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THE RISE OF INTEGRATIVE PERSONALIZED-PRECISION eHEALTH IN A COVID-19 ERA

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Given the associated risks and complexity of delivering health interventions during the coronavirus disease (COVID-19) pandemic, many patients haven't received the appropriate care, quality of services, or clinical support necessary to achieve optimal recovery. Continued stress from COVID-19, including social isolation, community disengagement, malnutrition, and widespread mortality have equally contributed to rising mental health problems and chronic illnesses globally (Dubey et al., 2020; Lau et al., 2020). The resulting biopsychosocial stress is now shared by patients and clinicians alike: a collateral state of uncertainty that's driving change at the population level as well as shifts in care delivery across the clinical landscape.

Fortunately, COVID-19 has accelerated the development, expansion, and utility of digital health interventions. Live video and eHealth mindfulness-based programs (eMBPs) are two principal examples used in neurological, behavioral, and palliative care (Greenberg et al., 2019; Matis et al., 2020; Ping et al., 2020). The Integrated Brain Health Clinical and Research Program at Harvard Medical School/ Massachusetts General Hospital is currently at the forefront of developing novel web-based programs for patients, couples, and caregivers (e.g., Toolkit for Optimal Recovery, Recovering Together Resiliency Program) (Lester et al., 2020; Vranceanu et al., 2019). These interventions not only provide high-reach, low-cost, and readily accessible clinical services, but address time and resource constraints that are increasingly prevalent in today's pandemic. It's also important to recognize that COVID-19 is a multifaceted illness that permeates across multiple dimensions of health.

For example, its symptom profile (respiratory dysfunction, somatic pain, neurological deficits, and gastrointestinal distress), direct and indirect mode of transmission (person-to-person contact, droplet, and airborne), and acute versus delayed onset all impact the body, mind, and brain just as much as spiritual well-being, social networks, and environment (Russell et al., 2018). The interrelation of these factors are thus critical targets and components of an effective digital health intervention. Deploying holistic, integrative, and virtually-enabled approaches to care will also be necessary in the post-COVID-19 era, where long-term side effects such as persistent pain and disability may continue, regardless of vaccination. In addition, these treatment modalities will be essential to reducing the psychological impact of COVID-19 and supporting adaptive coping strategies (e.g., mindfulness, resiliency, positive reframing, and acceptance). Hence, the rising tide of digital healthcare doesn't appear to be going anywhere anytime soon.

Clinicians, researchers, patients, and stakeholders can, instead, anticipate a new wave of on-demand services, virtual care, live video programs, telehealth psychotherapy, wearable medical devices with mobile interfaces, and predictive AI-based treatments: the rising trend of

integrative personalized-precision eHealth (IPPeH) interventions. The focus will now turn to optimizing these technologies and care models — communication patterns, degree of facilitator involvement, gender preferences, educational resources, user experience, scalability — to improve efficacy, adherence, attrition and subsequent positive health outcomes for people today, tomorrow, and years to come.

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