INSTRUCTIONAL DESIGN AND ASSESSMENT

An Interactive, Multifaceted Approach to Enhancing Pharmacy Students' Health Literacy Knowledge and Confidence

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Objective. To implement and evaluate the effectiveness of an interactive health literacy program by measuring pharmacy students' knowledge and confidence.

Design. A health literacy module consisting of a lecture and workshop was incorporated into a self-care course for first-year pharmacy students. Active-learning activities included practicing health literacy tools, discussing faculty-created video vignettes, and improving readability of patient education monographs. A non-validated survey assessed knowledge and confidence before and after training.

Assessment. Fifty-three students (88%) completed a pre-training survey, and 60 (100%) completed a post-training survey. Students' confidence improved in six of seven areas ($p < .001$). Students' knowledge significantly improved in three of 14 areas ($p < .01$) pertaining to the average American reading level, high-risk age groups, and correlation of late prescription refills to low health literacy. Although knowledge increased in other areas, the improvements were not significant.

Conclusion. An interactive, multifaceted health literacy training program significantly improved pharmacy students' knowledge and confidence in recognizing and being able to assist patients with low health literacy.

Keywords: health literacy, health literacy education, active learning, video

INTRODUCTION

Approximately 90 million adults in the United States, or 36% of the population, have low health literacy.¹ Health literacy is defined as the degree to which individuals have the capacity to obtain, process, and understand basic health information to make appropriate health decisions.¹ Low health literacy contributes to poor health outcomes as well as increased mortality and health care costs.² Factors that may contribute to low health literacy include older age (>65 years), low income, lower education level, and race/ethnicity, with 41% of Hispanics and 24% of African-Americans having below basic health literacy.^{2,3} One manifestation of this issue is that the average adult American reads at an eighth-grade level, while health-related patient information is often written at a 12th-grade reading level, which may lead to patients having difficulty in understanding or following health care advice.⁴

Pharmacists are one of the most accessible health care providers and should be readily equipped to assess

and address patients' health literacy issues. Pharmacists need to ensure patients are well informed about their medications and disease states including prevention strategies in order to empower them to make the right decisions on their health care.⁵

The American Association of Colleges of Pharmacy (AACP) Center for the Advancement of Pharmacy Education (CAPE) 2013 Educational Outcomes advised schools of pharmacy in Domain 3.5 to teach students to recognize social determinants of health to diminish health disparities and inequities in access to quality care.⁶ A suggested example of an activity to meet this domain is to provide instruction on health literacy assessment and modify communication strategies to meet patients' needs.⁶ The Accreditation Council for Pharmacy Education (ACPE) has adopted the CAPE Educational Outcomes, requiring that doctor of pharmacy (PharmD) curricula address, among other areas, patient health literacy.⁷ Additionally, the Institute of Medicine (IOM), American Medical Association (AMA), and the American Pharmacists Association (APhA) have called for the integration of health literacy education and competencies within all health professional curricula.^{1,8,9}

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Several models of health literacy training for pharmacy students have been described in the literature.¹⁰⁻¹⁴ Devraj and colleagues incorporated six health literacy sessions in a required third-year health promotion course.¹⁰ The sessions used active-learning exercises such as administering health literacy assessments, identifying signs of low health literacy, conducting mock patient counseling sessions, rating the readability of drug information, analyzing information in drug advertisements, and writing patient education materials.¹⁰ Upon completion of all sessions, pharmacy students' knowledge of health literacy increased and confidence in their perceived ability to care for patients with low health literacy improved.¹⁰ Another model by Sicat and colleagues demonstrated improvements in health literacy knowledge and confidence in first-year pharmacy students after a lecture and small group exercises that included calculating the reading level of patient education brochures to improve readability and mock patient counseling.¹¹ Additional studies also described approaches to training pharmacy students in health literacy that included using health literacy assessment tools, modifying medication labels, practicing using readability software, counseling a standardized patient with low health literacy, and group projects designing patient-friendly education documents and assessing patient cases.¹²⁻¹⁴

A common theme in the above-referenced studies is the use of active-learning strategies to teach health literacy to pharmacy students. There are various types of technology-based activities that exist to enhance active-learning in pharmacy self-care courses, including audience-response systems, videos, and social media.¹⁵ With regards to health literacy training, videos can be a valuable tool as they allow students to observe and recognize patient characteristics or situations where low health literacy should be considered. The AMA Foundation and the American College of Physicians (ACP) have created a series of health literacy videos directed at physicians and medical students.^{16,17} These videos examine the definition of health literacy, the scope of the problem, identify at-risk patients, and provide patient perspectives, but they do not portray the important role of the pharmacist on improving patients' health literacy as it pertains to medication-related situations. Therefore, in addition to using parts of these online videos, we created a series of video vignettes portraying pharmacists and actual pharmacy scenarios addressing health literacy issues.

DESIGN

The first-year Pharmacy Practice course at the University of California San Diego Skaggs School of Pharmacy and Pharmaceutical Sciences (SSPPS) is divided

into three quarters: fall, winter, and spring. This mandatory course focuses primarily on nonprescription therapy, effective patient assessment, and counseling on self-care conditions and medications. In the 2016 winter quarter, we introduced a three-hour multifaceted module on health literacy that used an active-learning approach with the use of faculty-created video vignettes, health literacy assessment tools, and group activities to improve pharmacy students' knowledge and confidence in identifying and addressing low health literacy.

The module consisted of a one-hour lecture followed by a two-hour workshop nine days later. Clinical faculty members in the Pharmacy Practice course designed the overall methodology and created survey questions based upon lecture and workshop objectives as well as previously published studies on health literacy in pharmacy education.^{10,14} To evaluate the effectiveness of the program, knowledge and perceived confidence were measured prior to and after training the students. While attendance at the health literacy workshop was mandatory, results from the surveys were not tied to the course grade. However, health literacy was assessed on our multiple-choice final examination for this course. The study was reviewed and deemed as exempt research by the University of California San Diego Human Research Protections Program. There was no direct incentive for the students to participate in this study.

At the start of the lecture, students were requested to complete a 21-item online survey using SurveyMonkey (SurveyMonkey Inc., San Mateo, CA) to assess their baseline health literacy knowledge and confidence. To better address course objectives, the lecture's content was modified from slide sets provided in the Health Literacy Universal Precautions Toolkit from the Agency for Healthcare Research and Quality (AHRQ). The revised lecture defined health literacy, explained the impact of low health literacy on patients, showed how to recognize high-risk groups, and explained how to assess health literacy level via behavioral cues. Additionally, the revised lecture introduced validated health literacy tools, presented communication strategies, and suggested strategies to promote a shame-free environment.¹⁸ The instructor felt it important to also include an overview of prescription labeling laws as required by the state of California to improve health literacy since many students were working as pharmacist interns. Students also viewed an ACP Foundation Health Literacy video that depicted how patients with low health literacy may present and their viewpoints.¹⁶

At the end of the lecture, students were instructed to use the Newest Vital Sign (NVS) health literacy tool on two volunteers outside the classroom and to submit

responses via email to the instructor prior to the workshop.¹⁹ In the email, students reported the information they collected on the volunteers' age, race/ethnicity, and level of highest education, and provided general comments regarding the activity.

Nine days later, the students returned for a two-hour health literacy workshop, where the instructor shared the students' responses from the NVS health literacy tool assignment and solicited additional informal verbal feedback from the students. The AMA video was viewed which highlighted poor health literacy with patient scenarios that involved polypharmacy, use of medical jargon and terminology, patients with reading levels at second and third grades, and a pharmacy technician with poor health literacy.¹⁷

Students also reduced the reading level of a patient drug monograph written at the 12th grade level (Appendix 1) by at least one grade level using the Flesch-Kincaid tool within Microsoft Word or via a readability website.²⁰ The students used their laptops to work in small groups of five to six students to accomplish this assignment and were instructed to use the "mark-up" feature to show changes made to the text within the document. To ensure participation, each student group emailed their revised monograph with all names of group members to the instructor, who subsequently displayed it on the projector screen while each group discussed their rationale and the process by which they lowered the reading level (Appendix 2). The instructor provided feedback on each presented monograph, reviewing the words that were used to decrease the reading grade level as well as their appropriateness within the context of the manuscript. The instructor also emphasized that the challenging part of this exercise was to improve the readability of the monograph while still maintaining the meaning and flow of the overall text.

Following this exercise, the instructor presented three video vignettes, each ranging from 1-2 minutes in length, which were created by two pharmacy practice faculty members. Vignette topics included an illiterate patient with asthma struggling with an expired rescue inhaler in a clinic setting, a patient with hyperlipidemia receiving a new prescription for a statin from a pharmacist in a community pharmacy who talks too fast and uses medical jargon, and an English-speaking pharmacist trying to counsel a Spanish-speaking patient on his new prescription.

Faculty members used a portable digital camera and a tripod to film each vignette. Two of the patient-actors used were friends and neighbors of one of the faculty members and the third was a Spanish instructor at a medical school. Each vignette required approximately two

rehearsals before filming and took 45 minutes to complete. After filming, course assistants uploaded the videos to a private YouTube site. This allowed ease of access for the faculty instructor during the health literacy workshop.

After each vignette was screened during the workshop, students worked in the same groups to answer a set of three standardized questions that included an assessment of clues that the patient had low health literacy, evaluation of the pharmacist's interaction with the patient, and recommendations for enhanced communication for the pharmacist to enhance health literacy. Specific questions asked were: "What clues may have suggested that this person had low literacy? How well did the pharmacist interact with this patient? Explain positives and negatives. What could the pharmacist have done better during this interaction?"

Similar to the previous group collaboration, each group emailed their responses to the standardized questions for each video to the instructor to demonstrate participation. Further, the instructor randomly selected groups to comment on each video and verbally discuss their responses. At the completion of the workshop, students were asked to complete an online post-training survey to assess their knowledge and confidence related to health literacy.

Surveys for this unfunded study were done anonymously in a limited (free) version of SurveyMonkey that provided unpaired results that were summarized with descriptive statistics. Differences in categorical responses to the confidence assessment questions and the number of students who answered the knowledge test questions correctly were compared with Fisher's exact test between the pre- and post-training surveys, with $p < .05$ considered significant using STATA/SE 10.1 software (StataCorp LP, College Station, TX).

EVALUATION AND ASSESSMENT

First-year pharmacy students at SSPPS have all completed a bachelor's degree prior to matriculation into this four-year PharmD program. In the 2015-2016 academic year, 60 students were enrolled in the first year of the program, with an average age of 22.5 years, 68% were women, and the mean undergraduate grade point average (GPA) was 3.7.

Out of a class of 60 students, 53 (88%) completed the pre-training survey and 60 (100%) completed the post-training survey. A mean of 20 of 53 students (39%) agreed with all seven pre-training confidence statements. No student strongly agreed with six of seven health literacy confidence-related questions, while 16 of 53 (30%) strongly agreed that they were confident they could provide a "shame-free" environment in the pre-training

Table 1. Pharmacy Students' Perceived Health Literacy Confidence Before and After Completing Training

Survey Question	Students Selecting Survey Responses Pre-training N=53; Post-training N=60										<i>p</i> value
	Strongly Disagree (%)		Disagree (%)		Uncertain (%)		Agree (%)		Strongly Agree (%)		
	PRE	POST	PRE	POST	PRE	POST	PRE	POST	PRE	POST	
1. I feel confident in being able to assess a patient’s health literacy when I provide medication counseling.	2	3	13	7	49	5	36	67	0	18	<.001
2. I am familiar with health literacy instruments (ie, tools, materials, surveys) that would help me identify a patient with low health literacy.	2	5	42	3	32	5	25	65	0	22	<.001
3. I am able to identify behaviors that are typically exhibited by people with low health literacy.	6	5	15	3	45	2	34	57	0	33	<.001
4. I feel confident of communication strategies that I could use to effectively counsel a patient with low health literacy.	2	3	25	7	36	13	38	55	0	20	<.001
5. I feel confident to judge the appropriateness of written health information for patients with low health literacy.	2	5	21	5	28	12	49	52	0	27	<.001
6. I feel confident in knowing how to reduce the readability of written health information from a higher grade level to a maximum of 7 th to 8 th grade literacy level.	2	7	23	2	28	7	47	63	0	22	<.001
7. I feel confident of being able to promote a “shame-free” environment with patients.	6	7	4	3	19	7	42	47	30	37	.40

PRE=Pre-training; POST=Post-training

survey. The majority of students were uncertain, disagreed, or strongly disagreed with six of seven confidence statements in the pre-survey (Table 1). Thirty-eight students (72%) agreed or strongly agreed that they were confident in providing a shame-free environment on the pre-training survey. On the post-training survey, the majority of students (75% to 90%) agreed or strongly agreed with the confidence statements in the first six confidence-related questions ($p<.05$). Students' confidence in their ability to provide a shame-free environment increased on

the post-training survey (83% agreed or strongly agreed), but not significantly.

Based on true/false questions, students' health literacy knowledge improved in three of 14 areas; from 47% to 64% correct answers pre-training to 80% to 95% correct post-training (Table 2). Knowledge questions that showed significant improvement pertained to recognizing the average reading level for most American adults, identifying that people older than 65 years are at higher risk for low health literacy, and the correlation between late

Table 2. Pharmacy Students' Health Literacy Knowledge Test Results Pre- and Post-training

Knowledge Test True/False Questions (Correct Answer) ^a	Students Answering Correctly, %		p value
	Pre-training Survey (N=53)	Post-training Survey (N=60)	
A patient with poor health literacy has less knowledge about their medical conditions. (True)	79	80	1.0
The average American reads at a 10th grade level. (False)	47	92	<.001
Minorities are at higher risk for low health literacy. (True)	85	93	.22
People older than 65 years old are at higher risk for low health literacy. (True)	64	95	<.001
People with less than a high school diploma are at higher risk for low health literacy. (True)	81	93	.08
People with low incomes are at higher risk for low health literacy. (True)	79	92	.10
Patients who are late in refilling their prescription medications may have low health literacy risk. (True)	57	80	<.01
Patients with high health literacy are less likely to take their medications as prescribed by their doctor. (False)	74	73	1.0
Patients with low health literacy usually ask their pharmacist a lot of questions about their medications. (False)	74	88	.05
Patients with low health literacy are less likely to be adherent to their medication regimens. (True)	92	93	1.0
Taking the time to verbally counsel a patient can help overcome poor health literacy. (True)	96	95	1.0
Using medical terminology and/or jargon when speaking to patients can help overcome poor health literacy. (False)	98	92	.21
The use of pictures to help teach patients can help overcome poor health literacy. (True)	98	100	.47
People with low health literacy are more likely to have poor health outcomes. (True)	83	92	.08

prescription refills and low health literacy. Knowledge scores did not significantly change from the pre- to post-survey in the remaining 11 areas.

The workshop group assignment that required students to improve the readability of a drug monograph written at a 12th grade reading level by decreasing it by at least one grade level resulted in groups achieving new reading levels ranging between 6th to 11th grades.

DISCUSSION

This study showed that a three-hour module with a homework assignment within a self-care course significantly improved first-year pharmacy students' knowledge and perceived confidence on selected items surveyed in health literacy. Post-training survey results demonstrated that students' answers improved significantly more on questions related to perceived health literacy confidence than on knowledge questions. The variety of hands-on skills that were developed during the workshop portion of the module likely contributed to the increased confidence that most students felt at the

completion of the module. Knowledge questions, for the most part, were well answered prior to the start of the health literacy module, suggesting that most of our pharmacy students had already been exposed to general health literacy concepts in their first quarter of pharmacy school, undergraduate programs, or previous work/volunteer experiences.

The outcomes related to student confidence are congruent with the study conducted by Devraj, whereby nearly all measures were significantly improved.¹⁰ We used a modified version of confidence statements detailed in this study.¹⁰ The only question that did not reflect significant improvement in students' knowledge from pre- to post-test was a question related to creating a shame-free environment. Students already had high confidence in this area prior to completing the module. The creation and use of a validated survey instrument to assess students' knowledge and perceived confidence in health literacy would have strengthened this component of the study. Studies by Devraj,¹⁰ Sicut,¹¹ and Trujillo¹⁴ showed that health literacy training could be successfully introduced

in the first-year curricula. Our health literacy module was also conducted in a first-year self-care course and was shorter in duration than Devraj and Trujillo, but similar in length to Sicut.

While our module and the three prior studies employed active-learning strategies, our module was unique in that it featured pharmacist-specific video vignettes. These video vignettes enabled students to visualize and recognize low health literacy cues in patients within pharmacy settings as well as in a clinic. Students were able to appreciate identifying poor as well as effective pharmacist-patient interactions in low health literacy situations. While many useful teaching resources on health literacy are publicly available through AHRQ, most of the videos we reviewed were either geared toward physicians, or had medication-related vignettes embedded within longer videos showing a physician discussing medications with a patient.^{5,16-18} While many of the teaching points within these longer videos are relevant for all health care professionals, and several sections were shown during the didactic portion of our module, we felt that pharmacy students may be able to better relate to situations showing a pharmacist interacting with patients within a pharmacy or clinic setting. Our goal was to create video vignettes that were realistic and that had been observed or experienced previously by our clinical faculty members during their clinical practices. In writing our pharmacy-specific scripts, we rehearsed them with volunteers and filmed the scenes using a personal video camera. While we could have hired standardized patient actors, we felt that the scenarios we created were simple and short enough that any adult could play these roles. Also, hiring actors would have incurred significant costs for this unfunded study. However, by not using standardized patients, we acknowledge that we may have created a less realistic representation of the scenarios. With current technology, we found creating video vignettes for classroom use can be easy, fast, and cost-effective.

Several lessons were learned when creating and presenting the modules. The videos that defined the health literacy problem and its scope with patient perspectives (AMA Foundation and ACP) were helpful but some of the material was redundant in content. In the future it would be sufficient to only show one video. Additionally, 45 minutes were allotted for revision of drug monographs during the workshop, but most student groups completed their monograph within 10 to 15 minutes. Reducing the time for students to revise their drug monographs would free up time for additional health literacy exercises as well as spending more time discussing insights from the NVS homework exercise. With respect to the drug monographs, it was useful to demonstrate to pharmacy students

that they could actively impact the readability of patient-specific health information. Additionally, students managed to successfully decrease the monograph by at least one reading level in a very short amount of time; therefore, it may be prudent to provide a specific reading level (ie, eighth grade or below) to demonstrate any challenges during this process. It is unclear whether we could have achieved the same positive results with just the one-hour lecture, especially since the knowledge-based questions on the survey were covered during the lecture. The inclusion of a control group in the study may have provided this insight; however, we realize that repetition is often the key to learning. Additionally, our study was anonymous, thus preventing pairing of pre- and post-training survey responses for individual students and possibly decreasing our power to detect significant within-subject changes. Therefore, while this health literacy module was covered over the course of 10 days in the first year, we plan to have these concepts and skills reinforced throughout the self-care course and within patient-simulation exercises in each year of their pre-clinical curriculum.

The NVS assignment lacked patient diversity as students most often asked parents or friends to participate. As a result, the majority of participants were 18-40 and 51-65 years old, and 20% only had a high school education or lower. However, several students were surprised to find that college-educated volunteers as well as those working directly in health care struggled with the health literacy tool, which highlighted how widespread low health literacy is. Nevertheless, students commented via informal feedback emailed to the instructor as well as verbally at the beginning of the workshop that the assignment using the NVS health literacy tool was a worthwhile exercise and that they were surprised to see lower health literacy levels than expected in the general community, with one student reflecting, "This was fun...but scary." Several students mentioned that their participants became embarrassed or flustered during the assessment with one student noting, "She was able to answer the first question, but after that the questions became too complex for her to answer. I did not want to make her feel bad, so we discontinued the questionnaire and reviewed the answers." In the future, we plan to provide this exercise at the start of the quarter so students will have four to six weeks to complete it. In addition, we will encourage them to recruit subjects for their assignment at health fairs or at our student-run free clinics, where students are more likely to encounter patients with low health literacy.

SUMMARY

An active-learning module using a multifaceted approach with integration of a lecture, workshop, group

activities, and pharmacist-specific video vignettes was a novel approach to enhancing first-year pharmacy students' knowledge and perceived confidence to recognize and deliver health information effectively to patients with low health literacy. Pharmacists are well positioned to identify high-risk patients and implement communication strategies to improve health education. Key limitations of this study included lack of pairing of data measuring before and after students were trained, as well as not hiring standardized actors for the video vignettes. However, re-inforcement of concepts learned in this module in subsequent years of the pharmacy curriculum will ensure students retain and apply their skills to recognize and assist patients with low health literacy.

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Appendix 1. Sample Monograph Assigned to Student Group

Health Literacy Patient Handout

Directions: Decrease the text below by at least one reading grade level. Make sure you turn on Track Changes in your document. [Click “Review”, then “Track changes on”.]

Names of group members:

Beginning grade level:

Final grade level:

Amoxicillin/clavulanic acid (Augmentin)

Uses: amoxicillin/clavulanic acid is a combination penicillin-type antibiotic used to treat a wide array of bacterial infections. Its mechanism of action is to inhibit bacterial growth. It is ineffective for viral infections (such as the common cold or flu). Unnecessary use or misuse of any antibiotic can lead to its decreased effectiveness.

How to Use: Take this medication every 12 hours with a meal or snack. Antibiotics work best when the amount of medicine in your body is kept at steady state. Therefore, take this drug at evenly spaced intervals. Continue to take this medication until the full prescribed amount is finished, even if symptoms are eradicated after a few days. Discontinuing the medication too early may enable bacteria to multiply, which may result in re-infection.

Side Effects: Diarrhea, nausea or vomiting may occur. If any of these effects persist or worsen, notify your doctor or pharmacist promptly. Taking this medication with meals will help minimize the stomach upset. The majority of people using this medication do not have serious adverse effects. Inform your doctor immediately if any of these unlikely, but serious side effects occur: jaundice of eyes/skin, persistent nausea/vomiting, unusual fatigue. Rarely, this medication can cause a severe intestinal condition caused by microbial resistance. This condition may occur during treatment or weeks to months after treatment has been discontinued. Tell your doctor immediately if you develop persistent diarrhea, abdominal cramping/pain, blood or mucus in your stool.

Appendix 2. Revised Monograph Submitted by Student Group

Health Literacy Patient Handout Case #5

Beginning grade level: 12.3

Final grade level: 9.8

Amoxicillin/clavulanic acid (Augmentin)

Uses: amoxicillin/clavulanic acid is a drug used to treat many types of bacterial infections. It works by preventing bacterial growth. It is not good against viruses like the common cold or the flu. Wrong use of any antibiotic may lower how well it works.

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How to Use: Take this medication at breakfast and dinner (with a meal or snack). Antibiotics work best when the amount of medicine is kept at the same level in your body. So, take this drug at evenly spaced time periods. Continue to take this medication until the full prescribed amount is finished, even if you feel better after a few days. Stopping the medication too early may allow bacteria to multiply, which may result in re-infection.

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Deleted: its decreased effectiveness.
Side (2)

Unwanted Effects of the Medication: Watery stools, nausea or throwing up may occur. If any of these effects continue or worsen, tell your doctor or pharmacist right away. Taking this medication with food will help lessen an upset stomach. Most people using this medication do not have serious unwanted effects. Tell your doctor right away if any of these uncommon, but serious side effects happen: yellowing of eyes/skin, continual nausea/vomiting, uncommon tiredness. Sometimes, bacteria can get used to medicine which causes a bad environment for your stomach. This may happen during treatment or weeks to months after treatment has been stopped. Tell your doctor right away if you have long-lasting diarrhea, pain in your stomach/belly, red and/or gooey poo.

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