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Impact of presentation at conference with timed release of academic publication

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Abstract

Fast-tracking publication of original research to coincide with a conference presentation ("coordinated publication") is a mechanism of rapidly disseminating new data. How often this occurs, whether its frequency is changing, and the impact of this approach on information dissemination, is unknown. Our objective was to describe the characteristics of coordinated publications, how the practice has changed over time, and evaluate its potential impact on dissemination of study results. We conducted a cross-sectional study of randomized controlled trials published in *NEJM, Lancet,* and *JAMA* between January 1, 2015, and December 31, 2019. Among the 1533 included randomized controlled trials, 502 (33%) had coordinated publications. Coordinated publications increased from 30% [n = 94] in 2015 to 37% [n = 136] in 2019. Coordinated publications were more likely to be unblinded (61% [n = 305] vs. 52% [n = 532]) and more likely to be funded by industry (50% [n = 249] vs. 30% [n = 311]). The strongest predictor of a coordinated publication was cardiovascular disease subspecialty (OR = 3.96, 95% CI [2.95, 5.36]). The median number of citations (188 vs. 98) and the median Altmetric score (318 vs. 182) were higher for coordinated publications than non-coordinated publications. These differences persisted in a multivariable regression model. Coordinated publication is increasingly common. While coordinated publications may generate greater attention, they were observed to be more likely to be unblinded and more likely to be funded by industry, raising questions about the value and intentions of such promotion.

Keywords Coordinated publication · Timed · Conference presentation · Fast-tracked · Altmetric score

Introduction

Coordinating the publication of a peer-reviewed article to coincide with a conference presentation ("coordinated publication") has occurred since the 1990s. The UK Prospective Diabetes Study, which showed that tight control of blood pressure in patients with hypertension and type two diabetes resulted in a clinically significant reduction in diabetes-related adverse outcomes, was one of the first studies to have its publication coordinated with its presentation at an international conference [1, 2]. This approach was thought to be an effective means of disseminating the study's important clinical messages [1]. A formalized publication fast track to allow for coordinated publication with conference presentation was adopted by major medical journals in the late 1990s [1, 3, 4]. At that time, there was a general recognition that the rapid dissemination of practice-changing research with public health importance should be prioritized [1, 3, 4]. More than twenty years later, fast-tracking a publication to be coordinated with a conference presentation has seemingly become routine [5–7]. The practice warrants examination—how often it occurs, the types of studies that pursue this approach, and its potential impact on information dissemination.

Fast-tracked publication differs from the non-fast-tracked publication process in several substantive ways. In the non-fast-tracked process, researchers often first present unpublished data at a conference; then, based on feedback including comments, questions, and suggestions, investigators

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often revise aspects of the data interpretation prior to submission to a journal for peer review. After submission, there are often multiple rounds of editor and reviewer feedback and author revision prior to acceptance for publication. With fast-tracked publication to coincide with conference presentation, informal feedback from peers at conference prior to submission to a journal is, by definition, absent. Further, with fast-tracked publications, the editorial process after submission is typically shortened, with some journals advertising a fast-track time frame between submission and publication as short as 20 days [8].

With rapid turnarounds, maintenance of quality is perhaps more challenging. Further, if coordinated publication has become a marker for research of public health importance, perhaps non-coordinated studies may not receive the attention they deserve. It is worth considering other motivations for coordinated publication: Journals may have an interest in coordinated publication as a means of promotion of the journal itself. Funders, including pharmaceutical companies, may have an interest in coordinated publication as a means of product promotion, particularly if the trial provides evidence of the benefits of a new medication or device. Our objective was to evaluate the characteristics of coordinated publications, the potential impact of coordinated publication on the dissemination of study results, and how the practice has changed over time.

Methods

We identified all randomized controlled trials (RCTs) published in the *Journal of the American Medical Association* (*JAMA)*, the *New England Journal of Medicine* (*NEJM*), and *Lancet* between January 1, 2015 and December 31, 2019. These journals were selected because they are among the highest impact journals in medicine. Our study focused on RCTs because they are generally regarded as the gold standard for evaluating the effectiveness of medical interventions. All data included in this study were publicly available and thus ethics approval was not required.

Data sources

Medline was used to systematically identify all articles published in *JAMA*, *NEJM*, and *Lancet* during the study period. The titles and abstracts of the articles were then uploaded into the systematic review software, COVIDENCE, and independently reviewed by two authors (MF, UP) to identify studies that were RCTs. Disagreements were rare (< 1%) and were resolved through consensus. Among clinical trials with more than one publication (e.g., longer-term follow-up, secondary analyses), only the first published study was included.

Baseline article characteristics

Characteristics of the included studies were extracted through manual review. The baseline characteristics that were extracted included subspecialty area, publication year, intervention, blinding, funding source, comparator (e.g., placebo), sample size, primary outcome (i.e., positive, negative, neutral [see Appendix]), and outcome (surrogate vs. non-surrogate). Examples of surrogate outcomes include hemoglobin A1C and blood pressure; examples of non-surrogate outcomes include myocardial infarction and death [9].

Definition of coordinated publication

A trial was considered to have a coordinated publication if the date of first online journal publication occurred within 2 days of the conference presentation. For conferences that spanned multiple days, if the date of online publication was any day within the multi-day conference, or up to 2 days prior to the first day of the conference, or up to 2 days after the last day of the conference, the article was included in the "coordinated" publication group. If the publication did not meet these outlined criteria, or if there was no conference presentation, the article was included in the "non-coordinated" publication group.

Identifying coordinated publications

The method for identifying articles that meet the definition of "coordinated publication" differed depending on the journal of publication. For *NEJM* and *JAMA*, the approach involved using the day of the week an article was published as proxy for coordinated publication status. This approach was developed via the following steps.

At *NEJM*, articles are published each week on a Thursday. Thus, articles not published on Thursday may represent a coordinated publication. This was confirmed by manually reviewing a random sample of 85 RCTs published in *NEJM* during the study time period (see Appendix). For each of the 85 RCTs, conference proceedings and media releases were manually reviewed by two study team members (EH, A. Raudanskis), and if the necessary information could not be found through review of conference proceedings and media releases, corresponding authors were emailed to confirm whether there was a coordinated publication. The calculated specificity was 91% and sensitivity was 98%, indicating that articles published in *NEJM* on a day other than Thursday typically represented coordinated publications. Thus, we designated *NEJM* articles not published on a Thursday as a coordinated publication.

JAMA typically publishes on Tuesday; thus, articles not published on Tuesday may represent a coordinated publication. To confirm, the same multi-step process was used to manually identify coordinated publications from a random sample of 85 *JAMA* articles in the dataset. The calculated specificity was 100% and sensitivity was 81%, indicating that articles published in *JAMA* on a day other than Tuesday represented coordinated publications. Thus, we designated *JAMA* articles not published on a Tuesday as a coordinated publication.

Unlike *NEJM* and *JAMA*, *Lancet* does not have a specific day on which articles are published each week, and thus the day of publication is not an indicator of whether a publication is coordinated. Therefore, all *Lancet* articles in the dataset were screened manually to determine if their publication was coordinated to coincide with a conference presentation (A. Raudanskis, SM). Conference proceedings and media releases at time of publication were manually reviewed, and if the necessary information could not be found through review of conference proceedings and media releases, corresponding authors were emailed to confirm whether there was a coordinated publication.

Study outcomes

The primary outcome was to describe the characteristics of coordinated publications and how the practice changed over time. Secondary outcomes, as surrogates for information dissemination and impact, were Altmetric scores and number of citations of coordinated publications compared to non-coordinated publications. An Altmetric score is a weighted count of the online attention that a scholarly work has received, taking into account volume (number of mentions), sources (for example, a tweet contributes less than a news article), and authors (for example, mentions from different accounts contribute more than one account pushing the same article automatically). Altmetric data, including Altmetric Attention Scores and their breakdown, were obtained using the Altmetric Details Page API via the rAltmetric R package. Number of citations was obtained using the CrossRef API via the rcrossref R package. Data were merged from the various sources using the Digital Object Identifier (DOI) of the peer-reviewed article.

Statistical analysis

Descriptive statistics were used to characterize baseline article characteristics. Multivariable logistic regression was used to identify predictors of coordinated publications. To identify predictors of higher Altmetric scores or number of citations, two separate multivariable quantile regression models were built. Quantile regression was used because the data were not normally distributed and thus the assumptions of linear regression were violated. All statistical analyses were conducted in R version 4.0.2. Logistic regression were performed using Base R. Quantile regression was performed using the quantreg package.

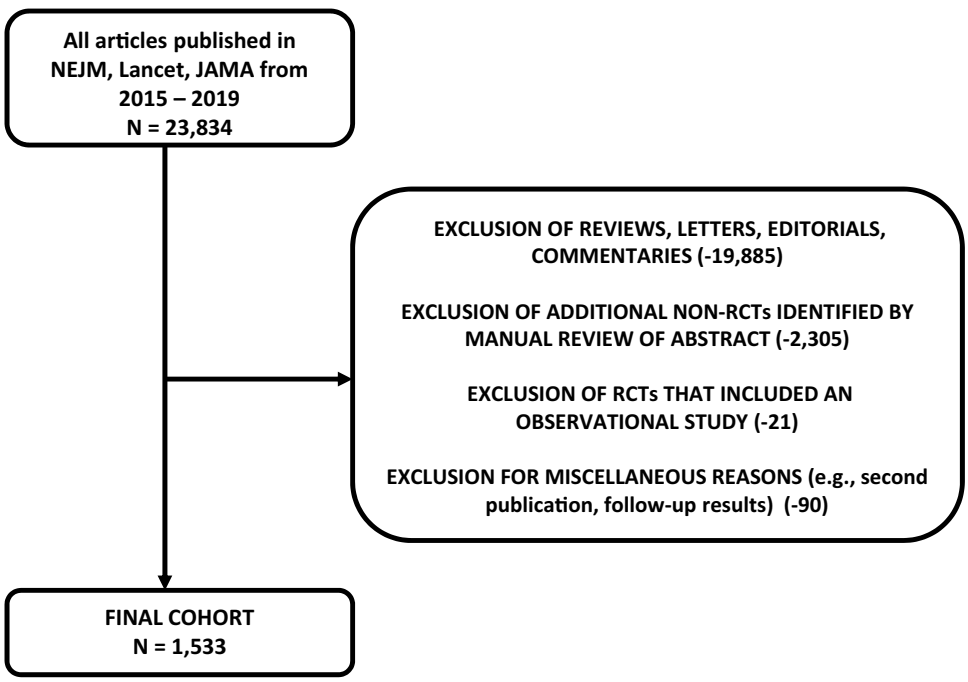

Fig. 1 Study flow diagram

Results

We identified 1533 RCTs published in *NEJM*, *JAMA*, and *Lancet* between January 1, 2015 and December 31, 2019 (Fig. 1). The median sample size of the included trials was 619 (Table 1). Cardiovascular disease trials were the most common subspecialty (n = 302, 20%), followed by oncology trials (n = 220, 14%) and infectious disease trials (n = 182, 12%). Most trials were unblinded (n = 837, 55%), and most were non-industry funded (n = 835, 55%). The intervention in 64% (n = 988) of the included trials was a

Table 1 Baseline characteristics

	Overall N = 1533	Coordinated N = 502	Non-Coordinated N = 1031
Journal			
JAMA	354 (23.1%)	70 (13.9%)	284 (27.5%)
Lancet	542 (35.4%)	110 (21.9%)	432 (41.9%)
NEJM	637 (41.6%)	322 (64.1%)	315 (30.6%)
Subspecialty focus			
Cardiovascular	302 (19.7%)	185 (36.9%)	117 (11.3%)
Oncology	220 (14.4%)	85 (16.9%)	135 (13.1%)
Infectious diseases	182 (11.9%)	35 (7.0%)	147 (14.3%)
Other	829 (54.1%)	197 (39.2%)	632 (61.3%)
Published year			
2015	318 (20.7%)	94 (18.7%)	224 (21.7%)
2016	277 (18.1%)	92 (18.3%)	185 (17.9%)
2017	292 (19.0%)	81 (16.1%)	211 (20.5%)
2018	280 (18.3%)	99 (19.7%)	181 (17.6%)
2019	366 (23.9%)	136 (27.1%)	230 (22.3%)
Intervention			
Drug	988 (64.4%)	332 (66.1%)	656 (63.6%)
Device/Procedure	306 (20.0%)	115 (22.9%)	191 (18.5%)
Other	239 (15.6%)	55 (11.0%)	184 (17.8%)
Blinding			
Double	537 (35.0%)	154 (30.7%)	383 (37.1%)
Single	159 (10.4%)	43 (8.6%)	116 (11.3%)
Unblinded	837 (54.6%)	305 (60.8%)	532 (51.6%)
Funding Source*			
Industry funded	560 (36.5%)	249 (49.6%)	311 (30.2%)
Non-industry funded	835 (54.5%)	207 (41.2%)	628 (60.9%)
Combination	137 (8.9%)	46 (9.2%)	91 (8.8%)
Surrogate Outcome			
Yes	638 (41.6%)	178 (35.5%)	460 (44.6%)
Primary Outcome			
Negative	44 (2.9%)	14 (2.8%)	30 (2.9%)
Positive	938 (61.2%)	311 (62.0%)	627 (60.8%)
Neutral	551 (35.9%)	177 (35.3%)	374 (36.3%)
Comparator**			
Active comparator	678 (44.2%)	245 (48.8%)	433 (42.0%)
Placebo	513 (33.5%)	162 (32.3%)	351 (34.0%)
Sample size			
Median	619 (IQR 270,1741)	882 (IQR 388,2650)	523 (IQR 228,1290)
Altmetric score	216 (IQR 117,443)	318 (IQR 164,557)	182 (IQR 100,354)
Number of citations	119 (IQR 56,250)	188 (IQR 85,403)	98 (IQR 47,192)

*Funding Source was not available for one study

**Remaining studies had a comparator that was neither

drug, while in the remaining trials the intervention was either a medical device, procedure, or surgery (n = 306, 20%) or another intervention (n = 239, 16%). Of the study outcomes for the included trials, 61% (n = 938) were positive, 3% (n = 44) were negative, and 36% (n = 551) were neutral (see Appendix).

Of the 1533 included trials, 502 (33%) had a coordinated publication. The rate of coordinated publications in *NEJM*, *JAMA*, and *Lancet* increased from 30% (i.e., 94 of 318 trials) in 2015 to 37% (i.e., 136 of 366 trials) in 2019. The median trial sample size was greater for trials with coordinated publication than trials with non-coordinated publication (n = 882, IQR 388–2650, vs. n = 523 IQR 228–1290). Cardiovascular disease trials were the most likely subspecialty to have a coordinated publication, representing 37% of all coordinated publications (n = 185). Compared to trials with non-coordinated publication, trials with coordinated publication were more likely to be unblinded (61%, n = 305 vs. 52%, n = 532) and more likely to be funded by industry (50%, n = 249 vs. 30%, n = 311). In the multivariable logistic regression model (Table 2), the variables with the strongest association to coordinated publication were cardiovascular disease subspecialty (OR = 3.96, 95% CI [2.95,5.36]), publication in *NEJM* (OR = 3.64, 95% CI [2.60,5.08]), and funding by industry (OR = 2.26, 95% CI [1.72,2.95]).

Among the coordinated publications, the median Altmetric score was 318, compared to 182 among the non-coordinated publications. In the quantile regression model (Table 3), after adjusting for year of publication, journal, sample size, funding source, cardiovascular disease, blinding, intervention type, and whether the study had a positive primary outcome, RCTs with a coordinated publication had a median Altmetric score that was 72 (95% CI [41,104]) points higher than RCTs without a coordinated publication.

Among the coordinated publications, the median number of citations was 188, compared to 98 in the non-coordinated publications. In the quantile regression model (Table 4), after adjusting for year of publication, journal, sample size, funding source, cardiovascular disease, blinding, intervention type, and whether the study had a positive primary outcome, RCTs with a coordinated publication had a median of 23 (95% CI [17,31]) more citations than RCTs without a coordinated publication.

Discussion

The number of RCTs with a coordinated conference presentation that were published in *NEJM*, *JAMA*, and *Lancet* increased over time. Coordinated publications were particularly common among RCTs in the field of cardiovascular disease. Trials with coordinated publication were more likely to be unblinded and more likely to be funded by industry than trials with non-coordinated publication. Coordinated publications were also associated with higher Altmetric scores and greater number of citations compared to non-coordinated publications.

A formalized process for expediting the publication of major, potentially practice-changing research was adopted by the major medical journals in the late 1990s, to avoid delays in the publication of data with important public health messages and maximize attention for research outputs of significant clinical or scientific importance [1, 3, 4]. After expediting the publication of the UK Prospective Diabetes Study to coincide with presentation at a major international

Table 2 Multivariable logistic regression model identifying predictors of coordinated publication

	Reference	Odds ratio	95% C.I
Published year			
2016	2015	1.43	[0.97, 2.13]
2017	2015	0.98	[0.66, 1.46]
2018	2015	1.45	[0.99, 2.13]
2019	2015	1.46	[1.02, 2.10]
Journal			
NEJM	*JAMA*	3.64	[2.60, 5.08]
Lancet	*JAMA*	0.93	[0.64, 1.33]
Sample size ≥ 1000	Sample size < 1000	1.46	[1.13, 1.89]
Cardiovascular subspeciality focus	Non-cardiovascular	3.96	[2.95, 5.36]
Industry & combination funding	Non-industry funding	2.26	[1.72, 2.95]
Primary outcome			
Positive	Negative	0.85	[0.41, 1.77]
Neutral	Negative	0.92	[0.44, 1.93]
Blinded trial	Non-blinded	0.75	[0.57, 0.98]
Drug Intervention	Non-drug intervention	0.89	[0.67, 1.20]

Table 3 Multivariable quantile regression model for the Altmetric score

	Reference	Estimate	95% CI
Published year			
2016	2015	58	[24, 89]
2017	2015	79	[45, 105]
2018	2015	122	[87, 171]
2019	2015	57	[31, 84]
Journal			
NEJM	JAMA	105	[69, 140]
Lancet	JAMA	− 60	[− 89, − 43]
Sample size ≥ 1000	Sample size < 1000	40	[14, 63]
Cardiovascular subspeciality focus	Non-cardiovascular	− 28	[− 56, 3]
Industry & combination funding	Non-industry funding	− 36	[− 61, − 13]
Primary outcome			
Positive	Negative	− 11	[− 123, 53]
Neutral	Negative	− 45	[− 155, 16]
Blinded trial	Non-blinded	10	[− 9, 35]
Drug intervention	Non-drug intervention	− 4	[− 33, 19]
Coordinated publication	Non-coordinated publication	72	[41, 104]

The above model demonstrates that the median Altmetric score was 72 (95% CI 41, 104) points higher for coordinated publications compared to non-coordinated publications after adjusting for the variables as noted in this table

Table 4 Multivariable quantile regression for the citation count

	Reference	Estimate	95% CI
Published year			
2016	2015	− 1	[− 6, 5]
2017	2015	3	[− 3, 9]
2018	2015	6	[1, 14]
2019	2015	12	[6, 19]
Journal			
NEJM	JAMA	33	[26, 41]
Lancet	JAMA	8	[4, 12]
Sample size ≥ 1000	Sample size < 1000	0	[− 4, 6]
Cardiovascular subspeciality focus	Non-Cardiovascular	5	[− 3, 13]
Industry & combination funding	Non-Industry Funding	20	[16, 26]
Primary outcome			
Positive	Negative	12	[− 4, 24]
Neutral	Negative	3	[− 12, 14]
Blinded trial	Non-blinded	− 9	[− 14, − 5]
Drug intervention	Non-drug intervention	4	[− 1, 8]
Coordinated publication	Non-coordinated publication	23	[17, 31]

The above model demonstrates that the median citation count was 23 (95% CI 17, 31) points higher for coordinated publications compared to non-coordinated publications after adjusting for the variables as noted in this table

conference, the *BMJ* recognized the utility of this approach to rapidly disseminate important clinical information, and subsequently formalized this process to make it available to all potential contributors [1]. In introducing their formal processes for fast tracks to publication, *JAMA* and *Lancet* described a plan to prioritize expedited publication to coordinate with presentation at an upcoming scientific meeting, implementing fast track processes for peer review [3, 4]. In separate editorials, both *JAMA* and *Lancet* stated that this approach to fast-tracked publication would help to mitigate

the potential for misinterpretation of incomplete pre-publication data [3, 7]. Since the introduction of these formalized fast-track processes, the practice has become increasingly routine [5–8, 10]. But there has been minimal research on the impact of fast-tracking publication to coincide with conference presentations.

Our study identified potential benefits of this practice. Specifically, we observed that coordinated publications were associated with greater attention in the lay press, as identified by a higher Altmeric score and a greater number of citations. These findings persisted in a multivariable regression model accounting for other study-level characteristics. Altmetric scores capture data from press releases from mainstream media outlets, social media (e.g., Twitter, Facebook, Weibo), and other media targeted towards the lay public (e.g., blogs, YouTube videos). The higher Altmetric scores observed among the coordinated publications indicate that coordinated publications are reaching a wider audience than the non-coordinated publications. This suggests that information disseminated through coordinated publication reaches not only clinicians and academics who attend conferences, but also the lay public. The greater number of citations observed among the coordinated publications also suggests they have wider reach than non-coordinated publications within the academic community. However, without randomization, it is impossible to disentangle cause and effect. For example, it is likely that articles selected for coordinated publication are "higher impact" than those that are not, and thus it is not necessarily the coordination of publication and presentation that causes the increased reach.

We also observed that trials with coordinated publication were more likely to be unblinded and more likely to be funded by industry compared to trials with non-coordinated publication. This is potentially concerning: unblinded trials, compared to double-blind trials, are more susceptible to bias. If unblinded trials are receiving more attention than higher quality double-blinded research outputs, this raises questions about the value and intentions of such promotion. However, it would be an oversimplification to indicate that trials with coordinated publication are of lower methodologic quality than trials with non-coordinated publication. On balance, we observed that trials with coordinated publication had a larger median sample size than trials with non-coordinated publication (882 vs. 523). Prevalence of placebo inclusion was similar between both groups. Trials with coordinated publication were less likely to have a surrogate outcome than trials with non-coordinated publication; however, this is likely driven by the fact that most coordinated publications were cardiovascular disease trials, and cardiovascular disease trials overall are less likely to have surrogate outcomes.

Our observation that trials with coordinated publications were more likely to be funded by industry than trials with non-coordinated publications could indicate that these companies are sponsoring research that has greater public health importance. Alternatively, it could indicate that these companies are motivated to find avenues to promote their products, and so seek coordinated publication as a method to do this. Product promotion through coordinated publication could lead to greater uptake of the product by physicians and the public.

More research is required to investigate other potential implications of coordinated publication. Perhaps in meeting a publication deadline to coincide with a conference, some authors, peer-reviewers, and journals rush in analyzing data and making publication decisions. The desire by authors and journals to maximize attention may come at the expense of maintaining research quality. Moreover, perhaps articles that are not published in coordination with conferences, even if they are of high importance, are not receiving the attention they deserve. With fast-tracked publication, authors lose the opportunity for informal feedback from peers at a conference prior to submission to a journal. Perhaps this pre-submission conversation has moved elsewhere, such as online forums; or perhaps it simply no longer occurs. The underlying motivation for coordinated publication warrants re-examination. In addition to rapid dissemination of research with public health importance, perhaps journals have an interest in coordinated publication as a means of promotion of the journal itself: if a journal regularly publishes original research of such public health importance that publication is expedited to coincide with conference presentation, the journal itself may receive more attention.

An important question is what, if anything, journal editors should do differently when it comes to coordinated publications. Because our study is one of the first to assess the characteristics and impact of coordinated publications, we believe further research is required to validate our findings, especially for subspecialty journals. To facilitate such research, it would be ideal if journal editors required authors to include a statement in their manuscript indicating whether the study's publication coincided with a presentation. Doing so would not only increase the feasibility of conducting studies similar to ours in the future but would also allow readers encountering a coordinated publication to consider the associated implications.

Limitations

This study has a number of important limitations. First, the Altmetric score measures online attention and does not necessarily reflect the impact or importance of a research output; therefore, the Altmetric results indicate only that coordinated publications achieve a higher level of engagement online than non-coordinated publications. Our study estimated the potential impact of coordinated publications

by assessing number of citations and the Altmetric score, but we lacked more nuanced data, such as how often coordinated publications were cited in guidelines. Second, we recognize our method for identifying a coordinated publication in *NEJM* and *JAMA* had relatively high specificity (> 90%) and sensitivity (> 80%), but because this approach was not 100% sensitive and specific, misclassification of coordination status is possible. Third, it is unknown whether our observed findings apply to articles published in other journals, or to articles with coordinated publication that are not RCTs.

Conclusion

In this study of RCTs published in high impact journals, the number of fast-tracked publications timed to coincide with a conference presentation increased over time. Coordinated publications generated more attention in both the lay press (as identified by higher Altmetric scores) and the scientific literature (as identified by greater number of citations). Coordinated publications were also more likely to be unblinded and more likely to be sponsored by industry, which raises important questions about the implications and intentions of this increasingly common practice.

Appendix A

Exploratory steps taken to identify coordinated publications in *NEJM* and *JAMA*

EH and A. Raudanskis used a multi-step process to manually identify which publications in a random sample of *NEJM* articles had an associated coordinated conference presentation. If a coordinated conference presentation was found during any step of the process, the conference date and details were recorded, and the process was considered complete for that article. The steps of the process were as follows: First, each abstract and full manuscript was screened for mention of conference presentation. Second, the Altmetric bookmarklet was used to identify online news releases associated with the article. News releases were manually screened for reference to a coordinated conference presentation. Third, a manual online search strategy using Google and Google Scholar was used to further screen for coordinated conference presentation. Key terms and phrases used in the manual online search included a combination of article title, trial name or acronym as registered on clinicaltrials.gov, name of major North American/European subspecialty society if applicable, the words "conference" or "meeting" or "congress" or "presentation." Lastly, if EH or A. Raudanskis had reason to believe that an article may have a coordinated conference presentation (e.g., if the article was published during the same week as a major subspecialty conference, or if the article was published on a day of the week not typical for the journal) but this information could not be found online, EH or A. Raudanskis e-mailed the corresponding author of the article to ask if the publication had an associated coordinated conference presentation. Once complete, EH reviewed the data to confirm accuracy. In the case of disagreements between EH and A. Raudanskis (which occurred with < 5% of articles), MF was consulted to resolve the difference. The same process was used for a random sample of *JAMA* articles.

Designating primary outcome status

A study's outcome was considered positive if the point-estimate for the primary outcome identified a benefit and the 95% confidence intervals excluded the null. The study outcome was considered negative if the point estimate for the primary outcome identified harm and the 95% confidence intervals excluded the null. The study outcome was considered neutral if the point estimate included the null. For non-inferiority trials, the study outcome was considered positive if the study was superior or non-inferior.

Author contributions Study concept and design: all authors. Acquisition of data: all authors. Analysis/interpretation of data: all authors. Drafting of the manuscript: EH, MF. Critical revision of the manuscript: All authors. Statistical analysis: MF, EH, KZ.

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Data availability The data in this article will not be shared.

Declarations

Ethics approval All data included in this study were publicly available and thus ethics approval was not required.

Human and animal rights and Informed consent Not applicable.

Conflict of interest Dr. Fralick is a paid consultant for a start-up company called ProofDx that has created a point-of-care diagnostic test for COVID-19 using CRISPR.

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