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Brave New Worlds: How Virtual Environments Can Augment Traditional Care in the Management of Diabetes

Alice J. Watson, MBChB, MRCP, MPH,[1,4] Richard W. Grant, M.D., MPH,[2,4] Heather Bello, B.A.,[1] and Daniel B. Hoch, M.D., Ph.D.[3,4]

Abstract

New technologies, such as online networking tools, offer innovative ways to engage patients in their diabetes care. Second Life (SL) is one such virtual world that allows patients to interact in a 3D environment with peers and healthcare providers. This article presents a framework that demonstrates how applications within SL can be constructed to meet the needs of patients with diabetes, allowing them to attend group visits, learn more about lifestyle changes, and foster a sense of support and emotional well-being. This experiential approach to education may prove more engaging, and therefore successful, than existing strategies. Addressing concerns relating to privacy and liability is a necessary first step to engage providers in this new approach to patient care.

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Introduction

Technology has changed the way we work, communicate, and keep ourselves entertained. The implications for industries such as banking, retail, and media have been far-reaching: old business models have died and new ones have flourished. Healthcare has been slow to join the technological revolution, but we are now witnessing how innovations, such as electronic medical records and remote monitoring devices, can change the way clinical care is organized, delivered, and evaluated. It is likely, however, that the current applications only represent the tip of the iceberg. The rapid pace of technology innovation and adoption signals that the healthcare landscape will continue to change over the next few years. Online social networking has been a key area of growth, and may offer opportunities for patients, providers, and healthcare institutions to improve both the quality and efficiency of care. Novel applications of online social networks, collaboration tools, and virtual worlds may have particular relevance for patients with chronic conditions such as diabetes that require ongoing self-management, a steep learning curve, and extensive behavior changes. Current diabetes care is frequently sub-optimal due to a variety of challenges, including provider inertia, poor patient adherence to care plan recommendations, low levels of patient knowledge and self-efficacy, and co-morbid depression.[1-5]

Author Affiliations: [1]Center for Connected Health, Boston, Massachusetts, [2]General Medicine Division, Massachusetts General Hospital, Boston, Massachusetts, [3]Neurology Division, Massachusetts General Hospital, Boston, Massachusetts, and [4]Harvard Medical School, Boston, Massachusetts

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Corresponding Author: Alice J. Watson, MBChB, MRCP, MPH, 25 New Chardon Street, Suite 400D, Boston, MA 02114; email address *AJWatson@partners.org*

This commentary will examine the potential health applications, for patients with diabetes and their providers, of one such environment, that of the virtual world called Second Life.

Second Life

Second Life (SL) is a 3D world, imagined, created, and owned by its residents. The previous sentence was probably a cue for some readers to look puzzled, bemused, or just plain skeptical. Let's be honest: when many of us hear "virtual world," we envisage spotty teenage boys engaging in role-playing games in their basements. In reality, however, the average user is 35 years old, and women comprise 40% of users. Since its inception in 2003, SL has seen dramatic growth in land mass, user numbers, and hours of usage. SL is now the equivalent of 462 square miles in size, and in just three years the total number of registered users has grown from around 30,000 to nearly 9 million. The total number of user hours clocked in the month of March 2008 was a staggering 30,800,000, equal to 3500 years! Over a third of active users are based in the United States, with residents from Germany, the United Kingdom, Japan, and France completing the top five.[6]

SL is a virtual world, or "metaverse," that thrives on the interactions of real-world individuals and their "in-world" residents or "avatars." Thus, for every avatar one encounters in SL, there is a live person somewhere in the world who is dictating that avatar's actions, emotions, words, dress, etc. In contrast to the two-dimensional browser of the World Wide Web, SL provides interactions with people, businesses, and organizations in a 3D environment. SL, as any of its users will be quick to inform you, is not a game.

Linden Lab, the developers of SL, created an environment where users play a major role in growth and development. Users are provided with an unlimited supply of geometric primitives, or "prims," that are the building blocks of SL. They can be stretched, shaped, given texture, and otherwise manipulated to create almost anything imaginable. Residents also have access to the Linden Scripting Language. As a result, they can create, change, and program elements of their own surroundings. There is a strong incentive to innovate within SL, which despite being a virtual world, is a place where real money can be made. There is a robust economy within SL, with transactions completed through the exchange of SL's unique currency, the Linden dollar. The Linden dollar, like any other currency, fluctuates according to supply and demand, but it currently trades around L$265: US$1.[7]

In addition to being able to purchase a myriad of objects, including hair, eyes, shoes, boats, cars, pets, and lawn furniture, it is also possible to lease land or property. Scattered across this virtual globe are hundreds of neighborhoods, nightclubs, and restaurants, all available to rent. Many businesses have become interested and invested in SL, including Coldwell Banker, which has a virtual sales office, Nike and Volkswagen. Many news networks and universities have a virtual presence in SL, with Reuters, Harvard University, and Boston College being just a few examples.

Second Life and Healthcare

So where does healthcare fit into all of this, and how is SL relevant to the care of patients with diabetes? In answer to the first question, many healthcare institutions are already active in SL. The American Cancer Society and the U.S. Centers for Disease Control, for example, have facilities within SL.[8] Palomar West Medical Campus, in collaboration with Cisco Connected Health, recently unveiled its new hospital in SL, to allow potential real-world patients to tour its amenities and see demonstrations of the new technology that will be in use. (The real facility will not open its doors until 2011.[9])

There clearly remains a far greater opportunity for providers to leverage SL as a medium to interact with patients outside of physical and geographical constraints. This interaction is quite different from an email exchange—SL provides an immersive experience that is much closer to an in-person interaction. Furthermore, SL offers opportunities for patients with diabetes to learn and interact with peers independent of physicians.

Second Life and Diabetes

Very little literature exists regarding the impact of virtual worlds on the care of people with diabetes. Preliminary observational studies have found that social norms appear to be retained in SL interactions.[10] In addition, assigning avatars with specific characteristics to a person in SL appears to have an impact on the person's behavior and perceptions in real life. A recent study demonstrated that visualizing one's avatar losing weight during exercise promotes more activity in real life.[11] There are many examples of how diabetes education or care can be delivered using communications technology such as the Internet or cell phones.[12,13] Although the findings from

these studies cannot be generalized to the SL learning environment, they do illustrate a willingness on the part of patients to engage in new models of care delivery.

The following framework outlines how people with diabetes could benefit from interactions in SL (**Table 1**). Within each of three domains, there are both direct translations of currently available care, and novel applications specific to the SL environment. These applications represent potential solutions to current challenges in diabetes care.

Education

Over the last ten years, group visits for patients with diabetes have increased in popularity. Such groups are not only an efficient way to deliver education, but also allow patients to provide each other support and peer training. These groups have consistently been shown to lead to high patient satisfaction, and compliance with care processes, e.g., screening.[14] The impact of this care model on clinical outcomes such as hemoglobin A1c and blood pressure is variable across studies.[15,16]

It is relatively simple to build an environment within SL that closely mimics a clinic setting where group visits can be conducted. Visualize a room with posters on walls, and chairs for patients and their families. Perhaps patients experimenting with SL might feel reassured to see a familiar layout with avatars that visually represent their providers. However, such a literal application assumes certain constraints that simply do not exist within SL. If we let our imaginations run free, it is possible to envisage group visits with a very different look and feel (**Figure 1**).

Patients often attend a series of 4-6 group visits. Within SL, each visit could comprise a unique experience—a weekly field trip. For example, patients could be taught about symptoms of hypoglycemia, not simply through didactic lectures but through visualizing the effects on their avatars. A simulation in SL already exists that allows people to experience the world of someone

Figure 1. Illustrations of a group visit taking place within SL. These avatars were being trained to elicit the relaxation response. Note how the setting differs from a conventional classroom or office. (Courtesy of Deborah Linton, Partners Healthcare)

Table 1:
A Framework for Applications in SL Relevant to Patients with Diabetes, and Current Problems That Would Be Addressed.

Domains	Current Problems	Applications	
		A. Direct translation	B. Novel / extension
Education	Knowledge deficits Resistance to insulin initiation	Group visits	Time machine Symptom recognition Insulin injection training "Inner space" tour
Lifestyle (dietary/activity)	Poor self-care skills Lack of motivation	Written information	Supermarket sweep Virtual coaching
Social support / emotional health	Depression Social isolation	Patient support groups	Virtual treats / SL splurges Removal of physical constraints

with schizophrenia. It feels very real to see your avatar walking through rooms hearing voices, and seeing disturbing images and distortions of reality. Such experiential education might be far more effective than simply "telling." Patients reluctant to start insulin therapy in real life could take a first step by giving their avatars insulin in SL. The connection between person and avatar is powerful, and this type of visualization might help patients conquer their fears in a safe setting.

Education about the adverse effects of diabetes could be taught in a number of novel ways. It might be possible to create a "time machine" that would allow patients to visualize the alternate futures they could experience with successful management of their diabetes. Seeing one's avatar confined to a wheelchair, or seeing the world as if through a damaged retina might provide a stimulus to act, particularly if positive alternative visions of the future were offered. Another teaching tool might be an "Inner Space" tour that allows people to travel inside the body of a person with diabetes and learn about the role of the pancreas and the effect of diabetes on blood vessels.

The intent of this commentary is not to postulate which of these suggestions would be most effective, but to illustrate the alternatives that SL makes possible if we become less literal in our thinking.

Lifestyle

One of the major areas of concern for patients with diabetes is what they can— or, more important, can't—eat. Currently in SL there is an abundance of restaurants and coffee shops where people meet to "eat." Learning about the right diet to follow could be moved out of a classroom and into a supermarket. Patients could travel around an SL supermarket with a dietician in tow, or simply make what they think are the right choices and be told at the checkout which of their selections were unwise. A "supermarket sweeps" game could be devised, where people accumulate points or prizes for coming up with the healthiest basket of goods. Supermarkets specializing in Asian and South American foods could be created to address cultural issues.

It may initially be a challenge to envision how real-world activity could be promoted using a virtual environment. After all, taking a long walk in SL isn't going to do much more than give your fingers a workout in the real world! However, with the rise in "wear and forget" pedometers that allow online tracking of activity, it is possible to think of simple ways in which the real and virtual worlds could become connected. Coaching within SL could be used to promote activity in the real world. By discussing barriers to activity, ways to overcome them, and setting goals, SL coaches could become valuable resources for patients from a wide geographic distribution. A single practice would be unlikely to have resources to fund someone to carry out this activity. However, coaching within SL would allow practices to share one resource—a potentially effective and efficient strategy to tackle this area of diabetes management where, traditionally, it has been difficult to make an impact. Incentives or rewards could be devised. Avatars can be granted special "powers," or gifted with items such as rollerblades that allow them to navigate the virtual world with greater speed and ease. Perhaps avatars could compete, individually or in teams, to receive some type of recognition.

Emotional Well-Being

The psychological benefits of interacting within SL are immense. SL is free from conventional definitions of disability—a hugely empowering feature. SL has literally provided many disabled adults with a new lease on life. There are many reports of stroke survivors being inspired to walk, and agoraphobics re-engaging with society after seeing what they can achieve through their avatars. Furthermore, for those people who cannot change their situation in the real world, SL becomes a place for them to make friends, travel, and experience many things that are otherwise unavailable to them.

Many communities developed in SL offer the benefits of online support, such as anonymity and access to rich information, while providing a far more humanistic setting than online message boards. Although it is likely that patients with diabetes will benefit from such groups, the support group model is only one way for patients to gain psychological support through SL.

Diabetes places huge restrictions on patients' lives. It is simply not possible to take a break from being diabetic, and this can be emotionally wearing, leading to poor adherence to care regimes and depression. SL offers an environment where it is possible to splurge, or escape from the physical restrictions of one's disease. Imagine being able to walk into an ice cream parlor, order a huge sundae, and sit and eat it with your friends for the first time in years. Perhaps being able to do this in SL could partially compensate for being unable to do it in real life. SL opens up a whole realm of possibilities for people with diabetes, allowing them to fly, travel, sit on top of

a mountain looking down on the sea—it is difficult to dispute that such experiences are likely to contribute to a better mental state.

Practical Concerns / Considerations

Much of this discussion has been around what is possible. However, practical considerations will ultimately decide whether such ideas lead to better health outcomes for significant numbers of patients with diabetes. Major concerns generally center on privacy, liability, and applicability.

One of the strengths of SL is that it places few restrictions on its users. Using SL to deliver care to patients will require much more work with regard to safety and clarification of regulations. Authenticating who is behind an avatar would be essential if providers were to use SL to deliver care. Authentication is a two-way street. In carrying out health education activities, it would be important for people to know who was delivering the information—after all, in SL anyone can call themselves a Diabetes Educator. There is no one strategy to address this issue, but using expert resources, such as the American Diabetes Association and hospitals, to direct patients to approved avatars, such problems could be ameliorated. Context and peer advice are important components in building trust both in the real world and in SL.

If SL were to be used to carry out private exchanges between patients and physicians, more robust data protection would be required than is presently found in SL. SL recently announced that it was building a private world for use by IBM, one of its largest corporate users.[17] Perhaps a private healthcare world would allay concerns about patient privacy.

Another unknown aspect of providing medical services in SL is liability. Defining standards of care and documenting interactions within a virtual-world environment may be challenging. In addition, it may not even be apparent whom providers can "treat" within SL. State licensure laws prevent providers from delivering care directly to patients from other parts of the country without the involvement of a local referring physician. How such restrictions are regulated or governed within SL is not yet clear. Fortunately, many of the interventions outlined above merely constitute education rather than medical care delivery.

Perhaps the most glaring concern for those who care for diabetes patients is whether any of their patients would actually use SL. The digital divide has been well-documented, and there is evidence that diabetes patients lag behind the general population in their adoption of technology. A recent survey of patients with diabetes in Massachusetts found that only 50% had ever been online.[18] This may appear disheartening, but given that this number represented an increase of 50% from three years previously, perhaps we should be more focused on the slope of the curve than its current height.[19] Disparities in technology adoption have also been documented in groups of different race, socioeconomic status, and educational attainment. These disparities are a problem, but the face of SL is changing rapidly. It is heartening that many other groups have become involved despite apparent barriers such as mental or physical disabilities.

There are also technical and financial considerations surrounding the development of diabetes resources within SL. Although it is free for patients or providers to establish an avatar, the costs of creating infrastructure to deliver interventions within SL could be considerable, depending on complexity. In addition, running SL currently requires a fairly high level of technical specifications that might not be found on a standard home computer.[20] It is likely that some of the technical hurdles will resolve over time, as more powerful computers become standard, and the environment becomes much easier to use.

Conclusion

Virtual worlds such as SL offer exciting new opportunities for patients with diabetes to learn and interact with providers and peers. Experiences within SL, such as watching one's avatar become unwell, or be rewarded for making healthy food choices, may translate into more favorable choices in real life. In addition, SL offers patients the opportunity to escape the constraints of their disease in ways that are not possible through other media. Physicians and healthcare institutions should be willing to explore how SL might benefit the diabetes patients they serve.

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