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Conflict of Interest and Funding Disclosure Policies of Environmental, Occupational, and Public Health Journals

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Abstract

Objective—To analyze conflict of interest and funding disclosure policies of 224 journals listed in Journal Citation Reports as focusing on environmental, occupational, or public health research.

Method—Survey of journal policies and content analysis.

Results—96.0% of the policies required COI disclosure, 92.4% required funding disclosure, 75.9% defined COIs, 69.6% provided examples of COIs, 68.8% addressed non-financial COIs, 33.9% applied to editors and reviewers, 32.1% required discussion of the role of the funding source, and 1.8% included enforcement mechanisms. Policies were significantly associated with journal impact factor and publisher.

Conclusion—Although a high percentage of journals in our sample have COI policies that provide substantial guidance to authors, there is room for improvement. Journals which have not done so should consider developing enforcement mechanisms and applying COI policies to editors and reviewers.

Introduction

Since the mid-1980s, government agencies, academic institutions, professional associations, and scientific journals have taken steps to address growing concerns about the impact of conflicts of interest (COIs) on the objectivity and trustworthiness of biomedical research.[1,2] Some examples of COIs include receipt of funding by a sponsor with a financial interest in the outcome of study, employment by a study sponsor, paid consulting arrangements with research sponsors, ownership of stock related to one's research, and intellectual property rights. COIs may also encompass non-financial interests, such as personal or professional relationships with the authors of a proposed study one is reviewing for a journal or funding

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agency.[3] Although COIs do not invalidate research, they create a potential for bias or the perception of bias. A scientist with a significant financial COI, for example, might make decisions related to study design, data analysis, or data interpretation which tend to skew the research in a direction favorable to his or her interests. Similarly, research sponsors might manipulate study designs or suppress data in order to promote their corporate interests. Biases need not be intentional and may operate at a subconscious level. An investigator with a COI may not even be aware that he or she is making choices that tend to slant the outcomes a study in a particular direction.[1,4]

Numerous studies have demonstrated a relationship between sources of funding or financial interests and research outcomes. For example, Friedberg and coauthors found that articles on new cancer drugs with pharmaceutical industry funding were 1.5 times more likely to report positive findings than those without industry funding.[5] Ridker and Torres found that articles on cardiovascular drugs with industry funding were 1.6 times more likely to report positive results than those without industry funding.[6] Friedman and Richter found that articles published in two top medical journals in 2001 in which an author disclosed a financial COI were 2.3 times more likely to report positive results than articles without any such disclosures.[7] Systematic reviews of articles that examine funding bias in biomedical research funding have found a strong relationship between industry sponsorship of research and outcomes favorable to the sponsor.[8–11]

Scientific journals, agencies, academic institutions, and professional associations have responded to concerns about COIs by developing policies which require disclosure and management of financial and other interests related to research.[3,12] For example, the Department of Health and Human Services (DHHS), which funds research supported by National Institutes of Health (NIH), requires that investigators who are applying for extramural funding disclose financial interests worth $5000 or more related to their work to their institutions, which are obligated to report them to the DHHS. The DHHS requires institutions to develop and implement COI disclosure and management policies as a condition of receiving funding.[13] The International Committee of Journal of Medical Editors[14] and Committee on Publication Ethics[15] have drafted COI disclosure and management guidelines which many journals follow.

An important difference between government and institutional policies and journal policies is that journals have a limited ability to enforce their policies. While journals may require authors to retract or correct articles in which authors have failed to disclose COIs, they usually lack the authority to impose significant penalties of policy violators. Government agencies and academic institutions have the authority to impose significant penalties, such as restricting funding or reprimanding employees. Also, journals may lack the resources to investigate the accuracy of COI disclosures and must trust authors to comply with their policies.

Though most of the discussion of COIs has focused on research on drugs, devices, or other medical products, in recent years there has been a growing awareness of the potential impact of COIs on environmental, occupational, and public health research. Articles have examined financial COIs and sources of funding in research on the safety of industrial chemicals,[16,17]

pesticides,[18] genetically modified foods,[19] sugar-sweetened beverages,[20] endocrine-disrupting compounds,[4,21] and electronic cigarettes.[22] Friedman and Friedman recently conducted a study of 373 articles published in 17 highly-cited environmental or occupational health journals in 2012. They found that studies disclosing a financial COI were 4.3 times more likely to report negative findings concerning health risks of industrial or commercial products than studies with no COI disclosure.[23]

Given the growing concerns about the impact of COIs and sources of funding in environmental, occupational, and public health research, it is important to better understand how journals are responding to these issues. Although a handful of articles have examined COI policies of biomedical journals,[12,24–27]only one article[28] has described the policies of journals that focus on environmental, occupational, or public health research. Krimsky and Sweet analyzed the COI policies of 47 toxicology journals and compared them to 180 medical journals. They found that 87% of toxicology journals and 84% of medical journals had COI policies. However, only 15% of toxicology journals specified the content of required COI disclosures, as compared to 28% of medical journals.[28]

While the study by Krimsky and Sweet makes an important contribution to our understanding of the COI policies of toxicology journals, their research does not encompass a wide range of environmental, occupational or public health journals. The purpose of our study was to build upon Krimsky and Sweet's analysis and examine the COI and funding disclosure policies of environmental, occupational, and public health journals. Our specific aims were to: 1) collect information on the COI and funding disclosure policies of English language journals listed in Journal Citation Reports as publishing research in toxicology or public, environmental, or occupational health; 2) analyze the content of these policies; 3) determine whether variables related to policy content are associated with the journal's impact factor and publisher.

Methods

We included English language journals listed in Journal Citation Reports (JCR), 2014 Science Edition as publishing research in toxicology or public, environmental, or occupational health in our study. JCR is widely recognized as an authoritative database of highly-cited, peer-reviewed journals. 227 journals met our inclusion criteria. To obtain policy information, we searched the journal's instructions for authors and editorial policy sections or links to publisher or organizational policies, COI forms, or online submission tools. If we could not find policy information using this method, we contacted the editors to ask them for it. We acquired the policies from May 11 to May 28, 2016. We obtained information on Journal Impact Factor and publisher from JCR or the journal's website.

We developed a coding system for categorizing the policies based on categories used in previously published studies of journal COI and funding disclosure policies and an initial review of the text we examined. Two of us, DBR and BK, independently coded the policies and resolved disagreements for the final coding by reexamining the text and comparing it to the coding categories. Policies were coded based on answers to the following yes or no questions:

1. Does the journal require disclosure of sources of funding?
2. Does the journal require disclosure of COIs?
3. Does the policy explicitly or implicitly define COI?
4. Does the policy provide examples of specific types of required disclosures, such as consulting arrangements, honoraria, board membership, stock, or intellectual property?
5. Does the policy require editors and reviewers to disclose COIs?
6. Does the policy require disclosure of the role of the funding source in study design, data analysis, data interpretation, or manuscript drafting?
7. Does the policy specifically address non-financial (e.g. personal or professional) COIs?
8. Does the policy prohibit publication of articles supported by some types of funding, e.g. tobacco industry?
9. Does the policy prohibit conflicted authors from publishing editorials?
10. Does the policy have an enforcement procedure, such as a punishment or other response (e.g. correction or retraction) for failure to disclose a COI or funding source?
11. Does the policy mention ICMJE guidelines?
12. Does the policy mention COPE guidelines?

The initial independent coding of policies by the two raters was assessed for agreement using kappa statistics.[29] Disagreements between the two raters were resolved prior to further analysis of the data. Frequencies and percentages were used to summarize the policy responses. Mean median, minimum, maximum, standard error and interquartile range (IQR) were used to summarize the impact factor scores.

To investigate associations between impact factor and each policy category, Mann-Whitney tests were used to compare impact factor scores between the ‘yes’ responses and the ‘no’ responses. Journals were grouped according to publisher, where six publishers held 10 or more journals and a seventh group was formed by combining all other journals. Extended Fisher’s exact tests[30] were used to investigate whether there were policy differences among these publishers. Analyses were conducted with SAS 9.3 (Cary, NC). All p-values were two-sided and considered statistically significant if less than 0.05. We decided to examine potential associations between impact factor and publisher and the policy categories between previous studies have shown that these two variables are associated with journal policy development.[31,32]

Results

We obtained policies from 224 out of 227 journals (98.7%). 221/227 journal policies were available online (97.4%). 3/6 editors (50%) responded to our requests for policies that were

not online. The mean impact factor of the journals was 2.43 (standard error, 0.13; range, 0.10 to 18.36; median, 2.03; IQR, 1.71). One journal, *Annals of Global Health*, had no listing for impact factor. The publishers with 10 or more journals were Elsevier (19.2%), Taylor & Francis (13.8%), Wiley-Blackwell (10.3%), Springer (7.1%), Oxford University Press (6.7%), and Biomed Central (4.5%). Publishers with less than 10 journals accounted for 38.4% of the total. 98.7% of journal policies that we obtained were available online. A data spreadsheet, including the names of journals in this study, is available upon request.

Inter-rater agreement for the initial coding of the policies was high. Percent agreement for the different categories ranged from 84.8% to 100%. In 11 out of 13 categories percent agreement was 94% or greater. Kappa statistics ranged from 0.40 to 1.00. Kappa statistics for 11 out of 13 categories were 0.66 or greater, and 12 out of 13 p-values for kappa statistics were less than 0.001. The two categories having kappa statistics less than 0.66 were Funding (kappa = 0.41) and Enforcement (kappa = 0.40). Complete inter-rater agreement data are available upon request.

96.0% of the policies required disclosure of COIs, 92.4% required disclosure of funding sources, 75.9% defined COIs, 69.6% provided examples of COIs, 68.8% addressed non-financial COIs, 33.9% applied to editors and reviewers, 33.5% mentioned ICMJE guidelines, 32.1% required discussion of the role of the funding source, 14.7% mentioned COPE guidelines, 1.8% included enforcement mechanisms, 0.9% prohibited specific sources of funding, and 0.4% prohibited editorials by conflicted authors (all tobacco industry) (See Table 1).

Journal impact factor was significantly higher in journals having the following specific policies compared to those without these policies: requiring disclosure of funding (Mann-Whitney p-value <0.001), providing examples of COIs ($p < 0.001$), discussing the role of the funding source ($p < 0.001$), enforcement mechanisms ($p < 0.001$), mentioning ICMJE ($p < 0.001$), defining COI ($p = 0.001$), discussing non-financial COIs ($p = 0.002$), applying to editors/reviewers ($p = 0.002$), and mentioning COPE ($p = 0.006$). Other associations between impact factor and policy categories were not statistically significant (See Table 2).

We found statistically significant differences among publishers with regard to some policy categories. For example, 100% of Biomed Central and Oxford University Press journal policies defined COI, as compared to 97.7% for Elsevier, 77.4% for Taylor & Francis, 75.0% for Springer, 30.4% for Wiley-Blackwell, and 69.8% for other journals (Fisher's exact test p-value <0.001). 100% of Biomed Central journal policies provided examples of COIs, as compared to 97.7% for Elsevier, 77.4% for Taylor and Francis, 73.3% for Oxford University Press, 68.8% for Springer, 39.1% for Wiley-Blackwell, and 57.0% for other journals ($p < 0.001$). 100% of Biomed Central journal policies applied to editors and reviewers, as compared to 79.1% for Elsevier, 17.4% for Wiley-Blackwell, 13.3% for Oxford University Press, 6.4% for Taylor & Francis, 0.0% for Springer, and 27.9% for other journals ($p<0.001$). 100% of Biomed Central and Oxford University Press journal policies discussed non-financial COIs, as compared to 95.4% for Elsevier, 77.4% for Taylor & Francis, 75.0% for Springer, 30.4% for Wiley-Blackwell, and 52.3% for other journals ($p<0.001$). It is worth noting that journals included in the "other category" for publisher

tended to laxer with respect to policy development than those from the top six publishers. For example, 18.6% of the journals in the other category did not require disclosure of funding, whereas all of the journals from the six major publishers (with the exception of Taylor and Francis) required funding disclosure. (See Table 3 for other associations between publisher and policy categories).

Discussion

Our most significant finding is that a high percentage of environmental, occupational, and public health journals in our sample have COI policies that provide substantial guidance to authors. The percentage of journals requiring COI disclosure (96%) is somewhat higher than the percentages reported by Krimsky and Sweets[28] for toxicology (87%) and medical (84%) journals and similar to the percentage reported by Cooper[25] and coauthors for medical journals (93%). A high percentage of journals (92.4%) require disclosure of funding sources, define COIs (75.9%), provide examples of COIs (69.6%), and address non-financial COIs (68.8%). All of this speaks well of environmental, occupational, and public health journals: most of them appear to be taking effective steps to deal with COI transparency.

There are some areas for potential improvement, however. Only 1.8% of journal policies in our sample include enforcement mechanisms. Enforcement of COI policies is important to promote the integrity and trustworthiness of research. If readers discover, following publication, that an author had a significant undisclosed COI, they may question the objectivity of the research and feel that they have been deceived.[2–4] *Environmental Health Perspectives* has a robust COI disclosure enforcement policy:

> EHP [Environmental Health Perspectives] relies on the integrity of all authors to provide accurate disclosure statements. However, authors can expect scrutiny of their statements by the editors, reviewers, and readership. Alleged inaccuracies of declared competing interests should be addressed to the Editor-in-Chief. EHP will impose a 3-year ban on publication in EHP by any authors found to have willfully failed to disclose a competing financial interest. A paper may also be retracted or an Expression of Concern published and appended to the article.[33]

While many journals may not have the resources to verify the accuracy of authors' COI disclosures, journals should be able to publish a correction, retraction, or expression of concern, whichever is appropriate, when they discover, through their own investigation or by receiving information from a reader, that an author has an undisclosed COI.

Only about a third (33.9%) of journals in our sample have COI policies that apply to editors and reviewers. One might argue that editors and reviewers should also disclose COIs, since financial or other interests may bias the peer review process in favor or against an article.[34] However, the percentage we found in our sample may underestimate the proportion of journals that require editors and reviewers to disclose COIs, since some journals may not describe these policies on their websites and may only implement them when someone is assigned to review an article or manage the editorial process. Since we were not able to search for policies by browsing websites in the role of reviewer or editor, we may have missed some policies or editorial practices which are not governed by written guidelines.

Another significant finding is that journals with higher impact factors in our sample tended to have more comprehensive COI policies than journals with lower impact factors. Journal impact factor was positively associated with several policy categories, including requiring disclosure of funding, providing examples of COIs, discussing the role of the funding source, defining COI, enforcement mechanisms, discussing non-financial COIs, and applying the policy to editors and reviewers. A possible explanation for these associations is that journals with higher impact factors may review more research involving COIs, and therefore have a greater need to develop comprehensive COI policies than journals with lower impact factors. Also, higher impact factor journals may receive greater scrutiny from scientists and the public than lower impact factor journals and therefore may have a greater need to develop comprehensive COI policies to ensure readers than the research meets ethical standards. However, these explanations are speculative, and more research is needed on the factors that influence journal COI policy development.

We also found significant differences among journal publishers with respect to COI development. All of the Biomed Central journals had policies that require disclosure of funding and COIs, define and give examples of COIs, discuss non-financial COIs, and apply to editors and reviewers. A high percentage of Elsevier journals also had policies that included all five of these requirements. Journals that were not from the top six publishers tended to have policies that included fewer of these requirements. A possible explanation for associations between publishers and policy development is that publishers may be requiring journals to adopt their standard COI policy. Many of the journal websites referred us to the publisher's COIs policies or disclosure forms. Publishers may be exerting some influence over journals in order to promote the integrity and trustworthiness of the research they publish. Publishers may have an economic motive for promoting integrity and trustworthiness, since individuals and institutions may decide not to subscribe to journals with a reputation for publishing unreliable or unethical research. Of course, this possible explanation is also speculative, and more research is needed on publishers' role in journal policy development.

It is also worth noting that ICMJE and COPE may be exerting some influence over journal COI policy development. About one third of journal policies mentioned ICMJE guidelines and nearly one sixth mentioned COPE guidelines. ICMJE and COPE have played an important role in promoting integrity in many different issues in scientific publishing, including authorship, data fabrication/falsification, plagiarism, retractions, peer review, and compliance with regulations pertaining to research with humans or animals. A previous study found that COPE has had a significant impact on the development of journal retractions policies.[35] ICMJE and COPE are likely to continue to provide useful guidance for journals, scientists, and publishers.

Finally, we should mention that our study has a few limitations. First, the generalizability of our results is limited by our sample size (224). With a larger sample, we might have observed trends and associations that we did not detect in this sample. Second, our sample is potentially biased because we drew our journals from the JCR, which may not include many lower-tier, open access and specialty journals. However, we believe that our results are still significant because the JCR includes most of the top journals in the disciplines we studied.

Third, we obtained most of our data from journal websites and it is conceivable that some journals have policies which they do not post on their websites. We do not view this is a significant limitation, given the role of the internet in scientific publishing. Most editors and publishers are aware of the importance of having a presence on the worldwide web and making information available to scientists browsing the internet. They are therefore likely to post their policies on their webpages or provide authors with access to their policies when they submit articles electronically.

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Table 1

Conflict of Interest and Funding Disclosure Policies of Environmental, Occupational, and Public Health Journals (n = 224)

Item	Response	Frequency	Percent
Requires Funding Disclosure	Yes	207	92.4
	No	17	7.6
Requires COI Disclosure	Yes	215	96.0
	No	9	4.0
COI Definition	Yes	170	75.9
	No	54	24.1
COI Examples	Yes	156	69.6
	No	68	30.4
Applies to Editors/Reviewers	Yes	76	33.9
	No	148	66.1
Role of Funding Source	Yes	72	32.1
	No	152	67.9
Non-Financial COI	Yes	154	68.8
	No	70	31.2
Prohibits Conflicted Funding Source	Yes	2	0.9
	No	222	99.1
Prohibits Editorial from Conflicted Author	Yes	1	0.4
	No	223	99.6
Enforcement Mechanisms	Yes	4	1.8
	No	220	98.2
Mentions ICMJE	Yes	75	33.5
	No	149	66.5
Mentions COPE	Yes	33	14.7
	No	191	85.3

Table 2

Associations between Journal Impact Factor and Conflict of Interest Policy Categories

Item	Response	N	Median IF*	IQR**	P-value***
Requires Funding Disclosure	Yes	206	2.10	1.79	<0.001
	No	17	1.30	1.10	
Requires COI Disclosure	Yes	214	2.04	1.71	0.939
	No	9	1.90	1.30	
COI Definition	Yes	170	2.20	1.74	0.001
	No	53	1.46	1.39	
COI Examples	Yes	156	2.26	1.64	<0.001
	No	67	1.38	1.62	
Applies to Editors/Reviewers	Yes	76	2.38	1.52	0.002
	No	147	1.80	1.55	
Role of Funding Source	Yes	72	2.45	1.54	<0.001
	No	151	1.80	1.54	
Non-Financial COI	Yes	154	2.20	1.66	0.002
	No	69	1.48	1.47	
Prohibits Conflicted Funding Source	Yes	2	3.96	3.95	0.326
	No	221	2.03	1.67	
Prohibits Editorial from Conflicted Author	Yes	1	4.53	–	***
	No	222	2.03	1.67	
Enforcement Mechanisms	Yes	4	6.96	4.40	<0.001
	No	219	2.01	1.62	
Mentions ICMJE	Yes	75	2.49	1.46	<0.001
	No	148	1.76	1.56	
Mentions COPE	Yes	33	2.71	1.41	0.006
	No	190	1.89	1.63	

*Median Journal Impact Factor

**Interquartile range (IQR)

***Mann-Whitney P-value

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**** Statistic cannot be calculated when n = 1

Table 3

Associations between Publisher and Policy Categories

		Percent*							
Item	**Response**	**Biomed**	**Elsevier**	**Oxford**	**Springer**	**T & F**	**Wiley**	**Other**	**P-value****
Funding Discl.	Yes	100	100	100	100	96.8	100	81.4	<0.001
	No	0	0	0	0	3.2	0	18.6	
COI Discl.	Yes	100	100	100	87.5	96.8	91.3	95.4	0.270
	No	0	0	0	12.5	3.2	8.7	4.6	
COI Def.	Yes	100	97.7	100	75	77.4	30.4	69.8	<0.001
	No	0	2.3	0	25	22.6	69.6	30.2	
COI Examples	Yes	100	97.7	73.3	68.8	77.4	39.1	57	<0.001
	No	0	23.3	26.7	31.2	22.6	60.9	43	
Editors/Reviewers	Yes	100	79.1	13.3	0	6.4	17.4	27.9	<0.001
	No	0	20.9	86.7	100	93.6	82.6	72.1	
Role of Funding	Yes	0	95.4	20	0	6.4	17.4	25.6	<0.001
	No	100	4.6	80	100	93.6	82.6	74.4	
Non-Fin. COI	Yes	100	95.4	100	75	77.4	30.4	52.3	<0.001
	No	0	4.6	0	25	22.6	69.6	47.7	
Conflicted Source	Yes	0	0	0	0	0	4.4	1.2	***
	No	100	100	100	100	100	95.6	98.8	
Conflicted Edit.	Yes	0	2.3	0	0	0	0	0	***
	No	100	97.7	100	100	100	100	100	
Enforcement	Yes	0	2.3	6.7	0	0	0	2.3	0.705
	No	100	97.7	93.3	100	100	100	97.7	
ICMJE	Yes	0	93	13.3	0	6.4	17.4	31.4	<0.001
	No	100	7	86.7	100	93.6	82.6	68.6	
COPE	Yes	0	58.1	6.7	0	0	13	4.6	<0.001
	No	100	41.9	93.3	100	100	87	95.4	

*Biomed Central n = 10; Elsevier n = 43; Oxford n = 15; Springer n = 16; Taylor and Francis n = 31; Wiley-Blackwell n = 23; Other n = 86

**Fisher's exact test P-value

*** Too few affirmative responses to calculate statistic