FUTURISTIC TRENDS IN PSYCHIATRY

Abstract

Advances in Technology dictate the zeitgeist of the ways in which people interact with the world. Healthcare is an integral part of life and one's access to and experience of the health care delivery determine the perception of its efficacy and the overall attitudes of individuals. The field of medicine cannot afford to lag behind in technology if it has to cater to the needs of a growing population. Many global events in the 20th century and the covid pandemic in the recent past have highlighted the need and benefits of incorporating newer technologies in providing the best healthcare possible for our generation. Mental Health is receiving more attention than ever and this beckons for a revolutionary but gradual change in the methods by which mental health professionals can serve our mental health needs. Digital Health Technologies are already in use in many fields of medicine and psychiatry is beginning to see its potential from community mental health to personalized care in a smartphone device. While randomized controlled trials are still underway, research up till now has shown some promise for digital health technologies in the form of smartphone apps, chatbots, artificial intelligence and robots for psychiatric disorders. Approaching this paradigm shift requires one to be optimistic but at the same time realistic in the way they help the patients and the clinicians involved in their care, without losing touch with the 'human-ness' that connects us all. The Tele-psychiatry Guidelines 2020, published in India during the Covid Pandemic has been a guide to tweaking the existing mental health services. However, legal hassles and technical problems have been hindrances in the adoption of telepsychiatry in routine practice. As both patients and clinicians become aware of the optionality that opens up from tele-psychiatric services and begin to familiarize themselves with the technology, tele-psychiatric services could ease the burden on the healthcare system while providing quality services.

Keywords: mental health, digital health technology, artificial intelligence, telepsychiatry.

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I. INTRODUCTION

Health professionals, worldwide are trying to keep up with the rapidly changing landscape of healthcare tempered by the cutting edge of science and technology. Most of the medical fraternity is already on its way to standardizing the use of technology in routine practice, from robot-assisted healthcare delivery to the implementation of electronic health record systems. The very nature of the therapeutic relationship between the mental health professional and the patient in psychiatry poses its own set of unique challenges with concerns about rapport and trust.

Mental health which was hitherto a lesser priority for a long period; has now become an important concern for developed and developing countries alike, given its high costs on the national economy and its insidious effects on the overall quality of life of the citizens. The burden of psychiatric illnesses worldwide is huge and thereby, increases healthcare costs. As per WHO, 1 in every 8 people, or 970 million people around the world have a mental disorder which disrupts their social life and impairs their functioning in various spheres of their lives. Though developed countries have better infrastructure and manpower to deal with psychiatric problems, the same is not true for developing or underdeveloped nations. Lack of infrastructure, manpower and resources account for the tremendous economic burden and lack of effective care.

The search has been on to develop newer treatment techniques which could help in easing this problem and the opportunities during the pandemic have been a stepping stone in envisioning newer forms of healthcare delivery systems. The attempt is to search for novel and ethically sound combinations of technology and mental healthcare systems to provide the best service possible to the mentally afflicted in the 21st century.

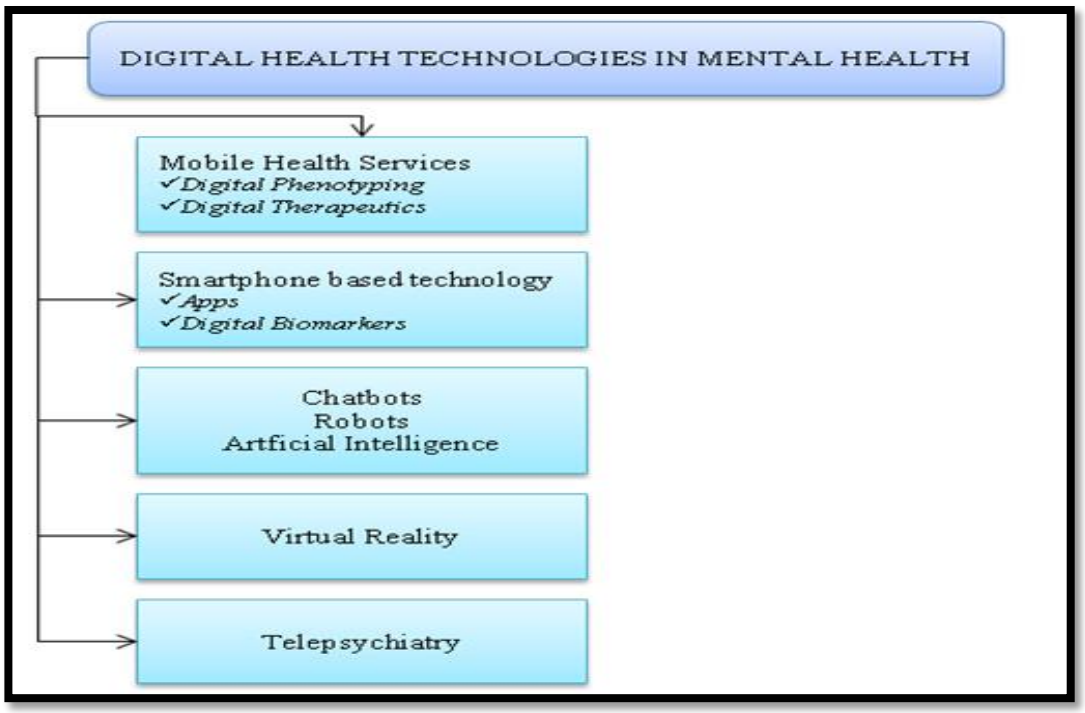

Figure 1: Types of Digital Health Technologies in Mental Health

The covid Pandemic has made us aware of a desperate need to provide for every possible member of the community through alternative modes of access to healthcare services apart from the traditional outpatient and inpatient facilities. There is also a pressing need for alternative forms of therapeutic interventions which bypass the physical presence of a mental health professional and thus, reduce the healthcare burden.

Technology today has brought the world to the doorstep, whether in an urban or rural setting. This makes scalability of healthcare services possible and reduces the lacunae in infrastructure, as digitalization has paved the way for futuristic trends in health care. However, they are also replete with technical challenges and the focus has to be on the effective and ethical utilization of the upcoming digital modalities in a way that creates trust in the users, especially in the discipline of psychiatry. Figure 1 shows the outline of various Digital Health Technologies prevalent in mental health.

II. MOBILE HEALTH SERVICES IN MENTAL HEALTH

The smart phone industry is one of the most rapidly growing sectors of technology and has brought access to the internet, transactional services and telecommunication to an individual, all packed in one device that could be carried at all times in a pocket or a purse. For obvious reasons, smart phone-based technology has opened up a market that attracts app developers worldwide from entertainment to crypto currency. While this area is in flux, Mobile health (mHealth) services offer a wide range of applications that cover the spectrum of health care delivery and have also been used in psychiatry. The primary objective of any health-based technology is to process and make sense of the data in a manner that informs clinical opinions and decision-making.

1. **Data types:** Active data typically refers to data provided by the person through his direct and active engagement with the device or the application. These range from smartphone-based surveys targeted at active symptom monitoring to ecological momentary assessment that also records the temporal and geographical data of the entry. Passive data are obtained automatically through input channels like sensors on the smartphone or a wearable device. Smart phones already have built-in accelerometry, a global positioning system (GPS), and voice and facial expression recognition programmers. Algorithms can be created to use different permutations of various channels of passive data to arrive at clinical parameters like counting pulse rate, tracking sleep-wake patterns and even sending ‘CPR’ notifications to the nearest medical service provider in some emergencies. Even behavioral data can be extracted from these permutations. For example, changes in mood and diurnal patterns can be understood from the user’s keystroke dynamics on the device and the pattern of changes in the content and style of social media posts may offer an early warning sign of relapse in some psychiatric disorders. Passive data have the advantage of providing objective information about the user’s body, capturing novel digital markers of behavior and controlling the bias associated with active data collection. Passive data also provide an objective reference to corroborate active data provided by the user and thus, improve the accuracy of detection and diagnosis.

2. **Digital phenotyping:** The pattern of behavior for a particular individual or category of individuals can be extrapolated from streams of data simultaneously received from multiple modalities like social media, online communities like forums, wearable technologies and mobile devices, which is referred to as ‘Digital Phenotyping’ within the emerging

framework of precision psychiatry. Such digital patterns can provide insight into the mental experiences of the user in context and real-time [1]. These data can augment our knowledge of biological manifestations of disease by providing a more comprehensive and nuanced view of the experience of illness, above and beyond the physical exam, laboratory values and clinical imaging data [2]. Digital phenotypes can also be a useful adjunct to the existing traditional approaches to disease treatment and management through medications and therapies. For example, by tracking digital phenotypes among members of an online disease community, researchers were able to demonstrate the lack of efficacy of certain medications in slowing disease progression in individuals with a specific illness [3].

3. **Digital health interventions/ digital therapeutics:** These are interactive, self-directed software tools that can overcome the lacunae of treatment options across the globe. Digital therapeutics can teach people effective skills to recognise and change unhealthy thoughts and behavior (such as drug use) and provide tools to help people apply these skills to their everyday lives. It can be available 24/7 and thus allow for 'on-demand' access to therapeutic support, reducing barriers to accessing care.

Based on the patterns of active and passive data, machine learning algorithms can deliver highly specific intervention strategies tailored to the user's needs as understood by the application. Interventions can be *Open-loop* where the data received from a user's device is provided to a healthcare provider who delivers the appropriate intervention or *Closed-loop* where the interventions do not involve the relay of information to a third party and the data processed by the AI or Machine Learning Algorithm directly activates or delivers a particular intervention in response to cues 'flagged' by the app developing team. Figure 2 shows the input and output schemas of Closed Loop Interventions.

A good example of closed-loop intervention is the 'Just in Time Adaptive Intervention' or JITAI. It uses active and passive data of symptoms based on the user's style of engagement with the smartphone to deliver a need-appropriate intervention. For example, when the app detects low mood in the context of social isolation, a JITAI may offer prompts or interventions like a contemplative or suggestions for social activity.

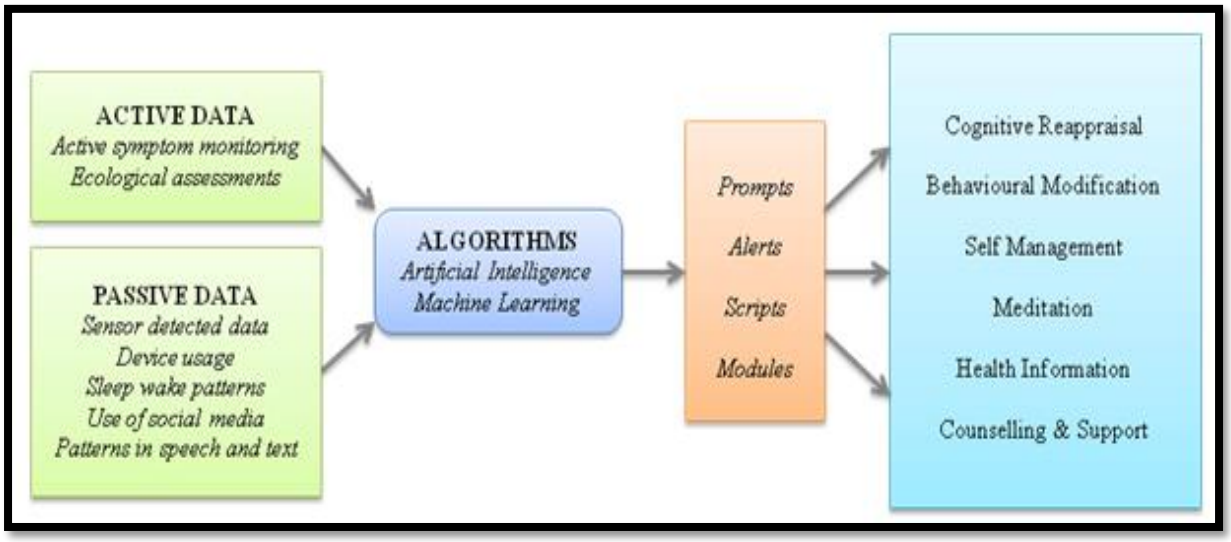

Figure 2: Outline of Closed Loop Digital Interventions

III. SMARTPHONE-BASED TECHNOLOGY

Following are the ways in which various smartphone-based technologies have been utilised to deliver mental health services.

1. Smartphones can be used for assessments of general mental health-related symptoms, cognitive status and suicidal risk which help patients with mental health issues globally without compromising on face validity.
2. Advances in artificial intelligence and machine learning can potentially translate new data into clinically relevant digital biomarkers like ones for self-harm or suicide.
3. Behavioral patterns in a person suffering from serious mental illness like schizophrenia and other psychotic disorders can also be picked up as 'anomalies' and predict the risk of relapse in schizophrenia [4]. Anomalous changes in sensor data like physical activity, geolocation, phone unlock duration, and speech frequency and duration have also been observed in participants with psychotic disorders in the days leading up to a relapse.
4. Apps like *Actissist* identify and challenge maladaptive and unhealthy appraisals of psychosis-related experiences like paranoia and provide alternative, more helpful coping strategies in the real-time context of the user's daily life [5].
5. As a system of multiple applications, *FOCUS* facilitates self-management in patients with schizophrenia like medication adherence, mood regulation, sleep, social functioning, and coping with persistent hallucinations as and when needed [6].
6. Eating disorder apps like *Mental Health Tests*, *Recovery Road*, *Rise Up*, *Psychiatry Pro-Diagnosis*, *Info*, *Treatment*, *CBT & DBT*) have managed to create a user base of which 96% are monthly active users [7].
7. *Text2Quit* sends pre- and post-quit educational messages, peer ex-smoker messages, medication reminders and relapse messages for disseminating cessation interventions to young adult smokers [8].
8. There is evidence of the efficacy of computerised or Internet cognitive behavioral therapy (iCBT) for children and adolescents [9].

Social networking apps and platforms also offer opportunities for social and therapeutic interventions to guide social behavior or activities in persons with mental illnesses.

1. **The Moderated Online Social Therapy or Most** project (based at the digital mental health division of Australia's Orygen youth mental health centre), has researched and developed online social therapy systems for mental health. It also contains forum-like features where users can pose and cooperatively crowdsource solutions to common mental health-related problems [10]. An enhanced multimodal, scalable digital version called *Enhanced Moderated Online Social Therapy (MOST+)* that merges real-time web chat counselling by clinicians along with previous features is also available.

2. **Personalized Real-time Intervention for Motivational Enhancement** (PRIME) helps schizophrenic patients and family members with SMS-based service in the mitigation of negative symptoms [11].

3. **Addiction–Comprehensive Health Enhancement Support System (A-CHESS**) offers emotional and instrumental support at almost any time and place. Services include peer networks, assessment of relapse risks, alerts and reminders that promote and sustain re-

covery. Additionally, it provides educational materials and tools to deal with and navigate through highly risky situations (eg using a GPS tracker to alert if a person is near a bar) that can lead to relapse [12].

4. **The programme *reSET-O*** is an 84-day prescription digital therapeutic, FDA-approved in outpatient therapy for patients with OUD treated with buprenorphine. It delivers a form of evidence-based neurobehavioral therapy in a series of 67 on-demand audio and video lessons which are progressively unlocked through the program. Based on contingency management, patients earn merit badges or gift vouchers by spinning a virtual rewards wheel for attending a fixed number of lessons per week, and for each negative drug urine screen logged [13].

All these modalities are useful in various mental conditions and so creating awareness about these apps among psychiatrists, physicians and the general public is essential. These interventions would make it easier to access treatment options as well as take away the stigma associated with the treatment.

IV. CHATBOTS, ROBOTS AND ARTIFICIAL INTELLIGENCE

A Chatbot is a form of embodied artificial intelligence that performs as a conversational agent to the user, backed by algorithms that respond independently of any expert human guidance. It can also take the form of a physically embodied presence, such as a robotic interface or a virtually embodied presence such as a face icon or a characteristic voice. Such applications engage with the patient like a virtual psychotherapist, helping patients to recognise their emotions and thought patterns and facilitating resilience. The bots can orient the users to the symptomatic nature of their complaints and introduce them to the clinical terms for what they are experiencing such as ‘overgeneralizing’, ‘jumping to conclusions or ‘selective abstraction'. Despite being run by an automated program, Chatbots have the look and feel that one is interacting with a human being at the other end. The use of such conversational style interfaces offers an intelligent, automated system for detecting and responding to immediate mental health needs, thus, can prove to be a good transitional substitute for a therapist and lower the healthcare burden.

Several therapeutic Chatbot apps like *Tess, Sara*, *Wysa*, *Woebot* etc work over short message service text messaging, or internet platforms and come with interactive screen presences.

1. *Woebot* is an automated conversational application that teaches practical skills such as identifying and challenging cognitive distortions and monitoring symptoms of anxiety and depression.

2. *Tess utilises* text messaging to coach individuals in self-appraisals through times of emotional distress. This tool enables the user to have the experience of an interaction with a therapist and delivers emotional wellness coping strategies.

Chatbots have their limitations as failure to recognize serious mental health concerns like suicidal ideations and provide for referral to a support service.

1. AVATAR therapy for schizophrenia belongs to a new wave of relational approaches where the patient who hears hallucinatory voices gets to have a dialogue with a digital representation (avatar) whose speech closely matches the pitch and tone of the persecutory voice, usually voiced over by a therapist who switches back and forth as a therapist and as an avatar. By the end of the scheduled sessions, the patient experiences less distress as the omnipotent voice loosens its grip over the patient, allowing him to gradually gain increased power and control within the relationship [14].

2. Avatars are also being implemented in risk prevention education, such as the *Kognito* program, which uses an avatar to help college students and faculty on a college campus identify others at risk for suicide.

3. Artificial Intelligent Robot Therapy uses AI and robotics to help patients. A class of 'companion robots' have been studied in geriatric clinics. A prime example of this is PARO- a pet-type robot with an appearance of a baby harp seal created to simulate the experience of animal-assisted therapy. It is equipped with different kinds of sensors for touch, light, audio, temperature, and posture. Through its life-like infantile appearance, it engages individuals such as the elderly, isolated, or depressed patients and responds to their speech and movement with dynamic dialogues that reduce stress, loneliness, and agitation and improve mood and social connectedness.

4. *RoboTherapy* with facial emotion recognition and gaze responses is designed to help children with Autism spectrum disorders learn appropriate social skills like imitation, taking turns, staying engaged, and empathy so that they can apply them in their relationships with humans. Similarly, the *Kasper* robot has demonstrated the potential to improve social skills among children[15].

5. Apple's virtual assistant *Siri* is widely used as a personal assistant from information browsing to basic problem-solving. Unlike parents and teachers working with autistic or behaviorally challenging children, AI assistants do not experience burnout and can be engaged at any time of the day for any duration. By providing the child with a safe learning environment and the patience necessary to practice social skills, AI assistants such as *Siri* can guide such children in developing the skills necessary to socially interact with others without the meltdowns that may occur during difficult human interactions.

The future of psychiatry does look promising with these interventions though these devices are still being developed and are not yet in wider therapeutic use. Collaboration with the technology sector is opening doors for a variety of other mental health areas including mood and anxiety disorders, children with challenging behaviours, and patients who may not satisfy the criteria for a clinical diagnosis or experience sub-threshold symptoms of psychiatric disorders. These interventions can reach out to more people than in scenarios where stigma and lack of infrastructure limit the number of people reaching out to a mental health professional.

V. VIRTUAL REALITY

Immersive Virtual Reality or VR creates an interactive computer-generated world, which replaces real-world sensory perceptions with digitally generated ones, creating a phe-

nomenological experience of being in a life-sized environment. The participant wears an enclosed head-mounted device (HMD) or a Cave Automatic Virtual Environment that displays three-dimensional images which are projected onto a room and are continuously rendered relative to the position of the head. The interface also captures movements of the body and translates them into a digital homunculus which just like the real body is within the person's control, allowing users to explore and interact with objects and avatars in the virtual space. The ability to simulate experiences in everyday life is a unique selling point of VR in digital psychiatry and makes it an ideal medium to assess symptoms and deliver exposure-based behavioral therapies. It has been tried in the following disorders:

1. By providing repeated exposure to feared stimuli in a safe and controlled therapeutic platform, VR enables the individual to adapt to triggers and develop healthy responses.
2. VR-based assessment can also help the clinician to test the temporal relationship between variables in real time. For example, the clinician can guide the patient through a stressful situation and accurately gauge what cues trigger thoughts, emotions, and behaviours in their chronological sequence.
3. In anxiety disorders like phobias and PTSD, VR allows individuals to not only enter simulations of difficult situations but allow for exposure to be graded in difficulty. The simulations can be repeatedly experienced until new adaptive responses are made.
4. For children with ASDs or Social Anxiety, several VR environments have been developed, such as virtual cafes, schools, or job interviews where 'confederates' from the treatment team can participate in the simulation, and interact with the users in practicing role-play and social skills without the threat of real-world consequences.
5. VR environments allow the patient to receive feedback about his/her behavior without the fear of embarrassment or exclusion. It can also greatly reduce the time required for skilled therapists to achieve therapeutic outcomes for each patient.
6. In psychotic disorders, VR environments can be manipulated to simulate delusion-like experiences and can aid the clinician to address problematic cognitions in relieving paranoia and lessening distress in real-world situations.
7. VR environments can help reduce cravings for cigarette smoking. Even crushing virtual cigarettes is helpful when added to standard treatment for smoking cessation [16].
8. VR environments have been used in eating disorders to help improve food cravings, and body image and have a healthy body mass index (BMI).

Though VR supports positive outcomes in the treatment of anxiety-related disorders, there is a lack of support for its use in the treatment of social skills in autism and compliance in schizophrenia.

VI. TELE PSYCHIATRY

Tele-psychiatry is the delivery of psychiatric services to a patient who is geographically distant from the mental health professional with the help of telecommunication and information technology. Tele-psychiatry like telemedicine does not imply one particular form of service but an entire spectrum of services, which can be delivered remotely. The earliest documented practice of telepsychiatry was in the University of Nebraska, in 1956 in conducting adult group psychotherapy. Tele-psychiatric services first saw a surge in North America, Europe and Australia in the late 1980s and early 1990s with the latest surge during the Covid pandemic when most elective and outpatient services were postponed and face-to-face mental

health service delivery was interrupted by social distancing, suspension of nonessential businesses, travel restrictions, and quarantine.

As corporate organizations gradually shifted towards a work-from-home culture, there was a need for the health care system to resort to alternative modes of offering consultation and services. The surge in mental disturbances during the pandemic paved the path for telepsychiatry with governments of various countries sanctioning the use of psychiatric services, video consulting services and digital prescriptions for psychiatric medications. In psychiatry where importance is given to the history and body language of the patient, video consulting made it possible in most psychiatric disorders. The ease of appointments and choosing the day and time made access to psychiatric consultation convenient for patients. Hence it continues today, as patients feel the digital connection is as good as the physical one.

1. **Tele-mental health care:** This entails remote or enhanced delivery of care to people in their respective homes or communities using remotely connected computerized medical devices or telecommunications. Lack of objective information due to no personal contact is compensated for by the continuous, automatic and remote gauging and monitoring of mental health care needs through the input from sensors and delivery of problem-based solutions through prompts and alerts.

   The healthcare providers could be mental health professionals such as psychiatrists, nurses, social workers, health workers and educators and services that have been offered in mental health care include case management, treatment planning, pharmacological and psychosocial interventions, follow-up and home-based care, crisis intervention, psychological testing, psycho-education and liaison services for other medical specialties.

   Two outpatient mental health clinics transitioned to virtual operations within a week of WHO's declaration of the pandemic and after an initial decline in appointments by 10.6% there was a 26.2% increase in completed visits [17]. This suggests that telepsychiatry services can gain wide and rapid acceptance within the foreseeable future of implementation.
   Review studies [18][19] on the efficacy of telepsychiatry services during the Covid pandemic have observed the following

2. **Advantages of Tele-psychiatric services**

   - A significant reduction in symptoms of common psychiatric disorders was noted.
   - Improvement in the quality of life in various settings was seen.
   - The diagnostic assessments were rated as reliable as face-to-face consultations for common disorders including mood and psychotic disorders, substance misuse and dementia.
   - They were valuable where geographic and financial issues were limitations.
   - The non-personal setting offered by virtual consultations was preferable and less intimidating to the patients.

3. Disadvantages of tele-psychiatric services

- Some patients felt the services were rushed and too impersonal in engagement.
- Clinicians were dissatisfied due to skepticism, inexperience, and a lack of familiarity with the technological infrastructure.
- Difficulties were experienced in conducting proper mental state examinations during situations of poor internet connectivity.
- Lack of guidance and clear standardized protocols were major factors in the unwillingness of clinicians to integrate telepsychiatry into their routine practice.
- No significant benefits were seen in the management of persons with personality disorders & in those with rehabilitation needs.
- Conducting psychological testing and evaluation was burdensome.

Clinicians expressed a strong preference to return to the private and safe space of in person consultation settings after the lifting of lockdown. The questions around confidentiality, consent, the criteria of selection or exclusion of certain patient groups and emergencies; substandard quality of physician-patient interactions via telemedicine were of concern. Suggestions were made for an urgent need to establish standardized protocols and practice guidelines for the implementation of telepsychiatry. Areas of focus included guidelines for privacy and confidentiality; training of clinicians, trainee doctors, medical students, social workers, nursing staff and patients in different technologies used in telepsychiatry. Despite all the challenges and technical gaps encountered worldwide in designing and implementing, the pursuit and delivery of all mental health services through telepsychiatry still appears to be a foreseeable reality.

Research in psychiatric disorders has shown the efficacy of telepsychiatry consultation and treatment via e-mail in patients with eating disorders internet-based CBT for panic disorder, social anxiety disorder, and depressive disorders; telephone psychotherapy in patients with depressive disorders, panic disorder and generalized anxiety disorder [20].

VII. DIGITAL HEALTH TECHNOLOGY FOR MENTAL HEALTH IN INDIA

India has a challenging mental health burden with one in every seventh person estimated to be suffering from a clinically diagnosable psychiatric illness. However, as per the National Mental Health Survey of 2016, 7% of the total population suffers from mental illnesses, of which nearly 90% are left untreated as the available mental health resources in terms of infrastructure and trained mental health professionals are deficient to meet the mental health treatment gap which is approximately 72–92 per cent [21].

The pandemic caused a 35% increase in the prevalence of clinical depression and anxiety disorders and a 10% rise in the number of suicide deaths in India. The government of India in the past has undertaken initiatives like the National Mental Health Programme and the District Mental Health Programme to address the burden of mental health, but the long-term goals remain to be achieved. Mental Healthcare Act (MHCA 2017) has mandated the government to ensure every citizen has access to mental health services. The Government of India in its recent union budget of 2022–23 announced the launch of the National Tele-Mental Health Program (NTMHP) to create a network of 23 tele-mental health Centres of

Excellence with NIMHANS as the nodal centre in collaboration with the International Institute of Information Technology-Bangalore to provide people with better access to counselling and quality mental health care services.

Under the NTMHP, NIMHANS started the Tele-Mental Health Assistance and Nationally Actionable Plan through States (T-MANAS) initiative to provide free round-the-clock tele-mental health services throughout the country, including the remote and underserved areas. T-MANAS is planned to link these new tele-mental health centres with the available infrastructure of locally available mental health resources at nearby Centres of Excellence, medical colleges, district hospitals, and other mental health services run by the government.

Ayushman Bharat Digital Mission (National digitalization of health records and services) and the e-Sanjeevani platform (National teleconsultation service) will provide various benefits to that availing of the scheme. In April 2021, a mobile app called *MANAS Mitra* was launched to promote mental well-being among people and the research on its logistical probabilities is under field testing. Tele- psychiatry is thus, a potentially cost-effective solution to bridge the manpower gap with the advantage of requiring only the rudiments of distant communications technology such as video-conferencing as compared to the advanced technology needed for other medical disciplines.

The following are some of the telepsychiatry models run in India [22]

- SCARF telepsychiatry in Puddukottai(STEP) model
- PGIMER telepsychiatry delivery model
- The Ganiyari model (under the Jan Swasthya Sahyog community health program)
- The Maharashtra State Telemedicine project

Currently, Tele- psychiatry services in India are available through synchronous as well as asynchronous technology in the form of the tele-aftercare model, on-consultation training models and collaborative models. At present, the NIMHANS -ECHO Project Virtual Knowledge Network provides access to didactic lectures, case conferences, telementoring, tele e-learning and a range of mental health services like teleconsultations in hospitals in various districts, talukas, prisons and relief and rehabilitation centres.

The Ministry of Health and Family Welfare of India brought out the Telemedicine Practice Guidelines, adding regulation 3.8 with the title ‘Consultation by Telemedicine’ as an amendment to Indian Medical Council Professional Conduct, Etiquette and Ethics Regulations, 2002. The Telepsychiatry Operational Guidelines were released in May 2020 with the joint effort of the Indian Psychiatric Society (IPS) and the Telemedicine Society of India (TSI) in collaboration with the National Institute of Mental Health and Neurosciences (NIMHANS) [23]. The guidelines advise the mental health professionals to abide by the relevant rules related to information technology, namely, Information Technology Act 2000, Information Technology (Intermediaries Guidelines) Rules, 2011; and the Information Technology (Reasonable Security Practices and Procedures and Sensitive Personal Data or Information) Rules 2011 to ensure privacy and confidentiality of patients [24].

Even the American Telemedicine Association and the American Psychiatric Association (APA) have recognized telepsychiatry as a validated form of treatment based on the

same principles as a conventional practice where its use is in the best interest of the patient and compliance with the APA policies on medical ethics and confidentiality.

VIII. CHALLENGES FOR USERS WITH DIGITAL HEALTH TECHNOLOGY

There are challenges that still need to be addressed and solved for digital health technologies to receive wider use and acceptance. Major challenges include

1. Lack of 'Human' connection

- While most users feel comfortable using DHT, the lack of human connection and relatability may lead to waning engagement with the applications and the benefits offered by them may plateau.
- Certain aspects of therapy or therapeutic interventions that may warrant a more unique approach by a trained professional in real life may not be within the scope of such DHT.
- Online reviews of mental health-related applications from online platforms like community forums, Reddit, Apple's iTunes and Google Play stores revealed that users did not find the currently available applications emotionally supportive and found them too distracting from real life.

In toto, artificial Intelligence-based technology in the healthcare domain hasn't been able to pass the Turing test, casting doubts on its ability to replicate the smooth to and fro coordination of social interaction between two living persons.

2. Low ease of daily use

- Most mental health illnesses affect cognitive flexibility and the impulsivity and impaired attention experienced by the patients further interfere with the learning curve of engaging with any new technology in the initial stages which can lead to the abandonment of such services.
- Applications usually see a high engagement in the beginning phase and more than 90% of users stop using the application within 10 days with studies showing a median participation time of 5.5 days [25].

3. Lack of cost-effectiveness

- The applications involved in DHTs utilize complex algorithms and machine learning technology coded by highly skilled personnel right from creating to maintaining them.
- Availability of sponsorship could be contingent on profitability that may affect the pricing and the publication of results of efficacy.

4. Need for compatible devices/ updates

- Although most mobile companies have released cheaper but effective smartphones for the broader population, the total number of beneficiaries of DHT may depend on demographic factors like age, education, racial and socioeconomic status and technical factors like technological literacy, availability of the internet and wireless plans availed.

- Incompatibility for certain software features may cut off an entire section of a population from accessing the full depth of the applications.
- Inability to install newer updates and bug fixes may cause the user to hit a ceiling point in their experience of the application

Such a digital divide may create long-standing barriers and ease of use, creating a disparity and inequality in the exercise of the right to access to such healthcare services.

5. Low in-app optionality

- Most applications are either aimed at particular interventions or specific disorders.
- A particular application may not cater to problems beyond the objectives they are designed for.
- Therapists improvise their therapeutic techniques while dealing with unique problems in a therapeutic alliance with a patient which benefits the patient and keeps him in therapy.

6. Lack of statistically significant benefit in the absence of personal care

- Even the applications with the strongest evidence of efficacy are not more or as superior to the quality of a session with a mental health professional.
- The option of access to some form of interaction or support from a real person through the application is currently responsible for the overall perceived benefit of DHTs [26].
- At present, these applications are not good standalone replacements or substitutes for the real-life versions of the treatment modalities replicated by them.

7. Less incorporation of evidence-based treatments and scientifically validated information

- Most scientific literature is either challenging or plain inaccessible to the layperson. These applications do not check for biases in the interpretation of the available information about treatments at the level of the user.
- Distortions in available information and the amount of misinformation about apps continue to pose obstacles to both clinicians and patients in perceiving their potential benefits.
- Barriers to scientific understanding often make app developers either use scientific language to highlight a few aspects of evidence-based information while using more ‘wisdom of the crowd’ or non-academic descriptions to advertise its efficacy [27].

8. Privacy Issues

- No digital application has foolproof firewalls.
- Information regarding one’s mental health condition is extremely sensitive and private to any individual. Leakage of such information can have unpredictable consequences on the mental health condition of the user and the perception of reliability of DHT in the population.
- Additional and continuous Screen Time concerns

- Engagement with DHT-based applications may add to the total time spent by the user on the device and risk further smartphone dependency.

IX. CHALLENGES FOR CLINICIANS WITH DIGITAL HEALTH TECHNOLOGY

While most patients are more accepting of DHTs, there is still some hesitation in the medical fraternity regarding the use of DHTs. Reasons include.

1. Lack of training

- Medical training does not include instruction on the use of Digital Tools.
- A transition from traditional health care into DHTs may be perceived as too drastic and challenging. This could deter many professionals from experimenting and venturing into DHTs [28].

2. Technological Factors

- Difficulties with program installation, login issues and system errors.
- Dependence on technical support.
- Less system reliability and compatibility with other technical tools.
- Skeptical attitude and unwillingness to use DHTs [28].

3. **Concerns about therapeutic alliance and trust:** Similar to patients, clinicians also placed a high value on face-to-face communication and the development of rapport. The fidelity of non-verbal cues like body language captured in live video streaming or inflexions in voice in the audio transmission is of concern to most mental health professionals, when communicating from a remote location.

X. CONCLUSION

Despite the advances in digital technology and its use in other professional services, the mental health care services globally are still to accept the change. The user and clinician challenges would probably account for the lacklustre response to the adoption of the innovations. The risk of causing more harm to the patient or the legal battles a mental health professional could face is definitely a reality in this virtual intervention. Needless to say, robust controlled trials demonstrating the benefit of AI technology in clinical practice would help in changing the mindset of mental health professionals in future.

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