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The Development of Operational Model Integrating Digital Technologies into Public Mental Healthcare Services in Nigeria

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Abstract

The availability and utilization of digital technologies can leverage the challenges of the sharp-depleting workforce due to the consistent migration of healthcare professionals (HCPs), the alarming ratio of the number of patients to HCPs, discretional use of digital technologies among HCPs in providing effective therapeutic interventions and mental healthcare services. This study aimed to develop an operational model that integrates digital technologies in mental healthcare service delivery for public facilities in Nigeria. The practice-oriented theory guides the development of the model. A qualitative method assessed the digital technologies used during the COVID-19 pandemic. A non-probability, purposive sampling technique that employed the snowball method was used in selecting the sixteen (16) HCPs from four (4) neuropsychiatric hospitals in South-West Nigeria. Thematic analysis was conducted on qualitative data. Findings from the qualitative analysis revealed several challenges in providing adequate and efficient services in public mental healthcare facilities in Nigeria, such as human resource challenges, brain drain, lack of infrastructure, and strains on HCPs. Findings from this study indicated that digital technologies are sparingly utilized in public mental healthcare service delivery due to a lack of policy and framework. HCPs perceive digital

technologies to be beneficial to themselves and their clients. The highlighted benefits to patients are reduced stigmatization levels, decreased financial burden, enhanced accessibility to therapists, strengthened adherence, mitigated relapse incidences and improved intervention. The transition from the traditional/conventional space of mental healthcare service delivery to digital space requires a collaborative approach with Computer scientists (software developers, database administrators), Data scientists, investors, stakeholders and mental HCPs. The proposed model serves as a contemporary framework that the Government, policymakers in the Ministry of Health and management of mental health facilities in Nigeria can adopt, providing the needed awareness of the benefit of technological intervention.

Keywords
Operational model; digital technologies; public mental healthcare; Nigeria

1. Introduction

The world is constantly experiencing the outbreak of deadly pandemics. Despite this, regulatory health systems and other stakeholders remain underprepared for the next major pandemic [1] and rely heavily on prevention and containment measures [2]. Mental healthcare service provision in Nigeria's public healthcare system usually involves the extension of synergies among healthcare professionals (HCPs). Naslund [3] found that digital tools provide an avenue to share everyday struggles, reduce loneliness, increase optimism, and communicate ways of coping with mental health issues. The recent outbreak of Coronavirus disease (COVID-19) was exhaustive on the medical team, spawned anxiety in people and burdened healthcare facilities with a significant influx of patients. At the same time, some avoided healthcare facilities due to fear of contracting the virus despite the need for medical attention [2].

In the Nigerian context, using digital technologies for mental healthcare services would enable few HCPs in public facilities to provide e-therapy and telemedicine to patients who are far away and cannot access the few available facilities. Digital technologies such as WhatsApp, Zoom, Google Meet, and Microsoft Teams, among other virtual platforms, provide viable alternatives that can leverage and scale up effective therapeutic mental healthcare services. There is sufficient evidence in the literature that these digital technologies were effectively utilized among HCPs in developed countries for telemedicine and various therapeutic interventions [4].

Research by Mamdouh et al. [5] has also shown that these digital technologies provided timely and effective mental healthcare solutions across various platforms using mobile applications for e-therapy, m-Health, and other web-based applications. Despite the COVID-19 pandemic providing a leverage that scaled up these technologies [6], these technologies were not adequately utilized in many sub-Saharan African countries [7].

Additionally, Lawal and Nwegbu [8] opined that preventive mental health education on topics such as depression could be provided to the public through conventional radio and television programs. Findings by Edo et al. [9] and Trans et al. [10] revealed that there is a history of emigration for greener pastures among these professionals as a result of the increasing demand for HCPs among developed countries seeking to strengthen their healthcare systems and plans for future

health emergencies. Unfortunately, this situation has seriously depleted the workforce in most public healthcare facilities in Nigeria, causing an alarming rate of one HCP and an average of forty in-patients [8] and grossly impacted services [11]. Onu and Onyeka [12] also found that digital technologies,, such as WhatsApp and Messenger, have been used based on the competence and discretion of the mental HCPs. Still, these technologies were not integrated into Nigeria's healthcare system.

There is a need to facilitate the widespread adoption and implementation of digital mental health interventions in routine care. Effective adoption and utilization of digital mental health interventions require consolidated and consistent guidelines as well as consensus, expert, and position statements on the screening and tracking of mental health in general, as well as affected populations, and also as considerations and initiatives for underserved and vulnerable subpopulations [13, 14]. There is a need to develop a localized framework that considers factors peculiar to the Nigerian populace, such as lack of electricity, poor infrastructure, underfunded healthcare system, unresponsive Government, inadequate and inconsistent data reporting, and low mental health awareness [13, 15-17].

The operational framework in public mental healthcare facilities in Nigeria falls short of a contemporary operational model, which is evident in inadequate and poor service delivery. There is a need to prioritize and strengthen the health care sector. An operational model is a structured framework to organize and interpret complex information, make decisions, or solve problems. It comprises interconnected concepts, principles, and guidelines that help stakeholders understand the organization's objectives, strategies, operations, and performance [18, 19]. Therefore, this study aimed to develop a conceptual model that integrates digital technologies in mental healthcare service delivery for public healthcare systems in Nigeria. This model aims to improve the use of digital technologies for mental health service delivery among public healthcare systems in Nigeria. The fundamentals of capacity building for outbreak readiness lie greatly in a resilient health system, as well as infrastructure and communication systems for easy accessibility and dissemination of information. The practice-oriented theory by Dickoff et al. [20] guides the development of the conceptual model that integrates digital technologies in public mental healthcare services delivery in Nigeria.

2. Literature Review

Articles involving the use of digital technologies for the provision of therapeutic and medical interventions among HCPs during and post-COVID-19 pandemic were explored. Information about the studies is highlighted in Table 1.

Table 1 Summary of literatures.

S/N	Author(s) Year Country	Design, Method Population and Sample	Purpose of Study	Quality Rating Scale (1 to 10)
1	Gillis, et al., 2024 United Kingdom [21]	Mixed-methods Design Primary data (Interview & Questionnaire) N = 49	To understand how people with severe mental illness (SMI) can use digital health interventions (DHIs) to support their physical health, the acceptability, factors affecting use, and impact on physical health	8 small sample size
2	Bond, et al., 2023 USA [22]	Technical Analysis of Digital Technologies and Artificial Intelligence Applications for Mental Healthcare N = 40	To provide insights into how digital technologies can enhance (but not replace) existing mental health services and present a suite of digital technologies from digital interventions to the application of artificial intelligence	10
3	Li, J. 2023 China [6]	Database Search (IEEE Digital Library, ACM Digital Library, PsycINFO, PubMed, and Web of Science) N = 20	To offer a scoping review of the characteristics and effectiveness of digital interventions that were employed to improve mental health in the real context of COVID-19 pandemic	8 small sample size
4	Mindu, et al., 2023 South Africa [4]	Mixed-methods Design Primary data (Interview & Questionnaire) N = 93	To identify the prospects and challenges of implementing a mobile phone-based mental health intervention for young people	9
5	Edo, et al., 2023 Nigeria [9]	Cross-sectional Survey N = 301	To investigate the factors that influence the adoption of technology among HCPs in Nigeria	10
6	Park & Kim 2023 South Korea [23]	Cross-sectional Survey N = 278	To examine factors influencing people's intentions to use digital mental healthcare content to manage depression	10

7	Eguchi, et al., 2023 Japan [24]	Cross-sectional Survey N = 2,501	To assess the prevalence of employees using digital technology services for mental health in occupational health settings in Japan	10
8	Scott, et al., 2022 Australia [25]	Qualitative Exploratory Design N = 10	To explore psychologists' attitudes and experiences with digital mental health intervention.	7 sample size small
9	Mamdouh, et al., 2022 Egypt [5]	Cross-sectional survey Design N = 707	To explore the interest of Egyptian youth in e-Mental Health, identify perceived barriers to e-Mental Health, and inform the design of e-Mental Health tools to best address the needs of youth	10
10	Al-zahrani, et al., 2021 Saudi Arabia [26]	Cross-sectional survey Design N = 100	To investigate the opinion of mental healthcare providers on the impact of electronic games on psychiatric patients in Saudi Arabia	9
11	Adenuga et al. 2020 Nigeria [27]	Quantitative survey design N = 252	Explore the need to positively reinforce the adoption of telemedicine among clinicians in Nigeria.	10

Evidence from literature showed that a wide range of digital applications powered by smartphones and computers connected to the internet has evolved from video conferencing platforms to the adoption of virtual reality platforms using Artificial Intelligence to provide various therapeutic interventions [9, 21, 22]. According to Edo et al. [4], web and mobile-based platforms, such as social networking and video conferencing applications such as Skype, Zoom, Google Meet, and Microsoft Teams, among others, were the most utilized digital technologies for mental health services across regions. The study by Mindu et al. [9] found that 60% of the young population preferred social media applications (WhatsApp and Facebook), 40% preferred mobile phone applications (apps, text, calls), and 17% preferred website applications for digital mental health interventions. Research has shown that digital technologies provide timely and effective mental healthcare solutions across various platforms using mobile applications for e-therapy, m-Health, and other web-based applications [18].

Findings from the literatures search showed that various types of digital technologies using smartphones for voice calls, video conferencing, web-based platforms (including web chats), text messaging, mobile health applications, robots, wearable devices, and non-contact sensing devices were used and are being scaled-up post COVID-19 pandemic [10, 20]. Al-zahrani et al. [21] found that using digital technologies for mental health interventions provides quick access to therapists and saves emergencies. Also, Mamdouh et al. [10] noted that using digital technologies reduces relapse incidents caused by poor follow-ups. The study by Eguchi et al. [19] found that most youths agreed that the use of a digital application known as “MyMentalPocket” was not only effective in reducing symptoms of depression but was also cost-friendly and convenient to use. Adenuga et al. [27] findings highlighted that, the integration of telemedicine in Nigeria healthcare system reduces clinicians’ travel time, eases travel cost and allows severe cases to be attended to virtually.

3. Materials and Methods

3.1 Participants and Procedure

The Durban University of Technology Research and Ethics Committee, South Africa (IREC Reference number 164/22) sought and granted ethical approval. Additionally, permission was obtained from Nigeria's four (4) neuropsychiatric facilities. All the participants completed an informed consent form before participating in the study as per ethical recommendations. The study was conducted in the southwest of Nigeria, and the study sites were in Ondo, Ogun, Lagos, and Oyo. These facilities were the only public mental healthcare facilities in these four states, except for Yaba and Ogun neuropsychiatric hospitals with annexes in Oshodi and Lantoro, respectively. The researchers worked with unit heads of psychiatric doctors, psychiatric nurses, clinical psychologists, and occupational therapists to schedule the interview sessions at their various duty posts and their convenience.

A non-probability, purposive sampling technique that employed the snowball method was used in selecting the sixteen (16) HCPs that participated in this study. Pre-informed HCPs identified and recruited other HCPs (population of interest). Inclusion criteria include HCPs with two years and above working experience and employed as a full-time facility staff member. Administrative staff members, HCPs on internship, and those who did not sign consent forms were excluded. HCPs granted permission to audiotape the interview. The entire interview was recorded on an audio device. The following steps guide the qualitative data analysis: The researcher records the whole

interview on an audio device; Familiarisation and transcription of the audio recording verbatim; Generation of codes; Transcripts are carefully read through to identify occurring themes; and Presentation and description of identified themes. The findings from the qualitative data are discussed and participants' views and narrations are incorporated.

3.2 Measurement

Qualitative data were gathered via a face-to-face structured interview guide. A voice recorder and field notes were used to record interview sessions and background statements as data collection techniques. Broad questions were asked of all participants, including: "What are your perceptions towards the utilization of digital technologies in improving mental healthcare services and wellbeing?" and "What do you think is/or has been a major barrier to the provision of mental healthcare services and wellbeing through digital technologies?" these questions were further probed under each response from the interviewed participants.

4. Analysis

4.1 Results

4.1.1 Demographic Characteristics

Demographic characteristics of participants include age, gender, years of experience and area of specialization as presented in Table 2. Of the HCPs that participated in the study, 9 (56.2%) were females, while 7 (43.8%) were males. Participants' ages range from 20-30 (18.8%) to 51-65 (6.2%). HCP interviewed had a minimum of 2-6 years (18.8%) and a maximum of 21 years (6.2%). The participants' areas of specialization were psychiatric nurses (31.2%), clinical psychologists (25%), occupational therapists (18.8%), and Psychiatrists (25%). Four (4) themes and twelve (12) subthemes were identified and discussed below.

Table 2 Demographic characteristics.

Variables	n (%)
Gender	
Male	7 (43.8%)
Female	9 (56.2%)
Age	
20-30 years	3 (18.8%)
31-40 years	7 (43.8%)
41-50 years	5 (31.2%)
51-65 years	1 (6.2%)
Specialization	
Psychiatric Nurse	5 (31.2%)
Clinical Psychologist	4 (25%)
Occupational therapist	3 (18.8%)
Psychiatrist	4 (25%)

Years in experience	
2-6 years	3 (18.8%)
7-11 years	3 (18.8%)
12-16 years	5 (31.2%)
17-21 years	4 (25%)
Above 21 years	1 (6.2%)

Table 3 below shows the code used to represent each interviewed participant's responses during the interview. This distinguished participants from different facilities and highlighted the source of the quotes.

Table 3 Coding of participants.

Facility	Facility Code	Total Participant Interviewed
Neuropsychiatric Hospital Yaba, Lagos State	YA#P1; YA#P2; YA#P3; YA#P4	4
ARO Neuropsychiatric Hospital Abeokuta, Ogun State	AR#P1; AR#P2; AR#P3; AR#P4	4
Department of Psychiatry, University of Ibadan Teaching Hospital, Oyo State	IB#P1; IB#P2; IB#P3; IB#P4	4
Neuropsychiatric Hospital, Akure, Ondo State	AK#P1; AK#P2; AK#P3; AK#P4	4

KEY:

#P1, #P2, #P3, #P4 represents each of the participant in the four neuropsychiatric facilities.

YA: represents participants in Yaba neuropsychiatric hospital.

AR: represents participants in ARO neuropsychiatric hospital.

IB: represent participants in Ibadan neuropsychiatric hospital.

AK: represent participants in Akure Neuropsychiatric hospital.

The themes and sub-themes identified are highlighted in Table 4 below. As part of the analysis, excerpts from the interviews have been included to explain the points identified further.

Table 4 Summary of themes and sub-themes identified.

THEMES	SUB-THEMES
Knowledge and use of Digital technologies during and after COVID-19 pandemic	
Benefits of digital tools for mental health service provision	● *Accessibility* ● *Continuity of service provision* ● *Eliminate stigmatization*
Perceptions of health workers towards the utilization of digital technologies to improve mental healthcare service	● *Attitude towards digital tools* ● *Acceptability*

Barriers and challenges impeding the provision of mental healthcare services and wellbeing through digital technologies	● *Human resource challenges* ● *Poor infrastructure* ● *Emerging operational issues* ● *Inconsistent power supply* ● *Poor network connectivity* ● *Possibility of being hacked* ● *Lack of framework/policy*

4.1.2 Knowledge and Use of Digital Technologies during and after COVID-19 Pandemic

The digital technologies available for mental health services play a massive role in how and when they are used. HCPs were aware of these technologies before the pandemic, which gained much popularity during COVID-19. According to qualitative responses, some of the digital tools HCPs were aware of before the pandemic include telephone, WhatsApp chats, WhatsApp Calls, Zoom, computers, electronic gadgets, Google Meet, Media platforms, and Teleconferencing. This study revealed that, although not officially, some HCPs started using digital technology tools before COVID-19. Due to the therapeutic alliance HCPs have formed over the years with their patients, they voluntarily make phone calls, send SMSes, or use WhatsApp platforms to check their patients' progress and well-being. Digital technologies enable HCPs to communicate better with their clients or patients.

> *"…. I am aware of Zoom, different app, WhatsApp platform, video or call, virtual reality, artificial intelligence."* [YA#P4]

> *"…. personally, I give my numbers to my patients……. I feel that giving out my contact information is a way to access me easily. Although l may not conduct a session, l feel it makes me reach my patients and we can agree on a time to meet at the clinic."* [IB#P3]

Due to the ban placed on movement during the COVID-19 pandemic, which came with its associated increase in the demand for mental health services, HCPs had to incorporate some digital tools in service provision. The COVID-19 pandemic made digital technologies famous and their use intensified. Findings further indicated that management was able to provide the needed digital tools to meet the needs of the patients during the COVID-19 pandemic. However, the use of digital tools post-pandemic is not the same as during the pandemic. Services have moved from online to face-to-face therapy sessions, while bookings, follow-ups, and appointments must be done physically at the facility. Some technologies already used before the pandemic were maintained, but others were also introduced. Although continuous use is not discouraged in some facilities, it is not encouraged in others.

4.1.3 Benefits of Digital Tools for Mental Health Service Provision

Digital tools have come to stay. They offer various benefits to HCPs and patients in providing mental health services. The advantages of using digital tools for mental health services are identified below:

Accessibility. Utilizing digital tools in mental health services bridges the distance gap in accessing mental health services. Irrespective of the location, these digital tools connect patients and HCPs

with the tap of a button. Issues of traveling long distances, waiting times at the hospitals, staying in long queues, and being sent back home without seeing the doctor do not come into play here. Additionally, having access to HCPs helps patients to ask pertinent questions they may have been shy to ask in person or forgot to ask, which promotes the continuity of care. One unique thing about using these digital tools is that care does not necessarily end at the health facility. It transcends physical locations and times, making it easier and more comfortable for patients. Patients also do not need to be within proximity of the health facility to be able to access mental health care. Digital tools make it possible for patients to connect with HCPs across borders. It paves the way for effective and efficient mental health services for people in need, regardless of location. Excuses such as travel costs and long waiting hours at the hospital, among others, will be reduced, and patients will not have any reason not to continue with their sessions online. Having relatively more accessible access to mental health services helps in their treatment process.

> "*Those in diaspora are also able to benefit through digital platforms. Due to cultural differences, some mental illnesses cannot be understood and treated outside the country, so those in the diaspora can reach out to HCPs in Nigeria for mental health services."* [YA#P3]

Continuity of Service Provision. The continuity of service provision is closely linked with having access to mental health services. As patients and HCPs alike can have access to their patients irrespective of their locations, it makes it easier to continue treatment without having the burden of traveling long distances. This has the propensity to reduce relapses or truncate treatment midway significantly. The use of digital tools also makes it ideal for emergencies due to how easy it is to connect patients and HCPs. Although there may be concerns raised about the ease with which patients can reach HCPs and the need to put in place measures to control access to HCPs, it helps in placing situations under control. The absence of these tools would mean having to physically move to a health facility to access care, even in emergencies.

> *"Sometimes, I tell my patient when to call at a specific time and in case l did not pick up, it does not mean they are not important, it means I am busy with other things and I will get back to them. With mental health patients, you need to be careful how you deal with them and explain very well to them otherwise, we will be having issues. Sometimes, l have patients who call in late at night or send in messages late at night, but I try to manage the situation "[YA#P2].*

With the introduction of digital technologies, HCPs do not necessarily have to be physically present at the health facilities to attend to patients, thereby reducing travel costs and time. Therapists can offer therapy sessions at their convenience. In addition, using digital tools would help better manage treatment in situations where patients live far away from the health facilities. The ease with which they can access HCPs would aid in the treatment process, thus requiring fewer visits and therapy sessions than when the said patients had to travel to the health facilities physically and had a high probability of skipping visits, leading to even worse outcomes.

Eliminate Stigmatization. At the heart of mental care service provision is patients' wellbeing. Stigmatization, which is often associated with mental health, to a large extent is reduced. This is because patients (and their families or caretakers) do not need to be physically present to have access to mental health services. This means less visibility with little to no association with mental health facilities. Patients with anxiety can benefit greatly from the use of digital tools. Such patients

do not need to visit the mental health facility but can have all their therapy sessions online seamlessly. Not only would it improve their mental health but also their wellbeing generally. Digital technologies will reduce missed appointments and the number of defaulting patients.

4.1.4 Perceptions of Health Workers towards the Utilization of Digital Technologies to Improve Mental Healthcare Service

Most HCPs perceived digital tools as reliable while few perceived them as unreliable. Not only does it reduce time spent in the hospitals, but it also makes treatment relatively easier and seamless. As in-person meetings are reduced, they can have sessions with their patients in their comfort zones. Although some HCPs accept digital tools, others have a different view.

One of the main concerns of some HCPs was the inability to read their patients' emotions and observe them on digital platforms, which are important cues in treatment. Although integrating these digital tools into daily care would make reaching patients easier and ensuring that their treatments are not derailed, caution is still needed.

Attitude Towards Digital Tools. HCPs' attitudes toward the use of digital tools may likely hamper their adoption and use. HCPs with a negative attitude towards using digital tools may likely not encourage their patients to use available digital tools. Many HCPs had positive attitudes to the use of digital technologies and perceived that digital technologies would benefit patients.

However, some HCPs believe the traditional mode of intervention is the only way to assist people with mental health challenges because important cues could easily be missed or hidden when using digital technologies. Signs of anxiety could easily be camouflaged on digital platforms. Facial cues could go undetected, which is why some HCPs are very rigid about the utilization of digital technologies. This is enhancing resistance to integrating digital technologies in mental healthcare service delivery.

> *"I initiated the use of the telephone to be used among staff to save time, energy and human resources so that staff would not need to run from one office to another but unfortunately, people are unwilling to use it, maybe not consciously because they are used to the crude method of doing things. Sometimes, when you try to investigate, you find that the phone has not been charged in a week, the battery is dead, or there is a fault with the phone, and nobody will report it. The attitude is just the challenge. It would have been effective and make things easier if the attitude of staff is positive."* [AK#P4]

Acceptability. Acceptability of digital tools by HCPs is high. In addition, digital technologies give a credible way to make inquiries and get timely information on mental health issues. Patients do not have to wait till their next appointment before getting assistance. HCPs opined that digital tools will make their work easier. Therefore, there is a need to be circumspect with their use and put in place the necessary measures to ensure that HCPs are conversant enough to use such tools to improve diagnosis and treatment.

4.1.5 Barriers and Challenges Impeding the Provision of Mental Healthcare Services and Wellbeing through Digital Technologies

The public healthcare system in Nigeria is fraught with a myriad of challenges, particularly with mental health service provision, which is often at the bottom of the pyramid. HCPs identified some major bottlenecks in providing mental health services through digital technologies in Nigeria. From the administrative point of view, setting up a system in mental health facilities to enable patients and HCPs to communicate seamlessly online as part of treatment options is expensive. The inadequate funds received from the Federal Government and the inability to generate funds internally preclude the integration of digital tools. Patients are burdened with the inability to purchase the tools needed for therapy, such as tablets and phones and the inability to afford data needed for Zoom calls, WhatsApp video and audio calls and Google Meet sessions.

Human Resource Challenges. The brain drain situation is worrying and compounds the issue of inadequate personnel in the provision of mental health services in Nigeria. This inadequacy places a burden on the HCPs on a day-to-day basis. Apart from stretching themselves thin, HCPs must further battle with being at different places at different times to be able to cater to the demand for mental health services. In an ideal case, a therapist is encouraged to attend to five to six patients daily. This is, however, not the case in many public healthcare facilities across the country. This significantly burdens them physically and their ability to attend to all of them and, more importantly, provide quality patient services.

> *"….. I was in the male ward and I saw just one psychiatric nurse attending to about 40 patients, the services you will give when you attend to six patients are not the same with 40 patients. She is not supposed to attend to patients. She is a senior-level officer. I am the only one here today to attend to patients in the ward and those coming for appointments. I am so overwhelmed."* [YA#P4]

Closely linked to the high HCP-patient ratio is the burdensome daily routine. They are often overworked, which presents as a daily challenge. HCPs always run through patients quickly to be able to attend to everyone present. As unfortunate as this is, there seems to be no solution. This places patients at the receiving end of the inefficiencies of mental health service provision in the country.

Poor Infrastructure. The infrastructure of some facilities is in a deplorable state, while some are in the process of renovation. HCPs need a conducive environment that aids in the provision of quality services. Compounding all these challenges above is the issue of inadequate public mental health facilities. The existing facilities serve a large catchment area and cannot meet demand. This inadvertently means that not all patients can be catered to. The inadequacy of facilities also translates into inadequate office spaces. Not only are the offices small, but HCPs often share these office spaces, doubling as therapy rooms. Privacy, therefore, becomes an issue. This influences patient's ability to talk freely and openly about their problems during therapy sessions.

> "*We do not have adequate facilities. We are now servicing Ondo state, Kogi state, Osun state, and Ekiti state. Mental health patients from these states can access this facility. This facility sometimes serves people from Benin and Delta states and riverine communities that share*

boundaries with Ondo Stare. Apart from this facility, we only have a unit in Federal Medical Centre Owo and Federal Medical Centre Ido Ekiti, which can only accommodate around eight males and eight female patients." [AK#P1]

Emerging Operational Issues. According to some HCPs, the use of digital technologies is viewed as being difficult, highlighting complicated mobile applications, extra time and effort to use, technological malfunctions, constant charging of digital equipment, lack of incentives, poor capacity development and lack of technical know-how. HCPs highlight the need for continuous training on the use of digital technologies. Furthermore, this study also found that HCPs viewed the training involved in the use of some digital tools as rigorous, while some consider the training as self-development as the world is fast moving towards digitalization.

Inconsistent Power Supply. Inconsistent power supply is also a challenge. The use of Wi-Fi requires electricity, unfortunately, electricity supply in the country is largely inconsistent. This influences the effectiveness of online therapy sessions. Mental health facilities, just like other health facilities, need a consistent power supply to be able to run effectively. This makes service provision inconsistent, uncomfortable, and inefficient, especially when it truncates therapy sessions. The inconsistent power supply has forced many facilities to use generators. Where both generator and power supply are off, providing the patients with mental health services becomes a challenge.

Poor Network Connectivity. Technology should foster hitch free online therapy sessions but unfortunately, this is not the case with the Nigeria system. This poses a challenge for the integration of digital technologies. The country has a problem with network connectivity, making it a challenge to have consistent therapy sessions without interruption. Sometimes, such therapy sessions may end abruptly due to bad connectivity. Poor connectivity also influences other patients' wait time and burdened HCPs who may have other patients waiting for their online therapy sessions.

"*I cannot bear to stay on the phone for too long when the network is poor or fluctuating because l have other patients waiting and other things to do."* [AR#P3]

Possibility of Being Hacked. One ought to be wary of a possible hack in using these digital tools. Intruders (hackers) could hack the datasets of health facilities and extract information on a person of interest. Considering the political terrain in the country, this is of major concern to some HCPs. Unwarranted internet intrusion is another highlighted challenge. There are strong possibilities that hackers can gain access to patient information and use it against them. Sometimes, these hackers use it as a weapon for blackmail to extort money or valuables from patients. Political opposition parties can also use this information against their opponents in their quest for power.

Although these barriers exist, incorporating digital tools into mental health service provision is still welcome. Despite the stated barriers and challenges, most HCPs believe digital technologies should be partially integrated into mental health to improve service delivery. HCPs who want partial integration are of the opinion that face-to-face sessions are very crucial in therapy and should not be discarded.

"There could also be security breaches even though there is end-to-end encryption. Therapist is not recording sessions but are being stored by the system. If some questionnaires are filled-

in by patients online and stored in emails, there is no guarantee that such emails cannot be hacked and such information leaked." [IB#P2].

Lack of Framework/Policy. One major concern that came up is the issue of regulations that protect HCPs. The use of digital tools is not a bad idea. However, appropriate policy and regulations should be in place to protect the HCPs and patient. There is a need for proper documentation to ensure both patients and clients are protected legally. The few HCPs who use telephone calls or WhatsApp with their patients do so at their own risk.

The use of digital technologies can give patients unwarranted access to HCPs. Having the contact details of the HCPs creates a personal bond between HCPs and patients, which can often be misconstrued. The patient could call at ungodly hours, bombard HCP with messages, or make a non-existent bond in his/her mind due to their mental state. This is why there is a need to put in place a controlled and regulated system to ensure this does not happen.

"…. we are using it, but until there is a policy guiding the use, I use it cautiously. There is a need for proper documentation of communication over digital platforms, and bookings need to be made before consultations are scheduled. Both patient and HCPs must be protected and communication documented because if it is not documented and no policy in place, I could easily be implicated and patients can make unfounded claims against me, so documentation and policy regarding the use of digital platforms need to be in place." [AR#P3]

4.2 Model Development

Research has shown that digital technologies provide timely and effective mental healthcare solutions across a wide range of platforms using mobile applications for e-therapy, m-Health, and other web-based applications. The COVID-19 pandemic provided a leverage that scaled-up these technologies [6]. However, research findings also suggested that these technologies were not adequately utilized in many sub-Saharan African countries, and their importance has not been well appreciated [7]. The aim is to develop a model that integrates digital technologies into mental health services in public healthcare facilities in Nigeria. The practice-oriented theory by Dickoff et al. [20] guides the development of the model. The six (6) item survey lists, according to Dickoff et al. [20], explain ways of integrating digital technologies into mental health service delivery. The items are agent, recipient, context, dynamics, procedure and terminus. These items focus on:

- Who is responsible for certain activities?
- Who are the beneficiaries of these activities?
- Within which settings would these activities be performed?
- What are the procedures that guide these activities?
- What are the dynamics of the activities?
- What are the expectations from these activities?

The conceptual framework by Dickoff et al. [20] offers a logical guide to developing a contemporary model for integrating digital technologies into mental healthcare service delivery in public healthcare facilities in Nigeria. Figure 1 shows a diagrammatic representation of a conceptual framework by Dickoff et al. [20], which this study adapts to explain the activities and responsibilities, procedures, beneficiaries, dynamics, and expectations in providing digital health interventions in public mental health settings in Nigeria.

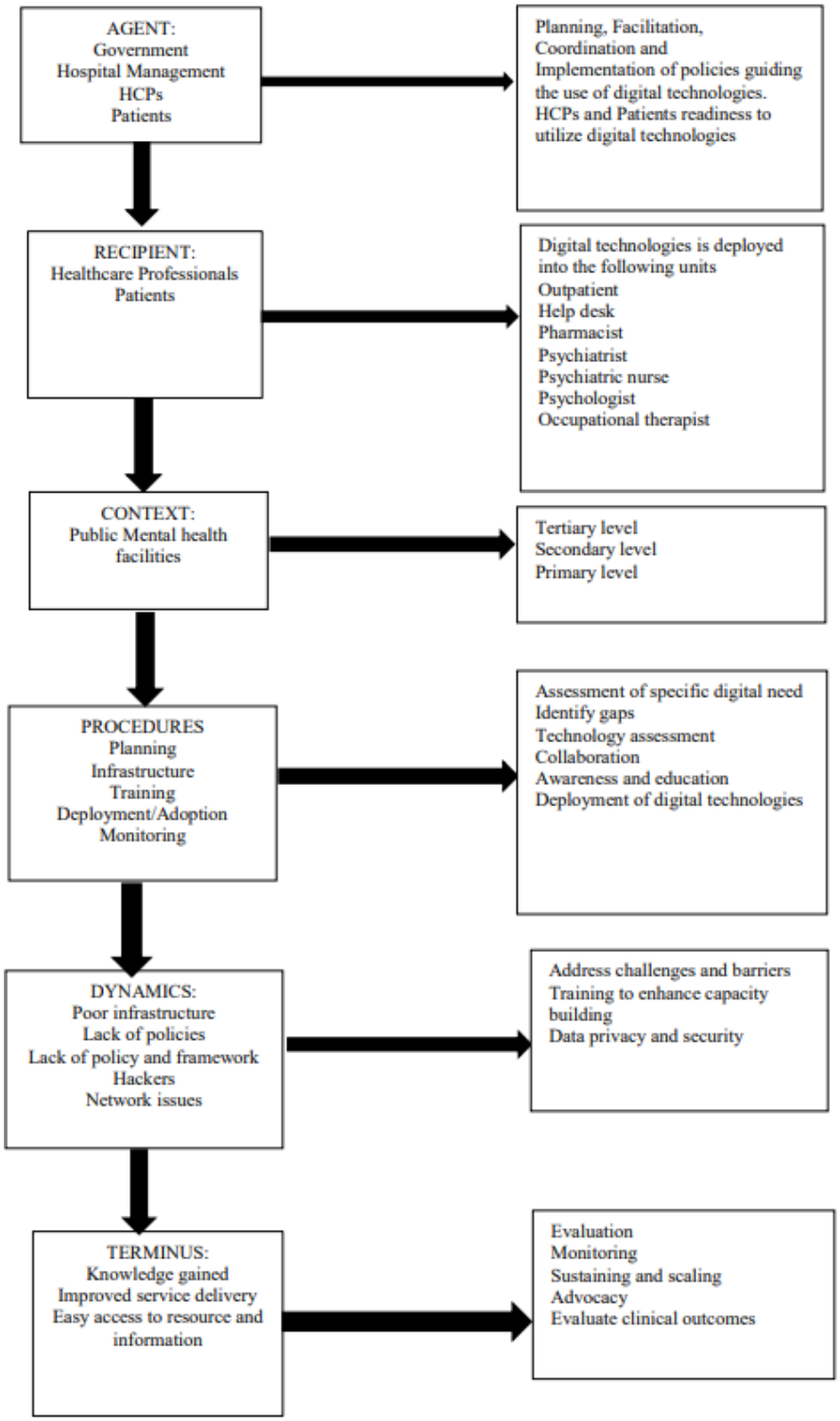

Figure 1 Proposed conceptual model.

In this study, the Government, Hospital management, HCPs, and patients represent the agents, HCPs and patients are the recipients, and mental health facilities are the context. Infrastructure and training entail the procedures and dynamics defined by the challenges and barriers in utilizing digital technologies for service delivery, while the terminus is improved services at public mental health facilities in Nigeria. These concepts are explained in line with each item focus question.

4.2.1 Agent: Who Is Responsible for Certain Activities?

The agent is responsible for the facilitation, coordination, planning, and development of strategies and pushes for the achievement of the goal [20, 28]. The agent designs policies that guide how digital technologies should be used, the level of use, control accessibility, and evaluates and addresses challenges and barriers in using digital technologies in mental health service delivery. In this model, those categorized as agents include the Government, Hospital management, HCPs and patients.

As an agent, the government puts policies in place that guide the use of digital technologies in public mental healthcare. These policies protect both HCPs and patients and also provide ethics of use. There is a need for the Government to provide infrastructures such as stable internet, laptops, phones, desktops, and applications that will aid the easy deployment of digital technologies into public mental healthcare. These tools will improve mental health services and wellbeing and enhance preparedness for health emergencies.

Hospital management should provide regular training for HCPs on the use of digital technologies and when innovations in mental health evolve. This will mitigate the challenges of unskilled HCPs and significantly enhance preparedness in case of any health emergencies or outbreaks. HCPs will have a positive attitude towards the use of digital technologies for service delivery when there is adequate training. A favorable working environment needs to be in place, such as a well-ventilated and equipped office space and maintenance of landscape around offices and wards to create a good ambiance.

HCPs and patients are also categorized as agents in this model. The HCP and patient are responsible for accepting and utilizing digital tools for mental health services delivery and wellbeing. HCPs can influence their patients to use digital technologies for their therapy sessions and follow-ups. Group therapy sessions, individual sessions, psychotherapy etc. can be conducted with ease on digital platforms without the need for patients and family members to travel to the facility.

4.2.2 Recipient: Who Are the Beneficiaries of These Activities?

Recipients are the beneficiaries of the activities [20, 28]. HCPs and patients are the beneficiaries of the integration of digital technologies into mental health service delivery. Integrating digital technologies will enable HCPs to provide effective and efficient services, reach as many clients/patients as possible, and not need to get to the facility to attend or conduct their therapy sessions. Distance will not be a barrier to the therapeutic alliance between patients and HCPs. Additionally, patients have easy access to HCPs, stigmatization associated with mental health facilities is eliminated, the cost of transportation and long queues is reduced and therapy sessions are not terminated abruptly if there is another health emergency or outbreak.

4.2.3 Context: Within Which Settings Would These Activities Be Performed?

Context is the setting in which the activities would be performed [20, 28]. The context in this model refers to all government-owned mental healthcare facilities at the tertiary, secondary, or primary level in Nigeria.

4.2.4 Procedure: What Are the Procedures that Guide These Activities?

Procedure according to Dickoff et al. [20] is the steps to achieve successful, effective and efficient activities. The empirical findings guide the procedure for integrating digital technologies into mental health service delivery and wellbeing.

Assessment and need analysis must be conducted at all mental health facilities to assess the level of need. This will enable the Government to identify gaps in service delivery and infrastructural needs peculiar to each facility. The infrastructure will entail a robust internet connection, reliable power generators, digital tools and necessary hardware. The Government should have a collaborative consultation with stakeholders, network providers, Hospital management and HCPs to have a holistic approach, generate funding for sustainability and provide context-specific solutions. The government facilitates the development of policies and frameworks to support the use of digital technologies for mental service delivery that critically address data security, privacy, and ethics. Evidence-based digital technologies appropriate for each mental health facility are selected and customized to align with cultural norms, languages and user preferences. Awareness and education are conducted to educate patients and the general public on the available digital tools for mental health services and the benefits (access to correct and up-to-date information, reduced stigmatization, easy access to HCPs) of utilizing these digital platforms. Hospital Management needs to regularly evaluate and collate feedback from HCPs and patients on the effectiveness of integrated digital technologies in mental health intervention. The feedbacks are utilized in refining productivity and improving service delivery.

4.2.5 Dynamics: What Are the Dynamics of the Activities?

The dynamics are the barriers and challenges that hinder the integration of digital technologies into mental health service delivery and wellbeing. The dynamics identified from qualitative findings were network issues, inconsistent power supply, poor infrastructure, lack of policy and framework, network issues, and problems of hackers. Currently, no policy regulates how HCPs use digital technologies to provide services to their patients. More so, the deplorable state of infrastructure in public health threatens the successful integration of digital technologies into the public healthcare system in Nigeria, which is further hampered by the low budget allocation. There is a need for a collaborative effort between the Government, Hospital management, and network providers.

4.2.6 Terminus: What Are the Expectations from These Activities?

This is the last of Dickoff et al. [20] survey list. This denotes the endpoint of the model. That is, it is the outcome of the integration of digital technologies in providing mental health services in public healthcare in Nigeria. HCPs can effectively carry out therapy sessions and demonstrate competencies in digital skills, the problem of distance is conquered, and they can reach more patients. Patients no longer face stigmatization or financial challenges, long queues at the facility are eliminated and mental health services are easily accessible. The agents are vital to the success of the model.

4.3 Significance and Purpose of the Conceptual Framework

The conceptual framework provides insights into relevant factors that will impact the utilization of digital technologies in mental health service delivery. The conceptual framework simplifies the pathways through which specific activities can be identified within a specific context, and how the responsibilities are assigned. The conceptual framework will benefit hospital management by identifying the infrastructural requirements for scaling up digital healthcare interventions and assigning responsibilities accordingly.

The availability of essential infrastructures such as laptops, internet-enabled phones, airtime, Wi-Fi, and constant electricity facilitates the acceptance and use of digital technologies among HCPs in public mental healthcare facilities in Nigeria. Further, if HCPs perceived the use of digital technologies to be beneficial, favorable and positively influences patient, then it enhances its use [27]. Additionally, more HCPs will embrace the use of digital technologies if their colleagues use the same technologies with no problems encountered and with utmost safety. The perceived benefit has a significant positive relationship with digital technologies for mental health service delivery and wellbeing. This study suggests that as HCPs in Nigeria perceive the benefits digital technologies offer them and their patients, their utilization will increase. This outcome informed and guided the development of an operational pathway integrating digital technologies into public mental healthcare in Nigeria.

4.4 Integration of Digital Technologies into Mental Service Delivery in Public Healthcare Systems in Nigeria

The model was developed based on the few digital technologies (Phone calls, WhatsApp, Zoom, Google Meet, and Telemedicine) utilized among HCPs in the selected facilities. This study found that adopting and using these digital technologies have a significant positive relationship with these theoretical constructs. Therefore, the developed model adapted the operational model for mental healthcare service delivery in public facilities in Nigeria and the associated type(s) of digital technologies utilized. The structure of the operational pathways is described below and presented in Figure 2.

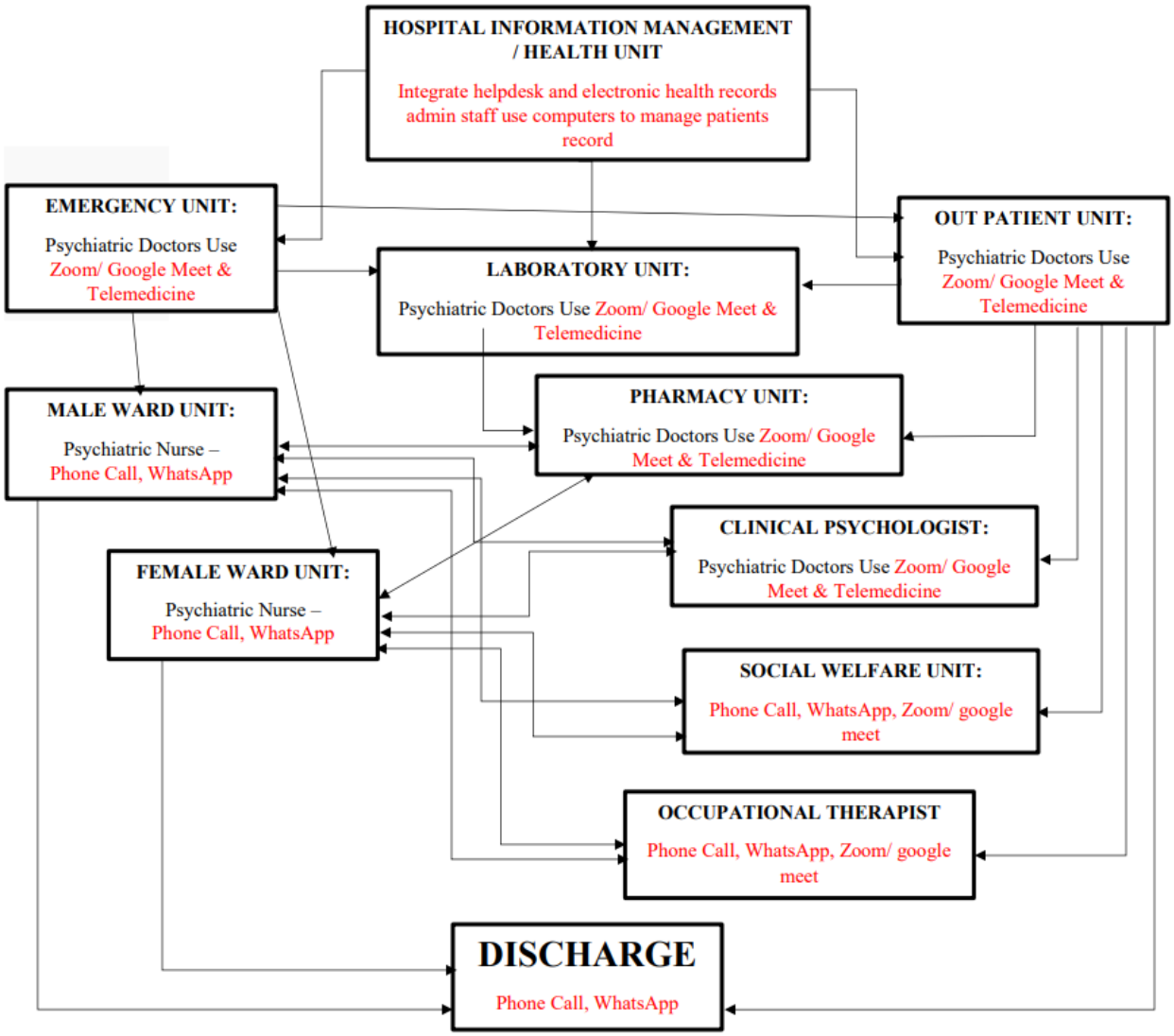

Figure 2 Integration of digital technologies into the operational model in the public mental healthcare system in Nigeria.

4.4.1 Hospital Information Management/Health Records Unit

The personnel in the Hospital Information Management/Health Records unit must be equipped with digital technologies for effective and efficient services promoting precise and well-documented patient records. Electronic health records (EHR) promote seamless medical workflow and have been incorporated into some tertiary healthcare in Nigeria to mitigate the challenges of paper-based record systems [29-31]. Also, Nguyen et al. [32] described EHR as *"a repository of information regarding the health status of a subject of care, in computer processable form"*. Computers and database management application software can document, manage, utilize and preserve patients' information and records. Furthermore, the recruitment of a helpdesk officer will ease the number of patients queuing for services at mental health facilities. Services will be rendered online or via telephone applications by the helpdesk officer to reach more patients quickly and reduce the inflow of patients into the facilities. The helpdesk officer will be able to attend to patients with pertinent

questions concerning mental health and wellness, book appointments, provide basic mental health interventions and give information on how to promote mental wellness.

4.4.2 Emergency Care Unit

The Emergency care unit is saddled with the responsibility of providing swift action for patients under severe or profound conditions. Psychiatric doctors and other emergency medical officers are obligated to be on 24-hour standby to take records of patients' histories, mental conditions, and vital signs, make tentative diagnoses, and provide quick medical interventions. The Emergency unit should be equipped with digital technologies to enable easy accessibility to those needing mental health services despite location barriers. In situations when the location of the mental health facility is far from a patient's location, especially during emergencies, digital technologies can be utilized to mitigate the situation to prevent exacerbated conditions. HCPs indicated that digital technologies such as Telemedicine, Zoom, and Google Meet could be effectively utilized, and easily facilitate patient/caregiver-doctor interactions during emergencies.

4.4.3 The Outpatient

Psychiatric doctors and nurses are the major HCPs providing services in the outpatient unit. HCPs acknowledged that mental health service delivery would improve and increase broader patient outreach when digital technologies such as Zoom and Google Meet were utilized to provide health education programs. The level of errors with the manual register is reduced when desktop, laptop computers and application-enabled phones are utilized. This will also provide timely feedback on test results instead of waiting seven days with the manual process.

4.4.4 Pharmacy Unit

The Pharmacy Unit will undoubtedly function more effectively by using tools such as computers and telephones with appropriate applications (WhatsApp, Zoom and Google Meet), which will accurately record and keep prescriptions. The unit can promptly refer patients to the appropriate pharmacy to purchase their medications in case they are out of stock in the mental health facility. Doctors can be contacted in case of medication substitution and adequately advise patients on the appropriate dosage and duration of drug use when they are in different locations.

4.4.5 Clinical Psychology Unit

Clinical psychologists in this study confirmed that they have utilized phone calls, WhatsApp, Zoom, and Google Meet at various times to provide effective therapeutic interventions to patients in other locations and timely intervention and follow-ups. HCPs confirmed that patients preferred digital interventions to eliminate stigmatization associated with physical visits to a mental health facility and provide an opportunity to remain anonymous. Clinical Psychologists in this study strongly agreed that the use of digital technologies addresses several challenges, including travel costs, accessibility to the few available mental healthcare facilities, and reduced waiting time at a facility. Digital technologies facilitate global professional collaboration among HCPs.

4.4.6 Occupational Therapy Unit

Occupational therapists provide special mental health services. This study's findings imply that using digital technologies such as WhatsApp, Zoom, Google Meet, and Phone calls will enable the Occupational Therapist to effectively provide training on patient handling and management to non-professionals in the unit and to plan socialization and leisure activities at ease.

4.4.7 The Social Welfare Unit

Patients in need of casework are referred from both in-patient and outpatient units to the Social Welfare unit. The prescribed form for referral to the unit ought to be duly recorded. The unit is required to work with other HCPs to conduct daily ward rounds, reviews, and evaluations. Also, the unit constantly assesses the patients to determine their fitness, getting involved in-home visits to patients within the community to facilitate rehabilitation and re-integration. This study indicates that digital technologies (WhatsApp, Zoom, Google Meet, and Phone calls) enable HCPs to conduct interviews, manage records of cases, participate in group therapy sessions and conduct follow-ups, and collaborate with colleagues worldwide virtually on best patient care and practices.

4.4.8 The Discharge Unit

This unit should be an extension of the Hospital Information Management where the discharge staff monitors patients by calling patients or through WhatsApp (audio/video calls, or text messages) applications. In situations where patients are referred to another facility for further treatment and management, personnel at the discharge unit can follow up on such referrals.

4.4.9 Ethics Statement

This manuscript is an extract of a doctoral study that was approved by the Institutional Research Ethics Committee of Durban University of Technology (DUT-IREC), with Reference Number: IREC164/22. The study was also approved by the hospital directorate of the Federal Neuropsychiatric Hospital, Aro, Abeokuta; Federal Neuropsychiatric Hospital, Yaba, Lagos; State Neuropsychiatric Hospital, Akure; and University College Hospital, Ibadan in South-west Nigeria, where the data were gathered. Informed consent was also obtained from each participant.

5. Discussion

This study found that a number of HCPs used smartphones and computers for therapeutic purposes such as phone calls/messages, WhatsApp chats/calls, Zoom meetings, Google Meet, and Telemedicine. This finding is consistent with Li [6] and Bond et al. [22] submission that mobile applications have been used for e-therapy, m-Health, and other web-based applications, and the COVID-19 pandemic provided leverage that scaled up the use of these technologies. The workplace environment has been identified as an important factor that impacts mental healthcare service delivery [26]. Edo et al. [9] also found that HCPs lamented poor working conditions, including poor electricity supply, lack of technological equipment, and poor office space and facilities as major factors responsible for the massive exodus of HCPs from Nigeria to European and American countries.

This study highlighted the lack of adequate HCPs in Nigeria's healthcare system due to high migration, and the remaining HCPs had to work under indigent conditions. The Government can mitigate the high level of migration in mental health sector by improving HCPs' working conditions, providing appropriate incentives and enhancing capacity building and human development. The improvement in working conditions will attract more personnel to the mental health sector.

Furthermore, this study found that the mental healthcare sector is plagued by infrastructural challenges, which contribute to poor service delivery. The number of public neuropsychiatric hospitals in Nigeria is grossly inadequate and there is a need for the establishment of more public mental health facilities and the full integration of psychiatric care into primary healthcare to reach more people in need of mental health services. With Nigeria's population sitting at around 200 million people [27], the incorporation of digital health technology in mental health care can create an avenue for treatment beyond physical presence at healthcare facilities and allow easy access to resources.

Digital technologies have the potential to offer vast opportunities to transform Nigeria's healthcare system by helping scarce psychiatrists and other mental health practitioners to do more with less. The adoption of digital technologies, therefore, offers the opportunity to immensely advance mental healthcare services. Laptops, desktop computers, tablets, internet enabled mobile phones and reliable internet services must be made available to HCPs for ease of adoption and utilization of digital technologies. More so, the Nigerian Government needs to increase the budget allocated to the mental health sector to fund the acquisition of these gadgets. Similarly, the Government needs to collaborate with the management of mental health facilities to provide subsidized sustainable internet services to aid continuity, which fosters preparedness in any case of any health emergencies.

The utilization of digital tools for mental healthcare services conveniently addresses many challenges associated with the distance between patients and facilities and access to HCPs [23]. Digital technologies have demonstrated the capacity for broader coverage, reaching many patients in record time for group therapies and cohort treatment [21].

Despite the pros of digital technologies, some cons were highlighted by HCPs in the study: lack of policy and framework, low budget allocation, unrestricted/unwarranted access by patients, electricity issues, network issues and the problem of hackers. The adoption and utilization of digital technologies are fraught with the high cost of implementation, network challenges, lack of policies and framework and absence of amenities and infrastructures. The Federal Government can collaborate with donors, sponsors, NGOs, and Information Technology (IT) firms to develop affordable technological platforms for mental health services.

The problem of unwarranted access can be moderated by providing dedicated phone numbers to patients. These numbers will be available for calls between the stipulated working hours, and after-hours access will only be provided through text messages. A dedicated line will also be open after hours for emergencies only. The use of passwords, proper storage of patient data, and restricted access can reduce the incidence of hackers.

6. Policy Implication and Practice

The findings from this study have substantial implications for the government, hospital management, and policymakers regarding the integration of digital technologies into mental health

services. Healthcare service delivery in Nigeria is premised on the empirical argument that, the Nigerian government establishes a strong policy framework for the utilization of digital technologies for mental healthcare service delivery. The policy should stipulate the level of use, documentation of therapy sessions, and management of patient information. The policy should highlight the required finance needed for mental services in public neuropsychiatric hospitals. Awareness and education of the populace are also important, as are the available digital tools that could be used for mental health services. Hospital management needs to sensitize HCPs on different digital tools that could be utilized for service delivery. Further, education and training for HCPs is crucial to ensure they have the necessary skills and confidence to use these technologies effectively. The training will be considered self-development as the world is rapidly progressing towards digitalization.

7. Conclusion

In the Nigerian context, the utilization of digital technologies in mental health service delivery suggests a positive transformation in the healthcare sector to the extent that the consequences of a depleting and overburdened workforce and inadequate facilities on service delivery can be drastically reduced. Therefore, it is imperative to integrate the digital technologies that this study identified among mental HCPs into the operational framework of public healthcare facilities in Nigeria.

HCPs are the strong determinant of either the continuous use of the traditional method of service delivery or a blended mental health service delivery. The proposed model serves as a contemporary framework that Government, policy policymakers in the Ministry of Health and the Management of mental health facilities in Nigeria can adopt, which will provide the needed awareness of the benefit of technological intervention. Furthermore, the model can be used to revise the existing policies and standard operating procedures in the public mental health sector. This study concluded that digital technologies hold promises to bridge the healthcare service gap beyond the COVID-19 pandemic. There is a need to validate the model and conduct more research on the effectiveness of digital technologies in mental health service delivery.

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Author Contributions

Conception and design: FOY, MNS, OO; data collection: FOY; analysis and interpretation of results; FOY, MNS, OO.

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Competing Interests

The authors have declared that no competing interests exist.

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