



2016

Food/Drug Interactions: Assessing student knowledge before and after viewing an interactive educational website

Cole Smith

Butler University, crsmith1@butler.edu

Follow this and additional works at: <https://digitalcommons.butler.edu/ugtheses>

 Part of the [Medical Education Commons](#), and the [Pharmacy and Pharmaceutical Sciences Commons](#)

Recommended Citation

Smith, Cole, "Food/Drug Interactions: Assessing student knowledge before and after viewing an interactive educational website" (2016). *Undergraduate Honors Thesis Collection*. 328.
<https://digitalcommons.butler.edu/ugtheses/328>

This Thesis is brought to you for free and open access by the Undergraduate Scholarship at Digital Commons @ Butler University. It has been accepted for inclusion in Undergraduate Honors Thesis Collection by an authorized administrator of Digital Commons @ Butler University. For more information, please contact omacisaa@butler.edu.

BUTLER UNIVERSITY HONORS PROGRAM

Honors Thesis Certification

Please type all information in this section:

Applicant Cole Smith
(Name as it is to appear on diploma)

Thesis title **Food/Drug Interactions: Assessing student knowledge before and after viewing an interactive educational website**

Intended date of commencement May 7, 2016

Read, approved, and signed by:

Thesis adviser(s) Jane Swasco 4/18/16
Date

Reader(s) Anthony Ton, Anthony Ton 4/15/16
Clay Smith, Clay Smith 4/15/16
Date

Certified by Rusty Jones 4/20/16
Date
Director, Honors Program

**Food/Drug Interactions: Assessing student knowledge before and after viewing an
interactive educational website.**

Jane Gervasio Pharm.D., BCNSP, FCCP – Department of Pharmacy Practice, College of
Pharmacy and Health Sciences, Indianapolis, Indiana, United States

Cole R. Smith, Pharm.D. Candidate – Department of Pharmacy Practice, College of
Pharmacy and Health Sciences, Butler University, Indianapolis, Indiana, United States

Corresponding Author: Jane Gervasio Pharm.D., BCNSP, FCCP, Butler University College
of Pharmacy and Health Sciences, 4600 Sunset Ave., Indianapolis, IN 46208; Tel: 317-940-
6134; E-mail: jgervasi@butler.edu

Word count: 1534

Keywords: Food, interactions, website, interactive

Abstract

Background: Knowledge of food and drug interactions is important and may greatly impact compliance and success of drug therapy. Patients are required to be educated about food and drug interactions at the point of care by the Joint Commission on Accreditation of Healthcare Organizations' standards; and, in both the institutional and community settings, quality of patient care is improved if the patient understands the importance of food and drug interactions.

Methods: This study was conducted online via a web-based survey using Survey Monkey. Students in their second year of pre-pharmacy classes were asked to complete a pre-survey, review a website containing educational materials regarding food and drug interactions, and then take a post-survey to assess knowledge learned and critique the layout and design of the website. The website, which was built by the investigators of this study, contains educational material on food and drug interactions.

Results: A total of 49 second-year pre-pharmacy students were identified and completed the study. All respondents indicated they learned something new about food and drug interactions after viewing the interactive website (n=49). A majority of respondents strongly agreed or agreed they could identify major foods or food groups that commonly interfere with medications after viewing the website (n=10 and n=38 respectively). Furthermore, a majority of respondents also indicated they strongly agreed with the statement that they could make recommendations to a patient on how to avoid a food and drug interaction after viewing the website (n=5 and n=20 respectively).

Conclusion: Results suggest that the interactive website is a useful tool in educating second year pre-pharmacy students on food and drug interactions.

BACKGROUND

Food and drug interactions are of significant importance to the pharmaceutical field as they greatly impact the compliance and success of drug therapy. Food has the ability to affect one or all areas of pharmacokinetics, including absorption, distribution, metabolism, and elimination. The FDA defines a food and drug interaction as a situation where a food affects the activity of a drug; for instance, the effects are increased or decreased, or a new effect of that drug is produced that would not be produced without consumption of that food.² Some of these interactions range from having little significant clinical effect such as slowing the absorption of a drug to causing detrimental effects to drug therapy and health outcomes. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) has created standards for health care practitioners to prevent oversight of food and drug interactions. JCAHO aims to ensure that, “Patients are educated about potential drug-food interactions, and provided counseling on nutrition and modified diets” (PF0.10.5).¹ Being a common everyday item sold on easily accessible shelves, consumers may not realize the potential impact a food, herb, vitamin, or supplement can have on the efficacy of a medication. The ability of a natural product to interact with a drug is based on the same pharmacokinetic and pharmacodynamic principles as drug-drug interactions. For example, several fruits and berries contain agents that disrupt the body’s enzymes that metabolize drugs. Grapefruit is the most well-known example, but also Seville oranges, pomelo, and star fruit contain agents that inhibit cytochrome P450 3A4 (CYP3A4), which is an important enzyme in metabolizing drugs.³ Other modes of food and drug interaction include binding or chelation, altering gastric pH, altering gastrointestinal motility, or affecting transport proteins such as P-glycoprotein.⁴ The extent of food and drug interactions is unknown. Consumers may be able to recognize the decrease or increase of a drug’s effect, but they may not be able to attribute this effect to an interaction caused by a food or herb that a person normally eats. Therefore, it is crucial that patients are educated on food and drug

interactions by pharmacists for drug therapy to be successful. Pharmacy students learn about food and drug interactions through a variety of methods such as in-class lectures, research, and online training. Ultimately, this information will be applied in the clinical setting when the students become pharmacists and educate patients on food and drug interactions. Educating students early in the curriculum on these potential interactions can help with patient care, compliance, and therapeutic success.

OBJECTIVE

The objective of this study was to analyze the level of knowledge that pre-pharmacy students have regarding food and drug interactions before and after using an interactive food and drug interaction website.

METHODS

Data Source: This study was conducted using a self-administered, web-based survey which focuses on common food and drug interactions. This survey was posted online, using Survey Monkey, and a link was sent out to students in the second year of Butler University's pre-pharmacy program. Students were asked to provide information regarding demographics and assessed on their knowledge of food and drug interactions. Students were then directed to take a pre-survey and then review the website paired with this study which contained information on food and drug interactions such as the mechanism of action of the interaction, common foods that interact with medications, where to find resources to identify a food and drug interaction, and signs and symptoms of a drug toxicity. After they finished viewing the website, the students were directed to take a post-survey to assess for learning and knowledge on food and drug interactions. They were also asked about the overall structure and setup of the website such as readability, layout, and ease of use.

Patient Population: Second year pre-pharmacy students who have access to a computer with internet connection. The listserv will be sent out to Butler University students via Dr. Jane Gervasio's listservs.

Exclusion Criteria: Students who cannot read, have visual impairment, or cannot self-administer the survey.

Statistical Analysis: Data was collected and assessed for pre-pharmacy students' understanding on food and drug interactions. Students created a key for themselves by using the first two letters of their first name and the last four digits of their phone number. All data was paired with each student's identifier and used for cross-sectional analysis.

RESULTS

Pre-survey data: A total of 49 second-year pre-pharmacy students were identified and completed the study. Results indicated that 80% of students had never been educated on a food and drug interaction and 20% had been educated, though 92% had heard that foods could interfere with medications. When provided with a list and asked which foods could interact with a drug, about 65% of respondents indicated iron/multivitamins, herbals/supplements, and fruit juices, while about 96% indicated alcohol. Approximately 80% of respondents stated they disagreed (n=25) or strongly disagreed (n=17) with the statement that they could describe how foods interfered with medications. Similarly, a majority of respondents disagreed with the statements that they could identify major foods or food groups that interfere with medications (n=29) and confidently make recommendations to patients on avoiding a food and drug interaction (n=40). In regards to drug toxicity, 18.37% (n=9) agreed and 2% (n=1) strongly agreed they could they could recognize signs or symptoms of drug toxicity. Lastly, a majority of respondents indicated that they strongly

agreed or agreed with the statement that they would like to receive more education regarding food and drug interactions (n=20 and n=25 respectively).

Post-survey data: The same respondents completed the post-survey after viewing the website built by the authors as all unique identifiers created by the responders matched between the pre and post-survey. All respondents indicated they learned something new about food and drug interactions after viewing the interactive website (n=49). When asked which foods could interact with a drug, 100% of respondents indicated fruit juices, alcohol, and herbals/supplements (n=49) and 98% indicated iron/multivitamins (n=48). A majority of respondents strongly agreed or agreed they could identify major foods or food groups that commonly interfere with medications (n=10 and n=38 respectively). A majority of respondents also indicated they strongly agreed with the statement that they could make recommendations to a patient on how to avoid a food and drug interaction (n=5 and n=20 respectively). In regards to drug toxicity, 75.5% (n=37) agreed and 14.3% (n=7) strongly agreed they could they could recognize signs or symptoms of drug toxicity. Lastly, a majority of respondents strongly agreed or agreed that they found the website helpful and easy to use (n=22 and n=24 respectively).

STUDY LIMITATIONS

This study is limited by its small sample size and fact that the study's population is confined to pre-pharmacy students in their second year at Butler University and does not expand to pharmacy students in other years of the pharmacy program, nor does it include students from other schools. This study relied heavily upon technology and ability to adequately use the internet to access and use an online website. One limitation of this study is that if a student had a slow internet connection, the information, videos, and pictures may have taken too long

to load, thus compromising the learning experience. This study is further limited due to the survey being self-administered and answers which were self-reported, potentially leading to errors in interpretation. Lastly, this study was set up so that respondents would take the post-survey immediately after viewing the interactive educational website. Therefore, the results of this study may not indicate how much information is retained over a longer time period.

DISCUSSION

The interactive website proved to be a resourceful tool in helping second year pre-pharmacy students learn about food and drug interactions. Every respondent stated they had learned something new after viewing the website and 99% of respondents were able to indicate that fruit juices, iron/multivitamins, herbals/supplements, and alcohol could all interact with medications whereas only about 65% could identify these potential interactions in the pre-survey. Across all areas of the survey, there was an improvement in knowledge of food and drug interactions with more respondents agreeing they could identify foods that commonly interfere with medications, make recommendations to a patient on how to avoid a food and drug interaction, and recognize signs or symptoms of a drug toxicity after viewing the interactive website. Furthermore, a majority of respondents indicated they found the website easy to use and the layout was easy to navigate. The website was created to be easily understood and readable by anyone without any prior education in pharmaceutical knowledge. Because this study's focus was solely upon pre-pharmacy students at Butler University, areas of future study would include other academic centers or the general public.

CONCLUSION

Results suggest that the interactive website is a useful tool in educating second year pre-pharmacy students on food and drug interactions. From survey results, respondents

increased their knowledge and ability to identify some of the most common food and drug interactions, recognize signs and symptoms of drug toxicity, and make recommendations to a patient on how to avoid a food and drug interaction. This interactive website has several benefits in its ease of use and accessibility and is a beneficial teaching tool for educating students in the pharmacy curriculum on food and drug interactions.

REFERENCES

1. Binkley J. Drug-nutrient interactions: we are required to look for them! *Nutr Clin Pract.* 1998;13(5):199-200.
2. Avoid food and drug interactions. Food and Drug Administration Website. <http://www.fda.gov/downloads/drugs/resourcesforyou/consumers/buyingusingmedicinesafely/ensuringsafeuseofmedicine/generaluseofmedicine/ucm229033.pdf>. Accessed: June 28, 2015.
3. Molden E, Spigset O. Fruit and berries – interactions with drugs. *Tidsskr Nor Laegeforen.* 2007;127(24):3218-3220.
4. Schmidt LE, Dalhoff K. Food-drug interactions. *Drugs.* 2002;62(10):1481- 1502.

Table 1. Presurvey responses					
Baseline characteristics	(N=48)				
Age	19.8±0.6				
Female	27 (55.1)				
Question	Response				
	Yes	No			
To the best of your knowledge have you ever been educated on a food and drug interaction?	10(20.4)	39(79.6)			
Have you heard of foods interfering with medications?	45(91.8)	4(8.2)			
Check all that apply					
Foods may speed up the effects of a drug when taken at the same time	32(65.3)				
Foods may slow down the effects of a drug when taken at the same time	39(79.6)				
Foods may inhibit (stop) the effects of a drug when taken at the same time	39(79.6)				
Foods may increase the effects of a drug when taken at the same time	35(71.4)				
foods do not affect the action of a drug	7(14.3)				
Food and drug interactions include:					
Iron/multivitamins	29(60.4)				
Herbals/supplements	31(64.6)				
Alcohol	34(70.8)				
Fruit Juices	46(95.8)				
How do you prefer to be educated about food and drug interactions?					
In person by a professor	45(91.8)				
In person by a healthcare professional	42(85.7)				
With a pamphlet or handout	6(12.2)				
By online modules or videos	19(38.8)				
Using online resources and websites	29(59.2)				
Question	Response				
	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
I know how to recognize signs of symptoms of drug toxicity	2(4.1)	18(36.7)	19(38.8)	9(18.4)	1(2)
I can describe the mechanisms of how food can interfere with medications	17(34.7)	25(51)	6(12.2)	1(2)	0
I can identify major foods or food groups that commonly interfere with medications	7(14.3)	22(44.9)	10(20.4)	10(20.4)	0
I can make recommendations to a patient on how to avoid a food and drug interaction	13(26.5)	27(55.1)	6(12.2)	3(6.1)	0
I know when to refer patients to receive additional food and drug interaction information	9(18.4)	20(40.8)	8(16.3)	11(22.5)	1(2)
I would like more education regarding food and drug interactions	0	1(2)	3(6.1)	25(51)	20(40.8)
I know how to use online resources to identify food and drug interactions	3(6.1)	9(18.4)	13(26.5)	19(38.8)	5(10.2)

Table 2. Post-survey responses

Question	Response				
	Yes	No			
I learned something new about food and drug interactions after viewing the website	49 (100)	0			
Check all that apply					
Foods may speed up the effects of a drug when taken at the same time	43(90.6)				
Foods may slow down the effects of a drug when taken at the same time	47(97.9)				
Foods may inhibit (stop) the effects of a drug when taken at the same time	42(87.5)				
Foods may increase the effects of a drug when taken at the same time	41(85.4)				
Foods do not affect the action of a drug	2(4.2)				
Food and drug interactions include:					
Iron/multivitamins	48(98)				
Herbals/supplements	49(100)				
Alcohol	49(100)				
Fruit Juices	49(100)				
Which elements did you find helpful on the website					
Common foods that interact with medications gallery	45(91.8)				
Educational video	9(18.4)				
Links to other online resources	20(40.8)				
Listed information throughout the website	36(73.5)				
Question	Response				
	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
I know how to recognize signs of symptoms of drug toxicity	0	0	5(10.2)	37(75.5)	7(14.3)
I can describe the mechanisms of how food can interfere with medications	3(6.1)	9(18.4)	13(26.5)	19(38.8)	5(10.2)
I can identify major foods or food groups that commonly interfere with medications	0	0	1(2)	38(77.6)	10(20.4)
I can make recommendations to a patient on how to avoid a food and drug interaction	1(2)	8(16.3)	15(30.6)	20(40.8)	5(10.2)
I know when to refer patients to receive additional food and drug interaction information	1(2)	3(6.1)	9(18.4)	29(59.2)	7(14.3)
I would like more education regarding food and drug interactions	0	1(2)	5(10.2)	33(67.4)	10(20.4)
I know how to use online resources to identify food and drug interactions	0	0	4(8.2)	28(57.1)	17(34.7)
I found the website helpful and easy to use	0	0	3(6.1)	24(49)	22(44.9)
The language the website used was easy to read and understandable	0	0	1(2)	19(38.8)	29(59.2)
The layout the website used was easy to read and understandable	0	1(2)	3(6.1)	25(51)	20(40.8)
I would recommend this website to others to learn about food and drug interactions	0	0	2(4.1)	28(57.1)	19(38.8)

Pre survey Questions

Section I: Demographic Information

Please enter the first two letters of your first name and the last four digits of your phone number: _____ (please remember this response as this is your identifier)

Age: _____

Sex: Male/ Female

To the best of your knowledge, have you ever been educated on a food and drug interaction: Yes/ No

Section II: Food and Drug Interaction Assessment

1. Have you heard of foods interfering with medications: Yes/ No
2. Please check all that apply
 - a. Foods may speed up or slow down the effects of a drug when taken at the same time
 - b. Foods may inhibit (stop) or increase the effects of a drug when taken at the same time
 - c. Foods do not affect the action of a drug
3. Food and drug interactions include (please check all that apply):
 - a. Iron/ Multivitamins
 - b. Herbals/ supplements
 - c. Alcohol
 - d. Fruit Juices
4. I know how to recognize signs or symptoms of drug toxicity
 - a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree
5. I can describe the mechanism of how foods can interfere with medications
 - a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree
6. I can identify major foods or food groups that commonly interfere with medications
 - a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree
7. I would like more education regarding food and drug interactions:
 - a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree

8. I know how to use online resources to identify food and drug interactions:
 - a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree
9. I can make recommendations to a patient on how to avoid a food and drug interaction
 - a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree
10. I know when to refer patients to healthcare professionals for additional food-drug interaction information
 - a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree
11. How do you prefer to be educated about food and drug interactions (check all that apply)
 - a. In person by a professor
 - b. With a pamphlet or handout
 - c. By online modules or videos
 - d. Using online resources

Post Survey Questions

1. Please enter the first two letters of your first name and the last four digits of your phone number:_____
2. I learned something new about food and drug interactions that I did not know before after viewing the website
 - a. Yes
 - b. No
3. Please check all that apply
 - a. Foods may speed up or slow down the effects of a drug when taken at the same time
 - b. Foods may inhibit (stop) or increase the effects of a drug when taken at the same time
 - c. Foods do not affect the action of a drug
4. Food and drug interactions include (please check all that apply):
 - a. Iron/ Multivitamins
 - b. Herbals/ supplements
 - c. Alcohol
 - d. Fruit Juices
5. I know how to recognize signs or symptoms of drug toxicity
 - a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree
6. I can describe the mechanism of how foods can interfere with medications
 - a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree
7. I can identify major foods or food groups that commonly interfere with medications
 - a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree
8. I would like more education regarding food and drug interactions:
 - a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree
9. I know how to use online resources to identify food and drug interactions:
 - a. Strongly agree
 - b. Agree
 - c. Neutral

- d. Disagree
 - e. Strongly disagree
10. I can make recommendations to a patient on how to avoid a food and drug interaction
- a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree
11. I know when to refer patients to healthcare professionals for additional food-drug interaction information
- a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree
12. I found the website helpful and easy to use:
- a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree
13. Which elements did you find most helpful on the website when learning about food and drug interactions?
- a. Common foods that interact with medications gallery
 - b. Education video
 - c. Links to other online resources
 - d. Listed information throughout the website
14. The language the website used was easy to read and understandable
- a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree
15. The layout of the website was visual appealing
16. The language the website used was easy to read and understandable
- a. Strongly agree
 - b. Agree
 - c. Neutral
 - d. Disagree
 - e. Strongly disagree
17. What did you like most about the website? (free response)
18. What changes or additions would you make to the website? (free response)
19. I would you recommend this website to others to learn about food and drug interactions
- a. Strongly agree
 - b. Agree

- c. Neutral
- d. Disagree
- e. Strongly disagree