A Game-Based Simulation Utilizing Virtual Humans to Train Physicians to Screen and Manage the Care of Patients with Mental Health Disorders

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Abstract

Every year, one in four American adults suffers from a diagnosable mental disorder, yet most of them go untreated, creating a significant public health challenge. This challenge is compounded by large-scale disasters, which can cause an influx of primary care patients presenting with physical symptoms that mask mental health disorders. Primary care providers (PCPs) are usually the first point of contact for those patients; thus there exist crucial opportunities to detect and address nonphysical disorders in primary care settings that would improve patient outcomes and quality of care. Unfortunately, many PCPs view mental health as separate from the services that they provide, and the majority of them have received little training during or after medical or nursing school about risk factors, symptoms, and treatment options. To help integrate behavioral health into primary care, Kognito Interactive developed "At-Risk in Primary Care," an online game-based simulation that integrates role-play conversations with virtual humans to train PCPs to screen patients for mental health disorders, perform brief behavioral interventions using motivational interviewing (MI), refer patients, and integrate behavioral health into their treatment while building patients' intrinsic motivation to adhere to it. Preliminary findings on the implementation of this game in New York City show significant increases in skill and motivation to screen patients, conduct behavioral interventions, and refer patients to specialized care. These results show the promise of innovative technology-based solutions to integrate mental health training in primary care.

Missed Opportunities in Primary Care

EVERY YEAR, MORE THAN 57 million American adults suffer from a diagnosable mental disorder,[1] yet 62.1% of them go untreated, creating a significant public health challenge.[2] The problem also extends to young people: Half of all mental health problems manifest themselves before 14 years of age, and three-quarters are evident by 24 years of age.[3] The National Institute of Mental Health estimates the total costs associated with serious mental illness, which includes disorders that are severely debilitating and affect about 6% of the adult population, to be in excess of $300 billion per year.[4]

Primary care providers (PCPs) are the first point of contact for most patients: In 2006, there were 568 million visits to primary care physicians, accounting for 57% of all medical visits that year.[5] Although patients may present with a physical health complaint, data have shown that underlying mental health issues are often the trigger for primary care visits.[6,7] In fact, as many as 70% of primary care visits are prompted by psychosocial issues, yet mental health conditions are often overlooked or mistaken for physical illness in primary care.[8]

Thus there exist crucial opportunities to detect and address nonphysical disorders in primary care, for they are all too often missed. Of the patients who die by suicide, 90% had contact with their PCP in the year prior to death, and 76% did so in the month before their death.[9] PCPs are therefore in a key position to recognize symptoms and integrate behavioral health into their patient's treatment plan.

However, integrating behavioral health into primary care requires training and changes in workflow that include concerns surrounding time and costs. Many primary care physicians and nurses view mental health as separate from the services that they provide, and the majority of them have received little training during or after medical or nursing school about risk factors, symptoms, and treatment options. Furthermore, although administering a depression screening tool such as the Patient Health Questionnaire (PHQ)-9

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requires little training, discussing the result of the screening, conducting a brief intervention, collaboratively developing a treatment plan that integrates behavioral health, and building the intrinsic motivation in the patient to follow that plan require training that includes how to effectively manage these challenging conversations with patients.

There is growing momentum and need to expand mental health services and to provide PCPs with the training and monetary incentives to conduct screening, brief interventions, and referral to treatment. The Affordable Care Act is expected to bring mental health coverage to 62 million new patients. In recent years, the U.S. Preventive Services Task Force and other government agencies have issued recommendations for screening in all primary care settings, and the Centers for Medicare and Medicaid Services have issued new Health Care Procedure Coding System codes to reimburse screening and behavioral assessments for alcohol misuse, depression, and obesity.[10] The White House also calls for the expansion of Screening, Brief Intervention and Referral to Treatment (SBIRT), an evidence-based approach to screening and early intervention that seeks not only to address the problem use of alcohol and drugs, but also to detect those who are at risk of such behaviors.[11]

The Game

"At-Risk in Primary Care" is an online game-based simulation designed to help address these challenges by training PCPs, including doctors, nurse practitioners, nurses, and physician assistants, to screen patients for mental health disorders, perform brief behavioral interventions using motivational interviewing (MI), refer patients, and integrate behavioral health into their treatment while building patients' intrinsic motivation to adhere to it. The 1-hour online training is approved for 1.50 CME *AMA PRA Category 1 Credits*™ (American Medical Association, Chicago, IL) and 1.50 American Nurses Credentialing Center (Silver Spring, MD) CNE contract hours.

"At-Risk in Primary Care" is built around a series of mini-conversation games where users assume the role of a primary care doctor and face a variety of increasingly difficult conversational challenges where they need to effectively apply MI skills to screen patients, conduct brief interventions, discuss treatment plans, and make referrals to a behavioral health specialist.

The role-play conversations with virtual humans were built using Kognito Interactive's proprietary Human Interaction Game Engine™, which supports the creation and delivery of simulated conversations with intelligent, fully animated, and emotionally responsive virtual humans. These virtual humans are coded to possess their own personality and memory and adapt their behaviors to the player's decisions throughout the conversation to provide a player with a highly realistic yet risk-free experience interacting with patients and experimenting with different communication approaches to achieve his or her goals and "win" the game. A free demonstration of the game can be viewed at www.kognito.com/pcp

MI conversation tactics

Conversations were developed iteratively by Kognito in collaboration with subject matter experts and end-users who provided guidance and feedback on the situations re-

presented in each conversation scenario. Subject matter experts are nationally recognized scholars and professionals in mental health, public health, social work, and health education. Conversations were designed to comply with the SBIRT training protocol. SBIRT itself relies on the use of MI, a counseling method developed by Miller and Rollnick[12] that fosters a collaborative relationship between doctor and patient to resolve patients' ambivalence about changing their behavior. This is achieved through several conversational tactics that can help patients make positive changes for their own health by highlighting cognitive dissonance between patients' unhealthy behaviors and their healthy goals.[13] Because it is quick and conversational in nature, MI can be integrated in most routine health practices, and controlled trials have shown it to be effective in bringing positive change to asthma management, oral care, weight management, and alcohol and substance abuse.[14]

Role-play conversation scenarios

The game is structured around three mini-conversation games. In the first conversation game, the player guides Dr. Rodgers, a primary care physician, through a conversation with Antoine, a new 38-year-old patient who suffers from back pain and requests prescription painkillers to remedy the pain (Fig. 1). Players refer to Antoine's medical record before engaging in conversation with him. The first player goal is to gather enough information about Antoine to determine whether he is at risk for a mental health disorder. The player must use MI conversation skills such as open-ended questions and reflective listening in order to gain Antoine's trust so that he will open up and provide more information. Players communicate with this virtual human patient by selecting from a dynamic menu of dialogue options. The dialogue options represent a variety of effective, neutral, and ineffective conversation tactics. In some cases, a tactic that is ineffective at one point in the conversation may be effective elsewhere. Once players choose a dialogue option, they see their virtual patient "perform" the dialogue and then observe the verbal and nonverbal response of the virtual patient. A new set of dialogue options then appears, based on which tactic was selected. Antoine's level of trust in Dr. Rodgers is displayed on a Trust Meter, which provides continual feedback based on the choices made by the player as he or she progresses through the game. If players select choices that include being critical, judgmental, labeling, or complying with Antoine's request for drugs before gathering enough information, the Trust Meter will show a decrease, and players will find it harder to win the game within the allotted time frame. Throughout the game players are able to occasionally view Antoine's private thoughts, which enables players to gain greater insight and understanding of the patient, thus increasing their empathic communication skills, which ultimately helps them "win" the game. The game is won once players gather enough details to determine that Antoine is a veteran who may be at risk for posttraumatic stress disorder (PTSD) and substance use and that further screening is necessary.

Players are then tasked with engaging in a second conversation with Antoine to collaboratively develop a treatment plan with him. Players are encouraged to build on the MI strategies they used previously by addressing the patient's motivation to change, guiding the patient to recognize the connection between his physical pain and emotional stress,
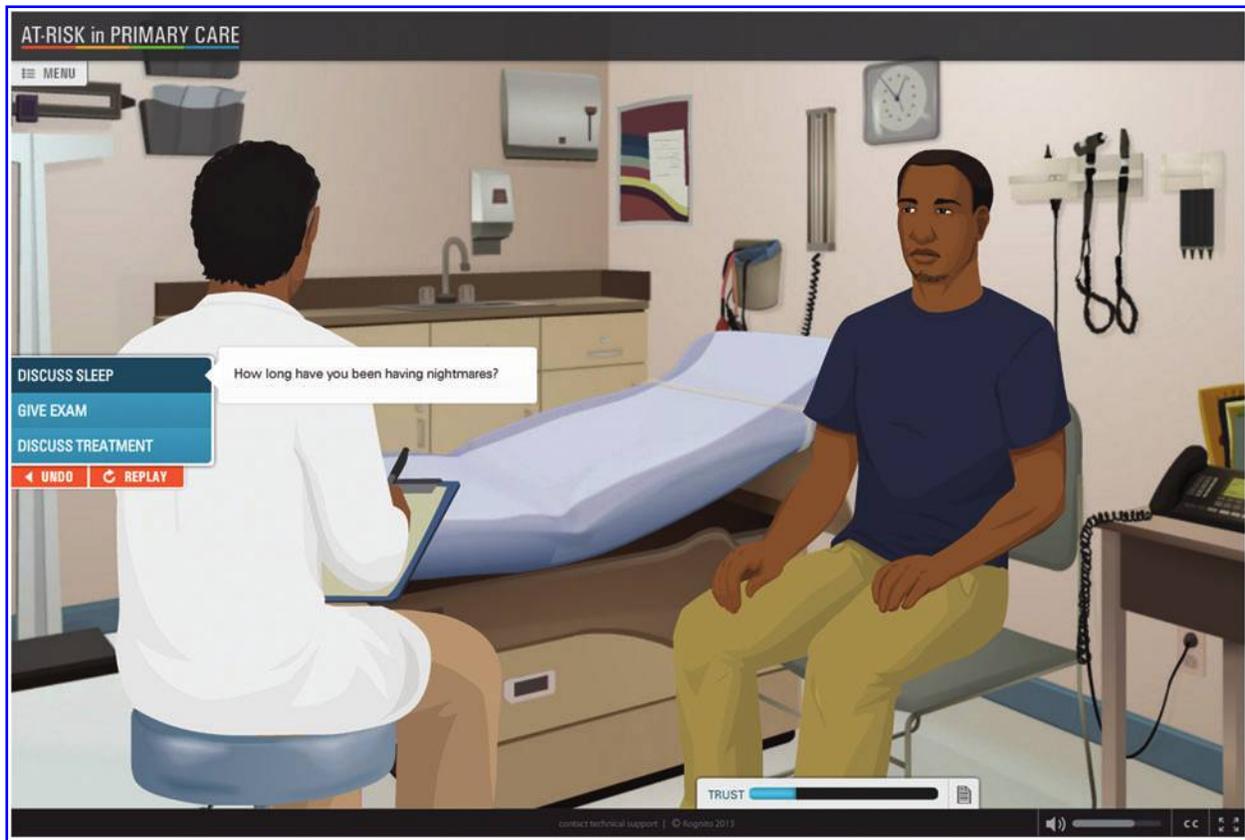
FIG. 1. Screenshot of a virtual role-play conversation with a patient in "At Risk in Primary Care." Color images available online at www.liebertpub.com/g4h

outlining treatment options, including a mental health referral, discussing potential barriers to treatment, and helping patients to think about solutions to those barriers. Players' choices are again reflected in the Trust Meter, and inner thoughts continue to build upon emotional intelligence. The game is won when the player successfully helps Antoine recognize his mental health symptomotology and he agrees to talk to a mental health professional, thus overcoming his initial resistance to the behavioral treatment.

In the third conversation, players guide Dr. Rodgers through a conversation with Judith, a patient who has seen Dr. Rodgers for the past few years. Her chief complaint is osteoarthritis for which she has been prescribed ibuprofen and physical therapy in the past. Judith filled out the CAGE-AID, PHQ-2, and PHQ-9 questionnaires in the waiting room, and her results correlate with moderately severe depression; she also indicated the possibility of suicidal thoughts. Throughout this game, players must gather enough information about Judith's complaint, discuss her depression and suicidal thoughts, and collaboratively decide on a treatment plan with her. By using the same MI tactics, Trust Meter, and inner thoughts, players learn that Judith was strongly affected by the loss of her daughter on September 11, 2001. Players discuss Judith's motivation for changing her unhealthy behaviors and collaboratively break down barriers for her to speak with a mental health professional. The game is won when players successfully reach an agreement with Judith that she will go to physical therapy and speak with a mental health professional by phone about her depression.

Training New York City PCPs

As part of its extensive emergency response strategy, the New York City Department of Health and Mental Hygiene (DOHMH) decided to utilize a tailored version of Kognito's "At-Risk in Primary Care" to further train the city's 7,000 PCPs to manage acute and long-term mental health conditions most commonly associated with trauma exposure. The City recognizes that large-scale traumatic events, both natural and man-made, often lead to a surge in the number of patients seeking help for physical ailments, which may be masking underlying mental health disorders. Increasing New York City's capability to efficiently respond to the mental health consequences of trauma, including those affected by the devastating consequences that arise after traumatic events like 9/11 and Hurricane Sandy, can benefit a significant number of New Yorkers. The need for such training is well-illustrated by Neria et al.,[15] who found that of the 929 adult primary care patients they followed, over 25% knew someone who had died in the September 11th attacks and that these patients were twice as likely to meet the clinical criteria for at least one of the four most common trauma-related mental health disorders.

During June–December 2012, Kognito worked closely with the DOHMH and conducted focus groups with New York City–based PCPs to narrow the program's scope from general mental health disorders to the four most common disaster mental health disorders: PTSD, substance use disorder, generalized anxiety disorder, and depression. The training

program was delivered within weeks after Hurricane Sandy and utilized in the City's recovery efforts.

Preliminary Results

As part of the training, learners are asked to fill out an optional pretraining Likert-scale survey measuring (1) their knowledge and skills in approaching patients demonstrating mental health symptomatology, (2) their likeliness to screen and manage the treatment of these patients, (3) the frequency with which they screen patients for such problems, and (4) whether they currently manage patients' mental health. An optional post-training survey measures their skill, motivation, self-efficacy and general satisfaction with the training.

As of September 2013, 66 primary care physicians, nurses, and care managers completed the presurvey and then the training, after which 27 finished the post-training survey. Data showed significant increases in all dependent variables ($P < 0.01$), including PCPs' knowledge, skill, likelihood, and behavioral intent (1) to identify risk factors and warning signs for trauma-related mental health disorders, (2) to screen patients for trauma-related mental health disorders, (3) to discuss treatment options, (4) to engage in collaborative decision-making about treatment plans, and (5) to build intrinsic motivation in patients to adhere to a suggested treatment plan.

The post-training survey also shows high satisfaction rates with the training as a learning tool: 80% found it well-constructed to a very great or great extent, 100% found it overall excellent (50%), very good (20%), or good (30%), and 95% said they would recommend it to a colleague. In addition, participants indicated in the post-training survey that they particularly appreciated the interactions with realistic virtual patients and the ability to take the training on their own time.

Collecting follow-up data is ongoing, with only eight matched pairs having finished the 3-month survey. Nonetheless, preliminary data is encouraging: 50% of participants agreed that as a result of the training there had been an increase in the number of patients they (1) identified and screened to be at risk for trauma-related mental health disorders and (2) engaged in collaborative decision-making about treatment plans.

These preliminary findings suggest that "At-Risk in Primary Care" can be effectively used to train and motivate PCPs to screen, conduct brief intervention, and integrate behavioral health into their treatment.

Conclusions

Integrating behavioral health into primary care is an important initiative that will result in better health outcomes for patients and increased efficiency and cost savings for the nation's healthcare system. Successful integration will require innovative approaches not only to address gaps in knowledge, skill, and motivation, but also to address concerns about training costs and time constraints. Additionally, to result in real changes in behavior, these trainings should include effective communication tactics such as motivational interviewing to ensure that providers can engage patients in screening, brief intervention, and referral to treatment. Training games such as Kognito's that integrate role-play conversations with virtual patients offer an effective and engaging way for PCPs to develop and practice these critical skills while saving valuable time and cost for the national healthcare infrastructure.

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Brief Biosketches

Glenn Albright, PhD, is a clinical psychologist and is Co-Founder and Director of Applied Research at Kognito Interactive, where he leads a research team in evaluating the efficacy of Kognito's training simulations. Dr. Albright received his PhD from the City University of New York in the area of experimental cognition with concentrations in neuropsychology and applied psychophysiology and is a former chair of the Department of Psychology at Baruch College. He is particularly interested in the application of recent findings in neuroscience that impact our understanding of what drives learning and changes in behavior in game-based training environments.

Cyrille Adam, EdM, is a Research and Development Consultant at Kognito Interactive and an EdD candidate in Communication, Computing and Technology in Education at Columbia University's Teachers College. Mr. Adam's research focuses on the design and effectiveness of games and simulations for behavioral change in the prevention and treatment of mental health disorders. Prior to joining Kognito, Mr. Adam helped design educational platforms for behavioral health at the Columbia Center for New Media Teaching and Learning.

Ron Goldman, BBA, is Co-Founder and CEO of Kognito Interactive, a New York City–based developer of training simulations that utilize virtual humans to help address the nation's health and behavioral health problems. Mr. Goldman has over 15 years of experience in business development, strategic planning, gaming technology, and learning design. Mr. Goldman also founded and manages the New York City Health Games Meetup events.

Deborah Serri has a Masters' degree in Digital Media & Design for Learning from New York University and over 10 years of experience in managing large-scale consulting projects and teams through the development of complex and multifaceted training software and programs for Fortune 500 companies, government agencies, and nonprofits. Ms. Serri joined Kognito in March 2010 as an instructional designer. Prior to Kognito she worked at leading companies including MTV, VH1, and Sudden Industries.