Online Education for Improving Communication and Documentation of Dietary Supplements Among Health Professionals Practicing in a Hospital Setting

Paula Gardiner, MD, MPH,¹ Amanda C. Filippelli, MSN, MA, MPH, RN,¹
Karim Kabbara, MS-CIS,² Steven C. Lin, MD, MPH,³ Ekaterina Sadikova, MPH,⁴
Ted J. Kaptchuk, OMD,⁵ and Kathi Kemper, MD, MPH⁶

Abstract

Background: Little is known about the feasibility of online education in improving communication and documentation of dietary supplements (DS) among clinicians.

Methods: This prospective educational study included clinicians at an urban teaching hospital. The curriculum included video streams, didactics, and interactive case presentations to discuss (1) DS safety and effectiveness, (2) cultural competency, (3) managing DS in a hospital setting, and (4) DS adverse events. Participants were surveyed, at baseline and after training, about DS knowledge, confidence, communication, and documentation practices.

Results: Thirty-nine of 61 (64%) recruited clinicians completed all four patient cases and post-tests. Most (82%) were women and 59% were physicians. The mean DS knowledge test score increased after the curriculum ($p < 0.0001$), and the clinician confidence score also increased ($p < 0.0001$). Most (82%) participants reported that curriculum changed their use of evidence-based resources ($p = 0.01$). There was a change in the indications for symptom management ($p = 0.05$) and gastrointestinal/digestive health issues ($p = 0.03$). There were statistically significant increases in the frequency of asking patients about DS use during discharge ($p = 0.01$), and 82% responded that the curriculum changed their DS documentation.

Conclusion: An online curriculum is an effective tool for presenting DS education to clinicians with the goal of improving clinicians' knowledge, confidence, and documentation practices about DS.

Introduction

USE OF DIETARY SUPPLEMENTS (DS) is prevalent among hospitalized patients.^{1–4} To ensure appropriate medical treatment, conduct accurate medical reconciliation, and avoid DS-medication interactions, clinicians need to be aware of patients' DS use.⁵ The Joint Commission requires health professionals to ask and document their patients' DS use in the same way as they would ask about and document prescription medication use.⁶ Despite this, in a study by Young *et al.*, 75% of patients reported that no physician asked them about DS use during hospital admissions; physicians documented asking about DS use only 20% of the time.⁷ One reason clinicians cite for poor communication and documentation of DS use is that they are poorly educated about this during training.⁸

Evidence suggests that physicians desire further education in DS in order to improve clinician-patient communication.^{9,10} Online education may be a helpful facilitator for a DS curriculum. Online education has gained popularity among clinicians because it can be done at the individual's pace and can provide access to resources. Online learning helps health professionals learn more about a given topic and make evidence-based clinical decisions.^{11,12} In a randomized controlled trial, an online curriculum led to sustained improvements in knowledge, confidence, and communication about DS.¹³ That trial, however, did not focus on clinician communication and documentation about DS in an inpatient setting.

At Boston Medical Center (BMC), 60% of 558 inpatients reported DS use in a recent study. Among those who reported using DS, only 36% had DS documentation in the admission note, 20% were asked about DS use by a physician or nurse at

¹Department of Family Medicine, Boston University Medical Center, Boston, MA.

²Information Technology–Application Service, Boston University School of Medicine, Boston, MA.

³Department of Medicine, University of California at San Diego, San Diego, CA.

⁴Department of Research and Evaluation, Kaiser Permanente, Pasadena, CA.

⁵Division of General Medicine and Primary Care, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, MA.

⁶Department of Pediatrics, Ohio State University College of Medicine, Columbus, OH.

admission, 18% said they would disclose use if asked, and 48% reported that they planned to continue to use DS after discharge.¹⁴ Hence, this academic medical center shows a clear need to improve patient-clinician communication and documentation about DS use.

The current pilot study of an online curriculum addressed the lack of clinician communication and documentation about DS. The purpose of this study was to evaluate the feasibility and effect of the curriculum on increasing knowledge, confidence, communication, and documentation of DS among clinicians. The study hypothesis was that clinicians who complete the curriculum will increase their DS knowledge and confidence scores, as measured by pre- and post-tests.

Materials and Methods

Participants

Participants were eligible for the study if they were clinically active licensed clinicians (medical doctors, nurses, nurse practitioners, physician assistants, nutritionists, or pharmacists) at BMC and were willing to participate in the online curriculum. At the time of the study approximately 3500 active clinicians were on staff at BMC. BMC is an urban teaching hospital that serves a low-income, diverse patient population. Excluded were participants who did not have a current email address. Participants were recruited through flyers, hospital-wide clinician email lists, weekly posts in the BMC and Boston University Medical School online communications, and presentations at faculty meetings. All recruitment materials contained an Internet address to the study's website. Potential participants interacted with an online eligibility screening tool and an online consent form. The Boston University School of Medicine institutional review board approved this study.

Intervention

The overall goal of the online DS curriculum was to improve knowledge, confidence, communication, and documentation of DS in the hospital setting. Four 1-hour case-based modules were developed to illustrate core concepts: (1) safety and effectiveness of the most commonly used DS; (2) cultural competency in communicating about DS use and reading labels; (3) managing DS use in a hospital setting, including medical reconciliation, ordering, and documenting in the medical record per Joint Commission guidelines; and (4) recognizing and reporting adverse events and drug DS interactions. The clinical cases provided audio-narrated PowerPoint (Microsoft Corp., Redmond, WA) presentations, videos, and links to evidence-based resources, designed to allow learners to go into additional depth as desired. Learning objectives for the individual cases are described in Appendix 1. Each case also included interactive questions on knowledge, attitudes, and behavior about DS to encourage learners to reflect on the material, use suggested resources, and increase communication and documentation of DS. All responses to questions embedded in the curriculum were captured on a secure server.

Clinicians were allowed to complete the 4-hour curriculum at their own pace within 30 days. Reminders were e-mailed weekly to encourage completion. Clinicians were given a \$50 gift certificate upon completion of the curriculum, a post-test, and post-intervention course evaluation.

Baseline and outcome measures

The baseline questionnaire asked about demographic characteristics (such as age, sex, race, profession/degree, practice type, years in practice, and training status). At baseline, participants were asked about: knowledge about DS from previous professional training, responses to patients who bring up DS use, barriers to discussing DS with patients, and who initiates the discussion of DS. At baseline, participants were also asked about their knowledge, confidence, and communication and documentation related to DS. These questions (described below) were repeated as outcome measures.

Knowledge. The DS knowledge test was adapted from a previously used test that measures knowledge of DS.¹³ The 10-item DS knowledge test was revised on the basis of the authors' previous research and current focus to test the key learning objectives of the four modules before and after the intervention.^{13,15} The improvement in knowledge about DS was measured by subtracting the baseline score from the post-test score.

Confidence. The clinician confidence test was adapted from a previously used test that measures clinical confidence about DS.¹³ Shifts in clinician confidence in counseling patients about use of DS were measured by comparing responses to 12 pre- and post-intervention questions based on the authors' previous research (Appendix 2).¹³ Responses were noted on a Likert scale of 1–5, where 1 was “strongly disagree” and 5 was “strongly agree.” Three items were reverse scored. The possible scores ranged from 12 to 60. The baseline scores were subtracted from the post-intervention scores to arrive at an absolute difference in the confidence scores.

Self-reported communication and documentation behaviors. Self-reported behavior, such as discussing and documenting DS, was assessed by comparing the pre- and post-intervention responses. Detailed questions focused on when discussions about DS occurred (e.g., during admission history and physicals, medical reconciliations, progress notes, or discharges). Additional questions included where they sought information about DS and the indications for which they recommended DS to patients. Participants were also asked about writing orders for DS use for an inpatient and providing patient information sheets. Finally, the questionnaire asked about when they documented information about patients' DS use in the electronic medical records (EMR). A free-text box followed to allow the participant to provide comments on how the curriculum changed their documentation.

The post-intervention course evaluation consisted of seven questions to assess various areas of the content, including whether objectives were met, barriers faced in documenting DS use, cases, didactic information, and links. Participants were also asked how long it took to complete the entire curriculum. Finally, a Likert scale of 1–5, where 1 was “strongly disagree” and 5 was “strongly agree,” was used to assess whether the curriculum described each of the five study objectives.

Surveys were completed online; data were de-identified and transferred to SAS software (SAS Institute, Inc., Cary, NC) for analysis by a statistician who had not participated in developing the curriculum or recruiting participants.

Statistical analysis

Simple descriptive statistics were used to describe demographic characteristics. Improvements in knowledge and confidence were measured by comparing pre-intervention and post-intervention scores using paired *t*-tests. Chi-square tests were used to compare pre/post changes in communication and documentation. Categorical responses used the McNemar test for agreement.

Results

One hundred and twenty-six individuals inquired about the online DS training (Fig. 1). Of these, 65 people were ineligible (e.g., not a health care professional or affiliated with BMC) or did not register. Of those who were eligible, 61 provided informed consent and completed the pretest. Of the 61 who completed informed consent, 46 (75%) completed at least one module, and 39 (64%) completed all modules and the post-test. Sociodemographic characteristics were similar between those who completed and those who did not complete the modules.

Participant description

Table 1 describes the characteristics of 39 participants who completed the pretest, modules, and post-test. Thirty-eight percent were age 21–30 years, most (88%) were female, and most (69%) identified as white. A large majority of the participants were medical doctors/doctors of osteopathy (MD/DOs) (59%), and 31% were registered nurses, physician assistants, or nurse practitioners. Forty-four percent of the participants worked in primary care, 56% worked in specialty care, and 46% were in training programs.

Baseline training, barriers, and behavior

When asked at baseline, “How much did you learn about dietary supplements from your professional medical training?”

FIG. 1. Study enrollment and completion.

TABLE 1. PARTICIPANT CHARACTERISTICS

Characteristic	Participants, n (%) (n=39)
Age	
21–30 y	15 (38)
31–40 y	13 (33)
≥41 y	11 (28)
Men	7 (18)
White	27 (69)
Profession	
MD/DO	23 (59)
RN	7 (18)
PA and NP	5 (12)
Other	4 (10)
Care specialty (not primary care)	22 (56)
Years practiced	
≤3 y	18 (46)
4–10 y	11 (28)
≥11 y	10 (25)
Self-identified trainee	18 (46)

MD/DO, medical doctor/doctor of osteopathy; RN, registered nurse; PA, physician assistant; NP, nurse practitioner.

10% of participants responded “nothing”; 64% reported “a little”; and 26% reported “the basics.” No participants reported advanced mastery of the topic. More than half (54%) indicated that their own doctors had asked about their use of DS. Most (74%) participants personally used DS before the online training.

At baseline, when asked, “If a patient brings up dietary supplements, how do you typically respond?” Thirty-three percent reported they would “answer any questions,” 41% reported they would “start a discussion and follow up in future visits,” and 5% noted they would “advise the patient to continue taking the product.” No participants responded that they would “ask patients to stop using supplements.” When asked, “What are the main reasons why, at times, you do not ask patients about dietary supplements?”, 54% reported they did not have enough time, 41% did not have the knowledge to answer patient questions, 31% reported they had more important things to talk about, 12% noted “even if I asked they would not tell me,” and 5% were uncomfortable discussing the topic with patients. When asked, “How often does the PATIENT initiate the discussion about dietary supplements?”, 41% said frequently, 54% said rarely, and 5% said sometimes.

When asked at baseline which websites were most helpful, 64% found that Natural Medicine Comprehensive Database was helpful, 62% found that government websites and Medline Plus were helpful, 54% found that Natural Standard was helpful, and 23% found that PubMed was helpful.

Changes in knowledge and confidence scores

The mean pretest knowledge score of 63% increased to 83% after the curriculum ($p < 0.0001$). There were no significant differences in improvements by age, sex, race, professional status, years in practice, or trainee status. The confidence score increased from a baseline mean of 34 of 60 to a post-intervention mean of 45 ($p < 0.0001$).

Changes in self-reported behavior

The study focused on the following behavioral changes: where the participants sought DS information, writing orders for use of home supply of DS, providing patient handouts, the indications for which they recommended DS, discussions about DS, and documentation. Participants reported changes in where they looked for DS information. After the intervention, they were significantly more likely to use an evidence-based resource recommended in the online training (e.g., Natural Medicines Comprehensive Database, Natural Standard) (from 33% to 56%; $p=0.01$). There were no significant changes in seeking information from Google, Wikipedia, PubMed, online journals, or colleagues.

Participants noted no statistically significant changes in writing medical orders for patient use of a DS home supply (from 28% to 33%; $p=0.5$) or providing patient handouts on DS (from 26% to 33%; $p=0.4$). The indications for which participants recommended DS did change. For example, they were more likely to recommend them for symptom management ($p=0.05$) and gastrointestinal/digestive health issues ($p=0.03$).

The frequency of discussing DS during the discharge process significantly increased, but the frequency of discussing DS at admission or during daily visits did not significantly change (Table 2).

In terms of changes in DS documentation, 82% responded that the curriculum changed their documentation. More than half (56%) felt that the curriculum addressed barriers in documenting DS use in the EMR. Of 32 free-text descriptions of what changes they made, 29 (91%) involved taking a more thorough approach to documenting and including more details when documenting patient DS use. Four responses reported asking patients about DS use more often.

Course evaluation

Completing the entire curriculum took 3–4 hours for 54% of participants. All participants agreed or strongly agreed (agreed) that the curriculum described DS regulations in the United States and how they affect patient safety; all agreed that the curriculum increased confidence in eliciting a culturally competent DS history. Most (97%) participants agreed that the curriculum demonstrated the ability to advise patients about the quality, risks, and benefits of DS; most

(95%) agreed that the curriculum increased confidence in documenting DS use in the EMR.

Discussion

This is the first description of an online DS education program designed for inpatient clinicians in an inner-city hospital setting in the United States. As was hypothesized, completing the curriculum was associated with significant increases in knowledge and confidence scores. The frequency of asking patients about DS use during discharge increased significantly ($p=0.01$), and most (82%) participants reported that the curriculum increased their DS documentation in the medical record. There was also a statistically significant increase in use of evidence-based databases to obtain information on DS.

National surveys report high DS use among chronically ill patients and those who frequently use the hospital.⁴ The Joint Commission requires documentation of patient DS use, as they do for any other medication.⁶ Despite this requirement, nationwide DS hospital policy and practice is plagued with confusion and lack of uniformity.^{16–18} In addition, curriculum standards for clinicians and trainees are needed because health professional education provides little information on DS administration, knowledge, and interactions.¹⁶

Previous research has examined educational interventions on DS.^{19,20} Like other studies, the current study found statistically significant increases in knowledge and confidence with online DS training.^{13,21} This online curriculum, following the Joint Commission guidelines, provided comprehensive modules on communicating about and documentation of DS use. Participants reported that the curriculum increased their documentation, with many participants indicating increasing efforts to obtain a more thorough DS history and more detailed documentation. More knowledge and confidence will enable clinicians to have evidence-based discussions with patients and troubleshoot potential DS–prescription medication interactions for which patients may be at risk.

Health provider education lacks formal training on DS use. In an educational study in Israel, researchers found that using specific, culturally sensitive keywords is effective in eliciting a comprehensive history of DS use.²² The current online curriculum hoped to increase cultural competency so that clinicians are better prepared to elicit a comprehensive history

TABLE 2. CHANGES IN BEHAVIOR: ASKING INPATIENTS ABOUT HERBS AND SUPPLEMENTS

When patients are asked about DS	Responses	Before training, n (%)	After training, n (%)	p-Value
History and physical	Never	7 (18)	5 (13)	0.4
	Sometimes	23 (59)	22 (56)	
	Always	9 (23)	12 (31)	
Medical reconciliation	Never	9 (23)	4 (10)	0.1
	Sometimes	16 (41)	18 (46)	
	Always	14 (36)	17 (44)	
Progress note	Never	17 (44)	14 (36)	0.3
	Sometimes	21 (54)	21 (54)	
	Always	1 (3)	4 (10)	
Discharge process	Never	20 (51)	10 (26)	0.01
	Sometimes	17 (44)	19 (49)	
	Always	2 (5)	10 (26)	

DS, dietary supplement.

of DS use. To meet the challenge of addressing DS use with patients, clinicians must be educated about DS and the importance of culturally sensitive discussions of their use.

It is important for clinicians to know where to access accurate information about DS so as to provide evidence-based information to patients.²³ Growing research has looked at specific databases that are helpful for obtaining accurate information on DS use.^{24–27} A statistically significant increase was seen in providers using evidence-based DS databases (e.g., Natural Medicines Comprehensive Database, Natural Standard, Micromedex, HerbMed, and government-based websites).

A few areas present an opportunity for improvement. First, participants revealed no statistically significant changes in writing medical orders for DS use at home. In addition, while it is promising that the frequency of providers discussing DS use at discharge increased, the frequency of discussing supplements at admission or during daily visits did not significantly change. Perhaps with increasing knowledge of DS, providers will have greater confidence in recommending them to patients as well as addressing patient inquiries about them. Future research is needed on how to make online learning more accessible and beneficial for educating clinicians.

This prospective cohort trial has several limitations. First, there is a potential bias as participants self-selected to complete the online learning because these individuals may not represent all inpatient clinicians; furthermore, this study was conducted in an inner-city teaching hospital in the Northeastern United States and may not represent clinicians practicing in other settings. Second, the study design did not include a control group, and it is possible that secular trends would have increased clinicians' knowledge, confidence, and communication even without the curriculum; future studies should include a control group and test varying doses of the curriculum. In addition, the study could not assess why some participants did not complete the cases and post-test or determine the motivations of those who did complete the cases. Of the 61 participants who provided informed consent, 39 (64%) completed all four cases and the post-test. This study focused on short-term outcomes, and the long-term effect of DS training requires additional study. Self-report may over- or underestimate actual behavior, and future studies should include objective measures of behavior change through direct observation, medical record review, or patient interviews.

Despite these limitations, this study provides important new knowledge about training clinicians about DS. Online training is feasible and results in improved knowledge, confidence, communication, documentation, and use of evidence-based resources. Additional work is required to create training programs that further improve discussions and documentation of DS at admission and during daily visits and providing evidence-based patient handouts. Future studies should include control groups and different dosages (length) of training and include diverse settings to control for secular trends in knowledge, optimize training, and provide more generalizable results. In addition to self-report, future studies should also monitor objective changes in the quality of care through medical record review and patient interviews.

In conclusion, improvements in clinician knowledge, confidence, and behavior in discussing DS use with patients are needed. This pilot study addresses how programs can

engage clinicians in DS education. Future research can further refine this curriculum for different groups of clinicians, targeting remaining areas for improvement, and monitoring objective outcomes.

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Author Disclosure Statement

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Address correspondence to:
Paula Gardiner, MD, MPH
Department of Family Medicine
Boston University Medical Center
1 Boston Medical Center Place
Dowling 5 South
Boston, MA 02118
E-mail: paula.gardiner@bmc.org

APPENDIX 1. LEARNING OBJECTIVES FOR EACH CASE-BASED MODULE

Case 1: Patient DS Use: Policy Guidelines and Regulation

- Name four different types of DS products frequently used by our patients.
- List ten different DS commonly used by our patients and describe their safety profiles.
- Describe key federal DS regulations and hospital policies for handling and ordering DS and how they affect patient safety.
- List the Joint Commission's DS patient safety guidelines.

Case 2: DS Use at the Patient Bedside: What You Need to Know

- Elicit a culturally competent DS history.
- List resources available to help elicit a DS history from diverse patient populations.
- Correctly record patient DS use in the medical record.
- Describe how DSs are stored and dispensed on the inpatient floor.
- Interpret product labels on DS products and research DS product ingredients.

Case 3: How to Address DS Use in the Inpatient Setting

- Order and interpret the appropriate laboratory tests; address safety issues.
- Describe how to write medical orders for inpatient use of home supply for DS users.
- Correctly detect and avoid DS/medication interactions in the hospital setting.
- Assess the safety of a surgical procedure in a patient who uses DS.

Case 4: Hospital Discharge: Adverse Events and Medical Reconciliation

- Advise patients about the risks and benefits of DS.
- Complete medical reconciliation of discharge medication and DS.
- Report suspected reactions to FDA, MedWatch, or poison control center.

APPENDIX 2. CONFIDENCE SCALE

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1	I feel confident responding to patients' questions about H/DS.
2	I feel confident initiating discussions with patients about H/DS.
3	I feel confident completing a medical reconciliation for a patient being discharged on both herbal medicine and prescription medicine.
4	I feel confident that I can counsel patients about side effects of commonly used H/DS.
5	I can counsel patients about interactions between commonly used H/DS and medications.
6	I can refer patients where to find information about the quality of different brands of H/DS.
7	I know where and how to report adverse effects related to H/DS.
8	I feel confident entering supplements in the electronic medical record.
9	Conflicting information about dietary supplements makes me confused about which supplements are most beneficial. (R)
10	I believe that dietary supplements deliver what they say on their labels. (R)
11	I feel uncomfortable about asking patients about herbs and dietary supplements because I am not an expert. (R)
12	Discussing herbs use during clinical encounters supports patient autonomy and culturally competent self-care.
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Each item is scored from 1 (strongly disagree) to 5 (strongly agree); total possible scores could range from 12 to 60, with higher scores indicating more confidence.

H/DS, herbs and dietary supplement; R, reverse scored.