

# Optometry Students' Exposure to and Perspectives on Pharmaceutical Industry Gifts and Interactions

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## Abstract

*Relationships between doctors of optometry and the pharmaceutical industry have the potential to create conflicts of interest. The purpose of this study was to evaluate optometry students' exposure to and perspectives on doctor-industry relationships. The results of an online survey showed that optometry students have substantial exposure to industry through meals, educational gifts, and sponsored trips. Perceptions differed among students regarding the appropriateness and influence of gifts. Students overwhelmingly believed that faculty members are immune to the influence of industry gifts and reported that their prescribing habits mirrored that of their faculty members. The results of this study have important implications for optometric educators.*

**Key Words:** *Pharmaceutical industry, conflict of interest, optometry students*

## Background

Over the past few decades, the relationships between physicians and the pharmaceutical industry have attracted increasing scrutiny by educational institutions,<sup>1</sup> lawmakers,<sup>2</sup> and the media<sup>3-7</sup> due to concerns about conflict of interest. Physicians and industry must maintain a working relationship, but doctors are often unsure how to legally and ethically navigate these relationships. In 2012, the pharmaceutical industry spent more than \$27 billion on the promotion of pharmaceutical products in the United States.<sup>8</sup> Some educational institutions have enacted stringent policies to limit or ban pharmaceutical industry interaction, receiving recognition from the American Medical Student Association (AMSA) in its PharmFree initiative.<sup>1</sup> In March 2010, lawmakers passed the Physician Payments Sunshine Act as part of the Affordable Care Act to increase the transparency of financial relationships between doctors and industry.<sup>9</sup> A clearer understanding of exposure to and attitudes about industry relationships is essential in identifying areas for reform and monitoring the effects of policy and cultural shifts.

The influence of industry in medicine is ubiquitous.<sup>10-12</sup> In a 2007 study, 94% of physicians reported a relationship with a pharmaceutical company in which they received some type of gift, such as food or drug samples.<sup>13</sup> Previous studies have also shown that increased exposure to industry representatives and branded items leads to more favorable opinions toward accepting gifts and generates positive feelings about the company's products.<sup>10,12,14</sup> This interaction between doctors and the pharmaceutical industry is initiated early in training<sup>15</sup> or even prior to medical school.<sup>16</sup> Pharmaceutical sales representatives offer gifts such as textbooks, anatomical models, or drug references.<sup>17,18</sup> Doctors and students are invited to continuing education lectures that offer free meals while industry-paid speakers lecture on the use of particular drugs and devices.<sup>10,19</sup> Students are honored with scholarships and travel grants from industry and select students are chosen to attend all-expenses-paid destination conferences.<sup>19</sup>

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Several studies have provided convincing evidence that interactions with pharmaceutical representatives influence the prescribing habits of physicians.<sup>20-23</sup> Pharmaceutical company visits are associated with an increase in medication prescriptions,<sup>24</sup> and physicians who rely on information provided by pharmaceutical sales representatives often have a higher prescribing cost than physicians with less industry interaction.<sup>20</sup> These interactions also influence which drugs physicians request to add to hospital drug formularies.<sup>21</sup> All-expenses-paid trips to attend pharmaceutical company educational programs in popular vacation locations appear to be particularly influential.<sup>23</sup> In a study by Orlowski and Wateska,<sup>23</sup> prescriptions of the sponsor's products increased significantly after a sponsored event, even though the majority of physicians who attended believed that such enticements would not alter their prescribing patterns.

Medication samples are another important marketing technique used by pharmaceutical companies and have also been shown to influence prescribing.<sup>25-29</sup> Samples of newer, often more costly, pharmaceuticals are distributed to doctors for patients or personal use.<sup>29,30</sup> The availability of samples during medical training can have a significant influence on forming the malleable prescribing practices of students and residents.<sup>26,31</sup> Like gifts, drug samples are an important factor to be cognizant of when considering the influences of the doctor-industry relationship.

The philosophy of doctors regarding industry interaction is often formed early in their medical education.<sup>17,32,33</sup> Students in professional programs may feel a sense of entitlement due to the financial hardship of student loans and the rigors of classes and clinical training.<sup>17,34,35</sup> This sense of entitlement leaves students susceptible to the allure of free meals and other niceties from pharmaceutical companies who are seeking to shape the prescribing habits of these soon-to-be doctors.

Many doctors and students believe they are above the influence of drug company incentives and are offended by the suggestion that they could be bought, although they acknowledge the influence on others. In one survey of medi-

cal students, 84% of respondents felt that gifts influenced their peers but only 39% agreed that their prescribing habits were likely influenced as well.<sup>33</sup> Another study found that 85% of medical students believed it was improper for politicians to accept gifts; however, only 46% believed it was improper for medical students to do the same.<sup>36</sup> Even among students who declared the acceptance of gifts and meals to be unethical, almost all admitted to accepting these favors when they were offered.<sup>33</sup> This shows a common disconnect between attitudes and behavior.

In addition to studies focusing on medical students, other studies have explored the influence of industry in other healthcare professions such as dentistry,<sup>37</sup> pharmacy,<sup>38</sup> and nursing.<sup>39</sup> To the authors' knowledge this is the first study to focus on the relationships between industry and the profession of optometry, specifically optometry students. Optometry students face many of the same ethical dilemmas as medical and other healthcare students, but optometry students struggle with some unique challenges as well. Optometry, by its very nature, focuses on the prescription of spectacles and contact lenses, both of which are marketable products. Practice management courses in optometry school focus on making a profit and running a successful business, but typically only address the ethics of industry relationships in passing or not at all. Learning more about the attitudes of optometry students toward industry and the factors that shape these attitudes will allow a deeper understanding of how to better prepare students to manage industry relationships.

## Methods

The Institutional Review Board at Midwestern University approved this study. An anonymous 30-item online questionnaire was utilized to survey fourth-year students at all schools and colleges of optometry in the United States. (**Appendix A**) Fourth-year students were studied because it was expected they would have the most exposure to pharmaceutical industry interaction and that they would have broader clinical experience having trained at external rotations sites. Approval was requested from the Dean, or the equivalent there-

of, at schools and colleges of optometry in the United States. Upon receiving permission, a website link to the online survey was distributed to fourth-year students via an e-mail from the Dean. Participation was voluntary and all questions were optional.

Survey responses were collected during January and February of 2013. This time frame was chosen for distribution of the survey as it was after the second session of the National Board exams and prior to the months approaching graduation. A better response rate was anticipated during these months.

The survey contained four sections: 1) demographic information including school, age, and sex, 2) exposure to the pharmaceutical industry, 3) attitudes about the influence of pharmaceutical company interaction and gifts, the appropriateness of various gifts, and pharmaceutical company motivation, and 4) adequacy of curriculum related to the topic.

To evaluate exposure, students were asked to report how many industry-sponsored events (dinners, receptions, lectures, etc.) they had attended in the past year and if they had received airfare or hotel accommodations to attend an industry-sponsored educational conference. To quantify gifts, students were asked the number of pieces of equipment (occluder, penlight, near card, drug guide, etc.) they currently owned with a pharmaceutical company logo. The topic of white coat sponsorship by a pharmaceutical or device company was also included to further determine exposure. In addition, students were questioned about the use of pharmaceutical samples in their clinical settings.

The next section of the survey evaluated attitudes of students regarding industry gifts and interaction. To evaluate beliefs about the influence of gifts and samples, respondents were queried about whether their prescribing habits would be influenced by gifts or samples. They were also asked to estimate what percentage of their colleagues would be influenced by gifts or samples. Students responded to three items investigating whether they believed the monetary or educational value affected the appropriateness of accepting the gift. Five items

evaluated the perceived motivation of drug companies. The survey also asked whether or not the respondents believed patients were aware that doctors accept gifts from drug companies.

Seven items were included to investigate faculty and curricular effects on exposure and attitudes. Regarding industry-sponsored events, the survey inquired if a faculty member had recommended or required attendance. Students were asked if they believed lecture content or prescribing habits of faculty were influenced by gifts and how likely they were to prescribe a medication that their attending faculty prescribed. Lastly, students were asked to describe the amount of instruction they had received regarding doctor-industry relationships and if they felt their school should provide more education on the topic.

## Results

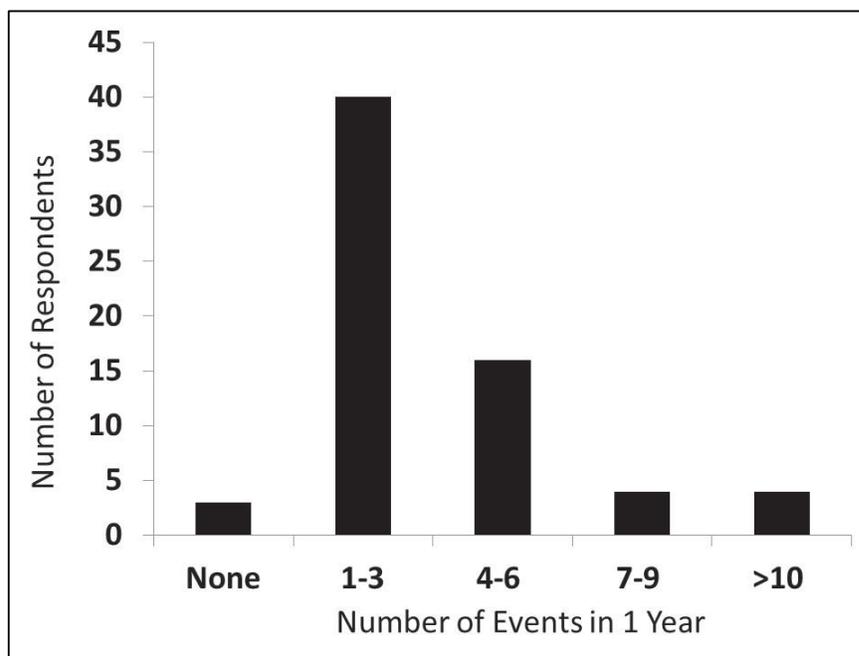
### *Study population*

The overall response was 67 students from 10 schools and colleges of optometry. Response rates among schools varied. Student ages ranged from 24 to 33 years with a mean of 26.8. Forty-five respondents (67%) were female and 22 respondents (32%) were male. The proportion of women and men in the study sample is similar to the national proportion for optometry students in 2013 (64.5% women).<sup>40</sup>

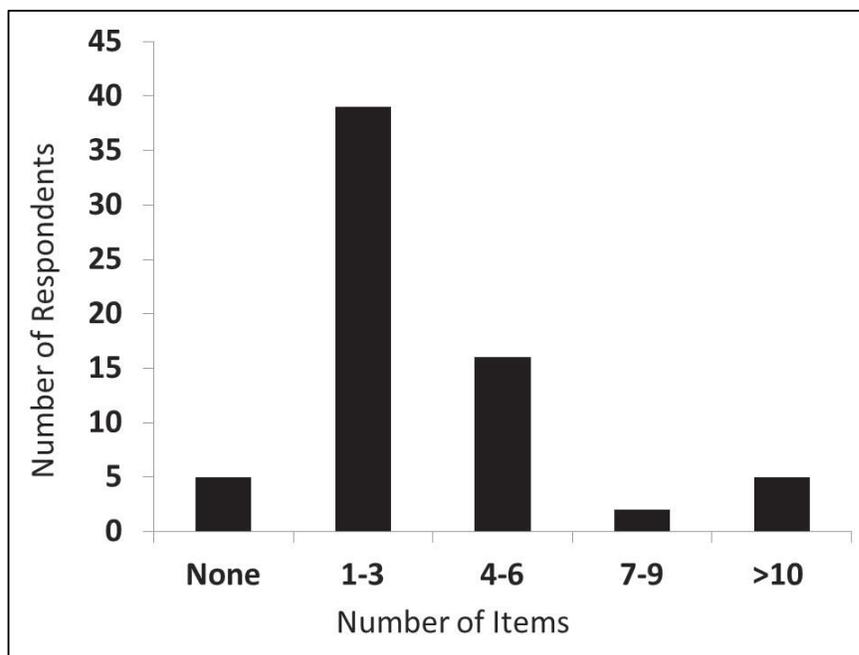
### *Exposure*

All students who responded to the survey had received gifts from a pharmaceutical or device company or attended industry-sponsored events. Ninety-five percent of students had attended at least one industry-sponsored event in the previous year. **Figure 1** shows the number of industry-sponsored events attended by respondents within the previous year. About half of respondents (47%) reported that a faculty member recommended or required attendance at an industry-sponsored event. Ninety-two percent of students had received at least one item of equipment from a pharmaceutical company. **Figure 2** quantifies the number of optometric-related gifts reported by students. Of respondents, 53% had received airfare or hotel accommodations to attend an industry-sponsored conference. Stu-

**Figure 1**  
Number of Industry-Sponsored Events Attended by Optometry Students



**Figure 2**  
Number of Pieces of Student Optometric Equipment Gifted from a Pharmaceutical Company



dents from four of 10 schools reported an industry logo on their white coat.

The survey inquired whether prescription or over-the-counter medication samples were used at the students' academic institution. In some cases,

students from the same institution gave differing responses regarding their school's usage of drug samples. This suggests a level of unawareness on the part of some students regarding the use of samples. Seventy-seven percent were

aware of the use of both over-the-counter and prescription samples at their institution. Only two respondents reported that their school did not use samples of any kind, but this information was refuted by multiple respondents from the same two institutions.

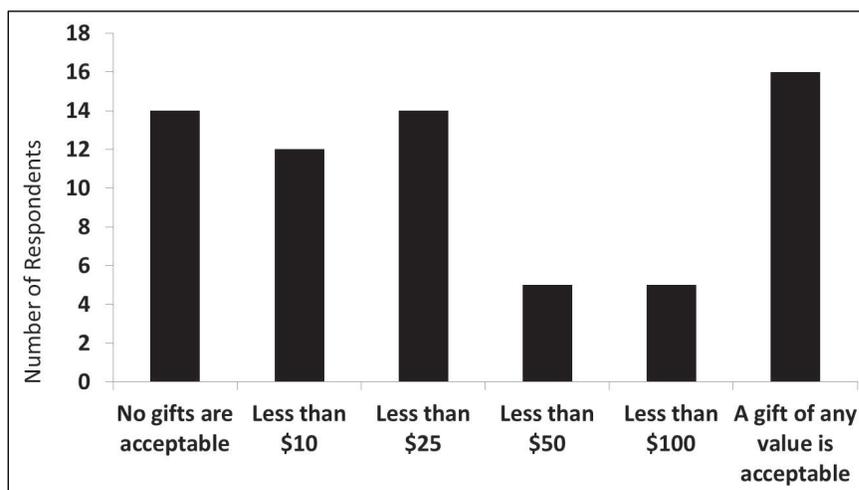
### Perspectives

Regarding beliefs about the effects of gifts, 75% of respondents said that gifts from drug companies would not influence which products they prescribe. When asked if their colleagues would be influenced by gifts, 18% responded that only a minority of optometrists (<10%) are influenced, 37% responded that approximately a quarter of optometrists are influenced, and 44% responded that at least half of optometrists are influenced by industry gifts. Ninety-four percent replied that they are more likely to eventually prescribe a medication if they have a sample, and 92.5% believed that at least half of optometrists would change their prescribing based on the availability of samples.

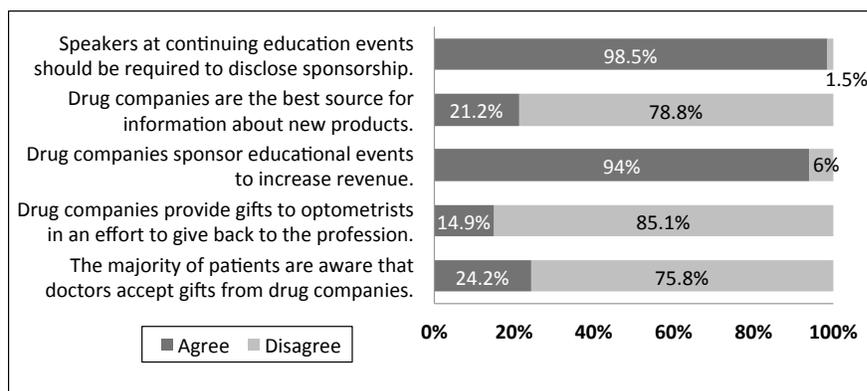
Students had differing beliefs about the guidelines that determine the acceptance of gifts. One such guideline bases acceptability on value, specifically the monetary value. The student responses are shown in **Figure 3**. Fourteen students (21%) responded that no gifts are acceptable, while 16 (24%) responded that gifts of any value are acceptable. The remaining 54% felt that the appropriateness of a gift was dependent on its monetary value, with more expensive gifts being deemed less appropriate. Seventy-three percent responded that accepting cash from a drug company is less appropriate than accepting a dinner of equal value. Furthermore, 75% percent of students felt it was more appropriate to accept a gift with an educational value, such as an eye model or drug reference guide, than a non-educational gift like a meal or trip.

Perspectives on drug company marketing and motivation are shown in **Figure 4**. Almost unanimously (98.5%), the students surveyed believed that speakers at continuing education events should be required to disclose sponsorship. Most students disagreed (79%) that drug companies were the best source for information about new products. Many students reported

**Figure 3**  
Monetary Value at which Industry Gifts were Deemed Acceptable by Students



**Figure 4**  
Optometry Students' Perspectives on Drug Company Marketing



skepticism about drug company motivation. Ninety-four percent agreed that drug companies sponsor educational events to increase revenue and only 15% agreed with the sentiment that drug companies provide gifts to optometrists to give back to the profession. Only 24% of respondents thought patients were aware that doctors accept gifts from drug companies.

### Education

Students reported that they are more likely to utilize a drug prescribed by a faculty member (90%), and that receiving gifts does not influence what fac-

ulty members teach in lecture (93%) or prescribe in clinic (72%). Regarding curricular education on the topic, 36% of respondents had received no formal instruction on doctor-industry relationships, 48% had received 1-2 hours and 16% had received 3 or more hours. Sixty-six percent felt they had a good understanding of the ethical considerations in dealing with doctor-industry relationships, yet 85% responded that schools should provide more instruction about how to deal with situations that may present potential conflicts of interest due to doctor-industry relationships.

## Discussion

This study adds to the literature on doctor-industry relationships by examining exposure and attitudes of optometry students. Optometry students face the same ethical dilemmas related to industry gifts and interaction as students in other healthcare professions.

Comparable to studies of medical students,<sup>10</sup> this study showed that optometry students have substantial exposure to the pharmaceutical industry. A study of 164 primary care residents found that 97% carried at least one item with a pharmaceutical logo in their white coat and approximately half of items that residents carried were from pharmaceutical companies.<sup>18</sup> Similarly, in this study 92% of optometry students had received at least one item of equipment from a pharmaceutical company. These gifts are permissible within the ethical guidelines of the American Medical Association (AMA) as they benefit the patient and are of non-substantial value<sup>41</sup>; however, branded equipment could be viewed as free promotion and patients may assume product endorsement by their doctor. In the same study of primary care residents, when asked if they would consider wearing a patch on the chest pocket of their white coat advertising a product if the company offered to pay them money, 13% responded affirmatively.<sup>18</sup> Industry sponsorship of white coats in optometry school is not uncommon, as students from four of 10 optometry schools represented in this study reported an industry logo on their white coat, albeit in a more inconspicuous location. This could be considered a type of branding and may send an unintended message to both students and patients. It is yet to be seen if enactment of the Physician Payments Sunshine Act will significantly affect student and physician exposure.

Perspectives on the appropriateness of accepting industry gifts and other doctor-industry interaction varied among the students participating in the survey. In agreement with previous studies,<sup>10,15,17,42</sup> optometry students were more accepting of inexpensive, small gifts and those with an educational purpose than expensive or non-educational gifts. In a survey of internal medicine faculty and residents, 23% of faculty members and 15% of residents believed

that doctors could not be influenced regardless of the value of the gift received.<sup>42</sup> In this study 24% of students responded that gifts were acceptable regardless of the monetary value.

Students and physicians alike tend to deny that gifts influence their prescribing habits, yet most feel their colleagues are susceptible to these same influences.<sup>16,20,33</sup> Chren et al. discuss the “phenomenon of gift giving” and the cultural significance of gifts.<sup>43</sup> Acceptance of a gift, regardless of monetary value, creates a relationship between the giver and recipient and generates a sense of obligation to reciprocate. It would be improper for doctors to give a gift in return to a pharmaceutical company representative, but they might reciprocate consciously or subconsciously in other ways.

Attitudes about the use of pharmaceutical samples are conflicting. Some of the purported benefits of samples include the ability to initiate treatment immediately, ability to evaluate effectiveness and adverse side-effects prior to patient purchase, and reduced cost for uninsured patients. The downside is that physicians might prescribe a drug based on the availability of a sample over an equally effective and more economical alternative.<sup>25,27</sup> Morelli and Koenigsberg<sup>29</sup> found that when a prescription was written at the same time that a sample was dispensed, it was almost always for the same brand name medication. In this study, 94% of students said they were more likely to prescribe a medication if they had a sample. A study by Miller et al.<sup>28</sup> found that physicians were three times more likely to prescribe a generic medication when samples were prohibited. The authors concluded that although physicians may believe they are saving their patients money by offering a free sample, these giveaways likely lead to higher costs for patients and society in the long run as physicians tend to prescribe the same, more expensive medication. Faculty modeling of this “sample-based prescribing” may negate teaching of evidence-based prescribing.

Doctors of optometry, particularly clinical academic faculty, should consider that the mere *perception* of influence may have powerful effects. A previous study found that among medical residents 47% believed that income or gifts

from industry sources influenced how attending physicians taught in rounds, and 58% believed it would influence lecture material.<sup>44</sup> In contrast, the majority of optometry students surveyed believed that faculty and attending doctors were immune to industry influences. In this study, 28% believed that industry gifts influence prescribing habits of faculty members, and only 7% believed gifts influence lecture content. According to the American College of Physicians, “Gifts, hospitality or subsidies offered to physicians by the pharmaceutical industry ought not to be accepted if acceptance might influence or appear to others to influence the objectivity of clinical judgment.”<sup>45</sup> Even if a faculty member feels that accepting a gift, dispensing a sample, or lecturing on behalf of a company does not influence his or her clinical judgment, a *perceived* influence by students or patients may be just as detrimental.

The Council on Optometric Practitioner Education (COPE) currently requires disclosure of relevant financial relationships for continuing optometric education courses.<sup>46</sup> In this study, 98.5% of optometry students responded that speakers at continuing education events should be required to disclose sponsorship from drug companies. In a study of medical residents, three out of four desired disclosure of all financial relationships between their clinical teachers and industry.<sup>44</sup> This raises the question of whether financial disclosures should be required of faculty lectures that are part of the didactic education in optometry school and whether clinical instructors who are prescribing pharmaceuticals and medical devices should also reveal financial relationships. Optometry students are at a very impressionable stage in their career, so perhaps this window of training is the optimal time to reinforce values of transparency and integrity. Full disclosure by faculty members would allow students to draw their own conclusions about potential bias and could reinforce the importance of independent thinking.

Instructional strategies that have been utilized in curricula addressing doctor-industry relationships include evidence-based literature review, facilitated discussion, mock simulations, independent readings, faculty debate, and

small group problem-based sessions. A 2008 review of formal curricula on the topic of pharmaceutical industry relationships conducted by Montague et al. found inconsistency in content, application, and methodology across programs.<sup>47</sup> In their review, it was reported that the impact of curricula on attitudes of medical residents was variable and modest.<sup>47</sup> To the authors' knowledge there has been only one study on the effect of curriculum regarding industry relationships on the attitudes of optometry students.<sup>48</sup> The AMSA has developed a "Model PharmFree Curriculum" that includes five core competencies, recommended strategies for teaching about conflict of interest, and additional resources.<sup>49</sup> Although developed for physician training programs, this guide is a good resource for all clinical medical professions and could be utilized by optometry students, faculty, and administrators interested in supplementing their curriculum on the topic. Further research on curricular content and its effects on attitudes, acceptance of gifts, and prescribing habits among optometry students and residents is warranted.

Frederic Hafferty writes about the hidden curriculum in medical education.<sup>50</sup> In addition to formal education on ethics, students form identities and philosophies based on the institutional culture and policies where they train and the role modeling of faculty. This education is not included in a syllabus or tested on an exam, but rather observed in clinical settings, informal conversations, and social events. Doctor-industry relationships in an academic setting have greater significance when considered in the context of role modeling. In this study, about half of students had been asked or required by a faculty member to attend an industry-sponsored event. Industry sponsorship of white coats, a symbol of professionalism, also sends a covert message. The impact of the hidden curriculum should not be discounted. The material presented in lecture halls should be reinforced by the behavior of faculty members in order for students to internalize it. Faculty modeling and institutional culture may in some cases contradict policies or ethics education, making it difficult for students to navigate the murky waters of industry interaction.

There were several limitations to this study. The first major limitation of the study is the small sample population. The study was distributed only once at participating colleges and there was no follow-up to encourage participation of non-respondents. The limited sample population creates the potential for bias of respondents. Students who chose to participate may have had greater interest in or stronger opinions on the topic of industry relationships than students who did not respond. The sample was, however, representative of the optometry student population and included participants from ten schools. Responses were not evaluated by college due to sample size; however, future studies could investigate how institutional policies on pharmaceutical interactions affect exposure and attitudes of optometry students.

Another limitation of the study is the cross-sectional design. Questions related to exposure are susceptible to inaccurate recall, and questions pertaining to perspectives may be influenced by social desirability bias. Additionally, the cross-sectional design evaluates opinions at one point in time and does not consider how attitudes may change from pre-clinical through clinical training. The study did not evaluate if increased exposure or education was correlated with positivity or skepticism. The results of this study do suggest the influence of faculty role modeling. Future studies might investigate faculty exposure to industry and prescribing behavior in relation to student attitudes and behavior.

## Conclusion

In conclusion, this study complements the previous literature on industry relationships in healthcare education. The results of this study have important implications for optometric educators. In addition to adding or increasing curriculum hours allotted for the topic of doctor-industry conflicts of interest, faculty and administration at colleges of optometry should consider the hidden curriculum. Recommending attendance at industry lectures, prescribing medicines based on availability of samples, and soliciting sponsorship of white coats likely sends a stronger message than a formal lecture on the ethics of industry relationships. Following the

path of the AMSA and medical education, it is time to consider the culture of pharmaceutical interaction in optometry education and determine the best practices to legally and ethically navigate these relationships.

## References

1. Conflict of Interest Policies at Academic Medical Centers. American Medical Student Association (AMSA). [cited 2014 Mar 12]. Available from: <http://www.amsa-corecard.org>.
2. Grande D. Limiting the influence of pharmaceutical industry gifts on physicians: self-regulation or government intervention? *J Ger Intern Med*. 2009;25(1):79-83.
3. Doctors Often Receive Payments From Drug Companies. Talk of the Nation. National Public Radio [Internet]. 2001 Sept 13. [cited 2014 Mar 12]. Available from: <http://www.npr.org/2011/09/13/140438636/doctors-often-receive-payments-from-drug-companies>.
4. Rosenberg M. 5 Shady Ways the Drug Industry is Influencing Your Doctor. Salon [Internet]. 2014 Jan 25 [cited 2014 Mar 12]. Available from: [http://www.salon.com/2014/01/25/5\\_evil\\_ways\\_the\\_multi\\_billion\\_dollar\\_drug\\_industry\\_is\\_in\\_bed\\_with\\_your\\_doctor\\_partner/](http://www.salon.com/2014/01/25/5_evil_ways_the_multi_billion_dollar_drug_industry_is_in_bed_with_your_doctor_partner/).
5. Saul S. Doctors and Drug Makers: A Move to End Cozy Ties. *New York Times* [Internet]. 2007 Feb 12 [cited 2014 Mar 12]. Available from: <http://www.nytimes.com/2007/02/12/business/12drug.html>.
6. Singer N. No Mug? Drug Makers Cut Out Goodies for Doctors. *New York Times* [Internet]. 2008 Dec 30 [cited 2014 Mar 12]. Available from: <http://www.nytimes.com/2008/12/31/business/31drug.html>.
7. Singer N, Duff W. Debate Over Industry Role in Educating Doctors. *New York Times* [Internet]. 2010 Jan 23 [cited 2014 Mar 12]. Available from: <http://www.nytimes.com/2010/06/24/business/24meded.html>.
8. Cegedim Strategic Data: 2012 U.S.

- Pharmaceutical Company Promotion Spending [Internet]. 2013 Jan [cited 2014 Mar 3]. Available from: [http://www.skainfo.com/health\\_care\\_market\\_reports/2012\\_promotional\\_spending.pdf](http://www.skainfo.com/health_care_market_reports/2012_promotional_spending.pdf).
9. Open Payments [Internet]. Baltimore: Centers for Medicare & Medicaid Services. 2014 Mar 4 [cited 2014 Mar 12]. Available from: <http://www.cms.gov/Regulations-and-Guidance/Legislation/National-Physician-Payment-Transparency-Program/index.html>.
  10. Austad KE, Avorn J, Kesselheim AS. Medical students' exposure to and attitudes about the pharmaceutical industry: a systematic review. *PLoS Med*. 2011;8(5):e1001037.
  11. Bellin M, McCarthy S, Drevlow L, Pierach C. Medical students' exposure to pharmaceutical industry marketing: a survey at one US medical school. *Acad Med*. 2004;79:1041-1045.
  12. Fitz MM, Homan D, Reddy S, et al. The hidden curriculum: medical students' changing opinions toward the pharmaceutical industry. *Acad Med*. 2007;82(10 Suppl):S1-3.
  13. Campbell EG, Gruen RL, Mountford J, et al. A national survey of physician-industry relationships. *N Eng J Med*. 2007;356:1742-50.
  14. Grande D, Frosch DL, Perkins AW, et al. Effect of exposure to small pharmaceutical promotional items on treatment preferences. *Arch Intern Med*. 2009;169(9):887-893.
  15. Soyk C, Pfeifferkorn B, McBride P, Rieselbach R. Medical student exposure to and attitudes about pharmaceutical companies. *WMJ*. 2010;109(3):142-8.
  16. Hodges LE, Arora VM, Humphrey HJ, Reddy ST. Premedical students' exposure to the pharmaceutical industry's marketing practices. *Acad Med*. 2013;88(2):265-8.
  17. Sierles FS, Brodkey AC, Clearly LM, et al. Medical students' exposure to and attitudes about drug company Interactions. *JAMA*. 2005; 294(9):1034-1042.
  18. Sigworth SK, Nettleman MD, Cohen GM. Pharmaceutical branding of resident physicians. *JAMA*. 2001;286:1024-5.
  19. Wazana A. Physicians and the pharmaceutical industry: is a gift ever just a gift? *JAMA*. 2000;283:373-80.
  20. Caudill TS, Johnson MS, Rich EC, McKinney WP. Physicians, pharmaceutical sales representatives, and the cost of prescribing. *Arch Fam Med*. 1996;5(4):201-6.
  21. Chren MM, Landefeld CS. Physicians' behavior and their interactions with drug companies: a controlled study of physicians who requested additions to a hospital drug formulary. *JAMA*. 1994;271(9):684-9.
  22. Cleary JD. Impact of pharmaceutical sales representatives on physician antibiotic prescribing. *J Pharm Technol*. 1992;8(1):27-9.
  23. Orłowski JP, Wateska L. The effects of pharmaceutical firm enticements on physician prescribing patterns. There's no such thing as a free lunch. *Chest*. 1992;102(1):270-3.
  24. Schwartz TL, Kuhles DJ II, Wade M, Masand PS. Newly admitted psychiatric patient prescriptions and pharmaceutical sales visits. *Ann Clin Psychiatry*. 2001;13(3):159-62.
  25. Boltri JM, Gordon ER, Vogel RL. Effect of antihypertensive samples on physician prescribing patterns. *Fam Med*. 2002;34(10):729-731.
  26. Brewer D. The effect of drug sampling policies on residents' prescribing. *Fam Med*. 1998;30(7):482-6.
  27. Chew LD, O'Young TS, Hazlet TK, et al. A physician survey of the effect of drug sample availability on physicians' behavior. *J Gen Intern Med*. 2000;15:478-483.
  28. Miller D, Mansfield RJ, Woods JB, et al. The impact of drug samples on prescribing to the uninsured. *South Med J*. 2008;101(9):888-93.
  29. Morelli D, Koenigsberg MR. Sample medication dispensing in a residency practice. *J Fam Pract*. 1992;34(1):42-8.
  30. Westfall JM, McCabe J, Nicholas RA. Personal use of drug samples by physicians and office staff. *JAMA*. 1997;278:141-3.
  31. Shaughnessy AF, Bucci KK. Drug samples and family practice residents. *Ann Pharmacother*. 1997;31(11):1296-1300.
  32. Gibbons RV, Landry FJ, Blouch DL, et al. A comparison of physicians' and patients' attitudes toward pharmaceutical industry gifts. *J Gen Intern Med*. 1998;13:151-154.
  33. Steinman MA, Shlipak MG, McPhee SJ. Of principles and pens: attitudes and practices of medicine housestaff toward pharmaceutical industry promotions. *Am J Med*. 2001;110:551-557.
  34. Lichter PR. Perspective: debunking myths in physician-industry conflicts of interest. *Am J Ophthalmol*. 2008;146:159-171.
  35. Sah S, Loewenstein G. Effect of reminders of personal sacrifice and suggested rationalizations on residents' self-reported willingness to accept gifts: a randomized trial. *JAMA*. 2010;304 (11):1204-1211.
  36. Palmisano P, Edelstein J. Teaching drug promotion abuses to health profession students. *J Med Educ*. 1980;55:453-5.
  37. Gillis MR, and McNally ME. The influence of industry on dental education. *J Dent Educ*. 2010;1095-1105.
  38. Piascik P, Bernard D, Madhavan S, et al. Gifts and corporate influence in doctor of pharmacy education. *Am J Pharm Educ*. 2007;71(4):68.
  39. Crigger N, Barnes K, Junko A, et al. Nurse practitioners' perceptions and participation in pharmaceutical marketing. *J Adv Nurs*. 2009;65(3):525-33.
  40. Annual Student Data Report Academic Year 2012-2013. Association of Schools and Colleges of Optometry (ASCO). [cited 2014 Mar 12]. Available from: [http://www.opted.org/wp-content/uploads/2013/03/ASCO\\_2012-2013\\_StudentDataReport.pdf](http://www.opted.org/wp-content/uploads/2013/03/ASCO_2012-2013_StudentDataReport.pdf).
  41. Opinion 8.061 - Gifts to Physicians from Industry [Internet]. American Medical Association. [cited 2014 Mar 16]. Available from: <http://www.ama-assn.org/ama/pub/physician-resources/medical-ethics/code-medical-ethics/opinion8061.page?>
  42. McKinney WP, Schiedermayer DL, Lurie N, et al. Attitudes of internal medicine faculty and residents toward professional interaction with pharmaceutical sales representatives. *JAMA*. 1990;264(13):1693-1697.

43. Chren MM, Landefeld MD, Murray TH. Doctors, drug companies, and gifts. *JAMA*. 1989;262(24):3448-3451.
44. Watson PY, Khandelwal AK, Musial JL, et al. Brief report: resident and faculty perceptions of conflict of interest in medical education. *J Gen Intern Med*. 2005;20:357-359.
45. American College of Physicians. Physicians and the pharmaceutical industry. *Ann Intern Med*. 1990;112:624-626.
46. Criteria for COPE Qualification of Continuing Education [Internet]. 2013 Dec [cited 2014 Mar 19]. Available from: <http://www.arbo.org/cope/Course%20Qualification%20w%20SCS.pdf>.
47. Montague BT, Fortin AH, Rosenbaum J. A systematic review of curricula on relationships between residents and the pharmaceutical industry. *Med Educ*. 2008;42:301-308.
48. Keith J. Effects of educational intervention in third year optometry students' perception of doctor/industry relationships. *Optom Vis Sci*. 2013;90:E-abstract 130857.
49. Evidence and Recommendation for a Model PharmFree Curriculum. American Medical Student Association [Internet]. [cited 2014 May10]. Available from: [www.amsa.org/AMSA/Libraries/Misc\\_Docs/ModelPharmFreeCurriculum.sflb.ashx](http://www.amsa.org/AMSA/Libraries/Misc_Docs/ModelPharmFreeCurriculum.sflb.ashx).
50. Hafferty FW, Franks R. The hidden curriculum, ethics teaching, and the structure of medical education. *Acad Med*. 1994;69(11):861-71.

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## Appendix A: Online Survey of Fourth-Year Students

- 1. If you do not wish to participate in the research study, please decline participation by clicking on the “disagree” button.**  
Agree  
Disagree
- 2. Which school do you attend?**  
ILLINOIS COLLEGE OF OPTOMETRY  
INDIANA UNIVERSITY  
INTER AMERICAN UNIVERSITY OF PUERTO RICO  
MASSACHUSETTS COLLEGE OF PHARMACY AND HEALTH SCIENCES  
MICHIGAN COLLEGE OF OPTOMETRY AT FERRIS STATE UNIVERSITY  
MIDWESTERN UNIVERSITY - ARIZONA COLLEGE OF OPTOMETRY  
NEW ENGLAND COLLEGE OF OPTOMETRY  
NORTHEASTERN STATE UNIVERSITY - OKLAHOMA COLLEGE OF OPTOMETRY  
NOVA SOUTHEASTERN UNIVERSITY  
THE OHIO STATE UNIVERSITY  
PACIFIC UNIVERSITY  
PENNSYLVANIA COLLEGE OF OPTOMETRY AT SALUS UNIVERSITY  
SOUTHERN CALIFORNIA COLLEGE OF OPTOMETRY  
SOUTHERN COLLEGE OF OPTOMETRY  
STATE UNIVERSITY OF NEW YORK  
UNIVERSITY OF ALABAMA AT BIRMINGHAM  
UNIVERSITY OF CALIFORNIA – BERKELEY  
UNIVERSITY OF MISSOURI AT ST. LOUIS  
UNIVERSITY OF HOUSTON  
UNIVERSITY OF THE INCARNATE WORD  
WESTERN UNIVERSITY OF HEALTH SCIENCES
- 3. Please select your gender.**  
Female      Male
- 4. What is your age?**
- 5. How many industry-sponsored events (dinners, receptions, lectures, etc.) have you attended in the past year?**  
None      1-3 events      4-6 events      7-9 events      >10 events
- 6. A faculty member has recommended or required that I attend an industry-sponsored event.**  
Agree      Disagree
- 7. How many pieces of your optometric equipment have a pharmaceutical company or product logo? (occluder, penlight, near card, drug guide, etc.)**  
None      1-3 items      4-6 items      7-9 items      >10 items
- 8. Have you received airfare or hotel accommodations to attend an industry-sponsored educational conference?**  
Yes      No
- 9. Is your white coat sponsored by a pharmaceutical or contact lens company? (Is there any logo other than that of your school's anywhere on your coat?)**  
Yes      No
- 10. Which of the following best describes how your school uses samples?**  
My school does not use samples of any kind  
Over-the-counter samples are available but no prescription drug samples  
Both OTC and prescription medications are available
- 11. Do you feel that gifts from drug companies (meals, gifts, educational materials, etc.) will affect which products you prescribe?**  
Yes      No

- 
12. **Approximately what percent of your fellow optometry students do you think would be influenced by gifts from drug companies?**  
<10 %    ~25%    ~50%    ~75%    >90%
13. **Are you more likely to eventually prescribe a medication if you have a sample of it?**  
Yes    No
14. **Approximately what percent of optometrists do you think are more likely to prescribe a medication if they have a sample of it?**  
<10%    ~25%    ~50%    ~75%    >90%
15. **It is OK to accept gifts as long as the value is less than:**  
No gifts are acceptable    Less than \$10    Less than \$25    Less than \$50  
Less than \$100    A gift of any value is acceptable
16. **It is more acceptable to accept a gift with an educational value such as an eye model or drug reference guide than a non-educational gift like a meal or trip.**  
Agree    Disagree
17. **Accepting \$50 in cash from a drug company is less appropriate than accepting a steak dinner which is worth \$50.**  
Agree    Disagree
18. **It is OK to accept gifts as long as you accept them from all companies so you are not biased.**  
Agree    Disagree
19. **Drug companies provide gifts to optometrists in an effort to “give back” to the profession.**  
Agree    Disagree
20. **Drug companies sponsor educational events to increase revenue.**  
Agree    Disagree
21. **Drug companies are the best source for information about new products.**  
Agree    Disagree
22. **Speakers at continuing education events should be required to disclose any sponsorship from drug companies.**  
Agree    Disagree
23. **The majority of patients are aware that doctors accept gifts from drug companies.**  
Agree    Disagree
24. **Receiving gifts influences what a faculty member teaches in lecture.**  
Agree    Disagree
25. **Receiving gifts influences what a faculty member prescribes in clinic.**  
Agree    Disagree
26. **I am more likely to prescribe the drugs my attending doctor prescribes.**  
Agree    Disagree
27. **How much instruction have you received regarding industry relationships?**  
None    1-2 hours    3-4 hours    >4 hours
28. **I feel I have a good understanding of the ethical considerations in dealing with physician-industry relationships.**  
Agree    Disagree
29. **Schools should provide more instruction about how to deal with potential conflict-of-interest situations.**  
Agree    Disagree
30. **Comments:**
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