



Muddy waters: Variability in the reporting of conflicts of interest in the biomedical literature

Journal:	<i>BMJ</i>
Manuscript ID	BMJ-2019-049989.R1
Article Type:	Analysis
BMJ Journal:	BMJ
Date Submitted by the Author:	28-Jun-2019
Complete List of Authors:	Grundy, Quinn; University of Toronto, Faculty of Nursing; University of Sydney, School of Pharmacy Dunn, Adam; Macquarie University, Australian Institute of Health Innovation; Boston Childrens Hospital, Computational Health Informatics Program Bero, Lisa; University of Sydney, School of Pharmacy
Keywords:	conflict of interest, disclosure, biomedical research, reporting standards

SCHOLARONE™
Manuscripts

1
2
3 **Muddy waters: Variability in the reporting of conflicts of interest in the biomedical**
4
5 **literature**
6

7
8 Quinn Grundy, Assistant Professor and Honorary Senior Lecturer*^{1,2}, Adam Dunn, Associate
9
10 Professor^{3,4}, Lisa Bero, Professor²
11

- 12 1. University of Toronto, Faculty of Nursing, Toronto, Ontario, Canada
13 2. The University of Sydney, Charles Perkins Centre, School of Pharmacy, Sydney, New South
14 Wales, Australia
15 3. Macquarie University, Centre for Health Informatics, Australian Institute of Health
16 Innovation, Sydney, New South Wales, Australia
17 4. Boston Children's Hospital, Computational Health Informatics Program, Boston, MA, United
18 States
19
20

21 *Corresponding author:
22

23
24 ORCID: 0000-0002-7640-8614
25

26 Address: Suite 130, 155 College St, Faculty of Nursing, University of Toronto, Toronto,
27
28 ON, Canada, M5T 1P8
29

30 Email: quinn.grundy@utoronto.ca
31

32
33 Telephone: +1-416-978-2852
34

35
36 Twitter: @QuinnGrundy
37

38 **Word count: 1999**
39

40 **Tables: 1**
41

42 **Boxes: 3**
43

44 **Funding acknowledgment:** This study was funded in part by the National Health and Medical
45 Research Council (Grant #APP1139997). QG was supported by a Postdoctoral Fellowship from
46
47 the Canadian Institutes of Health Research. The funders had no role in the design, conduct,
48
49 analysis, interpretation of the study, or the decision to publish.
50
51
52
53
54
55
56
57
58
59
60

1
2
3 **Competing interests:** All authors have completed the ICMJE uniform disclosure form at
4 http://www.icmje.org/coi_disclosure.pdf and declare: support from the Canadian Institutes of
5 Health Research and National Health and Medical Research Council; no financial relationships
6 with any organisations that might have an interest in the submitted work in the previous three
7 years, and no other relationships or activities that could appear to have influenced the submitted
8 work.
9

10
11
12
13
14
15
16
17 **Standfirst**

18
19 *Enforced, structured reporting and processes to assess relevance are required to make conflict of interest*
20 *disclosures purposeful.*
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 Conflict of interest disclosures act as a signal for risk of bias in the design, conduct, and
4 reporting of biomedical research. Researchers have explored the relationship between author
5 financial conflict of interest and bias in research results and interpretation across a variety of
6 fields; some have found a positive association(1-4) and others, no association.(5-7) Knowledge
7 of conflicts of interest is thus necessary for understanding the potential for bias.
8
9

10
11
12 Ten years ago, and reiterated since,(8, 9) the Institute of Medicine recommended
13 standardising and harmonising conflict of interest reporting practices.(10) The International
14 Committee of Medical Journal Editors (ICMJE) and Committee on Publication Ethics (COPE)
15 recommend that journal editors require published statements declaring authors' conflicts of
16 interest.(11, 12) Despite these policy developments, non-disclosure and other reporting failures
17 persist. For example, the Chief Medical Officer of Memorial Sloan Kettering, Dr José Baselga,
18 recently resigned after revelations that he failed to disclose millions of dollars in compensation
19 from pharmaceutical and biotech companies in more than 100 publications since 2013 and in
20 87% of articles that he authored in 2017.(13)
21
22
23
24
25
26
27
28
29
30
31
32
33
34

35 Data is lacking on the extent, nature, and impact of conflicts of interest due to the self-
36 reported nature of disclosure and variations in reporting practices.(14) We analysed 1002
37 randomly sampled biomedical articles and found that authors of 23% disclosed a conflict of
38 interest, 64% disclosed no conflicts, and 14% did not include a disclosure statement.(15)
39
40 Arriving at these prevalence estimates was challenging because disclosure practices in journals
41 that claim to follow ICMJE recommendations can be inconsistent, incomplete, and often hard to
42 access. When we could locate disclosure statements, the variability in terminology and lack of
43 detail made it difficult to interpret their meaning or relevance. Thus, current disclosure practices
44 remain muddy waters.
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

1
2
3 The result is that the policy conversation is focused on addressing the shortcomings of the
4 disclosure system rather than on how to manage relationships that threaten research integrity.
5

6
7 True transparency involves more than just making conflict of interest disclosures available; they
8 need to also be accessible, accurate, complete, and detailed. Enforced, structured reporting and
9
10 processes to assess relevance are required to make disclosures purposeful.
11
12

13 14 **The problem of accessibility: 94 pages of supplementary PDFs**

15
16 From a public perspective, a key challenge associated with conflict of interest disclosures
17 is locating them. For most articles, statements are in the online version and in the portable
18 document format (PDF) version of articles. For others, statements are only available online (not
19 in the PDF), available as supplementary files online, on separate webpages, or are unavailable
20 because links to disclosure statements are broken or missing entirely. Some journals provide
21 links to a PDF of the authors' uploaded ICMJE form in lieu of providing complete summaries or
22 sometimes any disclosures in the article. The longest supplementary PDF we found totalled 94
23 pages (for 31 authors).(16) Occasionally, articles have more than one conflict of interest
24 disclosure statement published in different locations and these statements may contain discrepant
25 information.(17, 18)
26
27
28
29
30
31
32
33
34
35
36
37
38
39

40 From a research perspective, we need to be able to access accurate disclosures across the
41 entire body of literature in order to analyse how conflicts of interest affect research integrity.(9)
42 Conflict of interest statements are identified by diverse and often synonymous headings or
43 keywords (Box 1), making it challenging to automatically extract this information, even from
44 well-structured web pages. Since March 2017, some publishers have included conflicts of
45 interest in the metadata used by PubMed,(19) which suggests a way to improve accessibility by
46 centralising where disclosures are recorded.
47
48
49
50
51
52
53
54
55
56
57
58
59
60

Box 1. Headings and keywords used to indicate conflict of interest statements

acknowledgments	declaration of interest	financial interest
COI	disclosures	potential conflict of interest
commercial relationships	disclosure statement	proprietary or commercial interest
competing interest	duality of interest	receipt of benefits
competing conflict of interest	financial conflict of interest	sources of funding
conflict of interest		

Conflict of interest statements are frequently conflated with statements about the funding of the research presented in the article, making it difficult to separately assess individual authors' conflicts of interest and study sponsorship. We argue that these disclosures should be reported and considered separately as there is some evidence to suggest that funding source and author conflict of interest may be independently associated with risk of bias,(1, 20) though the likelihood of confounding is high.(21)

The problem of semantics: 130 ways to say “no conflicts of interest”

In the event that conflict of interest disclosures can be located, the substantial variability in the language authors use to make disclosures makes it difficult to interpret the meaning. We identified 130 unique ways of stating “no conflicts of interest” across the 637 articles whose authors declared no conflict of interest,(15) ranging from 1-word (“nil” or “none”) to a 62-word statement:

The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties. No writing assistance was utilized in the production of this manuscript.

Some of the variants change the meaning of the statement suggesting that conflicts of interest might still exist but are not disclosed (Table 1).

Table 1. Categories of statements indicating there was no conflict of interest (n=637 statements; 130 unique statements)

Category	Examples
Vague “no”	Nil; None; Commercial relationships: none
None exist	There are no conflicts of interest; No author has a conflict of interest; No conflicts of interest exist for either of the authors of this manuscript; No direct or indirect commercial incentive associated with publishing this article; The authors declare they have no conflicts of interest
None declared	None declared; Nothing to disclose; None of the authors has any conflict of interest to disclose; No potential conflicts of interest were disclosed; There were no conflicts of interest to report
No relevant conflicts	No relevant disclosures; The authors have no relevant financial relationships to disclose; The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript this includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending or royalties, no writing assistance was utilized in the production of this manuscript
None in this work	No conflict of interest exists in this paper; We have no conflict of interest related to this work; The authors certify that they have no commercial or associative interest that represents a conflict of interest in connection with the manuscript
No perceived conflicts	The authors declare no relation that could be perceived as conflict of interest; The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported
None to our knowledge	To the best of our knowledge no conflict of interest exists

To strengthen transparency while minimising burden on authors and editors, the biomedical research community should develop a public, comprehensive, structured, author-centric database of financial interests.(9, 10, 22) The Institute of Medicine (IOM) proposed a detailed taxonomy for conflicts of interest,(22) which could serve as a structured, standardized,

1
2
3 digital template for disclosure, while providing adequate detail about the nature of the
4
5 relationship or interest.
6

7
8 Organisations such as ORCID may be well-placed to act as a repository for such
9
10 information given its international scope and strong uptake among biomedical journals; journals
11
12 could develop an interface to allow authors to automatically export relevant entries during
13
14 manuscript submission.(9) The Open Payments database, created through the United States
15
16 Physicians Payments Sunshine Act, is a notable model in achieving transparency, though it is
17
18 limited in terms of its national scope, and restriction to prescribing clinicians and certain
19
20 manufacturers. Due to the availability and accessibility of these detailed, accurate, structured
21
22 data, researchers have an unprecedented ability to understand the extent and the impact of
23
24 physicians' relationships with pharmaceutical and medical device companies.(23-25) The
25
26 success of the Open Payments database suggests that any sort of registry should be
27
28 conceptualised as infrastructure: publicly-funded and coupled with enforcement mechanisms.
29
30
31
32
33

34 **The problem of relevance: personal fees from 42 entities**

35
36 Compounding the problems of accessibility and semantics is the problem of relevance.
37
38 Current reporting practices rely on authors to judge relevance prior to disclosure, though journal
39
40 policies and procedures and editorial discretion may also influence what gets reported. For
41
42 example, the ICMJE form asks authors to “disclose interactions with any entity that could be
43
44 considered broadly relevant to the work.” However, authors sometimes seek to define relevance
45
46 in disclosure statements, using adjectives such as “potential,” “relevant,” and “financial” to
47
48 modify “conflict of interest” or contextualising statements by stating that disclosures pertained to
49
50 “this work,” or “this manuscript.” In some cases, authors disclose seemingly relevant financial
51
52 ties, but make statements refuting that the disclosed relationship constitutes a conflict of
53
54
55
56
57
58
59
60

1
2
3 interest.(18) For example, in an angiography clinical trial, under the heading “Sources of
4
5 Funding,” the authors reported receiving consulting and speakers fees and unrestricted grants
6
7 from multiple medical device manufacturers with products directly related to the study, but under
8
9 the heading “Disclosures” stated, “None.”(26)
10
11

12 In other cases, authors provide disclosures that include personal and professional
13
14 biographical information, misplaced funding information, or ambiguous descriptors that may
15
16 obscure clearer signals of risk of bias such as disclosures of financial relationships with industry.
17
18 For example, one article with 17 authors had a 706-word disclosure statement, which included
19
20 every type of conflict of interest defined by the ICMJE form amongst disclosure of receipt of
21
22 public funding and honoraria from not-for-profit organisations (e.g. public universities,
23
24 hospitals); one of the authors disclosed receipt of personal fees from 42 distinct entities outside
25
26 of the submitted work, which included 23 different pharmaceutical and medical device
27
28 companies.(27) Despite explicit instruction on the ICMJE form that “public funding sources . . .
29
30 need not be disclosed” if unrelated to the submitted work, authors sometimes disclose receipt of
31
32 past or unrelated research funding from public or not-for-profit sources. Similarly, authors
33
34 sometimes disclose their current employment as a conflict of interest, duplicating their
35
36 affiliation. Designations such as “unpaid consultancy” may mask the nature of the relationship
37
38 with industry and fail to make transparent other transfers of value such as paid travel.(28)
39
40
41
42
43

44 Journal editors, peer reviewers and readers must judge the relevance of disclosed
45
46 interests in relation to the work to evaluate whether a conflict of interest exists and poses a risk
47
48 of bias. While a public database could improve the accuracy and accessibility of conflict of
49
50 interest disclosure, it does not directly solve the problem of relevance. Conflicts of interest exist
51
52 in relation to a specific context – in this case, the published work. However, even when
53
54
55
56
57
58
59
60

relationships are disclosed, there is no way for a reader to evaluate the conflict because necessary contextual information is typically lacking. The result is that although the practice of conflict of interest disclosure is widespread, we struggle to make the disclosure purposeful.

The ICMJE recommends that authors report details on the funding source and the specific role of the sponsor in the design, conduct and publication of the research. There is not an equivalent requirement for author conflicts of interest.⁽¹¹⁾ For example, when an author discloses personal fees from multiple for-profit, not-for-profit, and public entities, there is rarely information about the scope or extent of the relationships, how the scientific work relates to a company's products, or the specific reason for the receipt of payment. Box 2 outlines what such a statement might look like.

Box 2. Sample conflict of interest disclosure statement outlining relevance

Conflict of interest: Dr Frog holds a leadership position in an advocacy organisation (“It isn’t easy being green” Foundation), and is a clinical specialist, deriving income from performing procedures related to skin slime and green-ness treatments. Dr Frog is engaged as a consultant (Croak, Inc.), expert witness (Miss Piggy Products), and receives research funding from companies (Sunstop, Croak, Inc.). The intervention tested in this study is made by Croak, Inc. and all of the companies mentioned above market products related to skin slime and green-ness treatments. Dr Frog holds a patent (licensed to True Green Pharma) unrelated to the current study.

[Link] to full disclosure statement.

*Content for sample disclosure taken from ICMJE sample disclosure form⁽²⁹⁾

Purposeful transparency: What should happen next

The variability in how conflicts of interest are reported likely relates to differences in standards imposed by journals rather than a consequence of author intentions. Currently, the onus is on authors to disclose, which makes a breach of this honour system all the more a significant violation of trust, and on editors to ensure the accuracy and integrity of the published

work.⁽³⁰⁾ Yet, journal editors are frequently without the information or resources needed to verify authors' conflicts of interest.⁽³⁰⁾ The ICMJE recently revised their policy to include purposeful non-disclosure of conflicts of interest as a form of scientific misconduct.⁽¹¹⁾

In the absence of a comprehensive registry, we propose recommendations to assist authors, editors and peer reviewers with identifying, evaluating, and reporting conflicts of interest, drawing from the work of the ICMJE,⁽¹¹⁾ IOM,⁽⁸⁾ and Open Payments implementation⁽³¹⁾ (Box 3). We propose that authors make comprehensive, structured disclosures to editors and peer reviewers and that these complete disclosures are made publicly available via a link placed in the article. Separately, authors should state which interests are relevant to the manuscript and why; this statement should be peer reviewed and adjudicated by editors (Box 3). There is a growing body of meta-research associating conflicts of interest with risks of bias; organisations such as COPE or the ICMJE might consider preparing evidence-based guidance to help authors, peer reviewers and editors make such judgements. A statement summarizing relevant conflicts of interest and the risk of bias should be visibly and succinctly included in all forms of the manuscript under the standard heading "conflicts of interest."

Box 3. Policy recommendations for identification, evaluation, and reporting of conflicts of interest

Recommendations	Current ICMJE recommendation?
Identification	
<ul style="list-style-type: none"> • Require authors to disclose interactions with any entity that could be considered broadly relevant to the work 	Yes
<ul style="list-style-type: none"> • Include dollar values for all financial relationships 	No
<ul style="list-style-type: none"> • Provide details on the nature of the relationship, for example <ul style="list-style-type: none"> - "Consulting for company X regarding drug Y" - "Fees for speaking on topic X to audience Y" 	Partial, "Comments" permitted

<ul style="list-style-type: none"> - “Unpaid consultant for company X regarding drug Y; company X reimbursed travel and meals for meetings on Z” - “Owner of private practice X, which derives clinical income from intervention Y” <p>• Develop processes to verify authors’ disclosures using existing registries, databases, and online searches</p>	No
Evaluation	
<p>• Require authors to indicate which interests are relevant to the submitted work and state how the interest may have influenced the design, conduct, or reporting of the work</p>	Partial; author judges relevance
<p>• Provide editors with full details of authors’ interests and have them evaluate whether a relevant conflict of interest exists</p>	No
<p>• Provide peer reviewers with full details of authors’ interests and require peer review of summary statement of relevance</p>	No
Reporting	
<p>• Publish separate statements of study support and author conflict of interest</p>	No
<p>• Provide hyperlinks to a complete summary of the authors’ conflicts of interest in all versions of the published article, which includes a statement of relevance</p>	Partial
<p>• Provide a policy on the journal website regarding the process of how conflicts of interest are assessed and whether and how they are managed (e.g. preventing individuals with certain interests from authoring certain types of articles)</p>	No
<p>• Consider novel ways to quickly and clearly communicate the presence of relevant conflicts of interest such as a traffic light labelling system</p>	No

Enforced and structured reporting of conflicts of interest would enable large-scale retrospective studies of the association between conflicts of interest and research methods, results and conclusions, making transparency purposeful. Future work should also consider randomised trials of novel structured reporting interventions to assess author, editor, peer

1
2
3 reviewer, and consumer usability and acceptability, and the effect on assessment of risk of bias
4
5 in published work.
6

7
8 Conflict of interest disclosures should help to evaluate risk of bias in biomedical research
9
10 but currently serve only to muddy the waters. Instead of providing an obvious and clear signal to
11
12 readers of biomedical research, current practices obfuscate the underlying relationships or flood
13
14 the signal with noise. To improve consistency, we need consensus around the definition of
15
16 conflict of interest and harmonisation of practices across journals. We recommend changes in
17
18 reporting practices to separate authors' conflicts of interest from funding statements, make
19
20 statements consistent and immediately visible on articles, and move to enforced, structured
21
22 reporting.
23
24
25

26 **Key messages**

- 27
28 • Disclosures of conflicts of interest in published biomedical articles are highly variable in
29
30 terms of location, format, wording, and content.
- 31
32 • Inconsistency creates problems related to the accessibility, semantics, and relevance of
33
34 disclosures making it difficult to assess their prevalence and impact on research design
35
36 and reporting.
37
38
- 39
40 • For conflict of interest disclosures to be meaningful, disclosures must be complete,
41
42 accurate, detailed, and visible.
43
44

45 **Contributors and sources**

46
47 The authors conduct qualitative and quantitative meta-research related to bias and conflicts of
48
49 interest in biomedical research. All authors designed the study and contributed to the planning,
50
51 writing, and editing of this paper. QG conducted the descriptive analyses of conflict of interest
52
53
54
55
56
57
58
59
60

1
2
3 reporting and is the guarantor. The corresponding author (QG) attests that all listed authors meet
4 authorship criteria and that no others meeting the criteria have been omitted.
5
6

7 **License**

8
9
10 QG has the right to grant on behalf of all authors and does grant on behalf of all authors, an
11 exclusive licence (or non exclusive for government employees) on a worldwide basis to the BMJ
12 Publishing Group Ltd ("BMJ"), and its Licensees to permit this article (if accepted) to be
13
14 published in The BMJ's editions and any other BMJ products and to exploit all subsidiary rights,
15
16 as set out in our licence.
17
18
19
20

21 **References**

- 22
23
24 1. Ahn R, Woodbridge A, Abraham A, Saba S, Korenstein D, Madden E, et al. Financial
25 ties of principal investigators and randomized controlled trial outcomes: cross sectional study.
26
27 BMJ. 2017;356.
28
29
30
31 2. Stelfox HT, Chua G, O'Rourke K, Detsky AS. Conflict of interest in the debate over
32 calcium-channel antagonists. N Eng J Med. 1998;338(2):101-6.
33
34
35
36 3. Wang AT, McCoy CP, Murad MH, Montori VM. Association between industry
37 affiliation and position on cardiovascular risk with rosiglitazone: cross sectional systematic
38 review. BMJ. 2010;340.
39
40
41
42 4. Mandrioli D, Kearns CE, Bero LA. Relationship between research outcomes and risk of
43 bias, study sponsorship, and author financial conflicts of interest in reviews of the effects of
44
45 artificially sweetened beverages on weight outcomes: A systematic review of reviews. PLOS
46
47 ONE. 2016;11(9):e0162198.
48
49
50
51
52
53
54
55
56
57
58
59
60

5. Bariani GM, Ferrari ACRdC, Hoff PM, Krzyzanowska MK, Riechelmann RP. Self-Reported conflicts of interest of authors, trial sponsorship, and the interpretation of editorials and related phase III trials in oncology. *J Clin Onc.* 2013;31(18):2289-95.
6. Aneja A, Esquitin R, Shah K, Iyengar R, Nisenbaum R, Melo M, et al. Authors' self-declared financial conflicts of interest do not impact the results of major cardiovascular trials. *J Am Coll Cardiol.* 2013;61(11):1137-43.
7. Amiri AR, Kanesalingam K, Cro S, Casey ATH. Does source of funding and conflict of interest influence the outcome and quality of spinal research? *Spine J.* 14(2):308-14.
8. Lichter AS, McKinney R. Toward a harmonized and centralized conflict of interest disclosure: progress from an IOM initiative. *JAMA.* 2012;308(20):2093-4.
9. Dunn A. Set up a public registry of competing interests. *Nature.* 2016;533(7601).
10. Institute of Medicine. *Conflict of interest in medical research, education and practice.* Washington, DC: The National Academies Press; 2009.
11. International Committee of Medical Journal Editors (ICMJE). Recommendations. Philadelphia, PA: ICMJE; 2018. [Available from: <http://www.icmje.org/recommendations/>]
12. Committee on Publication Ethics (COPE). Code of conduct and best practice guidelines for journal editors. London, UK; 2011.
13. Thomas K, Ornstein C. Top Sloan Kettering cancer doctor resigns after failing to disclose industry ties. *The New York Times.* 2018.
14. Dunn AG, Coiera E, Mandl KD, Bourgeois FT. Conflict of interest disclosure in biomedical research: a review of current practices, biases, and the role of public registries in improving transparency. *Res Int Peer Rev.* 2016;1(1):1-8.

- 1
2
3 15. Grundy Q, Dunn AG, Bourgeois FT, Coiera E, Bero L. Prevalence of disclosed conflicts
4 of interest in biomedical research and associations with journal impact factors and altmetric
5 scores. *JAMA*. 2018;319(4):408-9.
6
7
8
9
10 16. Kuehn HS, Boisson B, Cunningham-Rundles C, Reichenbach J, Stray-Pedersen A,
11 Gelfand EW, et al. Loss of B cells in patients with heterozygous mutations in IKAROS. *N Eng J*
12 *Med*. 2016;374(11):1032-43.
13
14
15
16
17 17. Hakoum MB, Jouni N, Abou-Jaoude EA, Hasbani DJ, Abou-Jaoude EA, Lopes LC, et al.
18 Authors of clinical trials reported individual and financial conflicts of interest more frequently
19 than institutional and non-financial ones: A methodological survey. *J Clin Epi*. 2017;87:78-86.
20
21
22
23
24 18. Hakoum MB, Anouti S, Al-Gibbawi M, Abou-Jaoude EA, Hasbani DJ, Lopes LC, et al.
25 Reporting of financial and non-financial conflicts of interest by authors of systematic reviews: a
26 methodological survey. *BMJ Open*. 2016;6(8).
27
28
29
30
31 19. Collins M. PubMed updates March 2017. *NLM Technical Bulletin*. 2017;Mar-
32 Apr(415):e2.
33
34
35
36 20. Lundh A, Lexchin J, Mintzes B, Schroll JB, Bero L. Industry sponsorship and research
37 outcome. *Cochrane Database of Systematic Reviews*. 2017;2:MR000033.
38
39
40
41 21. Lundh A, Bero L. The ties that bind. *BMJ*. 2017;356.
42
43
44
45 22. Lichter A, McKinney R, Anderson T, Breese E, Brennan N, Butler D, et al. *Harmonizing*
46 *reporting on potential conflicts of interest: A common disclosure process for health care and life*
47 *sciences*. Washington, DC: National Academy of Medicine; 2012.
48
49
50
51 23. DeJong C, Aguilar T, Tseng C, Lin GA, Boscardin W, Dudley R. Pharmaceutical
52 industry-sponsored meals and physician prescribing patterns for medicare beneficiaries. *JAMA*
53 *Internal Medicine*. 2016;176(8):1114-22.
54
55
56
57
58
59
60

- 1
2
3 24. Hadland SE, Rivera-Aguirre A, Marshall BDL, Cerdá M. Association of pharmaceutical
4 industry marketing of opioid products with mortality from opioid-related overdoses. *JAMA*
5
6 *Network Open*. 2019;2(1):e186007-e.
7
8
9
10 25. Fleischman W, Agrawal S, King M, Venkatesh AK, Krumholz HM, McKee D, et al.
11
12 Association between payments from manufacturers of pharmaceuticals to physicians and
13
14 regional prescribing: cross sectional ecological study. *BMJ*. 2016;354.
15
16
17 26. van den Wijngaard IR, Wermer MJ, Boiten J, Algra A, Holswilder G, Meijer FJ, et al.
18
19 Cortical venous filling on dynamic computed tomographic angiography: A novel predictor of
20
21 clinical outcome in patients with acute middle cerebral artery stroke. *Stroke*. 2016;47(3):762-7.
22
23
24 27. Woodruff PG, Barr RG, Bleecker E, Christenson SA, Couper D, Curtis JL, et al. Clinical
25
26 significance of symptoms in smokers with preserved pulmonary function. *N Eng J Med*.
27
28 2016;374(19):1811-21.
29
30
31 28. Menkes DB, Masters JD, Bröring A, Blum A. What does ‘unpaid consultant’ signify? A
32
33 survey of euphemistic language in conflict of interest declarations. *J Gen Int Med*.
34
35 2018;33(2):139-41.
36
37
38 29. International Committee of Medical Journal Editors (ICMJE). Conflicts of interest
39
40 Vancouver, BC: International Committee of Medical Journal Editors (ICMJE); 2017 [Available
41
42 from: <http://www.icmje.org/conflicts-of-interest/>]
43
44
45 30. Bauchner H, Fontanarosa PB, Flanagin A. Conflicts of interests, authors, and journals:
46
47 New challenges for a persistent problem. *JAMA*. 2018;320(22):2315-8.
48
49
50 31. Centers for Medicare & Medicaid Services (CMS). Open Payments public use files:
51
52 Methodology overview & data dictionary. Baltimore, MD: CMS.gov; 2019.
53
54
55
56
57
58
59
60