1 Factors predicting publication of Cochrane reviews

2Andrea C Tricco, MSc, atric060@uottawa.ca;¹ David Moher, PhD, dmoher@ohri.ca;²,³ 3Maggie H Chen, MSc, maggiehchen@gmail.com;⁴ Raymond Daniel, BA, 4rdaniel@cheo.on.ca.⁵

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- 61 Institute of Population Health, University of Ottawa, Ottawa, Ontario, Canada;
- 72 Clinical Epidemiology Methods Center, Ottawa Health Research Institute, Ottawa, 8Ontario, Canada;
- 93 Department of Epidemiology and Community Medicine, Faculty of Medicine, 10University of Ottawa, Ottawa, Ontario, Canada;
- 114 Department of Biostatistics, University of Toronto, Toronto, Ontario, Canada;
- 125 Children's Hospital of Eastern Ontario, Ottawa, Ontario, Canada.

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14Please address correspondence and reprint requests to:

15Dr David Moher,

16Clinical Epidemiology Methods Center,

17Ottawa Health Research Institute,

18401 Smyth Road, Ottawa, Ontario, Canada

19Tel: 613-738-3591, email: dmoher@ohri.ca, fax: 613-738-4800

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22Potential competing interests

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Background: Cochrane reviews are regarded as being scientifically rigorous, yet the 30proportion of Cochrane protocols that are published as reviews and the average time to 31publication remains unclear. If the time to publication of Cochrane reviews is affected by 32factors such as statistically significant results, this may lead to inaccurate decisions. We 33aimed to identify the frequency of published Cochrane reviews, determine their time to 34publication, and examine the factors associated with time to their publication.

35Methods: Retrospective cohort study of Cochrane protocols published in Issue 2, 2000. 36The publication status of these reviews was tracked up to Issue 1, 2008 in The Cochrane 37Library. The time from protocol publication to the first review publication and review 38factors predicting the time to publication were analyzed via univariate and multivariate 39analyses.

Results: There were 130 new Cochrane protocols published in Issue 2, 2000. After 41excluding 12; 25/118 (21.2%) were unpublished and 93/118 (78.8%) were published as 42Cochrane reviews. Thirty-seven reviews (39.8%) were updates. The median time to 43publication was 1.6 years (range: 0.1-7.3 years). An author change between the protocol 44and final review was associated with longer time to publication (p=0.002), while an 45updated review was associated with shorter time to publication (p=0.03).

46Conclusions: Only 80% of Cochrane protocols were published as final Cochrane 47reviews. The median time to publication was 19 months yet some reviews took much 48longer. Strategies to decrease time to publication should be considered, such as providing 49support to reviewers when a change in authorship occurs.

50Introduction

51Publication bias occurs when studies with certain characteristics (e.g., study funding) 52have a greater likelihood of being published (1), and being published quicker (2), than 53studies without these characteristics. Previously we examined publication bias of 54systematic reviews (SRs) through a retrospective cohort study and found that the majority 55of them (301/372; 81%) were published after 8 years of follow-up (3). A shorter time to 56publication was associated with the review being updated (hazard ratio: 1.80 [95% 57confidence interval: 1.39 to 2.33 years]) while a longer time to publication was associated 58with the review having two published protocols, indicating changes to the review plan 59(hazard ratio: 0.33 [95% confidence interval: 0.12 to 0.90 years]). We did not examine the 60*review factors* (e.g., statistically significant results) in our previous study. As such, we 61conducted this study to examine the association between review factors and the time to 62publication of Cochrane reviews.

63Methods

64All new protocols published in Issue 2, 2000 of the Cochrane Database of Systematic 65Reviews were selected. Their status was tracked through searching The Cochrane Library 66until January 23, 2008 (Issue 1, 2008) and contacting corresponding authors or the 67Cochrane Review Group coordinator. Cochrane protocols that were split into more than 68one Cochrane review, taken over by another review group, published in the same issue as 69the final Cochrane review, published later than the review publication or not published 70for the first time in Issue 2, 2000 were excluded (3).

A comprehensive data abstraction form was developed and pilot-tested. The form 72was used to abstract review characteristics (e.g., number of authors), methodology used

73by the reviewers (e.g., number of primary outcomes, inclusion of unpublished material, 74assessment of publication bias), and other factors (e.g., funding, number of updates).

In addition, the SR results and conclusions were classified using a system 76reported elsewhere (4). Briefly, results were classified as being non-statistically 77significant negative (e.g., unfavourable towards treatment intervention and p>0.05), 78statistically significant negative, neutral (i.e., effect size between 0.95 and 1.05 and the 79confidence interval crosses 1), non-statistically significant positive (e.g., favourable 80towards treatment intervention and p>0.05), statistically significant positive, and 81indeterminate (i.e., unable to judge; e.g., the SR lists 10 primary outcomes, all of which 82have different results). The conclusions were classified as being positive (i.e., authors 83stated that there is evidence of effectiveness), neutral (i.e., no evidence of effectiveness or 84they reported no opinion), negative (i.e., authors advised against use of the intervention 85or it was not recommended) or indeterminate (i.e., stated that there is insufficient 86evidence or that more research is required).

Published Cochrane reviews were analyzed via univariate and multivariate 88analyses. This was conducted by taking the log of the time between the "most recent 89substantive amendment date" of the protocol and subsequent review. Variables chosen for 90the univariate and multivariate analyses were based on *a priori* consideration. Statistical 91analyses were conducted with SAS, version 9.0 (SAS Institute, Cary, North Carolina).

92Results

93There were 130 new Cochrane protocols in Issue 2, 2000. After excluding 12; 25/118 94(21.2%) were unpublished and 93/118 (78.8%) were published as Cochrane reviews 95(Figure).

A primary outcome was reported in 80.6% (75/93) of the reviews, the majority 97included all languages of publication (52.7%, 49/93), as well as published and 98unpublished material (74.2%, 69/93; Table 1). Publication bias was found to affect the 99results in only 11.1% (1/9) of the reviews. The majority of Cochrane reviews that 100performed a meta-analysis of the primary outcome had statistically significant positive 101results (31.5%, 17/54) while the majority of the conclusion statements were 102indeterminate (43.0%, 40/93). Only 38.7% (36/93) of the reviews were subsequently 103updated. A not-for-profit funding source was the most commonly reported funder (50.0%, 10437/74).

The median time to publication was 1.60 years (range: 0.15 to 7.31 years). Four 106factors significantly predicted publication (univariate analysis): the review having two 107protocols, being subsequently updated, an author change between the protocol and 108review, and number of included studies (all p<0.05). An additional four factors were 109included in the multivariate analyses due to *a priori* consideration: results, conclusions, 110funding, and number of authors. Of the 8 factors, an author change between the protocol 111and review was associated with longer time to publication (p=0.002), and an updated 112review was associated with shorter time to publication (p=0.03; Table 2).

113Discussion

114Our results indicate that for every four published Cochrane reviews, one will remain 115unpublished. Furthermore, a longer time to publication was associated with a change in 116authorship between the Cochrane protocol and subsequent review. The Cochrane 117Collaboration should consider strategies to improve the publication rate of Cochrane

118reviews as well as decrease their time to publication. These may include providing 119additional support to reviewers when an author change occurs.

Our study identified a large proportion of unpublished SRs. An international 121survey of systematic reviewers identified a 12.4% non-publication rate of SRs (5). In a 122retrospective cohort study of the protocol factors predicting publication of Cochrane 123reviews, only 13% (9/68) of the unpublished SRs were published elsewhere (3). This 124implies that a large amount of potentially meaningful data is missing from the literature 125and implies enormous wasted time and resources.

Our results are inconsistent with research examining publication bias of individual 127studies (e.g., trials) (2;6-10). In these studies, statistically significant results and funding 128were associated with publication of SRs. Since our study did not find such an association, 129it is apparent that differences exist in publication patterns between SRs and trials.

As reported elsewhere, our study has some limitations (3). Only one investigator 131abstracted all of the data, which could have led to inaccuracies. Assessing the primary 132outcome, results, and conclusions of the Cochrane reviews was often difficult and may 133have also led to error (4).

In conclusion, only about 80% of Cochrane protocols were published as complete 135Cochrane reviews within 19 months and some reviews took much longer to be published. 136Strategies to decrease time to publication should be considered, such as providing support 137to reviewers when a change in authorship occurs.

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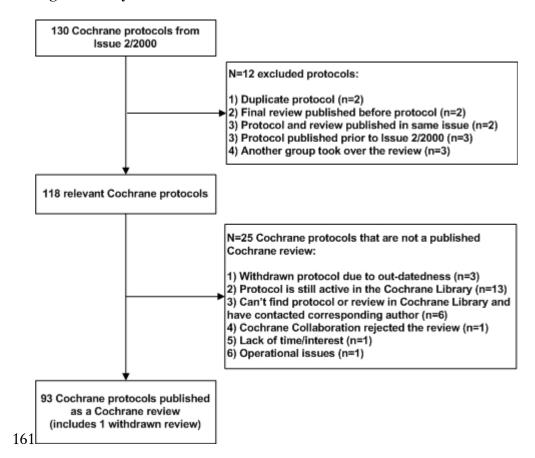
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148Author contributions:

149ACT conceptualized the research, obtained the sample of Cochrane reviews, designed the 150data abstraction form, abstracted all of the data from the reviews, verified the quality of 151the data, analyzed the results, wrote the manuscript, and approved the final version of the 152manuscript. ACT had full access to all the data in the study and takes full responsibility 153for the integrity of the data and the accuracy of the data analysis. DM conceptualized the 154research, designed the data abstraction form, edited the manuscript, and approved the 155final version of the manuscript. MHC verified the quality of the data, helped analyze the 156results, edited the manuscript, and approved the final version of the manuscript. RD 157helped obtain the sample of Cochrane reviews, edited the manuscript, and approved the 158final version of the manuscript.

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160Figure: Study Flow



162Table 1: Cochrane review characteristics

Item	53	1
Country of conduct: n (%)		Total: 93 published reviews
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Publication bias was assessed: n (%)* 9 (16.7)		

Publication bias affected the results: n (%)*	1 (1.9)
Heterogeneity assessed: n (%)*	54 (100.0)
Heterogeneity affected the results: n (%)*	8 (14.8)
Results and conclusions classification	
Results*	
Indeterminate	9 (16.6)
Non-statistically significant negative	10 (18.5)
Statistically significant negative	0 (0)
Neutral	7 (13.0)
Non-statistically significant positive	11 (20.4)
Statistically significant positive	17 (31.5)
Conclusions	
Indeterminate	40 (43.0)
Negative	10 (10.8)
Neutral	24 (25.8)
Positive	19 (20.4)
Other factors	
Gender of corresponding author: n (%)	
Female	32 (34.4)
Male	48 (51.6)
Unclear	13 (14.0)
Corresponding author was a healthcare provider: n (%)	25 (26.9)
Number of reviews that were updated: n (%)	36 (38.7%)
Number of updates per review: median (range)	1 (1, 3)
Number of reviews with funding: n (%)	74 (80.0)
Type of funding source: n (%)†	
Government only	17 (23.0)
Not-for-profit organization only	37 (50.0)
Government and not-for-profit organization	19 (25.7)
For-profit and government and not-for-profit	1 (1.3)

164
165**Notes:** * Denominator is number of reviews for which a meta-analysis was conducted (n=54), † 166denominator is number of reviews with funding (n=74).

168Table 2: Factors associated with the time to publication of Cochrane reviews from 169the multivariate analysis

170

Factor	Estimate*	Standard error	p-value
Two protocols (no vs. yes)	-0.810	0.467	0.086
Author change (no vs. yes)	-0.426	0.134	0.002 †
Number of authors	0.034	0.051	0.504
Funding (no vs. yes)	0.280	0.167	0.097
Number of included studies	0.007	0.005	0.145
Results (favourable vs. unfavourable)	0.018	0.274	0.948
Results (all others vs. unfavourable)	-0.167	0.244	0.495
Conclusions (negative vs. positive)	0.059	0.276	0.832
Conclusions (all others vs. positive)	-0.109	0.188	0.562
Update (no vs. yes)	0.305	0.138	0.030 †

171
172**Notes:** * Negative value indicates longer time to publication and positive value indicates shorter time to 173publication, \dagger p<0.05

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