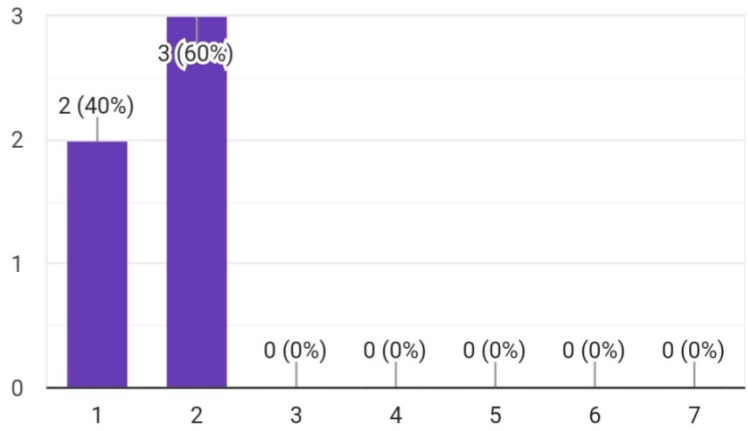


Fig 24: System comfort

It was easy to learn to use this system

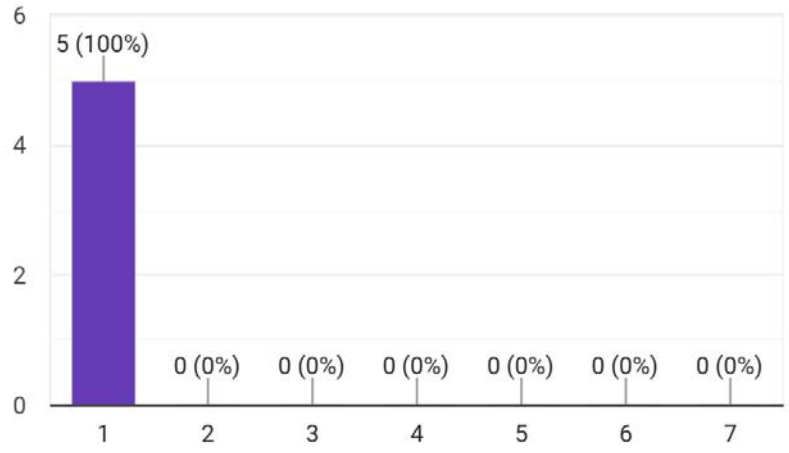


Fig 25: Learning system ease

I believe I could become productive quickly using this system

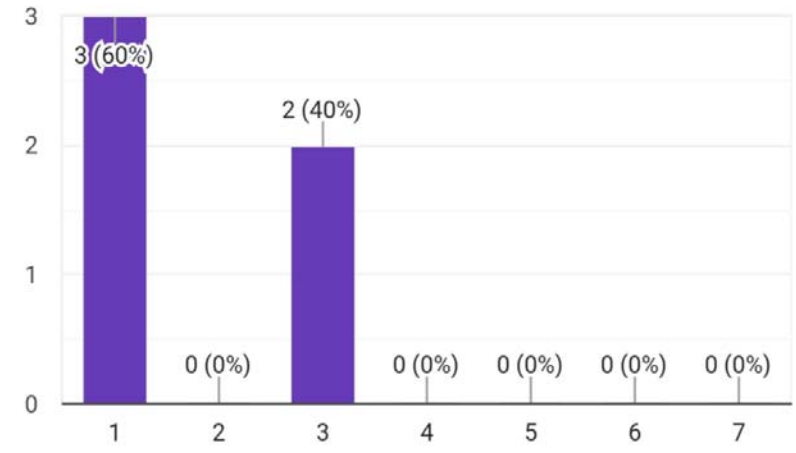


Fig 26: Productivity increase

Whenever I made a mistake using the system, I could recover easily and quickly

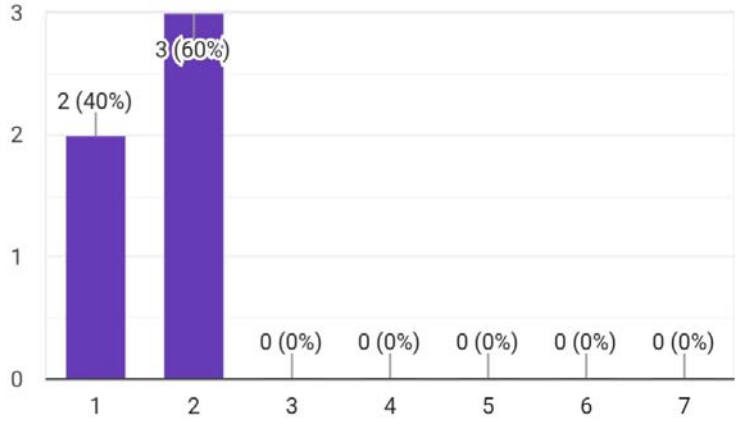


Fig 27: Recovery speed

The information (such as online help, on-screen messages and other documentation) provided with this sytem was clear

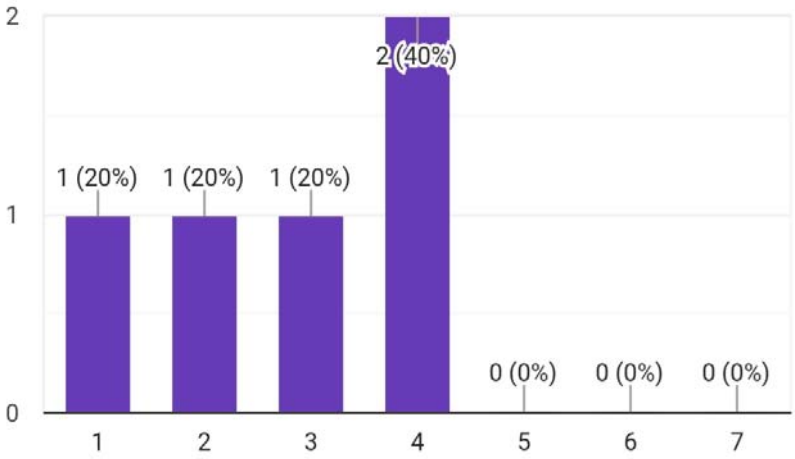


Fig 28: Assistance information clarity

It was easy to find the information I needed

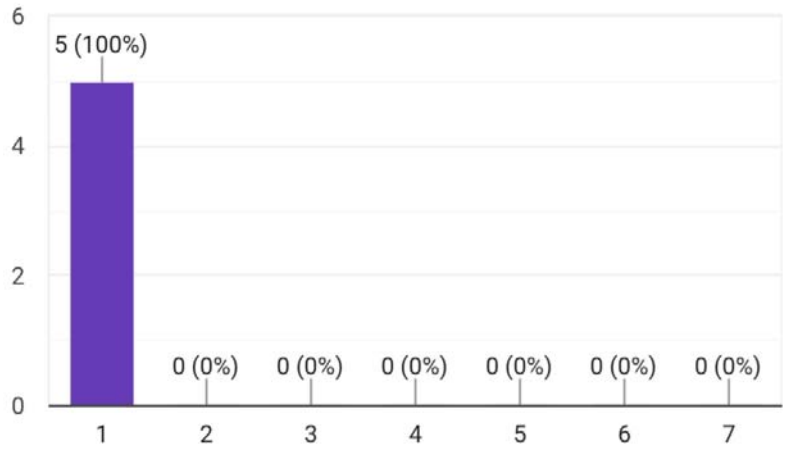


Fig 29: Ease of access to information

The information was effective in helping me complete the tasks and scenarios

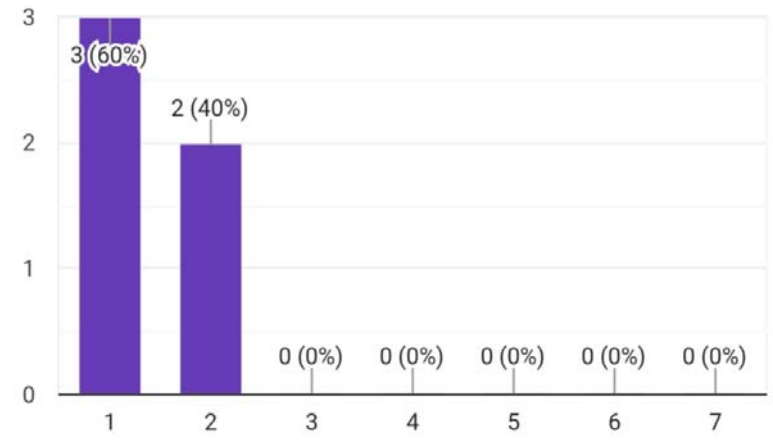


Fig30: Effectiveness of information

The organization of the information on the screen was clear

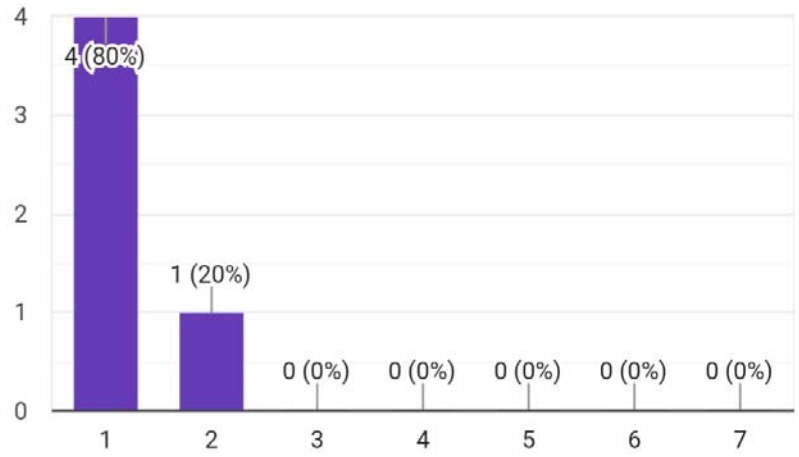


Fig 31: Information organization

The interface of the system was pleasant

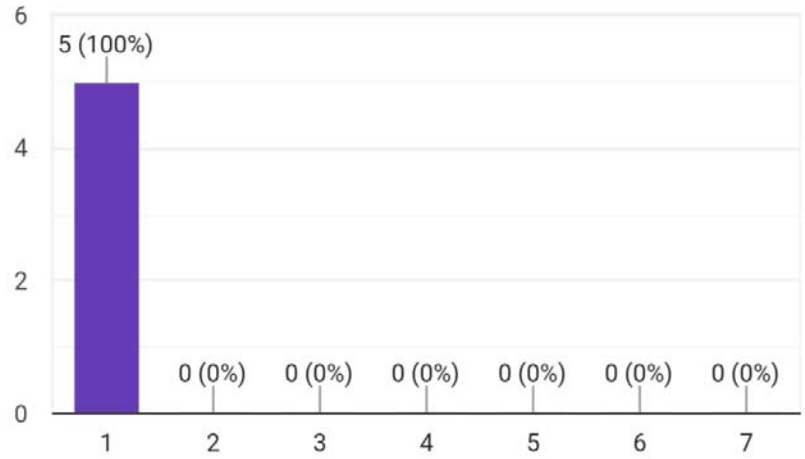


Fig32: System interface

This system has all the functions and capabilities I expect it to have

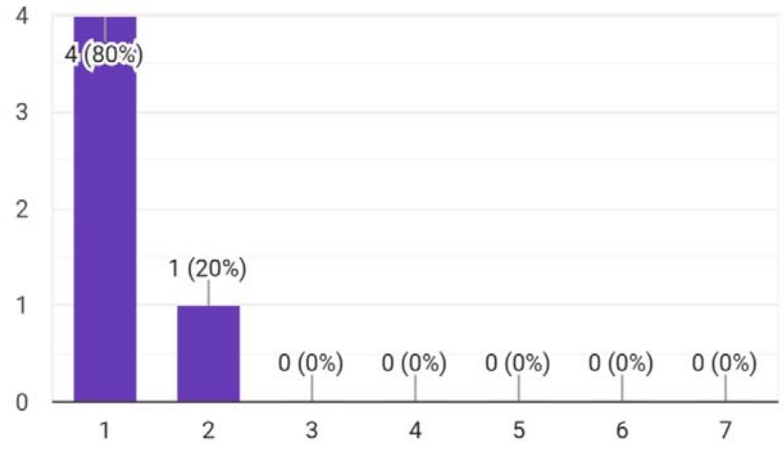


Fig 33: System functionality and capability

Overall I am satisfied with this system

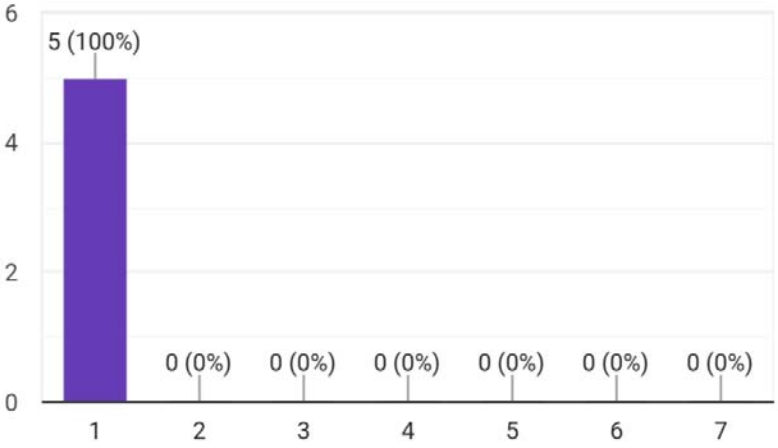


Fig 34:: Overall system satisfaction

Given access to the system I intend to use it

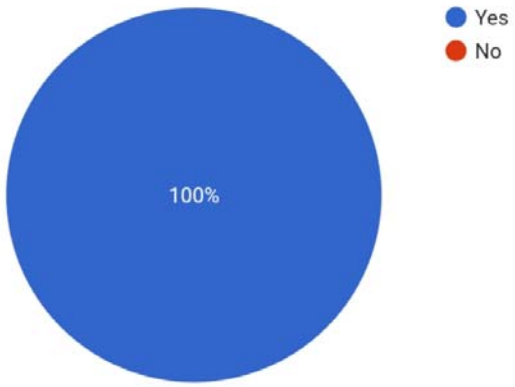


Fig 35: Intent to use

What improvements to the prototype would you suggest?

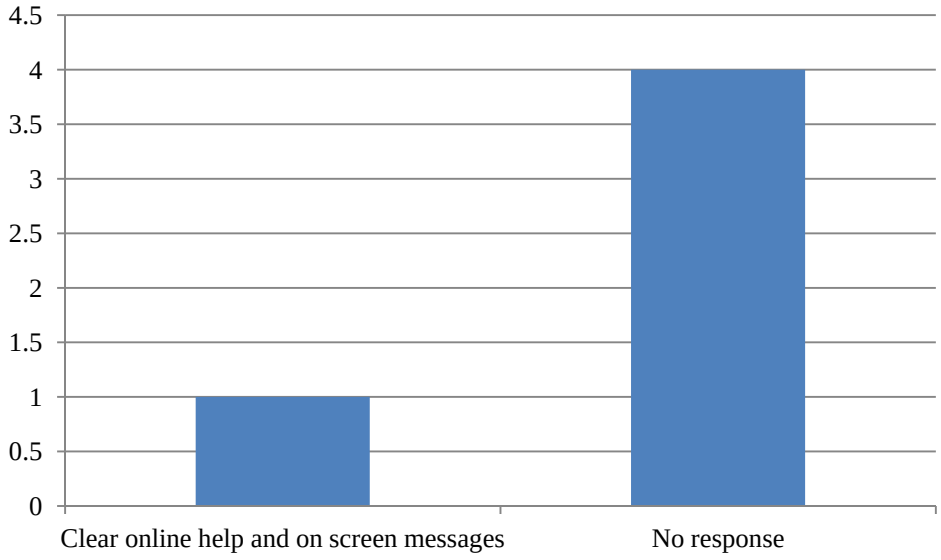


Fig36: Suggested improvements

Based on the results of the survey, the feedback given by the respondents portrayed the system to be useful and easy to use and the information and interface were found to be of quality. The results show a willingness to embrace the system in the psychiatrist's tasks of treating patients suffering from depression.

CHAPTER 6: CONCLUSION AND RECOMMENDATION

6.1 CONCLUSION

A review of literature revealed that people suffering from mental disorders in the country face numerous challenges. For one, the mental healthcare system in Kenya is very under-resourced. There are less than 100 psychiatrists in total in the entire country most of whom practice in urban areas. 75-85% of the population in Kenya does not receive the mental healthcare they need due to limited access to treatment owing to the shortage of medical personnel and few mental healthcare facilities. In fact, there is limited availability of services in the community and primary healthcare level facilities and as a result mental healthcare is provided from district level upwards only.

Access to healthcare is another challenge faced by the mentally ill patients. Limited or lack of finances for treatment and accommodation at the health facilities as well as the burden of having to travel to distant healthcare facilities, especially for follow up visits, weighs down on them and often times they are forced to live with the disease without receiving treatment.

Stigmatization is another problem faced by these patients. There is a belief that those suffering from mental illnesses have been bewitched or are being punished for bad deeds. Families of mentally ill patients are also prone to facing stigmatization and shame from communities and sometimes even from extended family members.

Telemedicine has widely been adopted globally and is currently in use in different medical fields such as telecardiology, telesurgery, telepathology, teleradiology, teledermatology and telepsychiatry. In Kenya, though the uptake is below per, it has a lot of potential for growth and it has been used, for example, in telediagnosis to reduce diagnosis time and get proper diagnoses of malaria, skin disease, tuberculosis, cholera and other diseases. Telepsychiatry has been used in the treatment of mental disorders successfully in other various jurisdictions to assist psychiatric clients via means of videoconferences and chats.

The developed prototype is an online web-based chat system for providing psychiatry services remotely. The design of the system was informed by the review of literature and existing models as well as the results of the preliminary study. Concepts such as video calling and chat and general access to a health provider were borrowed from the reviewed existing models and

implemented in the system design and the selection of the assessment tools, the note pad were influenced by responses from the preliminary study.

The system provides a platform where the clinician can interact with the client via chat or video call. The clinician is also able to assess the client online with the help of assessment tools available on the system. They can also take down personal notes which are not visible to the client. The system allows the clinician to review information from previous sessions as all the information is collected in a database that can be accessed through reports. The prototype underwent expert testing where it was handed to mental health providers who interacted with it and filled a usability survey. It was found to be efficient and convenient.

6.2 Limitation of the study

Below is a list of limitations of this study;

- The covid-19 global pandemic that hit posed a great hindrance in data collection for the study especially in the data collection and testing phases. The measures put in place including the lockdown and stay at home initiatives affected the access to information and interaction.
- Limited availability of information was another issue. Because mental health is a field that people shy away from, it has not been well explored hence there isn't much data and information.
- The number of respondents who participated in the survey was limited.

6.3 Recommendations for future works

- The study can be expanded into treatment of different mental disorders and especially those related to depression because there are incidences that exist where a patient may suffer from more than one mental illness or one mental illness may be as a result of another.
- The system can be integrated into a national database such as DHIS2 so that more data on mental health and especially statistics can be collected, aggregated and made available.

REFERENCES

1. Acharibasam, J.W. & Wynn, R., (2018). Telemental Health in Low- and Middle-Income Countries: A Systematic Review. *International Journal of Telemedicine and Applications.* [online] Available at: https://www.hindawi.com/journals/ijta/2018/9602821/ [Accessed 27 May 2019]
2. Adenuga, K.I., Iahad, N.A. & Suraya M., (2015). An Initial Model for Telemedicine Adoption in Developing Countries. *ARPN Journal of Engineering and Applied Sciences.* [online] Available at: http://www.arpnjournals.org/jeas/research_papers/rp_2015/jeas_1215_3217.pdf [Accessed12 July 2019]
3. American Psychiatric Association. What is Depression?. American Psychiatric Association. [online] Available at: https://www.psychiatry.org/patients-families/depression/what-is-depression [Accessed 29 February 2020].
4. American Psychiatry Association. What is Telepsychiatry?. [online] Available at: https://www.psychiatry.org/patients-families/what-is-telepsychiatry [Accessed 15 Dec 2019]
5. Amuomo, N. O. and Wagacha, P. W., (2018). Telediagnostic - Biomedical Image Matching and Retrieval in A Multi-Distributed Telecommunications Environment for Automatic Medical Diagnosis. [online] Available at: https://uonresearch.org/irs/wp-content/uploads/2018/03/IRS-2018-5-InnovationResearchSymposium.pdf [Accessed 17 Dec 2019]
6. Bitta, M. A., Kariuki, S. M., Chengo, E. & Newton, C. R. J. C., (2017). An overview of mental health care system in Kilifi, Kenya: results from an initial assessment using the World Health Organization's Assessment Instrument for Mental Health Systems. *International Journal of Mental Health Systems*. [online] Available at: https://ijmhs.biomedcentral.com/track/pdf/10.1186/s13033-017-0135-5 [Accessed 27 May 2019]
7. Burville, P. W., (1992) Looking beyond the 1:10,000 ratio of psychiatrists to population. *The Australian and New Zealand Journal of Psychiatry*. [online] Available at: https://www.ncbi.nlm.nih.gov/pubmed/1642618 [Accessed 17 Dec 2019]

8. CDC, (2018). Learn about Mental Health. [online] Available at: https://www.cdc.gov/mentalhealth/learn/index.htm [Accessed 12 July 2019]
9. Chakrabarti, S. & Shah, R., (2019). Telepsychiatry in the Developing world: Whither Promised Joy?. *Indian J Soc Psychiatry 2016;32:273-80*. [online] Available at: http://www.indjsp.org [Accessed July 12 2019]
10. Dent, L., Peters, A., Kerr, P. L., Mochari-Greenberger, H., Pande, R. L., (2018). Using Telehealth to Implement Cognitive Behavioral Therapy. *Psychiatric Services*. [online] Available at: https://ps.psychiatryonline.org/doi/10.1176/appi.ps.201700477 [Accessed 29 February 2020].
11. Egede, L. E., Frueh, C. B., Richardson, L. K., Acierno, R., Mauldin., P. D., Knapp, R. G., Lejuez, C., (2009). Rationale and design: Telepsychology service for depressed elderly veterans. *Trials*. [online] Available at: https://trialsjournal.biomedcentral.com/articles/10.1186/1745-6215-10-22 [Accessed 1 March 2020]
12. Fortney, J.C., Pyne, J.M., Kimbrell, T.A., Hudson, T.J., Robinson D.E., Schneider, R., Moore, W.M., Custer, P.J., Grubbs, K.M., Schnurr, P.P., (2015). Telemedicine-Based Collaborative Care for Post traumatic Stress Disorder a Randomized Clinical Trial. *JAMA Psychiatry*. [online] Available at: https://jamanetwork.com/journals/jamapsychiatry/fullarticle/1936092 [Accessed16 July 2019]
13. Grand Challenges Canada, (2016). Six mental health care projects in developing countries demonstrate effective, affordable options. *EurekAlert*. [online] Available at: https://www.eurekalert.org/pub_releases/2016-01/tca-pia012116.php [Accessed 20 February 2020].
14. Hoermann, S., MacCabe, K. L., Milne, D. N., Calvo, R. A., (2017). Application of Synchronous Tex-based Dialogue Systems in Mental Health Interventions: Systematic Review. *Journal of Medical Internet Research.* [online] Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5595406/ [Accessed 23 July 2020].
15. Hoppen, T. H. & Morina, N., (2019). The Prevalence of PTSD and Major Depression in the global population of adult war survivors: a meta-analytically informed estimate in absolute numbers. *European Journal of Psychotraumatology*. [online] Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6394282/ [Accessed 16 February 2020].

16. Israel, G. D. Determining sample size.[online] Available at: https://www.tarleton.edu/academicassessment/documents/Samplesize.pdf [Accessed 17 April 2020]
17. Johnson, K., Scott, J., Sasynuik, T., Ndetei, D., Kisielewski, M., Rouhani, S., Bartels, S., Mutiso, V., Mbwayo, A., Rae, D., Lawry, L., (2014). A national population-based assessment of 2007–2008 election-related violence in Kenya. *Conflict and Health*. [online] Available at: https://conflictandhealth.biomedcentral.com/articles/10.1186/1752-1505-8-2 [Accessed13 Dec 2019]
18. Kamaru-Kwobah, E. W., (2013) Psycho-social and Cultural Factors Associated with Non-adherence and follow up Among Outpatients at Mathari Hospital. [online] Available at: http://erepository.uonbi.ac.ke/handle/11295/57886 [Accessed16 Dec 2019]
19. Kamita, T., Ito, T., Matsumoto, A., Munakata, T., Inoue, I., (2019). A Chatbot System for Mental Healthcare Based on SAT Counseling Method. *Mobile Information Systems*. [online] Available at: https://www.hindawi.com/journals/misy/2019/9517321/ [Accessed 27 February 2020]
20. Kenya. Communications Authority of Kenya, (2020). Third Quarter Sector Statistics Report for The Financial Year 2019/2020. Retrieved from: https://ca.go.ke/consumers/industry-research-statistics/statistics/ [Accessed 18 July 2020]
21. Kenya Ministry of Health, (2015). *Kenya Mental Health Policy*. Nairobi: Ministry of Health. [online] Available from: https://healthservices.uonbi.ac.ke/sites/default/files/centraladmin/healthservices/Kenya%20Mental%20Health%20Policy.pdf [Accessed 27 May 2019]
22. Kifle, M., Mbarika, V., Tsuma, C., Wilkerson D., Tan, J., (2008). A TeleMedicine Transfer Model for Sub-Saharan Africa: Proceedings of the 41st Hawaii International Conference on System Sciences – 2008. Hawaii. [online] Available at: https://www.academia.edu/12145694/A_TeleMedicine_Transfer_Model_for_Sub-Saharan_Africa [Accessed12 July 2019]
23. Kifle, M., Solomon, A., Okoli, C., Mbarika, V., (2004). Critical Success Factors for Telemedicine in Ethiopia. [online] Available at: https://www.academia.edu/399905/Critical_Success_Factors_for_Telemedicine_In_Ethiopia [Accessed12 July 2019]

24. KNCHR, (2015). *A human Rights Audit of the Mental Health System in Kenya, 2011*. Silenced Minds: The Systematic Neglect of the Mental Health System in Kenya. [online] Available at: http://www.knchr.org/Portals/0/EcosocReports/THE_%20MENTAL_HEALTH_REPORT.pdf [Accessed 27 May 2019].
25. Kuhn, E., Weiss, B. J., Taylor, K. L., Hoffman, J. E., Ramsey, K. M., Manber, R., Gehrman, P., Crowley, J. J., Ruzek, J. I., Trockel, M., (2016). CBT-I Coach: A Description and Clinician Perceptions of a Mobile App for Cognitive Behavioral Therapy for Insomnia. *Journal of Clinical sleep Medicine*. [online] Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4795288/ [Accessed 1 March 2020]
26. Langarizadeh, M., Tabatabaei, M. S., Tavakol, K., Naghipour, M., Rostami, A., Moghbeli, F, (2017). Telemental Health Care, an Effective Alternative to Conventional Mental Care: a Systematic Review. *Acta Inform Med 2017 Dec; 25(4): 240-246.* [online] Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5723163/pdf/AIM-25-240.pdf [Accessed 27 May 2019]
27. Mbarika, V. & Meso, P., (2016). An Overview of Potential Factors for Effective Telemedicine Transfer to Sub-Saharan Africa'. Available at: https://ieeexplore.ieee.org/document/4358891 [Accessed12 July 2019]
28. Meyer, A.C., Ndetei, D., (2016). Providing Sustainable Mental Health Care in Kenya: A Demonstration Project. Paper presented at Forum on Neuroscience and Nervous System Disorders; Board on Health Sciences Policy; Board on Global Health; Institute of Medicine; National Academies of Sciences, Engineering, and Medicine. Providing Sustainable Mental and Neurological Health Care in Ghana and Kenya: Workshop Summary held at Washington (DC) 25 Feb 2016. Available at: https://www.ncbi.nlm.nih.gov/books/NBK350312/ [Accessed 20 January 2020].
29. Morin, A., (2019). Mental Illness Types, Symptoms and Diagnosis. *Very Well Mind*. [online] Available at: https://www.verywellmind.com/definition-of-mental-illness-4587855 [Accessed15 December 2019]
30. Musyimi, C., Mutiso, V. N., Ndetei, D. M., Unanue, I., Desai, D., Patel, S. G., Musau, A. M., Henderson, D. C., Nandoya, E. S., Bunders, J., (2017). Mental health treatment in Kenya: task-sharing challenges and opportunities among informal health providers. *International Journal of Mental Health Systems*. [online] Available at:

https://ijmhs.biomedcentral.com/articles/10.1186/s13033-017-0152-4 [Accessed 16 February 2020].

31. Ndetei, D. M., Khasakhala, L. I., Kuria, M. W., Mutiso, V. N., Ongecha-Owuor, F. A., Kokonya, D. A., (2009). The prevalence of mental disorders in adults in different level general medical facilities in Kenya: a cross-sectional study. *Annals of General Psychiatry*. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2631009/ [Accessed16 Dec 2019]
32. Njuguna, D., Wanjala, P., 'A Case for Increasing Public Investments in Health Raising Public Commitments to Kenya's Health Sector', Ministry of Health Policy Brief. Available at: http://www.health.go.ke/wp-content/uploads/2019/01/Healthcare-financing-Policy-Brief.pdf [Accessed 17 Dec 2019]
33. Okoroafor, I.J., Chukwuneke, F.N., Ifebunandu, N., Onyeka, T.C., Ekwueme, C.O., KK Agwuna, K. K., (2016). Telemedicine and biomedical care in Africa:Prospects and challenges', *Nigerian Journal of Clinical Practice*. [online] Available at: http://www.njcponline.com/article.asp? [Accessed12 July 2019].
34. PAHO &WHO, (2016). Framework for the Implementation of a Telemedicine Service. Washington, DC : PAHO, 2016. [online] Available at: http://iris.paho.org/xmlui/bitstream/handle/123456789/28414/9789275119037_eng.pdf [Accessed 3 Jan 2020]
35. Schimelpfening, N., (2020). Types of Psychotherapy for Depression. *Very well Mind*. [online] Available at: https://www.verywellmind.com/types-of-psychotherapy-for-depression-1067407 [Accessed 16 July 2020]
36. Trivedi, J. K., Goel, D., M.R.C. Psych, (2006). What Psychiatry Means To Us. *Mens Sana Monographs*. [online] Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3190449/ [Accessed 15 December 2019]
37. USIU, (2020). The Kenyan Social Media Landscape: Trends and Emerging Narratives, 2020. *Social Media Lab*. [online] Available at: https://www.usiu.ac.ke/assets/image/Kenya_Social_Media_Lanscape_Report_2020.pdf [Accessed 18 July 2020].
38. Wilson, L. S. & Maeder, A.J., (2015). Recent Directions in Telemedicine: Review of Trends in Research and Practice. *Health Informatics Research*. [online] Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4659877/ [Accessed12 July 2019]

39. WHO, (2010). Mental Health, poverty and development. Available at: https://www.who.int/mental_health/policy/development/en/ [Accessed 16 February 2020].
40. WHO, (2003). *Investing in Mental Health*. Switzerland: World Health Organization. [online] Available from: https://www.who.int/mental_health/media/investing_mnh.pdf [Accessed 27 May 2019]
41. WHO, (2010). *Depression and Other Common Mental Disorders Global Health Estimates*. [online] Available at: https://www.who.int/goe/publications/goe_telemedicine_2010.pdf [Accessed12 July 2019]
42. WHO, (2018). *Mental Health: Strengthening our Response*. [online] Available at: https://www.who.int/news-room/fact-sheets/detail/mental-health-strengthening-our-response [Accessed 27 May 2019].
43. World Health Organization, (2010). Telemedicine Opportunities and Developments in Member States. [online] Available at: https://www.who.int/goe/publications/goe_telemedicine_2010.pdf [Accessed 16 Dec 2019]
44. World Health Organization, (2016). Global Health Observatory (GHO) data. [online] Available at: https://www.who.int/gho/mental_health/human_resources/psychiatrists_nurses/en/ [Accessed 3 Jan 2020]

APPENDICES

Telepsychiatry for the Treatment of Depression in Kenya Questionnaire

This questionnaire is part of a research on telepsychiatry for the treatment of depression in Kenya. The questionnaire is intended for psychiatrists who practice in Kenya and seeks to collect information on the treatment of depression. The questionnaire will take 5-10 minutes to fill.

1. Gender (tick one)
   - □ Male □ Female
2. Age

□ 25-30 □ 31-40 □ 41-50 □ 51-60 □ 61-70 □ >70

3. Select the one that applies to you
   - □ Private practice □ General practice
4. County of practice……..
   Sub-county of practice……
   Health institution of practice……
5. When was your year of qualification to practice mental health?.....
6. Which services do you provide?
   - □ Assessment
   - □ Diagnosis
   - □ Treatment
   - □ Follow-up
   - □ Referrals
   - □ Others; Please list…….……
7. Kindly describe your typical day at work

   ……
   ….....
   .....
   .....
   .....
8. How do you get majority of your patients?

- Self-referrals
- Referred by clinician
- Referred by other professional
- Learning institutions
- Other; Please specify……

9. Do you routinely use assessment tools for diagnosis?
   - Yes
   - No
10. Which assessment tools do you use?
    - Beck Depression Inventory
    - Center for Epidemiologic studies depression scale
    - EQ-5D
    - Hamilton depression rating scale
    - Montgomery-Asberg depression rating scale
    - Social problem-solving inventory revised
    - Behavior assessment system for children
    - Child behavior checklist
    - Children's depression inventory
    - Children's depression rating scale
    - Beck hopelessness scale
    - Patient Health Questionnaire
    - Reminiscence function scale
    - Short form health survey
    - Social functioning questionnaire
    - Geriatric depression scale
    - Life satisfaction index
    - Other……..
11. Averagely how many patients do you see in a day?.....
12. How long does a session with a patient typically last (in minutes)? ……..
13. During a session, do you prefer;
    - Asking your patients questions
    - Listening to their story without interruption

14. Which diagnostic criteria do you use?
    - □ DSM 5
    - □ ICD 10
15. What do you rely on most to make a diagnosis
    - □ Scientific evidence
    - □ Personal experience
16. After how long do you reschedule follow up sessions?.....
17. What is the percentage rate of loss of follow up
    - □ 0-25 □ 26-50 □ 51-75 □ 76-100
18. Which of the following would you list as reasons for loss of follow up
    - □ Shame and fear of stigma
    - □ Financial difficulties
    - □ Change of provider
    - □ Limited availability of services
    - □ Perception of feeling better hence not needing more care
    - □ Lack of faith in medical practice
    - □ Carelessness and personal choices
    - □ Poor social support
    - □ Lack of awareness of medication
    - □ Drug adverse effects
    - □ other
19. Do you have an appointment scheduling system?
    - □ Yes
    - □ No
20. Do you call patients to remind them of upcoming appointments?
    - □ Yes
    - □ No
21. Who handles your patient diary?.....
22. In your own words kindly give your view on the current state of the mental health care system in Kenya and if it works sufficiently, listing its advantages and disadvantages

    ……

……

……

……

……

……

23. What do you think are the ways access to mental healthcare can be improved?
    - Building more hospitals
    - Integrating of mental healthcare to regular clinical care
    - Use of telepsychiatry services
    - Use of community health workers
    - Other:
24. How do you currently store patient files?
    - Manually
    - Electronically
    - Both
    - None
    - Other; Please specify……

    If electronically; kindly give the name of the software used

    ….…….....

25. What is the retrieval process of these files?

    .....

    .....

    .....
26. Do you or would you embrace the integration of technology into the mental healthcare field? Yes/No…….

    Give reasons for your answer

    ……

    ……

    ……

27. Do you provide professional consultation services through live chats, video conferencing, phone calls, SMS, WhatsApp or email?

- Yes
- No

28. Do you send prescriptions via SMS, Whatsapp, telegram or email?

- Yes
- No

Telepsychiatry for Depressive Disorders Usability Questionnaire

This questionnaire is part of a survey on the use of telepsychiatry for the treatment of depression in Kenya. It seeks to find out if the psychiatrist's needs are met through the use of the prototype system. The survey will take 5mins to fill.

INSTRUCTIONS: Please tick in the relevant box and explain where explanation is required.

SECTION 1

1. Gender (tick one)
   - □ Male □ Female
2. Age

□ 25-30 □ 31-40 □ 41-50 □ 51-60 □ 61-70 □ >70

3. Select the one that applies to you

□ Private practice □ General practice

4. County of practice……..
5. Sub-county of practice……
6. Health institution of practice……
7. Which services do you provide?
   - □ Assessment
   - □ Diagnosis
   - □ Treatment
   - □ Follow-up
   - □ Referrals
   - □ Others; Please list…….……

SECTION 2

How satisfied are you with the system?	**Strongly disagree**	**Disagree**	**Somewhat disagree**	**Neutral**	**Somewhat agree**	**Agree**	**Strongly agree**
Overall, I am satisfied with how easy it is to use this system							

It was simple to use this system							
I was able to complete the tasks and scenarios quickly using this system.							
I felt comfortable using this system.							
It was easy to learn to use this system.							
I believe I could become productive quickly using this system.							
The system gave error messages that clearly told me how to fix problems.							
Whenever I made a mistake using the system, I could recover easily and quickly.							
The information (such as online help, on-screen messages, and other documentation) provided with this system was clear.							
It was easy to find the information I needed.							
The information was effective in helping me complete the tasks and scenarios.							
The organization of information on the system screens was clear.							
The interface of this system was pleasant.							
I liked using the interface of this							

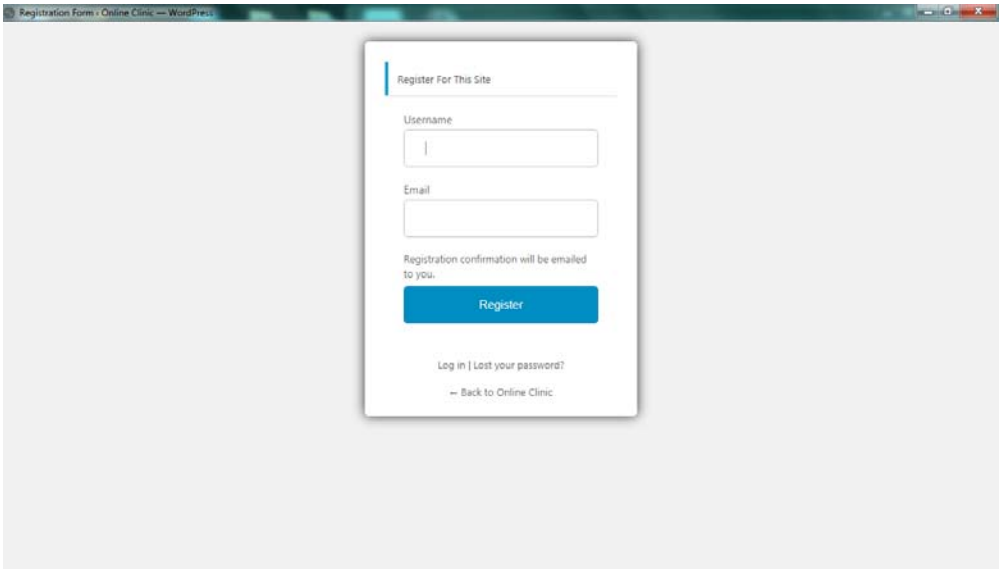
system.							
This system has all the functions and capabilities I expect it to have.							
Overall, I am satisfied with this system.							

What improvements would you suggest on the system?

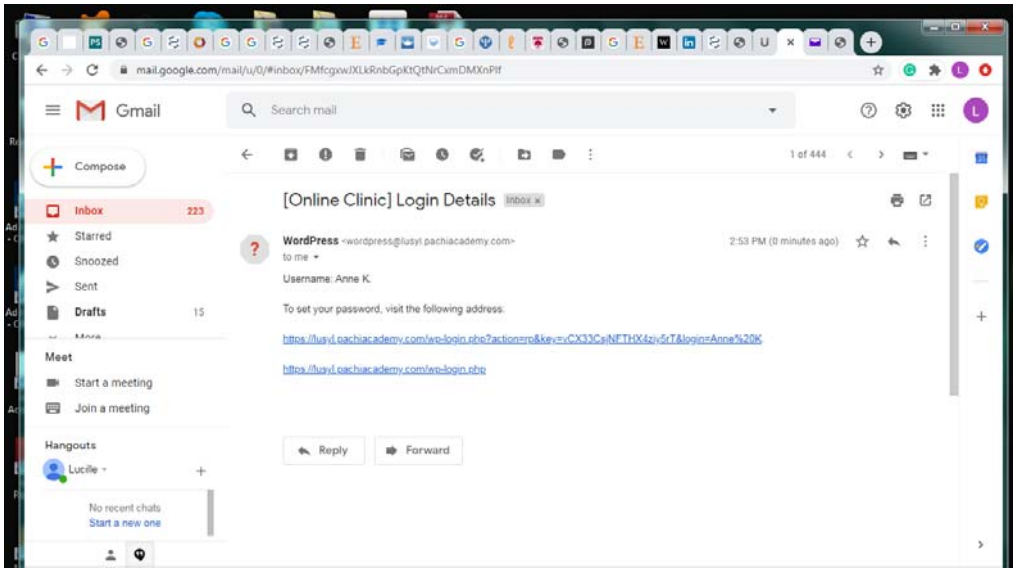
USER MANUAL

Account Set-up

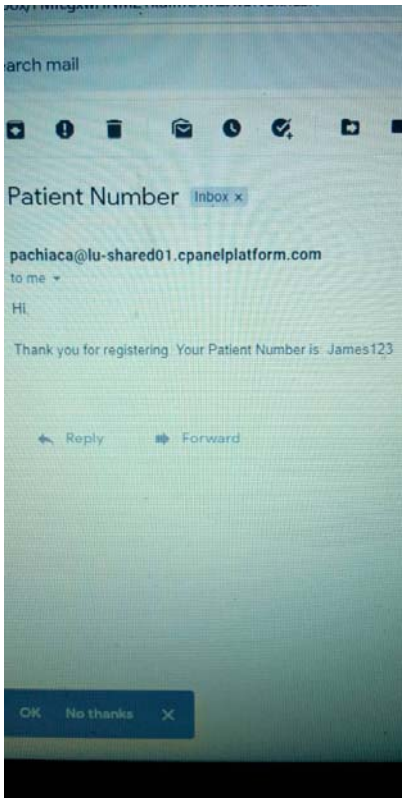
1. Download the app and install or access online via the link below;
   https://lusyl.pachiacademy.com/wp-login.php?redirect_to=https%3A%2F%2Flusyl.pachiacademy.com%2F
2. Register for a new account by providing a user name and your email address.



3. You will receive an email with a link. The email is for verification purposes.



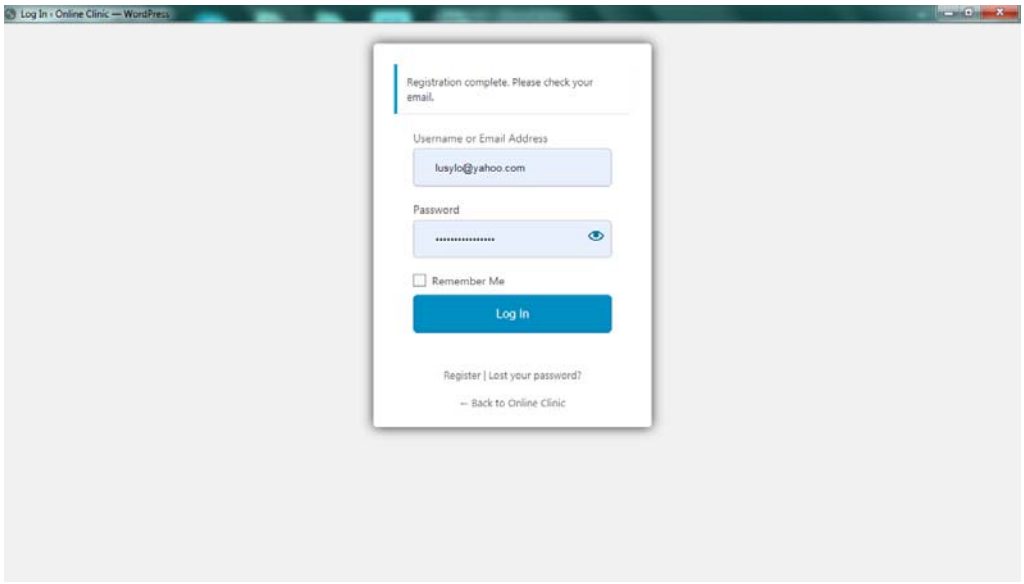
4. Click on the link. You will be redirected to get your system generated password.



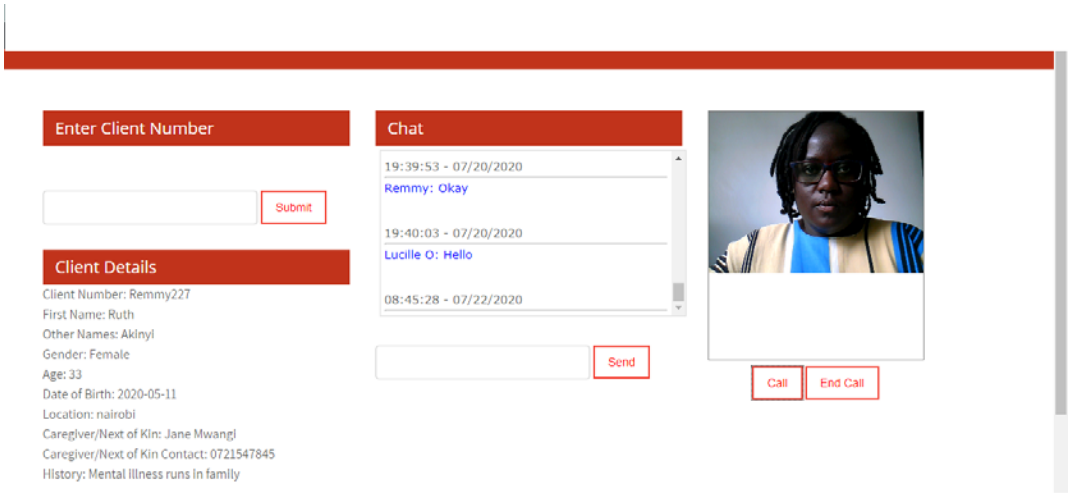
5. Your account is now active.

Using the system as a clinician

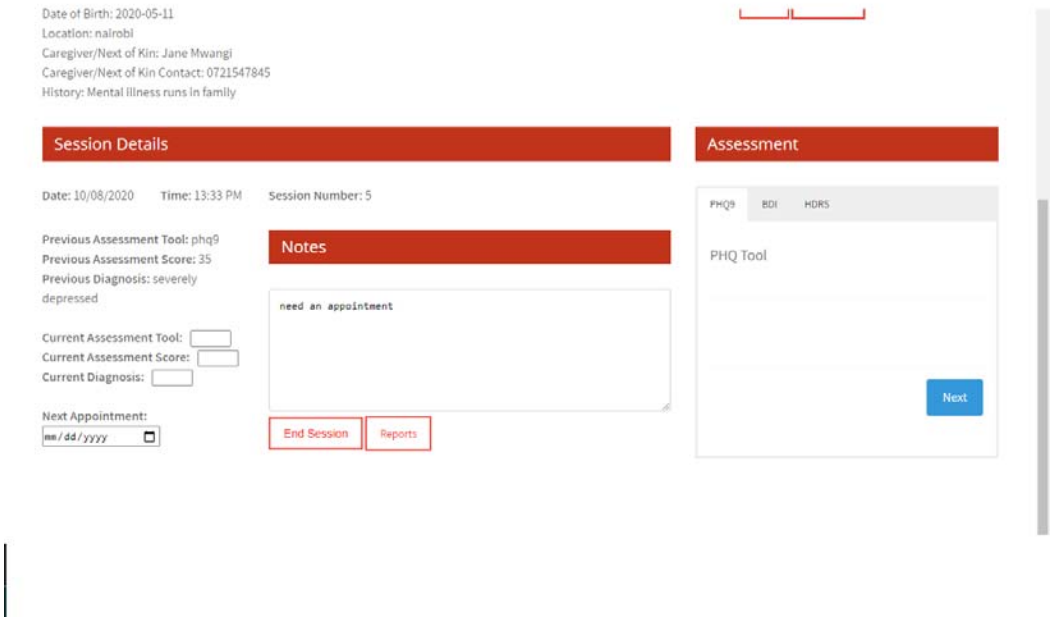
1. Open the application. The first page will be the login page. Enter your login credentials and click on the log in button.



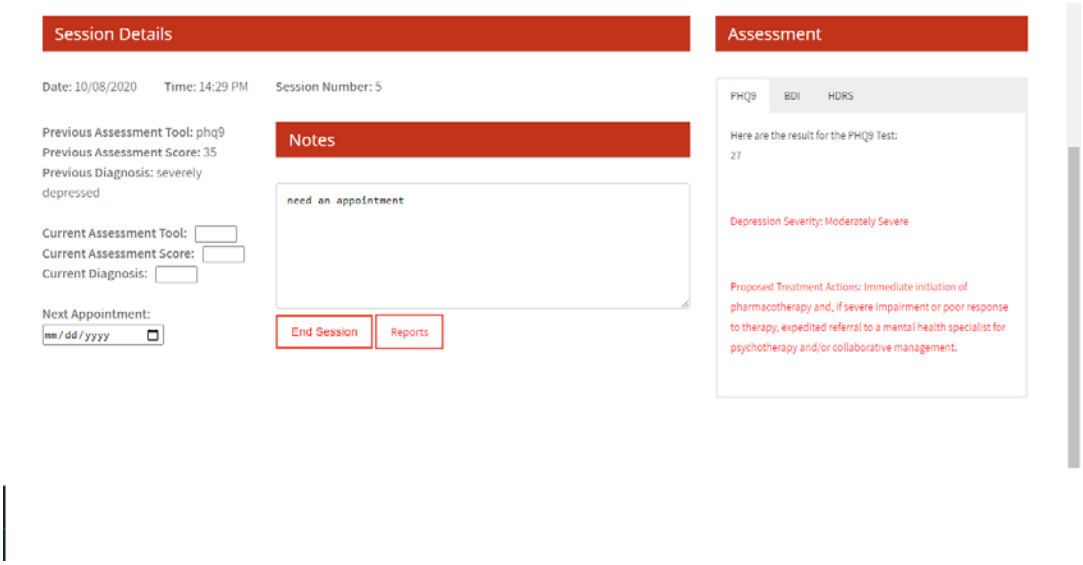
2. The next page is the user interface of the system. Enter the client number in the textbox and submit to retrieve the client's details and information. You can chat with the client via sending messages and you can see the client and speak to them using video call.



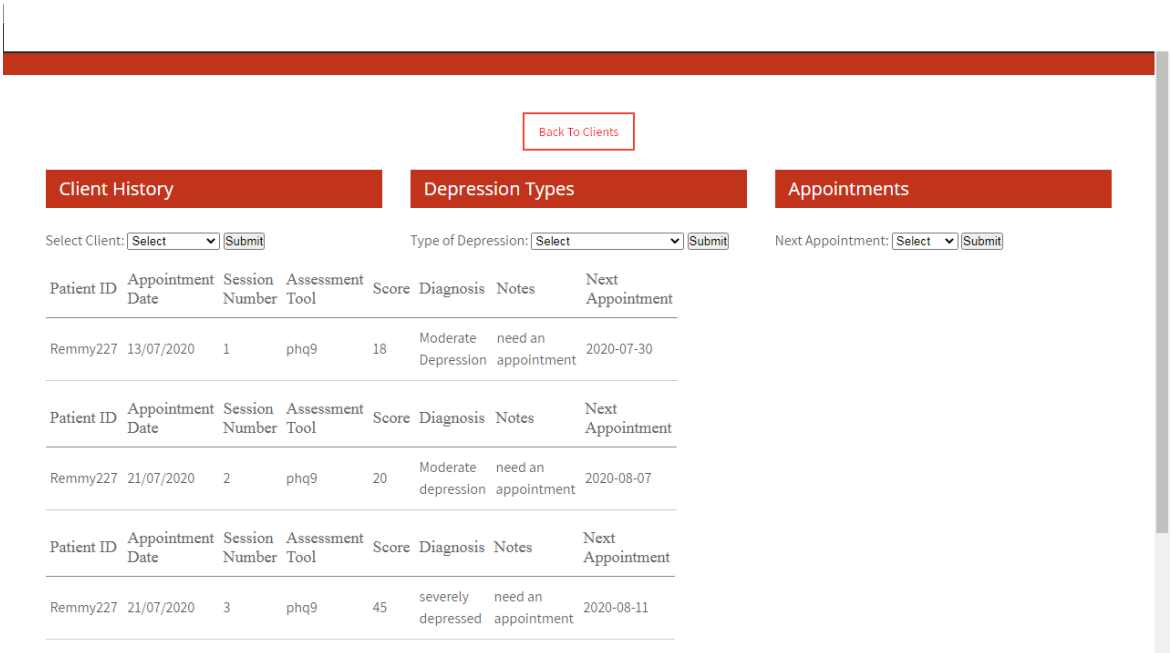
3. Scroll down to see the session details, access the assessment tools, take down notes during the session and schedule next appointments. Reports can be accessed by clicking on the reports button.



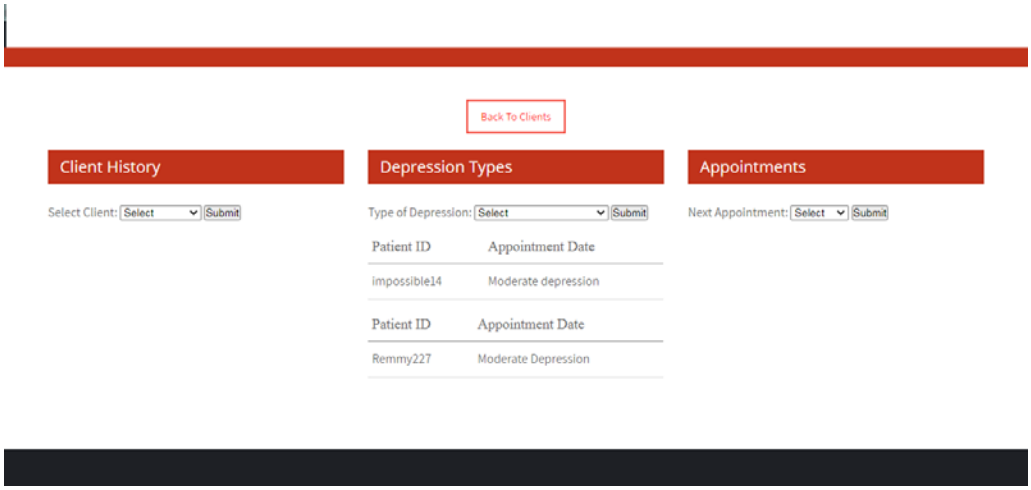
4. The system has three of the commonly used standardized assessment tools. Click on the tool of choice and the questions will be provided. At the end of the questions, the system will compute the score and indicate the severity level of the depression and suggest the next action to take.



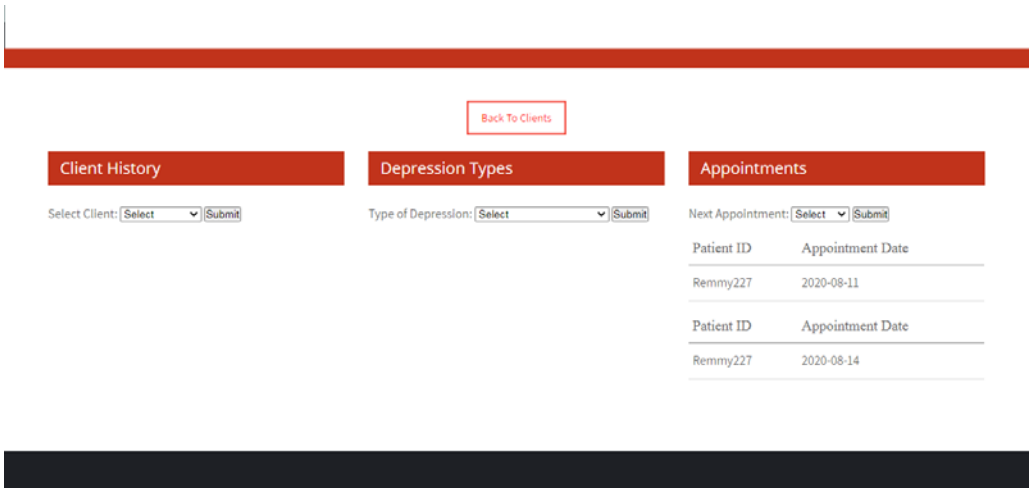
5. To view a client's history, select the client number from the dropdown list and click submit. Information on all the client's sessions will be provided.



6. To view the severity level of different clients' depression, select the severity level of choice from the drop down list and click submit.

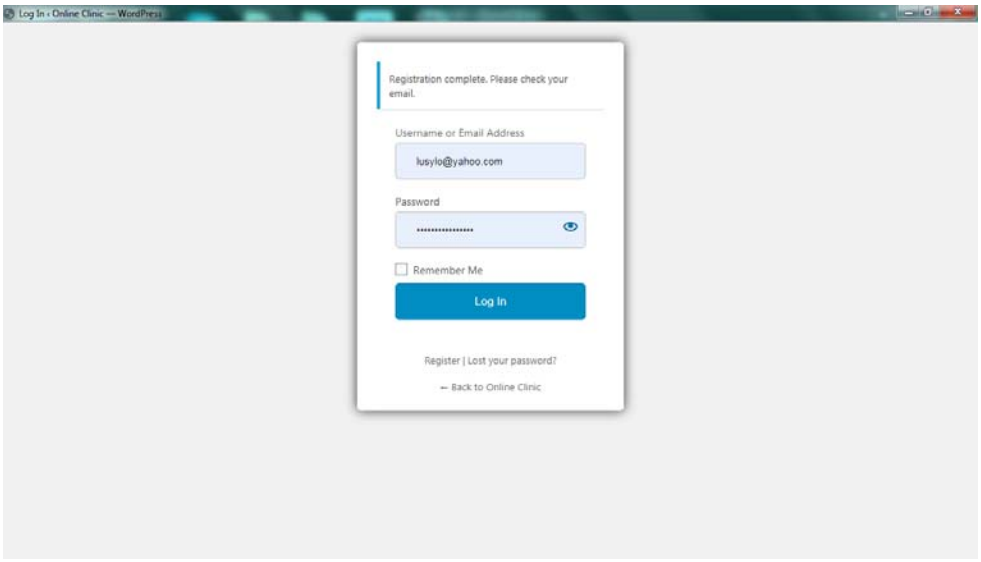


7. To see your scheduled appointments select the range and click submit.

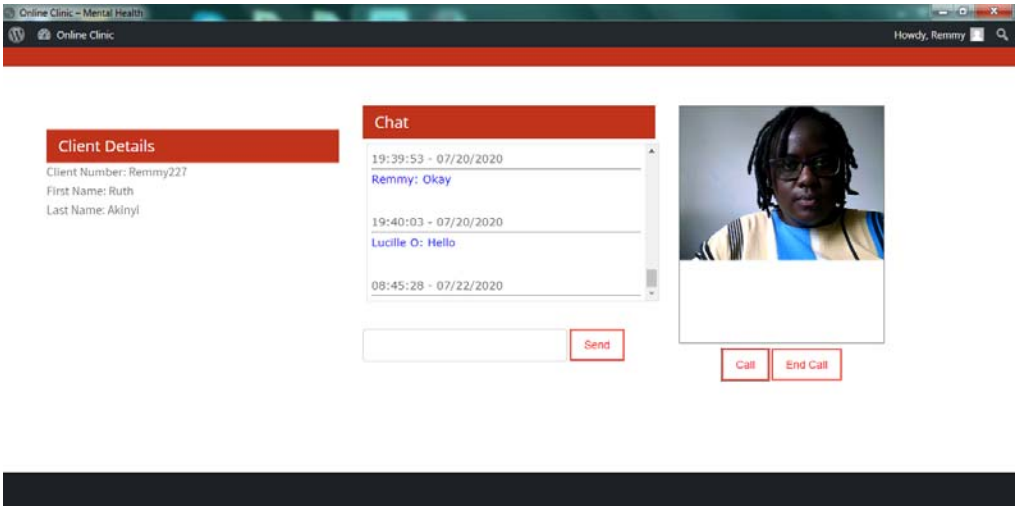


Using the system as a client

1. Log in to the system.



2. The next page will be the client's user interface.



3. The client interface provides the client details, the chat box and the video through which the client can see the clinician. Chat with the clinician by typing in the text box and pressing send.

Assessment Tools

PHQ9

Over the last 2 weeks, how often have you been bothered by any of the following problems? *(Use "✔" to indicate your answer)* **all**	**Not at**	**Several days**	**More than half the days**	**Nearly every day**
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

FOR OFFICE CODING *0* + _____ + _____ + _____

=Total Score: ____

Interpretation of Total Score

Total Score Depression Severity
1-4 Minimal depression
5-9 Mild depression
10-14 Moderate depression
15-19 Moderately severe depression
20-27 Severe depression

Beck's Depression Inventory

1.
0 I do not feel sad.
1 I feel sad
2 I am sad all the time and I can't snap out of it.
3 I am so sad and unhappy that I can't stand it.

2.
0 I am not particularly discouraged about the future.
1 I feel discouraged about the future.
2 I feel I have nothing to look forward to.
3 I feel the future is hopeless and that things cannot improve.

3.
0 I do not feel like a failure.
1 I feel I have failed more than the average person.
2 As I look back on my life, all I can see is a lot of failures.
3 I feel I am a complete failure as a person.

4. 0 I get as much satisfaction out of things as I used to.
1 I don't enjoy things the way I used to.
2 I don't get real satisfaction out of anything anymore.
3 I am dissatisfied or bored with everything.

4. 0 I don't feel particularly guilty
1 I feel guilty a good part of the time.
2 I feel quite guilty most of the time.
3 I feel guilty all of the time.

5. 0 I don't feel I am being punished.
1 I feel I may be punished.
2 I expect to be punished.
3 I feel I am being punished.

6. 0 I don't feel disappointed in myself.
1 I am disappointed in myself.
2 I am disgusted with myself.
3 I hate myself.

7. 0 I don't feel I am any worse than anybody else.
1 I am critical of myself for my weaknesses or mistakes.
2 I blame myself all the time for my faults.
3 I blame myself for everything bad that happens.

8. 0 I don't have any thoughts of killing myself.
1 I have thoughts of killing myself, but I would not carry them out.
2 I would like to kill myself.

3 I would kill myself if I had the chance.

9. 0 I don't cry any more than usual.
1 I cry more now than I used to.
2 I cry all the time now.
3 I used to be able to cry, but now I can't cry even though I want to.

10. 0 I am no more irritated by things than I ever was.
1 I am slightly more irritated now than usual.
2 I am quite annoyed or irritated a good deal of the time.
3 I feel irritated all the time.

11. 0 I have not lost interest in other people.
1 I am less interested in other people than I used to be.
2 I have lost most of my interest in other people.
3 I have lost all of my interest in other people.

12. 0 I make decisions about as well as I ever could.
1 I put off making decisions more than I used to.
2 I have greater difficulty in making decisions more than I used to.
3 I can't make decisions at all anymore.

13. 0 I don't feel that I look any worse than I used to.
1 I am worried that I am looking old or unattractive.
2 I feel there are permanent changes in my appearance that make me look unattractive
3 I believe that I look ugly.

14. 0 I can work about as well as before.
1 It takes an extra effort to get started at doing something.
2 I have to push myself very hard to do anything.
3 I can't do any work at all.

15. 0 I can sleep as well as usual.
1 I don't sleep as well as I used to.
2 I wake up 1-2 hours earlier than usual and find it hard to get back to sleep.
3 I wake up several hours earlier than I used to and cannot get back to sleep.

16. 0 I don't get more tired than usual.
1 I get tired more easily than I used to.
2 I get tired from doing almost anything.
3 I am too tired to do anything.

17. 0 My appetite is no worse than usual.
1 My appetite is not as good as it used to be.
2 My appetite is much worse now.
3 I have no appetite at all anymore.

18. 0 I haven't lost much weight, if any, lately.
1 I have lost more than five pounds.
2 I have lost more than ten pounds.
3 I have lost more than fifteen pounds.

19. 0 I am no more worried about my health than usual.
1 I am worried about physical problems like aches, pains, upset stomach, or constipation.
2 I am very worried about physical problems and it's hard to think of much else.
3 I am so worried about my physical problems that I cannot think of anything else.

20. 0 I have not noticed any recent change in my interest in sex.
1 I am less interested in sex than I used to be.
2 I have almost no interest in sex.
3 I have lost interest in sex completely.

Interpreting the Beck Depression Inventory

Now that you have completed the questionnaire, add up the score for each of the twenty-one questions by counting the number to the right of each question you marked. The highest possible total for the whole test would be sixty-three. This would mean you circled number three on all twenty-one questions. Since the lowest possible score for each question is zero, the lowest possible score for the test would be zero. This would mean you circles zero on each question. You can evaluate your depression according to the Table below.

Total Score_____Levels of Depression

1-10_____These ups and downs are considered normal

11-16_____ Mild mood disturbance

17-20_____Borderline clinical depression

21-30_____Moderate depression

31-40_____Severe depression

Over 40_____Extreme depression

Hamilton Depression Rating Scale

The HAM-D is designed to rate the severity of depression in patients. Although it contains 21 areas, calculate the patient's score on the first 17 answers.

1. DEPRESSED MOOD
(Gloomy attitude, pessimism about the future, feeling of sadness, tendency to weep)
0 = Absent
1 = Sadness, etc.
2 = Occasional weeping
3 = Frequent weeping
4 = Extreme symptoms
2. FEELINGS OF GUILT
0 = Absent
1 = Self-reproach, feels he/she has let people down
2 = Ideas of guilt
3 = Present illness is a punishment; delusions of guilt
4 = Hallucinations of guilt
3. SUICIDE
0 = Absent
1 = Feels life is not worth living
2 = Wishes he/she were dead
3 = Suicidal ideas or gestures
4 = Attempts at suicide
4. INSOMNIA - Initial
(Difficulty in falling asleep)
0 = Absent
1 = Occasional
2 = Frequent
5. INSOMNIA - Middle
(Complains of being restless and disturbed during the night. Waking during the night.)
0 = Absent
1 = Occasional
2 = Frequent
6. INSOMNIA - Delayed
(Waking in early hours of the morning and unable to fall asleep again)
0 = Absent
1 = Occasional
2 = Frequent
7. WORK AND INTERESTS
0 = No difficulty
1 = Feelings of incapacity, listlessness, indecision and vacillation
2 = Loss of interest in hobbies, decreased social activities
3 = Productivity decreased
4 = Unable to work. Stopped working because of present illness only. (Absence from work after treatment or recovery may rate a lower score).

8. RETARDATION
(Slowness of thought, speech, and activity; apathy; stupor.)
0 = Absent
1 = Slight retardation at interview
2 = Obvious retardation at interview
3 = Interview difficult
4 = Complete stupor
9. AGITATION
(Restlessness associated with anxiety.)
0 = Absent
1 = Occasional
2 = Frequent
10. ANXIETY - PSYCHIC
0 = No difficulty
1 = Tension and irritability
2 = Worrying about minor matters
3 = Apprehensive attitude
4 = Fears
11. ANXIETY - SOMATIC
Gastrointestinal, indigestion Cardiovascular, palpitation, Headaches Respiratory, Genito-urinary, etc.
0 = Absent
1 = Mild
2 = Moderate
3 = Severe
4 = Incapacitating
12. SOMATIC SYMPTOMS - GASTROINTESTINAL
(Loss of appetite, heavy feeling in abdomen; constipation)
0 = Absent
1 = Mild
2 = Severe
13. SOMATIC SYMPTOMS - GENERAL
(Heaviness in limbs, back or head; diffuse backache; loss of energy and fatigability)
0 = Absent
1 = Mild
2 = Severe
14. GENITAL SYMPTOMS
(Loss of libido, menstrual disturbances)
0 = Absent
1 = Mild
2 = Severe
15. HYPOCHONDRIASIS
0 = Not present
1 = Self-absorption (bodily)
2 = Preoccupation with health
3 = Querulous attitude

4 = Hypochondria cal delusions

16. WEIGHT LOSS

0 = No weight loss
1 = Slight
2 = Obvious or severe

17. INSIGHT

(Insight must be interpreted in terms of patient's understanding and background.)
0 = No loss
1 = Partial or doubtful loss
2 = Loss of insight

TOTAL ITEMS 1 TO 17: _____

0 - 7 = Normal
8 - 13 = Mild Depression
14-18 = Moderate Depression
19 - 22 = Severe Depression
> 23 = Very Severe Depression

18. DIURNAL VARIATION

(Symptoms worse in morning or evening. Note which it is.)
0 = No variation
1 = Mild variation; AM ( ) PM ( )
2 = Severe variation; AM ( ) PM ( )

19. DEPERSONALIZATION AND DEREALIZATION

(Feelings of unreality, nihilistic ideas)
0 = Absent
1 = Mild
2 = Moderate
3 = Severe
4 = Incapacitating

20. PARANOID SYMPTOMS

(Not with a depressive quality)
0 = None
1 = Suspicious
2 = Ideas of reference
3 = Delusions of reference and persecution
4 = Hallucinations, persecutory

21. OBSESSIONAL SYMPTOMS

(Obsessive thoughts and compulsions against which the patient struggles)
0 = Absent
1 = Mild
2 = Severe