

What role can the internet play in preventing diabetes?



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“The internet disseminates information and connects individuals in powerful ways, but its potential as a tool of preventive health counseling is just beginning to be realized.”



Current high rates of internet use in the USA [101] and other developed countries, and rapidly growing rates in the developing world [102,103], present unique opportunities for diabetes prevention. Many people have integrated the internet into their lives, with approximately 74% of US adults reporting using the internet in late 2009 and 60% reporting home broadband access [101,104]. Furthermore, senior citizens, low-income Americans and rural Americans, groups that have historically lagged in internet access, are among those for whom broadband adoption is growing particularly rapidly [104].

One area in which the internet may bring a new approach to diabetes prevention is by enabling the widespread delivery of intensive behavioral programs. While such programs were shown to prevent or delay diabetes nearly a decade ago [1,2], they have been difficult to disseminate in real-world settings, and the effectiveness data from such translational efforts have been mixed. Part of the difficulty is the sustained and intensive nature of the lifestyle counseling in these interventions. For example, the US Diabetes Prevention Program (DPP) lifestyle intervention, a

research intervention that reduced the incidence of diabetes by 58% among adults with prediabetes, included: clearly defined goals for weight loss (7% loss) and physical activity (150 min of moderate physical activity weekly); assignment of ‘lifestyle coaches’ to participants; intensive ongoing intervention with an initial core behavioral curriculum, followed by a flexible maintenance program with supplementary group classes, restart options and motivational campaigns; a ‘toolbox’ of adherence strategies; materials and strategies for working with ethnically diverse populations; and an extensive network of training, feedback and clinical support [3]. However, the associated cost of US\$2780 per person exceeds what insurers are typically willing to pay [4]. A key challenge in bringing programs like this into the community setting has been to maintain intervention integrity at a cost that is sustainable.

Common approaches for containing costs in community-based versions of the DPP have included using group-based counseling [5–13], decreasing the frequency or number of core counseling sessions [8,10,12,13], reducing or eliminating counseling contacts after completion of the

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core curriculum material [5,7,8,10,12] or including lay counselors [5,10]. However, aspects of these strategies are not ideal, as sustained intervention is considered important for sustaining behavior change, and access to experts may promote safety, particularly for individuals with weight-related health problems, such as heart disease, diabetes, hypertension or lower extremity osteoarthritis.

By shifting to online delivery, a very different approach can be taken to the translation of diabetes prevention interventions into community settings. For example, by automating much of the curriculum's counseling, an internet-based approach enables delivery of the full curriculum with fidelity at relatively low staffing levels [14]; there is no additional staff burden for delivering lessons once they are automated. Automation also ensures intervention integrity and intensity in diverse settings. Accordingly, the use of structured behavioral lessons [15,16] have been key components of efficacious online lifestyle interventions.

Online delivery also opens new avenues for lifestyle counseling. This counseling may be a particularly important component of successful online interventions since electronically delivered counseling and feedback has been shown to be beneficial over algorithm-based online advice [17]. If educational content is primarily delivered in an automated fashion, online lifestyle coaches can focus on the more sophisticated counseling tasks, such as providing support, motivation and personalized advice to identify and overcome participants' barriers and establish self-management skills for eating and physical activity. Online-enabled innovations, such as structured interactive exercises embedded within online lessons, can help reinforce lesson topics, as well as provide lifestyle coaches with the information they need to understand their participants' personal situations and individual needs.

Furthermore, the internet allows for technological innovations, such as automated graphical feedback of self-monitoring data, chat sessions or discussion boards through which participants can interact with experts or provide each other with support, automated email reminders, links to reputable health resources and avenues for communicating with an individual's routine healthcare providers. In addition, the use of automated education and asynchronous communication provides convenient access to online interventions at the time and internet location of a participant's choice.

It is important to note that the field of internet-facilitated weight loss is new and rapidly evolving. As a result, data from internet-based lifestyle intervention studies are limited, often relatively short term [18], and sometimes negative [19] or uncontrolled [14]. However, efficacy data for health-focused interventions incorporating behavioral counseling show promising effects for altering adults' obesity-related health behaviors [20], and promoting weight loss [15,17,20] or weight loss maintenance [21,22]. Limited data also suggest that the intervention developed specifically for the DPP can be successfully delivered in the online setting [14].

The internet may also open avenues for diabetes prevention by facilitating better preventive services within the healthcare system. Promoting diabetes prevention through an individual's typical source of healthcare adds some advantages to other community-based translational efforts. For example, physicians are a trusted source of health advice [23] and most primary care providers (PCPs) consider cardiovascular prevention counseling [24], and specifically dietary counseling [25], to be important. Thus, PCPs have significant potential to play an important role in helping individuals at high risk of weight-related health problems to develop and sustain healthier lifestyles, above and beyond referring patients to community resources. Although considerable barriers have hindered the translation of efficacious lifestyle interventions into the clinical setting [24–27], online lifestyle counseling programs can be successfully integrated with primary care practice, with the online lifestyle coach acting as a virtual member of the healthcare team [28]. Furthermore, online tools can help streamline preventive care delivered in the practitioner's office, for example by computerized intake surveys that efficiently collecting patient data relevant to preventive health screening [29]. Similarly, the capability of patient portals to facilitate communication between patients and providers, disseminate the results of clinical testing and provide links to educational materials can provide timely input for patient decision making regarding diabetes prevention [30].

Some may argue that the digital divide makes the internet an undesirable focus for disseminating diabetes prevention counseling. After all, poor and minority populations have some of the highest diabetes risk and consistently lower internet access than other segments of the population. While it is important to acknowledge that

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this divide persists, we feel that passing up on the potentially powerful new approaches that the internet brings to diabetes prevention is not the best response. Rather, we advocate a multi-pronged approach: first, develop and test online tools, followed by dissemination efforts that specifically work to enroll groups that tend to be under-represented on the internet (e.g., by facilitating internet access, including through public access sites such as libraries); second, launch concurrent policy initiatives to eliminate socioeconomic and racial/ethnic disparities in access; and third, promote understanding that internet-based delivery will not work for all people and other avenues (e.g., individual and group-based counseling) must continue to develop in parallel. Existing data suggest that there is already considerable interest in the use of the internet for health information among under-represented minorities. For example, fairly high health-related internet use (often from nonhome access sites) has been found in samples with a high proportion of poor, urban, minority individuals [31–33]. In addition, in one large study of adults in an online lifestyle intervention, African–American enrollment rates considerably exceeded the proportion of African–Americans in the four US regions involved [34]. Furthermore, while disparities in access persist, the scope of the ongoing global epidemic of diabetes is so large that no single strategy is likely to be appropriate for all-comers, and coupling the widespread prevalence of diabetes with the widespread availability of the internet holds promise to improve diabetes prevention for a large segment of the population.

Professionals, from clothing retailers to journalists, have made great strides in adapting to the new realities of life in an online society. By

developing mechanisms for electronic delivery of preventive counseling, we look to develop fresh approaches with the potential to transform medicine in similar, future-oriented ways [35]. We expect that the convenience of accessing an online program at the time and location of the participant's preference [36] may make it a successful option for supporting long-term behavioral change. The option to access lifestyle education and support for a stigmatized condition in a relatively private manner may particularly appeal to large numbers of individuals. Likewise, the relatively low staffing needs may result in cost-effectiveness. The internet disseminates information and connects individuals in powerful ways, but its potential as a tool of preventive health counseling is just beginning to be realized. While the current literature stops short of definitively establishing the effectiveness of internet delivery, cultivation of the online approach is a promising strategy for realizing the full potential of internet-based diabetes prevention. As challenges and opportunities of online counseling are identified, better computers and new technologies and strategies will emerge to facilitate success.

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Kathleen McTigue is an author of an online adaptation of a lifestyle curriculum. While the University of Pittsburgh has licensed the program contents for commercial use, the authors have assigned the copyright to the University and receive no personal royalties. The authors have no other relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript apart from those disclosed.

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