Medical Students' Exposure to and Attitudes About Drug Company Interactions
A National Survey

Frederick S. Sierles, MD
Amy C. Brodkey, MD
Lynn M. Cleary, MD
Frederick A. McCurdy, MD, PhD, MBA
Matthew Mintz, MD
Julia Frank, MD
D. Joanne Lynn, MD
Jason Chao, MD
Bruce Z. Morgenstern, MD
William Shore, MD
John L. Woodard, PhD

Context While exposure to and attitudes about drug company interactions among residents have been studied extensively, relatively little is known about relationships between drug companies and medical students.

Objective To measure third-year medical students' exposure to and attitudes about drug company interactions.

Design, Setting, and Participants In 2003, we distributed a 64-item anonymous survey to 1143 third-year students at 8 US medical schools, exploring their exposure and response to drug company interactions. The schools' characteristics included a wide spectrum of ownership types, National Institutes of Health funding, and geographic locations. In 2005, we conducted a national survey of student affairs deans to measure the prevalence of school-wide policies on drug company–medical student interactions.

Main Outcome Measures Monthly frequency of students' exposure to various activities and gifts during clerkships, and attitudes about receiving gifts.

Results Overall response rate was 826/1143 (72.3%), with range among schools of 30.9%-90.7%. Mean exposure for each student was 1 gift or sponsored activity per week. Of respondents, 762/818 (93.2%) were asked or required by a physician to attend at least 1 sponsored lunch. Regarding attitudes, 556/808 (68.8%) believed gifts would not influence their practices and 464/804 (57.7%) believed gifts would not affect colleagues' practices. Of the students, 553/604 (80.3%) believed that they were entitled to gifts. Of 183 students who thought a gift valued at less than $50 was inappropriate, 158 (86.3%) had accepted one. The number of students who simultaneously believed that sponsored grand rounds are educationally helpful and are likely to be biased was 452/758 (59.6%). Students at 1 school who had attended a seminar about drug company–physician relationships were no more likely than the nonattending classmates to show skepticism. Of the respondents, 704/822 (85.6%) did not know if their school had a policy on these relationships. In a national survey of student affairs deans, among the 99 who knew their policy status, only 10 (10.1%) reported having school-wide policies about these interactions.

Conclusions Student experiences and attitudes suggest that as a group they are at risk for unrecognized influence by marketing efforts. Research should focus on evaluating methods to limit these experiences and affect the development of students' attitudes to ensure that physicians' decisions are based solely on helping each patient achieve the greatest possible benefit.

JAMA. 2005;294:1034-1042 www.jama.com

MEDICAL STUDENTS ARE ENtering an environment with progressively fewer boundaries between medicine and the pharmaceutical industry,[1-6] which spends $12 billion to $18 billion annually marketing to physicians (including residents).[3,6] This includes 60 million visits annually by pharmaceutical representatives[6,7] and most of the $1.54 billion spent annually on continuing medical education.[2,8]

Drug company–physician interaction presents information favoring the sponsor's product[9-16] and increases the likelihood of prescribing that product.[17-20] Prescribing may be inconsistent with evidence-based guidelines[21-23] and may reflect the presence of drug samples or patient demand due to direct-to-consumer advertising, even if a drug was not the physician's first choice.[24,25] Interactions with pharmaceutical representatives increase the likelihood of physicians making formulary requests for drugs with no clear advantage over existing ones,[19,26] prescribing nonrationally,[26,27] prescrib-

Author Affiliations are listed at the end of this article. **Corresponding Author:** Frederick S. Sierles, MD, Department of Psychiatry and Behavioral Sciences, Rosalind Franklin University of Medicine and Science/The Chicago Medical School, 3333 Green Bay Rd, North Chicago, IL 60064 (frederick.sierles@rosalindfranklin.edu).

Table 1. Characteristics of Medical Schools in the Survey, 2003

Medical School	Case Western Reserve University	George Washington University	Mayo Clinic College of Medicine	Ohio State University	Rosalind Franklin University	State University of New York, Upstate Medical University	University of California, San Francisco	University of Nebraska
Location	Cleveland, Ohio	Washington, DC	Rochester, Minn	Columbus, Ohio	North Chicago, Ill	Syracuse, NY	San Francisco, Calif	Omaha, Neb
Ownership	Private	Private	Private	Public	Private	Public	Public	Public
Third-year class								
Class size, No.	140	164	42	215	173	151	150	108
Age, mean (SD), y	26.5 (3.4)	26.3 (3.2)	*	26.1 (2.6)	27.0 (3.1)	25.9 (2.3)	26.2 (3.2)	25.7 (2.0)
Women, %	45.2	47.1	63.6	46.4	43.6	42.3	52.2	37.8
Men, %	54.8	52.9	36.4	53.6	56.4	57.7	47.8	62.2
Response rate, No. (%)	99 (70.7)	140 (85.4)	13 (30.9)	151 (70.2)	123 (71.1)	129 (85.4)	73 (48.6)	98 (90.7)
National rank for NIH funding	18	92	37†	53	108	90	4	77
Residents and fellows, No.	859	453	1258	569	138	446	1408	361

Abbreviation: NIH, National Institutes of Health.
*The Mayo Clinic institutional review board required that student age not be presented.
†2004 Figure (Mayo Clinic data for 2003 unavailable).

ing costlier drugs,[26-28] and prescribing fewer generic drugs.[26-29] Authors of guidelines frequently have undisclosed industry ties.[30] Physicians often deny the influence of pharmaceutical promotion.[21,26,31-35]

Concerned that drug company–physician relationships can be problematic, numerous professional organizations, including the American Medical Association (AMA) and the American Medical Student Association (AMSA), have developed guidelines or recommendations about drug company–physician or drug company–student interactions. AMA guidelines[4,36] state that gifts to physicians must be primarily for patients' benefit and of insubstantial value, with no conditions attached. AMSA recommendations[37] include urging physicians and students not to accept gifts from drug companies, urging hospitals and residency programs to discontinue drug company–funded lectures and lunches, and opposing the granting of continuing medical education credit for drug company–sponsored events.

Studies of residents demonstrate tendencies to perceive that they are entitled to gifts based on hardship,[38] to accept gifts despite perceiving that gifts are inappropriate,[35] and to believe that their colleagues are more likely than they to be influenced.[35] Graduates of residency programs that restrict exposure to pharmaceutical representatives have more skeptical attitudes about marketing than other residents.[39,40]

The literature on student exposure to and attitudes about drug company marketing is sparse and is based on single medical school surveys. These surveys found considerable exposure to marketing,[41-44] denial by most students that marketing could influence them,[42,44] and perception by many students that they have not been adequately trained about interacting with pharmaceutical representatives.[44] However, studies of students have not addressed beliefs about entitlement to gifts, personal influence by gifts compared with colleagues, or being influenced by school policies about drug company interactions.

The purpose of this 8-school survey study was to measure the frequency of medical students' exposure to drug company gifts, students' attitudes about gifts, and correlates of these frequencies and attitudes in a large sample of students representing a broad array of schools. To determine the prevalence of policies regarding pharmaceutical representatives and students, we also surveyed deans at all US medical schools.

METHODS

Sample Selection

We obtained institutional review board approval at 8 schools to survey all (1143) of their enrolled third-year students: Case Western Reserve University, George Washington University, Mayo Clinic College of Medicine, Ohio State University, Rosalind Franklin University, State University of New York Upstate Medical University, University of California at San Francisco, and University of Nebraska. Schools were chosen nonrandomly, based on access to the students and a diversity of public or private schools, National Institutes of Health (NIH) funding, and geographic locations (TABLE 1).[45-47] Because fourth-year students take extramural electives, we studied third-year students exclusively so that reported behaviors would be related to their own schools' cultures. We distributed surveys between February and August 2003.

In 2005, we mailed a 1-page survey, returned anonymously in self-addressed envelopes, to the student affairs dean or equivalent at each of the 126 US medical schools, asking whether they had a school-wide written policy about pharmaceutical representative–student relationships. To increase response rate, the survey was mailed 3 times. Because surveys were returned

anonymously, all recipients received 3 mailings, and the second and third mailings included the statement, "If you responded to this survey previously, please disregard this mailing."

Student Survey Instrument

A 64-item 2-page anonymous questionnaire was developed based on literature review and expert consultation, and was administered after pilot testing on third-year students. The format was optical scanning sheets at 6 schools, paper at 1 school, and online at 1 school.

The questionnaire sought (1) information about the student including age, sex, school, membership in the AMA or AMSA, and if a member, familiarity with that organization's policies about drug company–physician interactions; (2) the student's perception of whether the school had a policy or guidelines about pharmaceutical representative–physician interactions; (3) number of months the student had participated in clerkships; (4) experience with specific types of drug company–related activities; and (5) beliefs about whether the school had taught the student enough about drug company–physician relationships. We used this information to create measures of exposure, skepticism, and appropriateness regarding drug company activities and gifts.

Exposure

For frequently occurring events or gifts (TABLE 2), we asked each student to report the number of times he or she attended or accepted since starting clerkships. We divided the total number of each type of exposure by the number of months the student had spent in clerkships, to identify the monthly frequency of that exposure. These frequencies were summed to create an exposure index. For sponsored lunches, we also asked how often a resident or attending physician asked the student to attend.

For less-frequently occurring gifts or events, we asked whether the student experienced any exposure. Students were not asked to quantify these gifts or events.

Responses for individual gifts or events are reported for each student who completed that questionnaire item. The exposure index was calculated only for students who completed all 8 items.

Skepticism

Students responded to a 9-item, 4-category Likert scale (strongly agree, agree, disagree, strongly disagree) that solicited their attitudes about drug company marketing (FIGURE 1). The items consisted of 5 statements for which agreement suggests acceptance of drug company marketing and 4 statements for which agreement suggests skepticism about drug company marketing. Those suggesting acceptance of drug company marketing were: (1) Most grand rounds sponsored by drug companies are helpful and educational; (2) It is sometimes okay for students to accept gifts and lunches from drug companies because most students have considerable debts and minimal income; (3) Drug company materials are a useful way to learn about new drugs; (4) It is sometimes okay for students to accept gifts and lunches from drug companies because drug companies have minimal influence on students; and (5) Funds to schools from drug companies are a helpful way to lower tuition. For these 5 items, strongly agree was scored 1, agree was 2, disagree was 3, and strongly disagree was 4.

Those items suggesting skepticism were: (6) My school should exclude pharmaceutical representatives from meeting with students and residents;

Table 2. Third-Year Medical Students' Exposure to Various Types of Drug Company Interactions

Type of Gift or Event	Students, No. (N = 826)	Students Who Received a Gift or Participated in ≥1 Event, No. (%)	Exposure Frequency per Month*	
			Mean (SD)	Range
A lunch provided by a drug company	793	768 (96.8)	1.08 (0.76)	0-4.2
A small, noneducational gift (eg, pen or coffee mug)	801	754 (94.1)	0.87 (0.69)	0-3.5
A journal reprint or a glossy brochure from a pharmaceutical representative	800	716 (89.5)	0.53 (0.52)	0-3.5
A snack (eg, donut, candy, coffee) provided by a pharmaceutical representative	800	713 (89.1)	0.75 (0.72)	0-8.5
A grand rounds sponsored by a drug company	798	690 (86.5)	0.54 (0.57)	0-2.4
A dinner provided by a drug company	801	405 (50.6)	0.13 (0.21)	0-2.4
A drug sample from a pharmaceutical representative	799	435 (41.9)	0.10 (0.20)	0-2.1
Another social event (eg, party) sponsored by a drug company	799	272 (34.0)	0.06 (0.11)	0-0.8
A book donated by a drug company†	826	421 (51.0)		
Attended a workshop sponsored by a drug company†	826	214 (25.9)		
Registration fee for a conference paid for by a drug company†	826	37 (4.5)		
Participated in a market survey sponsored by a drug company†	826	29 (3.5)		
Participated in a research project sponsored by a drug company†	826	22 (2.7)		
Travel expenses for a conference paid for by a drug company†	826	15 (1.8)		
Nominated for an award sponsored by a drug company†	826	5 (0.6)		
Obtained a fellowship sponsored by a drug company†	826	4 (0.5)		

*For each student, an exposure index was calculated as the sum of the monthly frequencies for the first 8 items.
†Monthly frequency data were not requested.

(7) Receiving gifts or food from pharmaceutical representatives increases the chance that I will eventually prescribe the drug company's products; (8) Receiving gifts or food from pharmaceutical representatives increases the chances that my fellow students will eventually prescribe the drug company's products; and (9) Drug company–sponsored grand rounds are often biased in favor of the company's products. For these 4 items, strongly disagree and disagree were scored 1 and 2, respectively, and agree and strongly agree were scored 3 and 4, respectively.

The students at 1 of the 8 surveyed schools completed an earlier, 6-item version of the questionnaire, which did not include items 2 through 4 listed previously. Therefore, for all students the scores for the original 6 items (1, 5, 6-9) were summed, divided by the maximum possible score of 24, and converted to a 0 (not skeptical) to 1 (skeptical) 6-item skepticism scale. Responses for individual items were reported for each student who completed that item. Skepticism scale scores were computed only for those students who responded to all of the original 6 items. For presentation, answers were dichotomized into agree and disagree.

Appropriateness

Students responded to an 8-item, 5-point Likert scale (very appropriate=1, appropriate=2, neutral=3, inappropriate=4, very inappropriate=5) that solicited their perceptions of the appropriateness of various drug company gifts (FIGURE 2). The points for each item were summed, divided by the maximum possible score of 40, and converted to a 0 (gifts appropriate) to 1 (gifts inappropriate) appropriateness scale. Responses for individual items are reported for each student who completed that item on the questionnaire. Appropriateness scale scores were calculated only for those students who completed all 8 items. For presentation, answers were aggregated into appropriate, neutral, and inappropriate categories.

School Policy and Teaching

To determine whether each school had a school-wide policy or curriculum component about drug company–student relationships, we asked the student affairs and educational affairs deans, respectively.

Survey Distribution

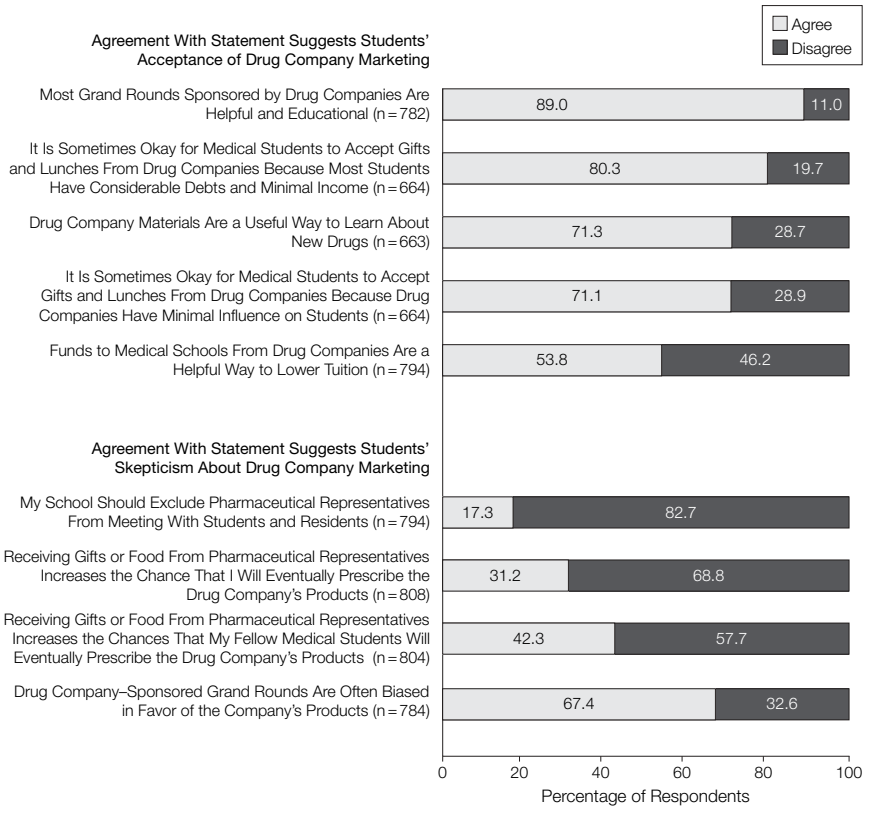
At 6 schools, questionnaires were administered to the students at meetings with required attendance, including clerkship seminars or class meetings. At 1 school, only two thirds of students attended the class meeting, so a mailing to their homes followed. At another school, surveys were completed online prior to a class about drug company–student interactions. At a third school, questionnaires were distributed once in student mailboxes.

Statistical Analysis

Data were entered into Microsoft Excel (Microsoft Corp, Redmond, Wash) and imported into SPSS, version 12.0.2 (SPSS Inc, Chicago, Ill). Pearson product-moment correlations (2-tailed) were used to characterize associations among the exposure index, skepticism score, and appropriateness score. Analysis of variance and *t* tests were used to compare exposure, skepticism, and appropriateness measures for groups of variables. The McNemar test was used to compare perceptions about an individual's susceptibility vs others' susceptibility to being influenced. χ^2 Tests were used to compare schools' policies and students' perceptions about them, and to compare our study sample with schools nationally on proportions with policies about drug company–student interactions, types of ownership (public vs private), and sex. $P<.05$ was considered statistically significant.

Because of low response rates at 1 private school (attributable to having only 1 mailbox distribution) and 1 public school (attributable to insufficient time

Figure 1. Third-Year Medical Students' Attitudes About Drug Company Marketing



allotment), we repeated our analyses after excluding data from these 2 schools. These results did not differ either in significance or direction from the results of the entire sample; therefore, we report the complete data.

RESULTS

Study Population

Overall response rate was 826/1143 students (72.3%). Response rates among schools ranged from 30.9% to 90.7%. Table 1 displays the schools' characteristics. Student ages ranged from 22 to 47 years (mean, 26.3 [SD, 2.9] years). Among respondents reporting sex, 352 (45.0%) were women and 430 (55.0%) were men. Five-hundred eight (70.2%) were members of the AMA or AMSA. Students had experienced a mean of 4.6 clerkships (SD, 1.3; range, 1-6).

The proportion of women and men in our third-year sample did not differ significantly from the national proportion for sex for intermediate (second- and third-year) students in 2003 (46.9% women; $P=.37$).[47] The proportion of public and private schools in our sample did not differ significantly from the national proportion in 2003 (60% public; $P=.85$).[47]

Exposure

Table 2 shows percentages of students exposed to each type of interaction and, where available, monthly frequency. For 7 items, more than 50% of students had been exposed; for 5 of these 7 items, more than 85% had been exposed.

A total of 790 students (69.1% of survey recipients, 95.6% of survey respondents) responded to all exposure index items. The mean exposure index was 4.1 exposures monthly (SD, 2.7; range, 0-22.7), averaging 1 sponsored activity attended or 1 gift received per week for each student. Almost all (762/818 [93.2%]) had been asked or required by a physician to attend a sponsored lunch 1 or more times (mean, 0.33 times monthly; SD, 0.48; range, 0-2.4 times monthly). There were significant exposure index differences among the schools (range, 1.7-6.7 exposures monthly; $P<.001$).

Skepticism and Appropriateness

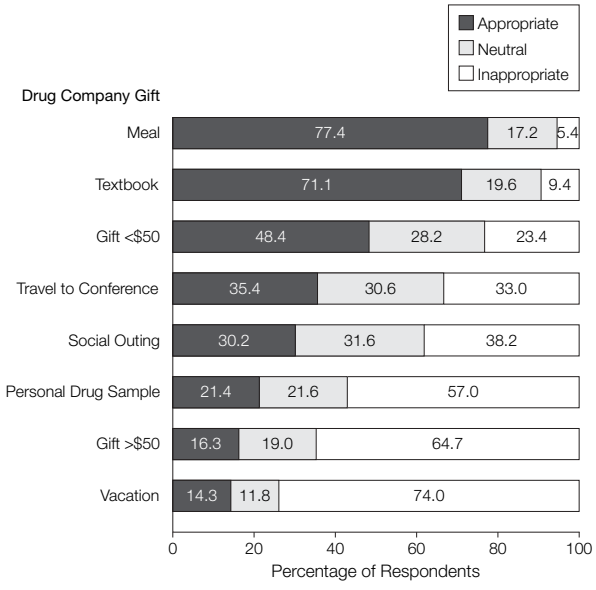
Results are shown in Figure 1 and Figure 2. Most students thought that sponsored grand rounds and sponsored materials were helpful, sponsored meals and textbooks were appropriate, gifts could not influence them or their colleagues, and that students may be entitled to gifts because of financial hardship.

When responses to attitudes about the educational value and influence of sponsored grand rounds were examined together, 452/758 (59.6%) of the respondents simultaneously believed that most sponsored grand rounds were helpful and that they were biased toward company products. When students' responses on their attitudes about themselves or their colleagues being influenced by receiving gifts or food from pharmaceutical representatives were examined together, 442/803 (55.0%) did not believe that either they or their colleagues would have an increased chance of prescribing the company's drugs. Significantly fewer students believed that they would be influenced by gifts or food than believed that their colleagues would be influenced (252 [31.2%] vs 340 [42.3%]; $P=.008$). Only 229 (28.5%) perceived that both they and their colleagues would be influenced. Students were 5 times as likely to believe that they would not be influenced and that colleagues would be influenced than to perceive they would be influenced and that colleagues would not (110 [13.7%] vs 22 [2.7%], respectively; $P<.001$).

Skepticism scale scores were calculated for 747 students who completed all 6 items (65.3% of survey recipients, 90.4% of respondents). The mean skepticism score was 0.43 (SD=0.14; range, 0-1.0), indicating relatively low skepticism. Students who completed the items did not differ significantly from noncompleters by sex, whether they had formal classes related to drug marketing, or perception about their school's policy.

Appropriateness scale scores could be calculated for 790 students (69.1% of survey recipients, 95.6% of respondents). The mean appropriateness score was 0.50 (SD, 0.22; range, 0-1.0), a neutral result. Skepticism scores were positively correlated with appropriateness scores ($r=0.43$, $P<.001$), indicating that students with more skeptical attitudes were less likely to think specific gifts

Figure 2. Third-Year Medical Students' Perceptions of the Appropriateness of Various Drug Company Gifts



were appropriate. There were significant differences in skepticism scores (range, 0.41-0.51; $P<.001$) and appropriateness scores (range, 0.45-0.61; $P<.001$) among the schools.

Relationships Between Exposure and Attitudes

Many students who perceived that various gifts were inappropriate had actually received them. Of 183 students who thought a gift valued at less than $50 was inappropriate, 158 (86.3%) had received one. Of 42 who thought that a meal was inappropriate, 36 (85.7%) had eaten a sponsored lunch. Of the 455 students who thought that a personal drug sample was inappropriate, 54 (11.9%) had accepted one.

There were modest but statistically significant inverse correlations between the exposure index and skepticism score ($r=-0.171$; $P<.001$), and between the exposure index and appropriateness score ($r=-0.155$; $P<.001$). The inverse correlation between exposure and skepticism was stronger for students who reported having been asked by a physician to attend a sponsored lunch compared with those who did not report this, but the difference was not statistically significant (–0.35 vs –0.185; $P=.18$).

Society Membership

Of the 350 respondents (42.4%) who belonged to the AMA, 49 (14.0%) reported familiarity with its guidelines on gifts. Of the 470 (56.9%) who belonged to AMSA, 59 (12.6%) reported familiarity with its recommendations regarding gifts and drug company sponsorship of activities.

School Policies

Of the 8 schools, 7 had no school-wide policies regarding pharmaceutical representative–student contact. One public school's student handbook contains a paragraph about support from commercial entities, permitting support if: (1) an academic administrator approves; (2) the representative gives no presentations; (3) the support does not interfere with the educational process; (4) the support is available to groups but not individuals; and (5) the student participates voluntarily and incurs no obligations. The school does not schedule time for faculty-student discussions of this policy.

At this same school, 94.9% of the respondents reported that they did not know if their school has a policy. These respondents also had a higher mean exposure index than students at the other schools (6.7/mo vs 3.7/mo; $P<.001$), with no differences in the skepticism or appropriateness scores.

At 2 of the other public schools without a policy, the affiliated university hospital itself formally limits pharmaceutical representative contact. The first one limits pharmaceutical representative visits to scheduled appointments with practitioners (students are not specifically mentioned) in non–patient care areas only, to discuss only formulary-related indications unless practitioners request more. Pharmaceutical representatives may attend educational conferences only if the chair or service chief approves. At the other one, contact between pharmaceutical representatives and students is limited by the university-affiliated hospital to department-sponsored presentations.

Comparing combined data for these 2 public schools with affiliated hospital policies with combined data for the other 6 schools, students at these 2 schools had a significantly lower mean exposure index (2.5 vs 4.6; $P<.001$) and a higher mean skepticism score (0.45 vs 0.43; $P=.03$) than at the other schools. There were no differences in appropriateness scores.

Of 822 students who replied to the item about their school's policy, 704 (85.6%) did not know if their school had a policy, 71 (8.6%) stated that they knew a policy existed but were not aware of what it was, 37 (4.5%) stated that their school has a specific policy of either limited or unlimited interactions, and 10 (1.2%) answered that their school does not have a policy. Among the 118 students who reported that they knew whether or not a policy existed, only 47 (39.8%) correctly described it.

Teaching

In the student surveys, 666/803 (82.9%) responded that their school had not taught them well about how to interact with pharmaceutical representatives and 625/803 (77.8%) responded that their school should teach more about drug company–physician relationships.

Two of the private schools taught formally about drug company–physician relationships. Fifteen months before this survey, 1 of these private schools had a 2-hour lecture on drug company–physician relationships in its second-year pharmacology course, for which attendance was optional. At this same school, the mean skepticism score and appropriateness score did not significantly differ from those of the 6 schools without formal teaching. The exposure index at this school was significantly greater than the exposure index for the other 6 schools (4.8/mo vs 3.7/mo; $P<.001$).

One of the other private schools included a 2-hour small-group discussion on drug company–physician relationships in its monthly third-year ethics seminars, so not all respondents had yet experienced the session before the survey. Attendance was not required. Students at this school who had attended the seminar had a slightly higher mean exposure index than those who had not (5.9/mo vs 5.1/mo; $P=.09$), and no differences in skepticism or appropriateness scores. For these students, the mean appropriateness score was significantly higher than for the students at the 6 schools without formal teaching (0.55 vs 0.50; $P=.03$), but the mean skepticism score did not differ significantly from the other 6 schools. The exposure index at this school was significantly higher than the exposure index for the other 6 schools (5.7/mo vs 3.7/mo; $P<.001$).

National Survey of Student Affairs Deans About Schools' Policies

One hundred ten student affairs deans (87.3%) responded, with 99 (90.0%) reporting that they knew whether their school had a school-wide policy, and 11 (10.0%) reporting that they were not

sure. Of the 99 who knew, 10 (10.1%) reported that there was a school-wide policy and 89 (89.9%) reported that there was no policy, a proportion that was not different from the schools in our survey ($P=.70$)

COMMENT

Our study provides information about student experiences and attitudes related to drug company interactions over multiple sites representing a wide variety of medical schools, using a relatively large sample size. There are several findings of note.

Most students perceive that they are entitled to gifts. Many simultaneously think that sponsored educational events are likely to be biased, but are helpful. Most think that their prescribing is not likely to be influenced by these interactions and that their colleagues are more likely to be influenced. This combination of perceptions, along with the high exposure to these interactions that the students reported, suggests that as a group they are at risk for unrecognized influence by marketing efforts.

Two other findings may be consistent with this. First, most of the students who perceived gifts to be inappropriate had actually received them. This raises a question of whether this represents a cognitive dissonance or whether the disapproval actually developed after receiving the gift, which would suggest important critical processing of the significance of the interaction. Second, most students who believed that attending a sponsored meal was inappropriate had eaten those meals. However, because 93% of students had been asked or required by physicians to attend sponsored lunches, this may have represented a subtle coercion. Even if this were so, persistence of this effect could lead to an eventual acceptance of appropriateness.

The majority of the schools lacked guidelines about drug company–student relationships; even when present, they were almost entirely unknown to students. At the 2 schools that taught formally about drug company–physician relationships, a 2-hour optional-attendance class about drug company–student relationships was insufficient to significantly influence students' behaviors, a finding that differed from results in 2 previous studies[42,48] that demonstrated short-term efficacy of this teaching.

At the University of Missouri[48] in the second-year pharmacology course, students attended a 50-minute required lecture and discussion regarding drug company marketing. Seven weeks later, the mean score of acceptability of drug company gifts was lower than the preclass score. The University of California at Los Angeles[42] presented a required half-day small group session to third-year students. In this activity, a UCLA pharmacist who was initially introduced as a pharmaceutical representative gave a 20-minute drug presentation, and answered questions from students and questions role-modeled by faculty. The pharmacist was then reintroduced as a faculty member and discussed pharmaceutical representative interactions with the students. Twelve weeks after the intervention, student perceptions about the influence of drug company–sponsored information indicated more skepticism than at preintervention.

Study Limitations

Certain limitations of this study should be considered. Although the schools represent a diverse range based on region, ownership, and NIH funding, they were not randomly chosen, raising a question of the generalizability of these results. For example, none of the schools were located in the southern United States. However, the proportion of students who are men vs women and the proportion of schools that are public vs private are similar to national averages for the same year. Our results are consistent with previous single-site studies. Our national survey of deans indicates that the absence of school-wide policies is widespread in a proportion similar to the schools in our student survey.

The study was cross-sectional. Because of this, it is susceptible to inaccurate recall, although students were asked about experiences that would have occurred within a relatively recent span of time. Because this study was not longitudinal, we cannot reach conclusions about changes in students' perceptions over time, and because we could only measure correlations, we can only make limited inferences about causality.

Response rate was low at 2 of the 8 schools. However, analysis excluding the data from these 2 schools did not significantly change our findings.

The Hidden Curriculum

Students manifest the same phenomena as do residents, such as accepting gifts while disapproving of them.[26,32-35,38] This may be due to role model behavior and other components of medicine's "hidden curriculum"—lessons students learn that are not formally scheduled into classes, included in a syllabus, or tested on examinations, but rather are learned during informal interactions, ward rounds, and clinical experiences in hallways and cafeterias. Physicians and peers who "teach" this curriculum may be unaware that the behaviors they model influence what students believe.[49]

The potential importance of this role modeling is suggested by the finding that 93% of the students had been asked or required by a faculty member to attend a sponsored lunch. In addition, although it did not reach statistical significance, the negative correlation between exposure and skepticism was far greater among these students compared with students who had not been asked to attend. If this effect is real, it may be a demonstration of covert messages that are communicated by faculty behavior and have a diminishing effect on student skepticism.

If we believe that our current approach to drug company–physician relationships does not help physicians serve their patients optimally, key issues need to be resolved. Given evidence of an accepting attitude toward these relationships early in the medical socialization process, before resi-

dency begins, interventions would best be directed to medical students. There is some evidence that classroom educational activities change attitudes or behavior but we did not find any important differences in students whose schools provided formal teaching. However, these activities were limited in duration, and by appearing only once during medical school did not have an opportunity for reinforcement. Moreover, voluntary attendance may signal to students that the school does not attach much importance to the material.

Nationally, very few schools have policies regarding drug company–student interactions and in our study, very few students were even aware of the presence or absence of such policies at their own schools. Moreover, students belonging to national societies with clear guidelines in this area were not familiar with those guidelines. However, we found that students at schools with affiliated hospitals that limited contact from pharmaceutical representatives had less exposure to these interactions and greater skepticism. This suggests that adoption of school-wide policies could be of benefit if they were made highly visible and discussed formally, although the influence of this has not been studied. Whether this would be effective if residents and faculty continue to model acceptance of these interactions is questionable.

In conclusion, our study adds to previous literature by demonstrating experiences and attitudes among large numbers of students at a variety of medical schools and indicating acceptance of the value of drug company–sponsored gifts and activities. Research should focus on evaluating methods to limit these experiences and affect the development of these attitudes, with a goal of ensuring that physicians' decisions are based solely on helping the individual patient achieve the greatest possible benefit.

Author Affiliations: Departments of Psychiatry and Behavioral Sciences (Drs Sierles and Woodard) and Psychology (Dr Woodard), Rosalind Franklin University of Medicine and Science, North Chicago, Ill; Department of Psychiatry, University of Pennsylvania, Philadelphia (Dr Brodkey); Office of the Associate Dean, and Department of Internal Medicine, State University at New York Upstate Medical University, Syracuse (Dr Cleary); Department of Pediatrics, University of Nebraska School of Medicine, Omaha (Dr McCurdy); Departments of Internal Medicine (Dr Mintz) and Psychiatry (Dr Frank), George Washington University, Washington, DC; Department of Neurology, Ohio State University, Columbus (Dr Lynn); Department of Family Medicine, Case Western Reserve University, Cleveland, Ohio (Dr Chao); Department of Pediatrics, Mayo Clinic College of Medicine, Rochester, Minn (Dr Morgenstern); and Department of Family and Community Medicine, University of California, San Francisco (Dr Shore). Dr McCurdy is now Regional Chairman of Pediatrics, Texas Tech University, Amarillo.

Author Contributions: Dr Sierles had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.
Study concept and design: Sierles, Brodkey, Cleary, Frank, Lynn, Chao, Morgenstern.
Acquisition of data: Sierles, Cleary, McCurdy, Mintz, Lynn, Chao, Morgenstern, Shore.
Analysis and interpretation of data: Sierles, Brodkey, Woodard, Cleary, McCurdy, Frank, Lynn, Chao, Morgenstern.
Drafting of the manuscript: Sierles, Brodkey, Morgenstern, Shore.
Critical revision of the manuscript for important intellectual content: Sierles, Brodkey, Cleary, McCurdy, Mintz, Frank, Lynn, Chao, Morgenstern, Woodard.
Statistical analysis: Woodard, Sierles, Brodkey.
Administrative, technical and material support: Sierles, Cleary, McCurdy, Lynn, Chao.
Supervision: Sierles, Brodkey, Lynn.
Financial Disclosures: Dr Lynn has received grants from the following for clinical research: Berlex Laboratories, Teva Neuroscience, Serono, Acorda Therapeutics, Cleveland Clinic Foundation, Neurocrine Biosciences, Biogen IDEC, Genentech, and Abbott Laboratories; honoraria (for public speaking) and consulting fees from: Berlex Laboratories, Teva Neuroscience, Biogen IDEC, Cephalon, and Serono; and stock ownership of less than $10 000 with Abbott Laboratories and Merck. No other authors reported disclosures.
Funding/Support: The Alliance for Clinical Education (ACE) funded supplies (cover letter, survey form, envelopes, postage) for the 2005 student affairs survey of deans. There was no other external funding.
Role of the Sponsor: ACE had no role in design and conduct of the study, in the collection, analysis, and interpretation of the data, or in the preparation, review, or approval of the manuscript.
Acknowledgment: We thank Michael Steinman, MD, University of California, San Francisco, and Joel Lexchin, MD, York University, Toronto, Canada, for their suggestions about the questionnaire and the manuscript (including Dr Steinman's recommendations for major revisions); Gregory Brotzman, MD, Medical College of Wisconsin, Milwaukee, for his suggestions about the questionnaire; Gary Beck, BA, University of Nebraska for obtaining institutional review board approval and administering the questionnaire at the University of Nebraska; Susanna Sung, BA, Rosalind Franklin University, for orchestrating the data transfer; and Terrie Stengel, MBA, National-Louis University, Wheeling, Ill, for her copyediting recommendations. None of these acknowledged persons received a sponsor's compensation for his or her contribution. We also thank ACE for hosting the 2002 annual meeting at which the decision to conduct this study was made. ACE consists of leaders of 7 clerkship directors' organizations nationally. Its mission is to foster collaboration across specialties to promote excellence in medical student clinical education.

REFERENCES

1. Bekelman JE, Li Y, Gross CP. Scope and impact of financial conflicts of interest in biomedical research. *JAMA*. 2003;289:454-465.
2. Blumenthal D. Doctors and drug companies. *N Engl J Med*. 2004;351:1885-1890.
3. Bodenheimer T. Uneasy alliance: clinical investigators and the pharmaceutical industry. *N Engl J Med*. 2000;342:1539-1543.
4. Studdert DM, Mello MM, Brennan TA. Financial conflicts of interest in physicians' relationships with the pharmaceutical industry—self-regulation in the shadow of federal prosecution. *N Engl J Med*. 2004;351:1891-1900.
5. Relman AS. Separating continuing medical education from pharmaceutical marketing. *JAMA*. 2001;285:2009-2012.
6. Brodkey AC. The role of industry in teaching psychopharmacology: a growing problem. *Acad Psychiatry*. 2005;29:222-229.
7. Pharmaceutical Research and Manufacturers of America. Appendix: detailed results from the annual survey. In: *Pharmaceutical Industry Profile, 2001*. Washington, DC: PhRMA; 2001:Table 18.
8. Accreditation Council for Continuing Medical Education. ACCME annual report data 2003. Available at: http://www.accme.org/dir_docs/doc_upload/97dd7a39-9746-4a5d-8c01-e56a9ffc0c8b_uploaddocument.pdf. Accessed August 7, 2005.
9. Bero LA, Rennie D. Influences on the quality of published drug studies. *Int J Technol Assess Health Care*. 1996;12:209-237.
10. Bowman MA. The impact of drug company funding on the content of continuing medical education. *Mobius (J Contin Educ Health Prof)*. 1986;6:66-69.
11. Cho MK, Bero LA. The quality of drug studies published in symposium proceedings. *Ann Intern Med*. 1996;124:485-489.
12. Spingarn RW, Berlin JA, Strom BL. When pharmaceutical manufacturers' employees present grand rounds, what do residents remember? *Acad Med*. 1996;71:86-88.
13. Ziegler MG, Lew P, Singer BC. The accuracy of drug information from pharmaceutical sales representatives. *JAMA*. 1995;273:1296-1298.
14. Stryer D, Bero LA. Characteristics of materials distributed by drug companies. *J Gen Intern Med*. 1996;11:575-583.
15. Schulman KA, Seils DM, Timbie JW, et al. A national survey of provisions in clinical trial agreements between medical schools and industry sponsors. *N Engl J Med*. 2002;347:1335-1341.
16. Villanueva P, Peiro S, Librero J, Pereiro I. Accuracy of pharmaceutical advertisements in medical journals. *Lancet*. 2003;361:27-32.
17. Prosser H, Almond S, Walley T. Influences on GPs' decisions to prescribe new drugs: the importance of who says what. *Fam Pract*. 2003;20:61-68.
18. Bowman MA, Pearle DL. Changes in drug prescribing patterns related to commercial company funding of continuing medical education. *J Contin Educ Health Prof*. 1988;8:13-20.
19. Chren MM, Landefeld S. Physicians' behavior and their interactions with drug companies: a controlled study of physicians who requested additions to a hospital drug formulary. *JAMA*. 1994;271:684-689.
20. Orlowski JP, Wateska L. The effects of pharmaceutical firm enticements on physicians' prescribing patterns: there's no such thing as a free lunch. *Chest*. 1992;102:270-273.
21. Avorn J, Chen M, Hartley R. Scientific versus commercial sources of influence on the prescribing behavior of physicians. *Am J Med*. 1982;73:4-8.
22. Siegel D, Lopez J. Trends in antihypertensive drug use in the United States: do the JNC V recommendations affect prescribing? *JAMA*. 1997;278:1745-1748.
23. Schneeweiss S, Glynn RJ, Avorn J, Solomon DH. A Medicare data base review found that physician preferences increasingly outweighed patient characteristics as determinants of first-time prescriptions for COX-2 inhibitors. *J Clin Epidemiol*. 2005;58:98-102.
24. Chew LD, O'Young TS, Hazlet TK, Bradley KA, Maynard C, Lessler DS. A physician survey of the effect

of drug sample availability on physicians' behavior. *J Gen Intern Med*. 2000;15:478-483.
25. Mintzes B, Barer ML, Kravitz RL, et al. How does direct-to-consumer advertising (DTCA) affect prescribing? a survey in primary care environments with and without legal DTCA. *CMAJ*. 2003;169:405-412.
26. Wazana A. Physicians and the pharmaceutical industry: is a gift ever just a gift? *JAMA*. 2000;283:373-380.
27. Haayer F. Rational prescribing and sources of information. *Soc Sci Med*. 1982;16:2017-2023.
28. Caudill TS, Johnson MS, Rich EC, McKinney WP. Physicians, pharmaceutical sales representatives and the cost of prescribing. *Arch Fam Med*. 1996;5:201-206.
29. Bower AD, Burkett GL. Family physicians and generic drugs. *J Fam Pract*. 1987;24:612-616.
30. Choudhry NK, Stelfox HT, Detsky AS. Relationships between authors of clinical practice guidelines and the pharmaceutical industry. *JAMA*. 2002;287:612-617.
31. Banks JW III, Mainous AG III. Attitudes of medical school faculty toward gifts from the pharmaceutical industry. *Acad Med*. 1992;67:610-612.
32. Hodges B. Interactions with the pharmaceutical industry: experiences and attitudes of psychiatry residents, interns and clerks. *CMAJ*. 1995;153:553-559.
33. Reeder M, Dougherty J, White LJ. Pharmaceutical representatives and emergency medicine residents: a national survey. *Ann Emerg Med*. 1993;22:1593-1596.
34. McKinney WP, Schiedermayer DL, Lurie N, Simpson DE, Goodman JL, Rich EC. Attitudes of internal medicine faculty and residents toward professional interaction with pharmaceutical sales representatives. *JAMA*. 1990;264:1693-1697.
35. 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.
36. American Medical Association. Opinion of the Council on Ethical and Judicial Affairs E-8.061: gifts to physicians from industry. Available at: http://www.ama-assn.org/ama/pub/category/4001.html. Accessed October 7, 2004.
37. American Medical Student Association. Principles regarding pharmaceuticals and medical devices. Available at: www.amsa.org/hp/pharmpolicy.cfm. Accessed June 15, 2005.
38. Keim SM, Sanders AB, Witzke DB, Dyne P, Fulginiti JW. Beliefs and practices of emergency medicine faculty and residents regarding professional interactions with the biomedical industry. *Ann Emerg Med*. 1993;10:1576-1581.
39. Brotzman GL, Mark DH. The effect on resident attitudes of regulatory policies regarding pharmaceutical representative activities. *J Gen Intern Med*. 1993;8:130-134.
40. McCormick BB, Tomlinson G, Brill-Edwards P, Detsky AS. Effect of restricting contact between pharmaceutical company representatives and internal medicine residents on post-training attitudes and behavior. *JAMA*. 2001;286:1994-1999.
41. Bellin M, McCarthy S, Drevlow L, Pierach C. Medical students' exposure to pharmaceutical industry marketing: a survey at one U.S. medical school. *Acad Med*. 2004;79:1041-1045.
42. Wilkes MS, Hoffman JR. An innovative approach to educating medical students about pharmacological promotion. *Acad Med*. 2001;76:1271-1277.
43. Sandberg WS, Carlos R, Sandberg EH, Roizen MF. The effect of educational gifts from pharmaceutical firms on medical students' recall of company names or products. *Acad Med*. 1997;72:916-918.
44. Monaghan MS, Galt KA, Turner PD, Houghton BL, Rich EC, Markert RJ, Bergman-Evans B. Student understanding of the relationship between the health professions and the pharmaceutical industry. *Teach Learn Med*. 2003;15:14-20.
45. National Institutes of Health. NIH awards to medical schools by rank, fiscal year 2003. Available at: http://grants1.nih.gov/grants/award/rank/medttl03.htm. Accessed August 7, 2005.
46. National Institutes of Health. NIH awards to medical schools by rank, fiscal year 2004. Available at: http://grants.nih.gov/grants/award/trends/rnk04all1to500.htm. Accessed August 7, 2005.
47. Medical schools in the United States: appendix IA. *JAMA*. 2003;290:1223-1231.
48. Vinson DC, McCandless B, Mosokawa MC. Medical students' attitudes toward pharmaceutical marketing: possibilities for change. *Fam Med*. 1993;25:31-33.
49. Hafferty FW, Franks R. The hidden curriculum, ethics teaching, and the future of medical education. *Acad Med*. 1994;69:861-871.

