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Analysis of Tech-Based and Telemental Health Approaches within the Adolescent and Young Adult Populations of Rural America

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ANALYSIS OF TECH-BASED AND TELEMENTAL HEALTH APPROACHES WITHIN
THE ADOLESCENT AND YOUNG ADULT POPULATIONS OF RURAL AMERICA

by

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Abstract

Background: The incidences of depression and anxiety among adolescent and young adult populations are intensifying, and resources remain limited for the management of these diseases within rural America.

Objective: The purpose of this literature review is to evaluate evidence-based practices regarding telemedicine and tech-based mental health interventions. Evaluation of different interventions will demonstrate the ability of access, efficacy, and patient adherence with the hope of decreasing the incidence of disease and increase the availability of resources to rural areas.

Methods: A comprehensive literature review was completed by assessing journal articles and scientific databases from the last fifteen years using a variety of keywords and MeSH terms, with limitations set among the population ranging from 13-23 years of age. Databases used included PubMed, PsycINFO, DynaMed Plus, and Cochrane Review Database. Abstracts were carefully reviewed, and then articles were furthermore assessed for quality, evidence, and proper methodology to ensure appropriate data were being represented in an unbiased way.

Conclusions: Based on the current completed research, there is a predominance of evidence that has shown moderate statistical data and promising outcomes from tech-based mobile applications and telemental health.

Statistical evidence supports that technology-based interventions are a potential treatment option that could assist in the management of mental health symptoms within the adolescent and young adult populations of rural America. However, due to small study sample sizes and the lack of follow up, further longitudinal research is still needed in order to determine adherence and long-term outcomes compared to other methods used in mental health treatments and in-person assessments.

Keywords: telemedicine, telehealth, e-health, mHealth, telepsychiatry, psychiatry, smartphone, adolescents, young adults, rural, mental health interventions, depression, apps, and smartphone app.

Introduction

Mental illness, including depression and anxiety, has continued to increase in prevalence among the adolescent and young adult populations within the United States. With the shortage of mental health specialists, there is a growing focus to evaluate specific evidence-based interventions to lessen the burden of mental health incidence in rural America, enhance access to mental health care, and improve patient outcomes.

In 2019, the National Institute of Mental Health (NIMH) estimated that 46.6 million or 18.9% of all U.S. adults aged 18 or older, live with any mental illness (2019). This prevalence was amplified among women and young adults, aged 18 to 25 years, representing 25.8% of all U.S. adults that had a mental illness. This data presents an "estimated 49.5% of adolescents, aged 13-18 years, had any mental disorder" (NIMH, 2019). The NIMH goes on to reveal that "60.1% of these patients did not receive treatment," which has been found to further lead to chronic symptoms or further sequelae long term (2019). Furthermore, rural areas of America, which the United States Census Bureau estimates to be approximately 19% of the U.S. population, remain chronically underserved and bestow a staggering burden in the diagnosis and treatment of mental health illnesses due to several barriers (2019). Barriers include such factors as geographic location, cultural beliefs, increased poverty rates, and a chronic shortage of mental health providers (Hilty, Yellowlees, & Nesbitt, 2006).

These somber statistics emphasize that many patients in rural areas do not get the high-quality mental health services and treatment they require. The lack of specialists and an increasing mental health prevalence has become a national and worldwide concern leading to increased interest in more effective mental health treatment options for rural and underserved populations. Primary care providers (PCP) are vital components in assisting with this effort, as

they are most often sought out first by patients and take lead roles in managing mental illnesses within these sparse areas. However, many of these providers lack confidence and expertise in managing mental health illness, so it has become an urgent necessity to provide another means of resource to these areas (Hodgkinson, Godoy, Beers, & Lewin, 2017).

To date, data shows that there is an increased need for evidence-based mental health treatment and practice guidelines in order to reduce possible complications associated with mental health disease and prevent long term effects (Mojtabai, Olfson, & Han, 2017). These issues are further complicated by the difficulty of being able to complete collaborative and integrated care with the patient's PCP and the referral mental health specialist, such as a consulting psychiatrist. Therefore, rural clinicians need to become pillars of knowledge to better assist in recognizing and managing mental illness using various available psychotherapies based on individualized patient needs.

This article will critically analyze and review the different emerging behavioral health care models to include telemental health (TMH), telepsychiatry (TP), mobile health (mHealth), mental health smartphone applications (apps). Furthermore, discussion will take place regarding the unique role of PCPs in providing evidence of effective diagnosis, mental health assessment, management of patients' psychiatric symptoms and overall mental health. The focus will be on the use of TMH resources to improve access to mental health resources with an effort to compare different delivery modalities, the efficacy of these modalities, safety, adherence, and collaboration of tech-based and telemental health services for adolescent and young adult populations residing in rural communities.

In this review, the terms telemental health, telepsychiatry, m-health, telemedicine, and tech-based applications are used interchangeably.

Statement of the Problem

Within the rural areas of America, access to mental health resources for children and adolescents remains a difficult task with the deficit of essential services for mental health treatment. Barriers such as traveling and financial constraints demonstrate to be a hurdle in obtaining quality interventions and can lead to a decrease in treatment compliance, ultimately leading to increased chronic health problems. The lack of mental health services to these underserved, remote areas causes further disparities with the time required away from school and jobs in order to seek medical care. These access deficits leave adolescents' and young adults' mental health concerns untreated, as well as make the completion of treatment difficult and contribute to high rates of misdiagnoses (Hodgkinson, Godoy, Beers, and Lewin, 2017).

The advancements of technology, such as smartphone apps and the development of TMH, have shown statistical evidence in providing an improved means of access to those that may not be able to otherwise obtain mental health treatment. However, the question that remains is whether telemedicine is as statistically efficacious as other currently used treatment options, including psychotherapies, in-person assessments, or cognitive behavioral therapy (CBT). Efforts were also aimed at evaluating whether TMH has the potential to provide optimal patient outcomes and long-term reduction in symptoms.

Research Question

In the adolescent and young adult populations of rural America, suffering from depressive disorders, does the use of a smartphone mental health applications or telepsychiatry, provide an efficacious means of treatment in comparison to in-person psychotherapies?

Methods

An appraisal of systematic literature was completed, focusing on research carried out within the years of 2005 to 2019. Journal articles and scientific databases within, but not limited to, PubMed, PsycINFO, Embase, and Cochrane Review Database were reviewed for information regarding this topic. Keyword and MeSH terms were both used to narrow the search further and included: *telemedicine, telehealth, e-health, mhealth, telepsychiatry, psychiatry, smartphone, adolescents, young adults, rural, mental health interventions, depression, apps, and smartphone app*.

Furthermore, database-specific filters were used to focus research results to full-text articles, the English language, and specific age groups. Duplicated articles were eliminated, and each research article was assessed for quality, strong evidence, and proper methodology to ensure appropriate data was being represented in an unbiased way. The concentration of the literature review was focused on meta-analyses and systematic reviews. Several studies were disregarded as they aimed attention on other mental health conditions directly or were in relation to depression secondary to a chronic medical condition. However, articles that contained research for depression, along with further studies to include other mental illnesses and ages older than 25 years, were taken into consideration if additional inclusion criteria were met.

The inclusion criteria involved the adolescent population ranging from ages 13 to 18 years and young adults aged 18 to 29 years. Other inclusion criteria encompassed randomized-control trials, peer-reviewed journal articles, meta-analyses, and systematic reviews with statistical representation. Exclusion criteria included any research older than 15 years, articles that concentrated the research of depression secondary to co-morbidities, and telemedicine regarding other medical conditions with no correlation to mental health.

Review of Literature

A critical review of telemedicine and the use of tech-based media research has been an area of increased interest due to the rising rates of mental illness and the increased shortage of mental health professionals, especially within rural areas of America. Research has demonstrated that TMH has statistical evidence to support its efficacy in decreasing depression symptoms. However, it discussed that TMH should be used as an additional tool to bring mental health resources to those that cannot readily access in-person psychiatric evaluation. These types of situations include time constraints, inability to see a psychiatrist urgently due to over demand, and financial or travel burdens (RHIhub, 2019; Benavides-Vaello et al., 2013).

While there has been a fair deal of research completed, TMH remains a topic for continued study due to the national shortage of mental health professionals, the scarcity of available mental health resources, and barriers that stand in the way of access to TMH or TP. Access to TMH resources and appropriate mental health management in rural areas have provided challenges to providers, communities, and patients due expenses involved with necessary technology, difficulties with delegating reimbursement, a lack of proper training in mental health for healthcare providers, deficient TMH guidelines, and constraints of patients missing work and school in order to receive care they need (Hilt, 2017).

At this time, there is not enough evidence to predict longitudinal outcomes nor which type of tech-based support is found to be the most beneficial and efficacious in reducing symptoms and sustaining remission. However, what little data is available shows promise to improve access to mental healthcare while condensing symptoms of depression/anxiety and decrease the rate of adverse patient outcomes.

This article provides a brief summarization of completed literature in terms of access to mental health in rural areas and explains how telemedicine is being incorporated into today's healthcare practice of primary care providers. It offers an overview of a few different modalities of telemedicine to include telepsychiatry and tech-based interventions. Additionally, it identifies the efficacy, safety, and satisfaction of tech-based mental health interventions and how it has contributed to integrated care amongst providers.

Access to Adolescent Psychiatric Care in Rural Setting

Access to mental health care within rural areas has been one of the biggest challenges due to the ongoing critical shortage of physicians and difficulties recruiting providers to rural areas. This impediment has led to the patients not seeking assistance for their mental concerns, inability for them to receive adequate treatment, or even misdiagnosis of their condition. Several articles reviewed reflected on access in rural areas and emphasized that the primary care provider is the mainstay of implementing any mental health intervention. This is found to be imperative as most patients are likely to seek out initial mental health care with their PCP and have an established rapport and trust between them. This trusting relationship allows for more natural communication and management of patients.

The literature further outlined how advancements in telemedicine for rural areas have been a valuable resource of a mental health specialist to be accessible on a daily, if not hourly, basis. This advancement in access to TMH can assist the referring provider in assessing, diagnosing, assisting with management and treatment plans, along with contributing counseling and education to patients and the referring providers.

Prevalence. To assess national trends of those who experience a major depressive episode (MDE) in 12 months, Mojtabai, Olfson, and Han conducted an annual cross-sectional

survey of the US general population among adolescents and young adults, from different

sociodemographic groups, between the years 2005 through 2014. The study revealed that the

prevalence of 12-month MDEs noted to increase in adolescents from 8.7% in 2005 to 11.3% in

2014 revealing a 37% increase in occurrence "(odds ratio [OR] 1.37, 95% confidence interval

[CI] 1.27-1.48, p <.001)" (Mojtabei, Olfson, & Han, 2016). The study further found that the

effects on young adults were less significant, with a change from 8.8% to 9.6% (OR 1.13, 95%

CI 1.05-1.22, p<.001); however, it remains statistically significant. These results demonstrate an

alarming prevalence of depression in adolescents and young adults, which translates to the

increasing demand and need for mental health services.

Influencing factors. Poverty and geographic location are two factors that demonstrate

burdens for accessing mental health resources within rural areas. Hodgkin, Godoy, Beers, and

Lewin (2017) investigated and sought out the effects of poverty on a patient's mental health

among children and families in the pediatric primary care setting and the increasing need for

pediatric psychology or mental health resources. The group found that the relationship between

socioeconomic status (SES) and a child's mental health status has shown to correlate with each

other. They estimated that approximately 33% of all children under the age of 18, in 2014 were

living in poverty within the United States, thus increasing their risk of experiencing adverse

health consequences throughout their lifetime to include the effects on the child's development,

social-emotional functioning and increased risk of developing mental health disorders (Hodgkin

et al., 2017). Shockingly, less than 15% of these children will receive services or treatments for

their symptoms, which can further lead to long-term health consequences into their adult lives.

Because adolescents living in low SES areas have a higher risk of developing mental

illness, emphasis on pediatric primary care providers (PCPs) to implement screenings and

interventions within the clinical setting in order to assist in identifying which patients need

further intervention. Having the PCPs be involved is one of the main pillars of success with this

initiative of tech-based medicine. Hodgkin et al. added that the goal is that compliance and

treatment outcomes will improve among this population by eliminating the barriers within rural

areas such as traveling long distances, lack of insurance, decreasing long wait times to get an

appointment, decreasing daily stressors and eliminating the stigma of mental health.

      Primary care provider involvement. Telepsychiatry with video consultation has offered

PCPs to become more comfortable with assessing and managing younger patients that suffer

from depression and anxiety within their hometown practices. A cross-sectional study was

conducted by Hilty, Yellowlees, and Nesbitt in 2006, evaluating 400 patients who underwent

initial telepsychiatry consultation via referral from their PCP with an emphasis on addressing

utilization of telepsychiatric services by PCPs in rural areas. The group found that by increasing

the collaboration between the PCP and mental health professional by interactive

videoconferencing and telephone interventions, it has allowed for the healthcare team to work

together with the patient to assess, monitor, aid in decision making, and assist with treatment

plans. These methods have improved previous gaps between the PCP and specialist. TMH has

also been able to provide a means of mentoring opportunities via the specialist to the PCP. The

study found that with this enhanced integrated care model, PCP's had improved knowledge and

skills on mental health topics, and they felt more comfortable with prescribing medications and

managing these types of psychiatric disorders. The results translated into providers using fewer

telepsychiatry services over time and prescribing more adequate dosages of medications from

47.7% among the first 271 patients to an overall increase of 63.6% (p <.001) of adequate dosing

in the latter consulted patients (Hilty et al., 2006). This statistical data demonstrates a significant

improvement in the way mental health care was being provided within rural areas via the

patient's PCP with the use of telepsychiatry efforts.

Overall the primary care provider satisfaction with the use of telepsychiatry modalities

such as videoconferencing and duo-assessment with the referral mental health specialist was

noted to be 4.61 on a 5-point scale with quality of consult at 4.62. Quality of satisfaction

improved over time from 4.45 to 4.83 (p <0.001) and overall satisfaction of 4.49 to 4.73 (p

<.025) as physician's gained further knowledge and familiarity with the TP practices and

guidelines (Hilty et al., 2006). The positive reflection of this study revealed that access to TP in

the rural setting can assist primary care providers with valuable expertise not always promptly

available, along with enhancing the PCP's skills and knowledge of management of mental health

illness.

Hilty, Sunderji, Suo, Chan, and McCarron further insinuated with their 2018 review that

"quantitative studies with qualitative feedback suggested that TP helps build relationships

between the primary care provider and the telepsychiatrist" thus improving coordination of

patient care, communications, and patient treatment (Hilty et al., 2018). It concluded that by

being able to address the "needs patient and primary care provider with the specialist's expertise

provides the maximal value" for the team and patient outcome along with the ability to provide

ongoing collaboration between the mental health specialist and the PCP in order to follow on

patient management and ensure treatment goals are being met (Hilty et al., 2018).

Another theory endorses TP satisfaction among PCP within a cross-sectional study that

was completed by Roberts, Hu, Axas, and Repetti, 2017. The group concluded that TP was found

to be beneficial to patients and eliminated barriers such as financial burdens or time constraints

due to travel to see a specialist, which could prove to be a barrier to a patient from receiving

care. Within Roberts et al.'s study, patients found that telepsychiatry assessments and methods of

intervention were confidential, user-friendly, and easy to use. One aspect of TP that varied was

that some patients felt there was a difference in communication with the physician on the TP vs.

in-person intervention (3.88 ± 1.08 [SD], n=25), which was seen more so in patients with attention

deficit hyperactivity disorder or disruptive disorders (Roberts et al., 2017). These evidence-based

findings suggest that TP is beneficial for ED and PCPs settings and allows for quick assessment

of mental health conditions, decreased travel to urban facilities, and increases the satisfaction of

the process for both the provider and the patient.

The limitations of this study and with TP included obtaining patient and provider

responses to treatment and satisfaction based on questionnaires that were not completed by all

participants. Furthermore, not being able to assess the long-term outcomes, the healthcare

facility's ability to finance the needed equipment associated with the service, reimbursement

difficulties and not having knowledge of the different protocols that need to be adopted in order

to incorporate this into everyday practice were included in limitations of this study and method

of intervention.

Although TM is a promising, up and coming resource, it requires much training, financial

support, and resources in implementing the process to include effective collaboration among the

caregivers, having adequate protocols, and the necessary equipment.

Comparison of Different Methods of Delivery with Telemental Health

Several methods of intervention are being utilized nationwide in order to decrease the

need and enhance the accessibility of mental health resources available. With the ever-growing

use of technology, availability of internet via smartphones, and web-based applications, it has

allowed for access to different modalities of mental health treatment to be readily accessible

anywhere one may be. However, it remains unknown which modalities are evidence-based and

most efficacious in the treatment of mental health disorders. Hilty et al. in their 2018 review,

stated that no one TP model is found to be more superior than others and any one model may be

fitting for every patient. Thus, selection of TP models should be based patient needs and

symptoms, provider's comfort and expertise, specialist's contributions, the clinic offering the

service, and specific outcomes with the resources available (Hilty, 2018).

A study completed by Birnbaum, Rizvi, Correll, and Kane (2017) revealed that 93% of

teens and young adults within the United States have access to and regularly use the internet for

research of symptoms and possible treatments. This statistical finding makes it known that the

internet is being used as a resource for gathering information and advice on identifying

behavioral health-related symptoms and possible questions on the management of symptoms.

These results provide significance because they demonstrate that readily available resources can

be accessed and utilized without significant barriers, no matter geographical location, social-

economic status, race, or level of education. If a patient can access and effectively run the

available technology, they have a means of resource for treatment to them. It also reveals that

patients are open to technology-based care and outreach services via technological methods.

Toscos, Coupe, Flanagan, Drouin, Carpenter, Reining, Roebuck, and Mirro (2019)

reinforced that this age population is exploiting self-help apps, websites, and TMH resources in

order to gain insight and knowledge on their symptoms and advice on coping methods or

treatments. The group performed logistic regression models and a general linear model on 2789

students in order to test relationships between their demographics, mental health symptoms,

stress, and prior TMH use. This inquiry has shown promising evidence that 16.03% (447/2789)

of students had previously used at least 1 of 4 types of TMH resources to include anonymous

chat groups, online-counselors, crisis lines, etc." (Toscos et al., 2017). It was also concluded that

when combined with cognitive-behavioral therapy guidelines and principles, this method of

treatment can be effective at eliminating mild to moderate depressive symptoms in teens (Toscos

et al., 2017). Despite the limitations of small sample sizes provided in their studies, the variables

would not necessarily change the outcomes of the results.

  A meta and systematic review completed by Hollis, Falconer, Martin, Wittington,

Stockton, Glazebrook, and Davies in 2017, further analyzed evidence of digital health

interventions (DHIs) or 'mHealth' in terms of computerized cognitive behavioral therapy

(cCBT) and telecommunications ('tele-health,' 'tele-medicine,' 'tele-psychiatry,' etc.) via use of

the internet, computer-assisted therapy, smartphone apps, and other electronic devices. The

intention was to determine if DHIs have helped expand access to areas of need, cost-

effectiveness, and whether evidence has supported the integration of these interventions into

mental health care. It was concluded that DHI programs have a wide range of interactive

measures to help patients understand and manage depression, anxiety, or other mental health

illnesses.

  Nonetheless, DHIs are not standardized, and no 'substantial equivalence' exists, which

would assist in the regulation of RCTs completed on DHIs. Thus, data and evaluation are hard to

obtain. Another limitation was with the rapidly changing and advancements of technology

associated with DHIs and the fact that RCTs can take up to seven years to perform and report.

Due to frequent innovations created, once an RCT is completed, the report is most likely

outdated. Thus, indicating that evidence-based research on data of these resources remains

limited.

A meta-review and systematic review were similarly completed in 2017 by Hollis,

Falconer, Martin, Wittington, Stockton, Glazebrook, and Davies to further analyze evidence of

digital health interventions (DHIs) or 'mHealth' in terms of computerized cognitive behavioral

therapy (cCBT) and telecommunications. The findings that Hollis et al. concluded were in strong

favor that evidence supported cCBT provided a "small to moderate effect (g= 0.16-0.62) on

depression outcomes, and moderate-to-large effects (g= 0.53-1.41) for cCBT targeting anxiety"

(Hollis et al., 2017). The authors demonstrated in their findings that depression and anxiety were

the most common diagnoses made amongst cCBT.

With the combination of DHIs and cCBT, there is strong evidence affirming this dual

approach provides the most efficacious method and is found to be accepted amongst patients and

healthcare providers. This study further provided information and research on the different

modalities of technology-based medicine that may be utilized and a review of previously studied

methods in comparison to newer methods of DHIs. Nevertheless, with this more recent study, it

emphasizes that there remains a gap in data and research on the impacts of DHIs in terms of

populations it can be used on, efficacy, adherence, and cost-effectiveness.

Additionally, several studies found robust evidence affirming that a dual approach to

include cCBT and access to other varying methods of evidence-based DHIs, based on patient

symptoms, provides the most efficacious method and is found to be accepted amongst patients

and healthcare providers (Hollis et al., 2017; Toscos et al., 2019).

Another meta-analysis of 52 randomized studies exposed statistically improved outcomes

with evidence-based psychotherapies (EBPs) in comparison to usual care to reflect a probability

of approximately 58% of randomly selected youth receiving EBP, resulting in symptom

improvement after receiving EBP treatment more than that of a patient receiving usual care

(Weisz, Kuppens, Eckshtain, Ugueto, Hawley & Jensen-Doss, 2013). The outcomes of Weisz and associates' meta-analysis demonstrated that evidence-based psychotherapies had a mean estimate size (ES) of 0.29 (95% CI, 0.19-0.38; t47.7 = 5.95; p <0.001). With these findings comes statistical significance in improved patient outcomes and symptoms. The study was found to have little bias, as demonstrated with a funnel plot that was asymmetrical (t50 = .076; p= .45) (Weisz et al., 2013).

Identified limitations of this study were that usual care was not fully defined and may differ from study to study that is analyzed. Evidence-based psychotherapies (EBPs) were compared only amongst usual care, and there was no consideration of other modalities or use in combination therapies. Although the study provides modest statistical support for improved outcomes and reduced symptoms, the effects of EBPs continue to vary widely and cause providers to question if it is an appropriate methodology for young patients with more in-depth disorders or those who need combination therapies.

Contrary, a review on approximately 45 randomized control trials was completed by Weersing, Jefferys, Schwartz, and Bolano (2017), which focused their efforts on comparison of previous and newly evidence-based treatments for depression and anxiety among adolescent and child populations in order to identify where further research needs to be completed in order to assist in treatment of depression. After review, Weersing and associates found cognitive behavioral therapy (CBT), as well as interpersonal psychotherapy (IPT) methods, were well-developed for this age group. However, technology-assisted CBT has not demonstrated a significant difference in management. The importance of this article demonstrates that little data is available regarding the influence of technology-assisted CBT methodology for the younger populations.

Efficacy, Safety, and Adherence of Telemedicine

Ensuring that telemental health and tech-based applications provide safe, effective, and ease of use to patients increases the adherence and success of these resources. The advancements of telepsychiatry have provided an approach of leveraging mental health resources and expertise to outreach distances by providing access to a mental health specialist to assist with diagnosis, assessments, treatment, and management of care in areas that are remote, under-served, and within rural geographic locations.

Hilty, Sunderji, Suo, Chan, and McCarron (2018) performed a review of several evidence-based telepsychiatric care models and examined different applications available for telemental health and separated them into high, medium, and low-intensity delivery models which represent the interventions that assist with aiding primary care providers and patients. Evidence was apparent throughout the article that TP has shown to assist in providing quick access and availability of mental health consultation, monitoring patient outcomes, and assists in areas where language barriers and cultural diversity play a factor in patient care (Hilty et al., 2018). Hilty et al. amplified TP to be an effective treatment technique of anxiety and depression, notably via means of internet-based cognitive behavioral therapy in their review of models of TP (2018). The review went on to stress the importance of finding the appropriate means of delivery to meet the need of the patient and their primary care provider in order to aid in the maximal outcomes and provide the most flexibility. The effectiveness of TP relies heavily on the collaboration and integrated care (IC) between the patient, specialist, and PCP along with the competencies, guidelines, and protocols set up to ensure appropriate steps are being met in patient care and management.

The delivery models of TP were further broken down by Hilty and colleagues into levels of intensities based on the amount of resources involved including mental health specialists, the required interventions for the patient based on their complexity and acuity of illness, technology intricacy, and the need for additional support staff and primary care involvement (2018). The high-intensity model, which involves an increased amount of continued consultation and collaboration between the specialist and PCP via the use of video TP, in-depth assessments, and augmentation of on-site services through the PCP, has been the methods found to be studied the most. This model has demonstrated substantial evidence that TP is as effective as in-person care in terms of diagnosis and treatment, decreased hospital days, increased medication compliance, better communications, and improved outcomes for the patient (Hilty et al., 2018). However, this model demonstrated to be challenging to sustain with the extensive and ongoing collaboration required (Hilty et al., 2018).

Even though high-intensity models demonstrated having substantially better outcomes, moderate and low-intensity TP require fewer interventions, expenses, and human resources with a lesser amount of supervision and direct involvement on patient care yet continues to prove positive, sustainable outcomes. Mid and low-intensity models proved to have other unprecedented benefits to include increased comradery among the PCP practice, by complementing the services they can provide, along with filling the gaps that the specialist can offer (Hilty et al., 2018). The authors explained that low-intensity interventions such as 'home-based tele-interventions' are becoming more popular and are in higher demand due to the increase in non-compliance of this patient population, which overall hurts the patient's outcome due to missed appointments and non-adherence with treatment plans. Hilty et al. went on to explain that with TP models, including those of lower intensity, could become a means of

reaching the patients that are less compliant and continue to aid in reducing depression and disability by not requiring the patient to leave their home, miss work or inquire other financial or travel stressors (2018). Nonetheless, there continues to be a need for further research, especially with RCTs, which would help provide a comparison of the different models, explanations of competencies, and regulations of implementation in order to fully evaluate the full effects of these different levels of intensity modalities on a longitudinal aspect.

With the newer models of TP, quantitative studies with qualitative feedback has demonstrated that PCPs are engaged with this style of tech-based mental health intervention and have noted an improvement in mental illness along with enhanced confidence in managing these patients due to the increased educational opportunities, collaboration and consultation with mental health specialists (Hilty et al., 2018). The conclusions provided within this article proves that TP is becoming a mainstay of care within PCP offices with promising results in comparison to face-to-face CBT therapy that can further leverage expertise from a distance and enhance collaboration among the PCP and mental health specialist to facilitate clinical decision support and integrated care. Yet, further education and competencies need to be developed in order to ensure the best outcomes of patient care. Several limitations of this report remain in the inability to fully cover and research the ever-growing amount of TP, which continues to change frequently, the lack of control studies to compare the different TPs across the spectrum, and how to implement, evaluate and carry out the different delivery models.

Malas, Klein, Tengelitsch, Kramer, Marcus, and Quigley (2018) accedes the findings of Hilty et al.'s 2018 conclusions. Malas et al. obtained additional qualitative and quantitative information from PCPs regarding their experiences with their utilization of Michigan Collaborative Child Care (MC3) Program telepsychiatry design via surveying 1475 possible

responder whom 649 (44%) elicited a response. The MC3 is a program that offers several

modalities of telepsychiatry practices to assist underserved areas with a feasible and cost-

effective means of consultation services via such modalities as telephone consultation with Child

and Adolescent Psychiatrists (CAPs), videoconferencing, group case consultations, or more basic

consultations with Behavioral Health Consultants (BHCs) whom can provide referrals or

guidance on local resources, brief evaluations, or non-pharmacologic guidance. This

collaborative program was found to "provide psychiatric consultation to 97% of patients with no

other access to psychiatric care" and to be highly supported by those who utilized the resource

(Malas et al., 2018).

Malas et al. aimed to evaluate the PCP's perception, attitude, and experience regarding

the use of the MC3 TP model. Results were based on two quantitative items assessing

friendliness and efficiency and two qualitative questions gaging how MC3 may influence further

patient care and the PCP's practice, along with if MC3 changed the PCP's practice of

diagnosing, prescribing, or management of pediatric mental illness. The survey was delivered

immediately after the conclusion of the consultation. Based on Malas et al.'s data, on average

MC3 was rated as "strongly agree" for user-friendly nature, efficiency (mean of 1.11, SD of

0.33), and increase in PCP confidence in managing mental health disorders following MC3

consultation (mean of 1.19, SD of 0.43) while, allowing improved access to psychiatric

healthcare (Malas et al., 2018). These positive perceptions among PCPs further elicit an

improved knowledge base and skill set of mental health evaluation and management allowing

PCPs more confidence and comfort in treating their patients (Malas et al., 2018).

Table 1: Perception and practice changes related to MC3 consultation

General	Responses	% Responses
Improved comfort and confidence in caring for youth with mental illness	131	30.9%
Ability to care for youth with complex mental health needs	32	7.5%
Improved access to mental healthcare for youth	98	23.1%
Enhanced efficiency of care for youth with mental illness	83	19.6%
Improved patient care and high utility for youth with mental health needs	192	45.3%
Evaluation		
Improved assessment and diagnostic approach	53	12.5%
Greater knowledge and education in pediatric mental health	64	15.1%
Management		
Greater comfort and understanding in the use and monitoring of psychotropics	110	25.9%
Increased understanding and access to psychotherapy services	10	2.4%
Improved understanding of non-pharmacologic approaches to management and referral services	13	3.1%

*MC3 = Michigan Child Collaborative Care.
(N = 159 respondents with 424 responses, 786 themes elicited from the responses)

Note: Adapted from "Exploring the telepsychiatry experience: Primary care provider perception," by N. Malas, E. Klein, E. Tengelitsch, A. Kramer, S. Marcus, and J. Quigley, 2018, *Psychosomatics,* 60, p. 184. Copyright *Academy of Consultation-Liasion Psychiatry.*

Hilty, Ferrer, Parish, Johnston, Callahan, and Yellowlees (2013), completed a comprehensive systematic review of telepsychiatric literature which articulated that TP, including videoconferencing, has shown positive outcomes and effectiveness when compared to in-person care among many different ages and populations in terms of feasibility, outcomes, and satisfaction. The same results were presented by Ruskin, Silver-Aylaian, Kling, Reed, Bradham, Hebel, Barrett, Knowles and Hauser in their 2004 study that validated telepsychiatry to have similar improvements in symptoms, treatment adherence, satisfaction, and remission as in-person treatments with no compromise in the quality of care appreciated.

In addition, to fully evaluate usage, adherence, and effectiveness, a systematic and meta-review was completed by Hollis, Falconer, Martin, Whittington, Stockton, Glazebrook, and Davies in 2017. Hollis et al. concluded that until the United States (US) Food and Drug Administration (FDA) enforces a 'substantial equivalence,' it will be challenging to compare evidence of efficacy, safety, usage, adherence, and demographic access. Being able to assess and evaluate these factors fully would help in identifying if these newer technological-based interventions are beneficial or not. The group found that DHIs do assist in widening access to areas in need, and the blending of DHIs and face-to-face therapy remains the ultimate treatment modality (Hollis et al., 2017). Additional research would help determine how these technologies can be adequately integrated into health systems and assess long-term effectiveness.

A systematic review and meta-analysis completed by Firth, Torous, Nicholas, Carney, Pratap, Rosenbaum, and Sarris (2017) reviewed 18 RCTs on approximately 3,414 patients that suffer from depressive symptoms to assess the effects of mental health interventions delivered by smartphone devices. The analysis of the 18 studies, obtained and reviewed by the authors, verified a "moderate positive effect" of mental health interventions delivered via smart-phone modality in order to reduce depression symptoms in patients with mild-to-moderate depression (N=3,414, g=0.383, 95% CI: 0.24-0.52, p<0.001) (Firth et al., 2017).

Firth et al. then went on to complete a comparison of smartphone interventions to an "inactive" or "active" control group which revealed a moderate effect on depressive symptoms (g=0.56, 95% CI: 0.38-0.74) when compared to the inactive control group and a small effect when compared to the active control conditions (g=.22, 95% CI: 0.10-0.33). These results demonstrate that smartphone interventions were more beneficial compared to patients that had no intervention during the trial period. The limitations of the study conducted by Firth et al. include

the inability to analyze, which was the single most effective intervention that produced the most efficacious results for the different populations that use them. This suggests that further research needs to be completed on the individualization and deliverance of smartphone-based mental health interventions in order to determine the optimal usage, adherence, and longstanding outcomes.

In order to fully understand the efficacy and quality of research completed on mobile apps for mental health within the adolescent population, a systematic review was completed by Grist, Porter, and Stallard (2017). Their results correspondingly demonstrated that due to the significant lack of evidence and study, it is not possible to claim that mobile apps can effectively manage depressive symptoms and that adolescents would prefer a smartphone app over face-to-face intervention. The study was able to demonstrate that usage of apps was a moderately appropriate means of intervention with estimated adherence noted to be 65-85% and that certain apps provided higher adherence than others based on their purpose and targeted audience. However, the evidence is currently not available to support the benefits or effectiveness of these interventions due to the infancy of their technological advancements. Limitations include insufficient data regarding evidence in the treatment of moderate to severe depression.

Rathbone and Prescott (2017) also performed a systematic literature review in order to appraise the usability, feasibility, and efficacy of mHealth interventions for mental health concerns based on strict inclusion and exclusion criteria. The research included five RCTs and one study that evaluated SMS messaging, in order to assess the effects that the interventions of the app had on depression and be able to monitor follow up at one, two, three, and six-month intervals. With their extensive research, Rathbone et al. demonstrated improvement in patient's mental health along with their physical health, the satisfaction of smartphone apps, reduced

symptoms, and improved adherence to medication therapies. This article proves to bring

evidence that mHealth interventions are effective in terms of assisting with reducing and

improving symptoms in mild-to-moderate depression, is practicable, and easy to employ.

However, there continues to be little monitoring or guidelines available to produce mHealth

apps, which has led to difficulty in distinguishing mental health expert-guided applications in

comparison to those with little or no mental health expertise input. It also lacks evidence in the

treatment of moderate to severe depression. This statement provides significance concerning the

research question of this literature review with the explanation that despite the benefits of

mHealth and tech-based applications, patients and providers must be cautious when using apps

and tech-based interventions to assist with mental health needs due to limited regulations.

Wang, Varma, and Prosperi conducted a literature review and systematic appraisal in

2018, which included a critical analysis of 17 studies. The group evaluated the efficacy and

acceptability of mobile apps in terms of mental health monitoring, along with the management of

symptoms and disorders. Based on strategic inclusion criteria, studies were reviewed and found

that over 15,000 apps are available for health care management, with 29% being designed

specifically for mental health. After review of the six different qualifying apps targeting

depression and anxiety, studies revealed evidence to support that the mobile apps are effective at

managing mental health symptoms to a lesser degree than other traditional interventions.

In addition, mobile health continues to expand and advance with increased potential in

being able to facilitate in monitoring and managing mental illness, especially in underserved

areas and hard-to-reach populations (Wang et al., 2018). The authors proclaimed the advantages

of mHealth within the article to exhibit evidence that it has provided a means of access and

constant availability to mental health resources and provides support with "3 billion smartphone

users globally". Having this substantial use of the app alleviates geographic barriers. This means

of intervention has also been shown to reduce barriers of patients not seeking assistance due to

the stigma of mental health issues and the fear of lack of confidentiality in their care (Wang et

al., 2018).

Limitations to this article include the smaller sample sizes and limited studies available

due to strict inclusion and exclusion criteria. The study also included an analysis of other mental

health illnesses such as alcohol disorder and PTSD. An awareness was illustrated that numerous

apps are available to the public for use; yet, a few have been clinically validated due to

difficulties with evaluation.

Wang et al. extend insight on how mHealth can be beneficial in increasing access to

evidence-based interventions and facilitate the management of mental disorders and the improve

longevity of symptom relief. However, urgent consideration needs to be taken regarding whether

the smartphone app is supported by mental health specialists rather than a company with little or

no mental health expertise. This has been a common theme among articles demonstrating the

lack of guidelines and means of evaluating mHealth interventions.

Implementing Collaboration of Care with the Primary Care Provider and Referral Mental Health Specialist

When implementing any change of care, the most crucial aspect to consider is 1) will the

change have positive outcomes, 2) what is the benefit of the change, 3) how will patients and

providers perceive and incorporate these changes to assist in success? Over the years, medicine

has shifted to a more collaborative and integrated means of deliverance due to the mass amount

of knowledge and continued changes within the medical field. This change has ultimately led to

a more specialized approach. These specialized efforts have made it possible to have experts of

specific areas rather than having generalists with superficial knowledge in many areas of medicine, such as rural primary care providers.

TP has provided a means of bringing expert care to rural areas via technology with video conferencing and consultation. Several articles were critiqued and overall demonstrated strong support of collaborative efforts between PCPs and mental health specialists via consultation or videoconferencing and found these methods to be the most successful in providing optimal patient outcomes (AACAP, 2017a; AACAP, 2017b; Hilty et al., 2018; Malas et al., 2018). Yet, as newer research is evolving, there is information suggesting that direct care models, which entail care of a mental health specialist alone, via means of mHealth apps and in-home access, are also demonstrating positive results of care management. The following articles reviewed demonstrate data on this area.

The American Academy of Child and Adolescent Psychiatry (AACAP) Committee on telepsychiatry and quality issues conducted a systematic review from January 2004 through March 2017 in order to further assess clinical guidance for telepsychiatry within child and adolescent populations in the United States. The reviewed articles were thoroughly screened and evaluated for duplications, bias, and statistical findings relevant to the topic. Due to the lack of evidence for the practice among adolescents and children, studies supporting telepsychiatry practice within the adult population were also included for review. Several aspects of TP practices were addressed within the article and not in relation towards this literature review.

The study did provide evidence by ten outcome studies that PCPs and patient families endorsed high levels of satisfaction with teletherapy, indicating that the intervention was "well perceived, tolerated, and feasible" (AACAP, 2017). Further data demonstrated that among the adult population, teleconsultation with PCPs, and mental health specialist proved to be well-

established and promising. This emerging intervention is showing preliminary indication of

providing positive outcomes and further possibilities of future management of mental health

problems by PCPs with the collaboration of mental health specialists via consultation.

Attributable to the limited evidence, further investigations with the pediatric population need to

be further established in order to deem it an evidence-based practice.

In 2017, the American Telemedicine Association (ATA) set forth a review and suggested

guidelines to further assist in the implementation and deliverance of mental health services to the

child and adolescent populations via telemental health (Myers et al., 2017). The practice

guidelines recommended by the ATA were rigorously reviewed by a panel of experts based on

evidence-based practices and brought to a consensus that was further approved by the ATA

Board of Directors. Within the article, guidelines are discussed which should be followed to

include a needs assessment to assess who needs TMH, competencies of TMH, along with

barriers, ethical considerations, and future directions of TMH interventions. The article provides

extensive research and studies demonstrating the feasibility of implementing TMH interventions

across diverse settings, along with the acceptance of the referring PCPs, parents, and youth via

means of videoconferencing (Myers et al., 2017). The authors discuss the limited access to

traditional models of care in remote areas and demonstrate that TMH is producing clinical

outcomes that are comparable to traditional in-person psychotherapy.

The significance of this article in relation to the literature review is that TMH offers a

means of collaboration, which has found to be significantly receptive between psychiatrists and

PCPs. This collaborative care model allows the care team to jointly diagnose and manage

common mental health disorders among the adolescent and young adult populations that the PCP

may not have as much knowledge or experience with. The available intervention can improve the

relationship between the referring provider and specialist, along with enhancing the primary care

provider's skills, knowledge base, and comfort in caring for these types of patients via

consultation conferences.

        Hilty, Sunderji, Suo, Chan, and McCarron (2018), furthermore performed a systematic

review to evaluate TP options for primary care providers based on evidence of effectiveness,

evaluation, and outcomes among different delivery models and patient outcomes. Their findings

included quantitative studies that included qualitative feedback in order to assess how TP builds

relationships between PCPs and mental health specialists via TP efforts. The aim of this

evaluation was geared toward evaluating if TP enhances patient care with better-quality

communications, facilitated clinical decision support, enhanced coordination, and improved

skills of the PCP with the consultation of expert assistance.

        Evidence found that integrated care (IC) allows clinical decision support among the care

team and consolidates processes, interventions, thoughts, and plans no matter the TP model

being used. IC accommodates patient needs, and expedites augmented services in relation to

access, quality, user satisfaction, efficiency, and management of mental health disease (Hilty et

al., 2018). Other essential factors that the authors detailed, which have been shown to improve

with the collaboration of care was the reduction in mistakes, increased efficiency leading to less

time needed by the PCP that could be spent with other patients, and improved patient outcomes

(Hilty et al., 2018). The conclusions of the article bring attention to the importance of the

clinician's competencies and ability to evaluate apps for efficacy along with the capability to

screen patients in order to identify what may be the most appropriate means of technology based

on their symptoms, availability, and state of well-being. This vehicle of technology has

established a bridge of knowledge and care to patients with mental health needs globally, but the

appropriate implementation and involvement of all parties is a key factor in success. Appropriate, evidence-based competencies and preparation needs to be further established for providers in order to gain exposure and guidelines as to how to incorporate this means of technology into their medical practice.

Discussion

With evidence supporting the increased prevalence of developing a mental illness among those living in rural America and in poverty, an emphasis must be placed on the importance of further research and development in providing a means of resources to these underserved populations. It also demonstrates the importance of not only the incorporation of telemedicine to these areas, but the ultimate role of the PCP is one of the main pillars of success and change in this initiative.

Through the review of data, the question remains as to who meets appropriate criteria to be a candidate of TP and to which level of care module deliverance that the patient requires. Most of the studies support the use of TP and mHealth in patients who suffer from mild to moderate depressive symptoms, but those with more symptoms than depression may need a more intense intervention and face-to-face evaluation via videoconference or in person. Since there continue to be very few protocols and guidelines in place directing TMH interventions, some medical providers are found to have hesitation in using these modalities, especially within the adolescent and child populations due to lack of evidence-based practices.

How can we adequately evaluate and compare different modalities of TMH and determine substantial equivalence? With the emerging use and advancements of TMH, TP or other web-based resources such as smartphone applications (apps), research has statistically shown promise that TMH and mHealth have facilitated a means of resources in order to assess

and manage depressive symptoms in adolescents and young adults who sustain barriers of accessing mental health care. Multiple small, RCT studies have shown TP to provide outcomes as good as in-person therapy but have also benefited in providing patients and referring providers with faster consults and quicker interventions (American Academy of Child and Adolescent Psychiatry, 2017; Malas et al., 2018; Myers et al., 2017; Ruskin et al., 2004; Hilty et al., 2018). The collaboration of the PCP and mental health specialist, along with the enhanced integrated care provided with TP has led to an increase in the knowledge and comfort of the referring provider in order to adequately treat this population (Malas et al., 201; Myers et al., 2017). The availability of access to smartphones and mHealth is further providing a key factor, as many young adults and adolescents have these types of resources with them most of the time. It provides a unique mode of communication and mental health intervention between the healthcare team and patient, which further allows easy utilization in times of need.

Thus far, little evidence and data are available to support the efficacy, benefits, and long-term outcomes with technology-based applications, especially smartphone mental health apps, which have proven to be difficult to evaluate. Further research and longitudinal studies continue to be completed and required to identify safety, effectiveness, and adverse side effects. Other areas of study that need to be considered would encompass the deliverance of these applications along with the outcomes of sole treatment via a web-based modality versus face-to-face consultation with a mental health provider.

What is the comparison of outcomes between in-person intervention with a mental health specialist versus TMH methods? It is imperative that additional research and guidelines for evaluation of DHI programs and TMH resources is required in order to appraise the various methods of mental health tech-based treatments. In order to do so, there would need to be a

nationally standardized process set forth for all programs. This standardization would allow for

the ability to keep up with frequent technological changes and provides a baseline of

expectations of every mental health application or tech-based program. The AACAP further

published a statement in June 2017, declaring their support of telepsychiatry being an evidence-

based practice of psychiatric care that has enhanced mental healthcare in the PCP setting along

with embellished integrated care and collaboration leading to improved quality of care (AACAP,

2017b). Recommendations were proposed by AACAP that each State passes legislation allow

telepsychiatric services to be utilized for patients in need and that reimbursement from third-

party payers was mandated (AACAP, 2017b). This Centers for Medicare and Medicaid Services

further adopted expanded criteria and support for TMH services and coverage (AACAP, 2017b).

The evidence of findings held within this article brings an important understanding to the

research question that although TMH, TP, mHealth, etcetera have been found to be efficacious,

further development of provider education and competencies need to be developed in order to

provide the best outcomes followed by further research of RCTs with different approaches in

order to assess long-term management.

Limitations.

TMH is an evolving and promising approach to leveraging psychiatric care for diagnosis,

assessment, consultation, treatment, and management to many geographic areas and populations.

However, several limitations apply to this article. Despite providing empirical evidence base

supporting telepsychiatry practices, there remains a lack of longitudinal studies evaluating the

efficacy of different TMH models and the competencies needed to implement and evaluate each

model based on PCP skill development and clinical impact. Furthermore, there were several

qualitative and quantitative studies conducted via surveys to assess PCP perceptions and

utilization of TMH, which can lead to potential bias.

Due to the limited research of the different populations, lack of competencies and

standardization, and the ability to evaluate the competencies, there remains to be the uncertainty

of the long-term effects of TMH. Thus far, it seems TMH has proven to have patient and

provider satisfaction, but this could conceivably be due to the fact of having improved access to

mental health resources rather than the quality of care TMH is providing. The findings of the

article exposed where further research is needed and advocates for the advancement in the

integration of behavioral health services into primary care.

Applicability to Clinical Practice

After analysis of the literature and assessment of the evidence within the articles, TMH

and mobile applications have proven to be a modality of access to mental health and psychiatric

care within rural areas that lack available resources. Integrating PCPs with the use of a mental

health specialist is providing a means of access to decrease this overwhelming need within rural

areas. Depression, anxiety and several other mental health disorders are a large portion of

primary care medicine and having a means of quick reference and referral can significantly

improve management and outcomes of patients within the PCP office while keeping patients

within their home communities and lessening additional burdens of seeking care outside the

community.

When applying TMH, DHIs, and tech-based modalities of treatment for depression into

practice, it is important to incorporate an emphasis on CBT. Being able to blend face-to-face

interaction with the collaboration of the patient's primary care provider and a mental health

specialist is more effective at establishing the optimal medical care and outcomes for the patient.

The advancements of DHIs and TMH does not replace the medical provider or delivery of health care but has shown to be a supplement in being able to provide a means to fill the gap of availability and assist in quicker consultations, referral, and earlier implementation of diagnosis and treatment. Thus, it should be used as a bridge for monitoring of treatment rather than eliminating the complete need for face-to-face assessment and interaction with a medical provider. It is important to emphasize that there remains a certain degree of uncertainty in the telemedicine scope, due to the lack of data and insufficient research of new technologies and the quickly evolving/changing applications with no set FDA regulations, has made it difficult to demonstrate the long-term clinical outcomes, cost-effectiveness, and adherence.

With the increased use of telemental health resources, it can guide the primary care provider to be better informed of their patient's mental health care plan and execute monitoring and treatments within the PCP setting while having continued support from a specialist. Statistics have shown that TMH has increased educational opportunities amongst the PCP population to gain additional knowledge and better understand appropriate treatment methods and guidelines associated with mental health disorders. The TP approach has allowed for enhanced integrated care and collaboration with the care team so that a greater extent of treatments can be carried out by the PCP to meet the patient's needs within the patient's community (Hilty et al., 2018). TP has further facilitated clinical decision support to improve patient outcomes, increase efficiency, decreased costs, and increased compliance (Hilty et al., 2018).

Conclusions

The development and advancements of tech-based telemental health resources have allowed PCPs to bridge the necessity for mental health destitution to patients in underserved areas. Expansion of TMH/TP have statistically proven to improve the access of mental health

care with more prompt referral services, discussion and consultation regarding patient case reviews with specialist, assistance with diagnosis and treatment plans, video conferencing for counseling and assessments, and having patient intervention options available around the clock for 365 days a year (Hilty et al., 2018; Hodgkinson et al., 2017; Malas et al., 2018).

The progressions of technology and patient-based-care applications in terms of mental health are providing a means of access to underserved areas and can assist all parties involved in the patient's care. These models of care contribute to keeping the patient, mental health specialist, and PCP informed and aware of treatment plans and management. TP has further provided healthcare professionals with an enhanced education and increased comfort in management of mental health illnesses along with improvement in patients' quality of care and outcomes which has been found to be as effective as face-to-face consultations and usual psychotherapies (Hilty, Rabinowitz, McCarron, Katzelnick, Chang, Bauer, & Fortney 2018).

Ultimately, further research needs to be completed using a rigid, nationally standardized guideline of tech-based telepsychiatry interventions in relation to the different modalities of mental health treatment within the adolescent and younger adult populations. Emphasis needs to be made on comparisons of each intervention based on efficacy, deliverance methods, satisfaction, adherence, and long-term outcomes. It is necessary for medical providers to stay up to date on the latest studies in order to provide optimal evidence-based practices that will be the most efficacious for their specific patient needs. This integrative technology brings the promise of increased access to mental health services to those who may otherwise not had the ability to consult with a specialist, further allowing for better health, improved outcomes of less severe mental health disorders, and provides a vital asset to primary care providers across the nation.

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