Manuscript Number: 15-0424-0465R

Title: Interactive Web-Based Learning: Translating Health Policy Into Improved Diabetes Care

Article Type: Topics in Education

Corresponding Author: Ms. Briana B Rider, PharmD

Corresponding Author's Institution: U.S. Department of Health and Human Services

First Author: Briana B Rider, PharmD

Order of Authors: Briana B Rider, PharmD; Silje C Lier, MPH; Tisha K Johnson, MD, MPH; Dale J Hu, MD, MPH

Abstract: In August 2014, the DHHS' Office of Disease Prevention and Health Promotion (ODPHP) released the National Action Plan for Adverse Drug Event Prevention (ADE Action Plan), highlighting prevention of diabetes agents-related hypoglycemia as a key area for improvement. In support of the ADE Action Plan, ODPHP then developed a web-based interactive module, or eLearning lesson, based on formative research and stakeholder feedback to educate health care professionals on strategies to prevent adverse drug events from diabetes agents. The training incorporates health literacy principles by demonstrating, through video scenarios, how to apply shared decision-making when setting individualized glycemic targets, and how to use the teach-back method to confirm patients' understanding. Prior to release in September 2014, the training went through intensive usability testing and was pilot-tested using a 36-item evaluation. Six months after its release (September 2014 - March 2015), the training landing page on health.gov had 24,334 unique page-views. Over 90% of the 234 participants that earned continuing education credit agreed that they will be able to apply the knowledge gained from the lesson to their practice. Online trainings that model key prevention strategies are well-received by health professional users and may play an important role in translating policy into improved outcomes.

Interactive Web-Based Learning

Translating Health Policy Into Improved Diabetes Care

Briana B. Rider, PharmD,¹ Silje C. Lier, MPH,¹ Tisha K. Johnson, MD, MPH,² Dale J. Hu, MD, MPH¹

From the ¹Office of Disease Prevention and Health Promotion, U.S. DHHS, Washington, District of Columbia; and ²University of Kentucky College of Public Health, Department of Preventive Medicine and Environmental Health, Lexington, Kentucky

Address correspondence to: Briana B. Rider, PharmD, Division of Health Care Quality, Office of Disease Prevention and Health Promotion, U.S. DHHS, 1101 Wootton Parkway, Suite LL-100, Rockville MD 20852. E-mail: briana.rider@hhs.gov.

In August 2014, the DHHS' Office of Disease Prevention and Health Promotion released the *National Action Plan for Adverse Drug Event Prevention*, highlighting prevention of diabetes agent-related hypoglycemia as a key area for improvement. In support of the Action Plan, the Office of Disease Prevention and Health Promotion then developed a web-based interactive module, or eLearning lesson, based on formative research and stakeholder feedback to educate healthcare professionals on strategies to prevent adverse drug events from diabetes agents. The training incorporates health literacy principles by demonstrating, through video scenarios, how to apply shared decision making when setting individualized glycemic targets, and how to use the teach-back method to confirm patients' understanding. Prior to release in September 2014, the training went through intensive usability testing and was pilot tested using a 36-item evaluation. Six months after its release (September 2014 to March 2015), the training landing page on health.gov had 24,334 unique page views. More than 90% of the 234 participants that earned continuing education credit agreed that they will be able to apply the knowledge gained from the lesson to their practice. Online trainings that model key prevention strategies are well received by health professional users and may play an important role in translating policy into improved outcomes.

Introduction

Diabetes mellitus is a major public health problem, with more than 25 million people in the U.S. estimated to be living with diabetes.¹ A growing elderly population coupled with increasing rates of diabetes and concomitant medication use have contributed to greater risks for adverse drug events (ADEs) related to diabetes agents. An ADE has been defined by the IOM as “an injury resulting from medical intervention related to a drug” and may encompass adverse drug reactions, overdoses, medication errors, and allergic reactions.² Factors such as polypharmacy, altered pharmacokinetics, limited health literacy, and cognitive decline in the elderly increase the risk for ADEs. This rising burden has been increasingly highlighted as an important and largely preventable public health issue, with the potential to adversely affect millions of people and place a huge financial burden on annual healthcare expenditures, adding upwards of \$3.5 billion to U.S. healthcare costs.^{3–6} According to the 2010 Inspector General Report, hypoglycemia was the third most common ADE experienced in the inpatient setting among Medicare beneficiaries, and more than 50% of the ADEs were judged to be preventable.⁴ With insulin and oral diabetes drugs implicated in approximately 25% of the nearly 100,000 annual emergent hospitalizations for ADEs in older adults, engaging healthcare professionals is an urgent priority as the U.S. population ages and the prevalence of diabetes and medication use continues to rise.⁷

In response to the increasing problem posed by ADEs, Congress requested that the DHHS convene a federal interagency taskforce to develop and establish the *National Action Plan for Adverse Drug Event Prevention* (ADE Action Plan), which was finalized and released in August 2014 by the Office of Disease Prevention and Health Promotion (ODPHP), within the Office of the Assistant Secretary for Health, DHHS.^{8,9} Diabetes agents were selected as one of three initial

drug classes to target, based on the morbidity and mortality associated with their harms and their well-established amenability for prevention.

The ADE Action Plan identifies individualizing glycemic targets as a key strategy in preventing hypoglycemic ADEs. Recent studies have found that setting glycemic targets too low increases the risk of hypoglycemia and mortality in many individuals with certain risk factors.^{10–12} The most recent guidelines recommend individualized target hemoglobin A1c values for all individuals with diabetes.^{11,13–15} Despite the body of evidence recommending individualized glycemic targets, some providers may still attempt to have their patients adhere to strict hemoglobin A1c goals. A recent study found that approximately 60% of adults with complex or very complex medical problems were treated with insulin or sulfonylureas to achieve tight glycemic targets.¹⁶ Intensive glycemic goals may be influenced in part by current performance metrics for glycemic control that focus exclusively on achieving glycemic targets below a certain threshold. Based on recent guidelines, a higher hemoglobin A1c target may be appropriate for many patients, such as those with advanced microvascular complications, major comorbid illness, or limited life expectancy—in essence, those who are unlikely to benefit from aggressive glucose management.^{11,13–15} Implementing these guidelines requires healthcare professionals to thoroughly integrate current evidence with patient-specific factors.

Health literacy is one of many patient-specific factors that must be considered when setting individualized glycemic targets. Individuals with low health literacy have been identified as being especially vulnerable to ADEs.¹⁷ Nearly half of all American adults are estimated to have limited health literacy, and only 10% of Americans are proficient in understanding and using

health information.¹⁸ As such, the ADE Action Plan calls for provider education to emphasize health literacy principles.

To promote the recommendations outlined in the ADE Action Plan related to preventing hypoglycemic ADEs from diabetes medications, the ODPHP, in collaboration with other federal agencies across the DHHS and non-federal subject matter experts, developed an interactive web-based eLearning lesson titled Preventing Adverse Drug Events: Individualizing Glycemic Targets Using Health Literacy Strategies. The main goal of the project was to engage healthcare professionals through an eLearning platform designed to translate policy into improved diabetes care.

Methods

Identifying Gaps in Existing Training

As the ADE Action Plan was being finalized in spring 2014, ODPHP conducted an environmental scan and background research to determine the need for a new training on hypoglycemic ADE prevention strategies (e.g., individualized glycemic targets, health literacy principles). ODPHP found that few training opportunities existed to educate health professionals on how, when, and why to apply individualized glycemic targets. Even fewer incorporated health literacy strategies into the application of individualized targets.

After reviewing currently available trainings on diabetes management, ODPHP identified the following gaps in current trainings: integration of health literacy principles, information on the prevention of hypoglycemia, and behavior modeling. Most training focused primarily on

diabetes management, with limited to no discussion regarding how to effectively prevent hypoglycemia. Few of the trainings used immersive learning techniques based on the behavioral learning theory, or modeled real-life situations to demonstrate how learners can implement ADE prevention strategies in their healthcare setting. The majority of trainings found were based on written, didactic materials rather than interactive content, further illustrating a need for an immersive online training.

Finally, through outreach to various professional organizations involved in the fields of diabetes management and public health,^a ODPHP gauged their interest and need for an interactive eLearning lesson focused on hypoglycemia prevention and health literacy. Several organizations indicated that the proposed eLearning lesson would be valuable to their members, especially if continuing education (CE) credits were offered.

Development of Interactive Learning Lesson

To address the professional practice gap, an eLearning lesson was developed to teach health professionals how to:

1. apply health literacy strategies to provide personalized care for patients with diabetes;
2. help patients with diabetes understand and act on information to prevent hypoglycemia;
3. use current, evidence-based guidelines for individualizing glycemic target goals; and
4. adopt patient-centered communication strategies (teach-back and shared decision making) in the healthcare setting.

^aAmerican Association of Family Physicians, American Board of Internal Medicine Foundation, American Association of Medical Colleges*, American College of Physicians*, American College of Preventive Medicine*, American Diabetes Association, American Geriatric Society, American Medical Student Association, American Public Health Association, Association of American Medical Colleges, Institute for Healthcare Improvement*, National Association of Community Health Centers.

*Organizations that indicated that the proposed eLearning lesson would be valuable to their members.

These learning objectives were foundational to the development of the lesson, a process that was overseen by an advisory group of subject matter experts. The eLearning lesson content was based on evidence-based resources adapted from the ADE Action Plan and from vetted sources within the DHHS and the Department of Veterans Affairs.

Evaluation

Prior to release, usability testing was performed to identify any barriers to effective learning and to explore ways to improve the overall user experience. Three remote usability testing sessions with healthcare professionals were conducted using usability software (TechSmith Morae).

Testing among three users yielded a 58% chance to encounter usability issues at least once at the probability of problem occurrence ($p=0.25$). Overall, the usability testers gave the eLearning lesson a score of 91.7 on the System Usability Scale, with 100 representing a perfect score.¹⁹

Results of the usability testing were used to inform subsequent content and usability enhancements.

The eLearning lesson was then pilot tested by 23 independent reviewers. Pilot testers represented the target audience and included seven physicians, a physician assistant, six pharmacists, two nurse practitioners, five nurses, a health policy analyst, and a health communication and social marketing professional. The training was pilot tested using a 36-question evaluation that assessed the following areas: content and learning materials; presentation; learning environment; knowledge, competence, and practice; learning objectives; access; and activity specific questions. To the extent possible, all pilot testing feedback was integrated into the final version of the training.

Discussion

Following the launch of the eLearning lesson in September 2014, a variety of strategies were used to disseminate the training, and increase reach and awareness (Table 1). Several measures have been used to evaluate the reach and utilization of the lesson. Six months after its release (September 2014 to March 2015), the training landing page on health.gov had 24,334 unique page views. “Unique page views” refers to the number of users exposed to a web page, and is determined using a combination of the Internet Protocol address of the user’s computer, as well as the cookie file, or text file that provides more information about a user’s browser history. In other words, the metric indicates how many **users** visit a website, not how many **times** the web page is accessed.

The eLearning lesson was launched by 1,962 unique users, and 390 unique users completed the training. Of those 390 users, 272 of them registered to obtain CE credit for the lesson. Of the registrants, 85.29% went on to earn CE credit after completing the full lesson and evaluation, scoring at least 70% on the post-test. The training offers various forms of continuing education; from September 2014 to March 2015, of the 234 people who received CE credit, 17% received continuing medical education credit, 63% received continuing nursing education credit, 12% received continuing pharmacy education, 6% received continuing education unit credit for other professionals, and 2% completed the training for auditing purposes. The lesson currently has a 4.7 out of 5–star rating (with 5 stars being the top rating) among users who accessed the training through CDC’s external learning management system, TrainingFinder Real-time Affiliate Integrated Network.

CDC's post-lesson evaluation requests activity-specific feedback that corresponds to the course learning objectives. More than 80% of CE participants either *agreed* or *strongly agreed* that after participating in the training they:

1. *feel prepared to apply individualized glycemic targets with patients;*
2. *feel more knowledgeable about the treatment and prevention of hypoglycemia;*
3. *are more likely to engage in shared decision making with patients; and*
4. *are more likely to confirm patient understanding using the teach-back method with patients* (Figure 1).

The results indicate that for 75% of the people who obtained CE credit, the availability of CE credit/contact hours influenced their decision to participate in the activity. More than 90% of the participants that earned CE credit agreed that they will be able to apply the knowledge gained from this activity to their practice, indicating that the eLearning lesson might play an important role in translating policy into improved outcomes.

Patient education is an extremely important component of risk mitigation for hypoglycemia. For patient education to be effective, health literacy must be taken into account. This eLearning lesson sits at the intersection of two major initiatives within ODPHP—the ADE Action Plan and the *National Action Plan to Improve Health Literacy* (Health Literacy Action Plan). The Health Literacy Action Plan seeks to engage organizations, professionals, policymakers, communities, individuals and families in a linked, multisector approach to improve health literacy nationwide.²⁰ Since its release in 2010, health literacy has been strategically integrated into

various projects and initiatives across the DHHS, including the ADE Action Plan and the diabetes eLearning lesson.

Among patients with diabetes and limited health literacy, only 50% demonstrated familiarity with the symptoms of hypoglycemia, in comparison with 94% of patients with functional health literacy.²¹ Patients with low health literacy and diabetes are more likely to have hypoglycemic episodes.²² The eLearning lesson teaches providers to assume initially that all patients may have some trouble understanding healthcare information. This “universal precautions” approach has been shown to improve care for all patients, regardless of their level of health literacy.²³ When education is provided in plain language, patients are better equipped to understand and act on information to prevent hypoglycemia.

In addition to the “universal precautions” approach, the diabetes eLearning lesson identifies shared decision making as a patient-centered communication strategy that engages patients in their ongoing care. A position statement released by the American Diabetes Association and the European Association for the Study of Diabetes advocates for the use of shared decision making in setting treatment goals.¹¹ Shared decision making allows for increased collaboration between healthcare professionals and patients on goal setting and problem solving, resulting in increased patient engagement and incorporation of patients’ beliefs and values into care. Healthcare professionals should adopt the eight key elements of shared decision making (Table 2) when discussing individualized glycemic targets with patients in their practice.²⁴ Table 2 explains the key steps for conducting shared decision making and can be used to help healthcare professionals incorporate the principles outlined in the eLearning lesson into daily clinical practice. In order

for shared decision making to be effective, patients need to clearly understand the relevant health information, including the benefits and risks. Informed, engaged patients and caregivers are more able to make decisions with their providers regarding glycemic targets.

The teach-back method is another patient-centered communication strategy taught in the eLearning lesson. This method is meant to confirm patient understanding, and has been shown to be underutilized in those with diabetes and limited health literacy.²⁵ Prompted by open-ended questions, patients should be instructed to explain information back to their provider, using their own words. The teach-back method has been shown to increase knowledge of diabetes among patients with limited health literacy.²⁶ The eLearning lesson provides learners with sample teach-back questions, a simulated video scenario of the teach-back method in action, and an interactive knowledge check to test understanding of the concept.

The ADE Action Plan identifies individualizing glycemic targets as a key strategy to advance the prevention of hypoglycemic ADEs from diabetes agents. This strategy, therefore, is a key component of the diabetes eLearning lesson. The eLearning lesson includes clear, evidence-based charts and graphics, as well as real stories from the field, to equip users with the necessary resources to discuss individualized glycemic targets with patients while adopting health literacy approaches.

Online learning can play a critical role in teaching and promoting preventive medicine. Although motivations for seeking education differ from one individual to another, online learners report several advantages over traditional classroom learning. These advantages may include: self-

paced learning, engaging topics that are relevant and current, flexibility, and the ability to learn from almost anywhere.²⁷

In addition to convenience and enhanced accessibility, another advantage is that learning theories can be built into the educational design of the program to promote effective learning. The behavioral, cognitive, and humanist theories are among the learning theories that can be used to strengthen the educational design of eLearning lessons.²⁶ The diabetes eLearning lesson includes video vignettes and interactive knowledge checks, which were incorporated based on the behavioral theory of learning. The video vignettes are used to model how healthcare professionals can implement the diabetes management recommendations using health literacy strategies. The clinical application activities (e.g., quizzes) help learners apply what they have learned about identifying optimal individualized glycemic targets with their patients. Finally, the activity integrates real-life examples to demonstrate how healthcare professionals can prevent hypoglycemia, implement shared decision making and teach-back, and apply individualized glycemic targets with their patients.

As evidenced in the results, free CE credit is another motivating factor for participating in online learning. Most healthcare professionals are required by their respective licensing bodies to obtain CE credit in order to maintain an active license. The target audience of this eLearning lesson—physicians, nurses, pharmacists, and other healthcare professionals—has the ability to gain free CE credit while using an interactive platform that reflects principles central to the ADE Action Plan. For nonclinical health professionals and students that are not licensed or certified, CE credits may not be a motivator. However, for these individuals, web-based learning provides a

vehicle to stay informed about the latest research, trends, and best practices in a way that is convenient and fast.

To this end, the diabetes eLearning lesson integrates health literacy principles, the recent recommendations advocating for individualized glycemic targets, prevention of hypoglycemia, and behavior modeling to translate the key prevention strategies outlined in the ADE Action Plan into improved diabetes care through provider education. Several strategies (Table 1) continue to be undertaken to maximize the reach and utilization of the eLearning lesson.

Limitations

There is limited evidence to support the claim that online learning is superior to traditional classroom learning. Although ODPHP's research shows that participants viewed the eLearning environment as conducive to learning, there are several limitations to online learning and more high-quality RCTs are needed. However, for the purposes of training health professionals on ADE prevention, the authors have found eLearning to be an effective strategy to help disseminate emerging public health information and recommendations.

The inability to follow-up with users beyond the post-lesson evaluation is another limitation. Impact outcomes, such as improved health literacy among patients, increased use of teach-back and shared decision making in healthcare settings, and decreased hypoglycemic ADEs, have not been evaluated and are outside the scope of this project.

Access to the training may be limited by the fact that the eLearning lesson is currently only available in English and can only be viewed on mobile devices that support Adobe Flash

Player[©].^b Research into preferred digital platforms for learning could help inform future trainings.

Conclusions

Online trainings that model key prevention strategies can play an important role in translating policy into improved diabetes care. By creating interactive, engaging content, public health professionals can improve the likelihood of evidence-based recommendations being put into practice. It is the authors' hope that using an eLearning platform to educate healthcare professionals on ADE prevention strategies will help contribute to safer and higher quality health care, more-informed and -engaged patients, and ultimately, improved health outcomes.

Future Directions

As part of its commitment to health professionals, students, and community leaders, ODPHP plans to offer a growing library of online lessons and trainings (full list at www.health.gov/learn) to provide the tools and skills needed to improve health in communities. Course topics, learning objectives, and overall content will continue to be informed by formative research on audience needs, gaps in research, and continued exploration of adult learning principles. By tracking and assessing engagement metrics and evaluative results from past eLearning courses, ODPHP will also determine future lesson formats and design other interactive features to address important public health topics.

^bThe eLearning lesson will be made available as a HyperText Markup Language (HTML) course within the year, which will make it mobile responsive to a broader range of smart phones and devices, and increase accessibility to users with visual, audio, and cognitive disabilities.

Acknowledgments

The views expressed herein are those of the authors and do not necessarily reflect the views of the U.S. DHHS. This research was supported in part by an appointment to the Research Participation Program at the DHHS administered by the Oak Ridge Institute for Science and Education through an interagency agreement between the U.S. Department of Energy and DHHS.

Authors Rider, Lier, Johnson, and Hu all had a significant role in the manuscript and all:

1. made a substantial contribution to the conception and design of the study, to data acquisition, or to data analysis and interpretation;
2. wrote the article or revised the article for important intellectual content; and
3. read and approved the final version of the submitted manuscript.

An earlier version of this work was presented in the form of a poster abstract at the 49th American Society of Health System Pharmacists Midyear Clinical Meeting and Exhibition.

No financial disclosures were reported by the authors of this paper.

References

1. CDC. National diabetes fact sheet: national estimates and general information on diabetes and prediabetes in the United States, 2011.
www.cdc.gov/diabetes/pubs/pdf/ndfs_2011.pdf. Accessed April 1, 2015.
2. IOM. *To Err is Human: Building A Safer Health System*. Kohn LT, Corrigan JM, Donaldson MS, eds. Washington, D.C.: National Academy Press; 2000.
www.nap.edu/catalog/9728.html. Accessed June 5, 2015.
3. Bates DW, Spell N, Cullen DJ, et al. The costs of adverse drug events in hospitalized patients. *JAMA*. 1997;277(4):307-311.
<http://dx.doi.org/10.1001/jama.1997.03540280045032>.
4. Levinson DR. *Adverse Events in Hospitals: National Incidence Among Medicare Beneficiaries*. DHHS, Office of Inspector General; Published November 2010.
<https://oig.hhs.gov/oei/reports/oei-06-09-00090.pdf>.
5. CDC, unpublished data. Updated numbers for: Budnitz DS, Pollock DA, Weidenbach KN, Mendelsohn AB, Schroeder TJ, Annest JL. National surveillance of emergency department visits for outpatient adverse drug events. *JAMA*. 2006;296(15):1858-66.
Division of Healthcare Quality Promotion. National Center for Infectious Diseases. Coordinating Center for Infectious Diseases. CDC: Atlanta, GA.
6. IOM, Committee on Identifying and Preventing Medication Errors. *Preventing Medication Errors*. P.A, Wolcott JA, Bootman L, Cronenwett LR, eds. Washington, D.C.: The National Academies Press; 2007. www.nap.edu/catalog/11623.html. Accessed June 5, 2015.

7. Budnitz DS, Lovegrove MC, Shehab N, Richards CL. Emergency Hospitalizations for Adverse Drug Events in Older Americans. *N Engl J Med.* 2011;365(21):2002-2012.
<http://dx.doi.org/10.1056/NEJMsa1103053>.
8. Harris Y, Hu DJ, Lee C, Mistry M, York A, Johnson T. Advancing Medication Safety: Establishing a National Action Plan for Adverse Drug Event Prevention. *Jt Comm J Qual Patient Saf.* 2015; In press.
9. U.S. DHHS, Office of Disease Prevention and Health Promotion. *National action plan for adverse drug event prevention.* Washington, DC: 2014.
10. The NICE-SUGAR Study Investigators. Intensive versus Conventional Glucose Control in Critically Ill Patients. *N Engl J Med.* 2009;360(13):1283-1297.
<http://dx.doi.org/10.1056/NEJMoa0810625>.
11. Inzucchi SE, Bergenstal RM, Buse JB, et al. Management of hyperglycemia in type 2 diabetes, 2015: a patient-centered approach: update to a position statement of the American Diabetes Association and the European Association for the Study of Diabetes. *Diabetes care.* 2015;38:140-149. <http://dx.doi.org/10.2337/dc14-2441>.
12. The Action to Control Cardiovascular Risk in Diabetes Study Group. Effects of Intensive Glucose Lowering in Type 2 Diabetes. *N Engl J Med.* 2008;358(24):2545-2559.
<http://dx.doi.org/10.1056/NEJMoa0802743>.
13. U.S. Department of Veterans Affairs, U.S. Department of Defense. VA/DoD Clinical Practice Guideline for the Management of Diabetes Mellitus. U.S. Department of Veterans Affairs. U.S. Department of Defense; 2010.
www.healthquality.va.gov/guidelines/cd/diabetes. Accessed June 16, 2014.

14. Moghissi ES, Korytkowski MT, DiNardo M, et al. American Association of Clinical Endocrinologists and American Diabetes Association Consensus Statement on Inpatient Glycemic Control. *Diabetes care*. 2009;32(6):1119-1131. <http://dx.doi.org/10.2337/dc09-9029>.
15. Lee SJ, Boscardin WJ, Stijacic Cenzer I, Huang ES, Rice-Trumble K, Eng C. The Risks and Benefits of Implementing Glycemic Control Guidelines in Frail Older Adults with Diabetes Mellitus. *J Am Geriatr Soc*. 2011;59(4):666-672. <http://dx.doi.org/10.1111/j.1532-5415.2011.03362.x>.
16. Lipska KL, Ross JS, Miao Y, Shah ND, Lee SJ, Steinman MA. Potential overtreatment of diabetes mellitus in older adults with tight glycemic control. *JAMA Intern Med*. 2015;175(3):356-362. <http://dx.doi.org/10.1001/jamainternmed.2014.7345>.
17. Brown M, Frost R, Ko Y, Woosley R. Diagramming patients' views of root causes of adverse drug events in ambulatory care: An online tool for planning education and research. *Patient Educ Couns*. 2006;62(3):302-315. <http://dx.doi.org/10.1016/j.pec.2006.02.007>.
18. Kutner M, Greenberg E, Jin Y, Paulsen C. The Health Literacy of America's Adults: Results from the 2003 National Assessment of Adult Literacy. (NCES 2006-483). Washington, D.C., U.S. Department of Education. National Center for Education Statistics; 2006. <http://nces.ed.gov/pubs2006/2006483.pdf>.
19. Brooke J. *SUS: a 'quick and dirty' usability scale*. In: Jordan PW, Thomas B, Weerdmeester BA, McClelland AL, eds. *Usability evaluation in industry*. London; Bristol, PA: Taylor and Francis; 1996:189-194.

20. U.S. DHHS. *National action plan to improve health literacy*. Washington, DC: Office of Disease Prevention and Health Promotion, U.S. DHHS; 2010.
21. Williams MV, Baker DW, Parker RM, Nurss JR. Relationship of functional health literacy to patients' knowledge of their chronic disease: A study of patients with hypertension and diabetes. *Arch Intern Med*. 1998;158(2):166-172.
<http://dx.doi.org/10.1001/archinte.158.2.166>.
22. Sarkar U, Karter A, Liu J, Moffet H, Adler N, Schillinger D. Hypoglycemia is More Common Among Type 2 Diabetes Patients with Limited Health Literacy: The Diabetes Study of Northern California (DISTANCE). *J Gen Intern Med*. 2010;25(9):962-968.
<http://dx.doi.org/10.1007/s11606-010-1389-7>.
23. DeWalt DA, Callahan LF, Hawk VH, et al. Health Literacy Universal Precautions Toolkit. AHRQ Publication No. 10-0046-EF. Rockville, MD., U.S. DHHS. Agency for Healthcare Research and Quality; April 2010. www.ahrq.gov/professionals/quality-patient-safety/quality-resources/tools/literacy-toolkit/index.html. Accessed June 16, 2014.
24. U.S. Department of Veterans Affairs. DM Shared Decision Making Diabetes Pocket Card. 2012.
www.healthquality.va.gov/guidelines/CD/diabetes/cpgSDMDMPOCKETFinalPRESS022513.pdf. Accessed June 5, 2015.
25. Schillinger D, Piette J, Grumbach K, et al. Closing the loop: Physician communication with diabetic patients who have low health literacy. *Arch Intern Med*. 2003;163(1):83-90.
<http://dx.doi.org/10.1001/archinte.163.1.83>.
26. Negarandeh R, Mahmoodi H, Noktehdan H, Heshmat R, Shakibazadeh E. Teach back and pictorial image educational strategies on knowledge about diabetes and

medication/dietary adherence among low health literate patients with type 2 diabetes.

Prim Care Diabetes. 2013;7(2):111-118. <http://dx.doi.org/10.1016/j.pcd.2012.11.001>.

27. Sargeant J, Curran V, Allen M, Jarvis-Selinger S, Ho K. Facilitating interpersonal interaction and learning online: Linking theory and practice. *J Contin Educ Health Prof*. 2006;26(2):128-136. <http://dx.doi.org/10.1002/chp.61>.

List of Figures

Figure 1. User response to the activity-specific evaluation questions ($n=234$).

Table 1. Dissemination Strategies to Increase Reach and Awareness of the eLearning Lesson

Partnerships	Leverage existing resources and networks of federal and non-federal partners to promote the eLearning lesson and increase course participation
Targeted outreach	Conduct targeted web outreach and send promotional language to pre-identified organizations, medical schools, and training programs, as well as other key influencers to share with their audiences
Social media	Conduct social media outreach to broaden reach of course link, and to encourage discussions related to adverse drug events
E-marketing	Conduct online outreach via established stakeholder listserv
Events	Promote the eLearning lesson to stakeholders at national conferences, presentations, and exhibits related to diabetes, health literacy, medication safety, and adverse drug event prevention
Press	Pitch course lesson to medical trade press and other key media

Table 2. Eight Key Elements of Shared Decision-Making

1. Ask	Identify the issues by asking patient-centered questions. Use motivational interviewing.
2. Prioritize	Explore patients' needs and help them prioritize their needs and expectations.
3. Assess	Identify any barrier to shared decision-making on the part of both patient and provider. Assess the patient's capacity to be part of the decision-making.
4. Advise	Provide balanced information about the risks and benefits of treatment options using plain language. It's appropriate to assume initially that everyone may have some trouble understanding health care information.
5. Acknowledge	Learn what's important to the patient and acknowledge the criteria that patients use to make decisions so you can both share values, power, and expectations.
6. Assist	Provide tools to help patients weigh their options. Invite input from others, such as spouses and caregivers.
7. Make a Decision	When the patient is ready, agree upon the glycemic target. Recommend individualized target glycemic goals based on life expectancy, comorbid conditions, microvascular complications, and patient preferences.
8. Evaluate	Use the teach-back method to confirm that you have explained what patients need to know in a manner they understand. Follow-up with patients to learn about their expectations of and satisfaction with the decision-making process. Revisit the process if you or the patient have concerns.

Feel more knowledgeable about the treatment and prevention of hypoglycemia

Feel prepared to apply individualized glycemic targets with patients

Am more likely to engage in shared decision-making with patients

Am more likely to confirm patient understanding using the teach back method with patients