Is publication bias present in gastroenterological research? An analysis of abstracts presented at an annual congress

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Background Publication bias is the tendency of investigators, reviewers, and editors to submit or accept manuscripts for publication based on their direction or strength of findings. In this study, we investigated if publication bias was present in gastroenterological research by evaluating abstracts at Americas Hepato-Pancreato-Biliary Congresses from 2011 to 2013. **Methods** We searched Google, Google Scholar, and PubMed to locate the published reports of research described in these abstracts. If a publication was not found, a second investigator searched to verify nonpublication. If abstract publication status remained undetermined, authors were contacted regarding reasons for nonpublication. For articles reaching publication, the *P* value, study design, time to publication, citation count, and journals in which the published report appeared were recorded. **Results** Our study found that of 569 abstracts presented, 297 (52.2%) reported a *P* value. Of these, 254 (85.5%) contained *P* values supporting statistical significance. The abstracts reporting a statistically significant outcome were twice as likely to reach publication than abstracts with no significant findings (OR 2.10, 95% CI 1.06–4.14). Overall, 243 (42.7%) abstracts reached publication. The mean time to publication was 14 months and a median time of 9 months. **Conclusion** In conclusion, we found evidence for publication bias in gastroenterological research. Abstracts with significant *P* values had a higher probability of reaching publication. More than half of abstracts presented from 2011 to 2013 failed to reached publication. Readers should take these finding into consideration when reviewing medical literature.

Title page

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Abstract

Background

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Methods

We searched Google, Google Scholar, and PubMed to locate the published reports of research described in these abstracts. If a publication was not found, a second investigator searched to verify nonpublication. If abstract publication status remained undetermined, authors were contacted regarding reasons for nonpublication. For articles reaching publication, the *P* value, study design, time to publication, citation count, and journals in which the published report appeared were recorded.

Results

Our study found that of 569 abstracts presented, 297 (52.2%) reported a *P* value. Of these, 254 (85.5%) contained *P* values supporting statistical significance. The abstracts reporting a statistically significant outcome were twice as likely to reach publication than abstracts with no significant findings (OR 2.10, 95% CI 1.06–4.14). Overall, 243 (42.7%) abstracts reached publication. The mean time to publication was 14 months and a median time of 9 months.

Conclusion

In conclusion, we found evidence for publication bias in gastroenterological research. Abstracts with significant *P* values were more frequently published than those with negative results. More than half of abstracts presented from 2011 to 2013 failed to reached publication. Readers should take these findings into consideration when reviewing medical literature.

Introduction

The practice of evidence-based medicine integrates clinical expertise with the best available clinical research evidence.(Sackett et al. 1996) This movement promotes the use of high-quality clinical research into clinical decision making.(Masic, Miokovic, and Muhamedagic 2008) If treatment decisions are to truly be evidence based, it is necessary that the literature accurately reflect an intervention's effectiveness.(Dickersin 1990) This information is thwarted, however, when research regarding efficacy does not reach publication.

Publication bias is one such reason why studies fail to be published. Publication bias is the tendency of investigators, reviewers, and editors to submit or accept manuscripts for publication based on their direction or strength of findings.(Dickersin 1990) A substantial body of evidence supports that studies reporting negative (nonsignificant) findings are less likely to be published.(Fanelli 2010; Easterbrook et al. 1991) The implications of publication bias are far reaching for clinical decision making owing to the possibility of overestimated treatment effects. For example, several meta-analyses have re-evaluated the efficacy and safety of antidepressants and determined that their therapeutic value has been overestimated when considering data used from unpublished studies.(Turner et al. 2008; Eyding et al. 2010; Barbui, Furukawa, and Cipriani 2008; Whittington et al. 2004) Interestingly, while publication bias has been widely discussed in many areas of medicine such as cancer(Harris et al. 2010; Saeed et al. 2011; Paulson et al. 2011; Salami and Alkayed 2013; Sartor, Peterson, and Woolf 2003; Takeda et al. 2008) and anesthesiology(Chong et al. 2016; De Oliveira et al. 2012; Lim et al. 2016; Sukhal et al. 2017; P. M. Jones 2016; Hedin et al. 2016), this important issue has received limited attention in

gastroenterology with mixed results.(Timmer et al. 2002; Shaheen et al. 2000; Eloubeidi, Wade, and Provenzale 2001) One example of the implications of publication bias concluded that the incidence of Barrett's esophagus may be overestimated due to publication bias.(Shaheen et al. 2000) If the incidence is lower than previously assumed, there might be an overemphasis on the benefits of costly screening programs, leading to a loss of resources.

Publication bias may also arise during scientific meetings. Organizations hold scientific meetings to allow researchers to come together to discuss new and ongoing topics related to their field of interest through oral and poster presentations of original abstracts. Because of the competitive publication process, abstracts that are presented likely represent strong research that may influence the current literature.(Frank et al. 2017) However, not all presentations will be published, and non-publication of findings may be harmful to patients, may result in unnecessary duplication of efforts, may contribute to research waste, and may prevent results from being included in systematic reviews.(Durinka et al. 2016)

In this study, we measured the publication rate of abstracts presented at Americas Hepato-Pancreato-Biliary Association (AHPBA) Congresses and established whether publication bias may have occurred between abstract presentation and publication. We also evaluated the length of time to publication and which journals most frequently publish AHPBA abstracts. For unpublished abstracts, we contacted authors to determine the reason for nonpublication.

Methods

Oversight and Reporting

This study did not meet the regulatory definition of human subjects research as defined in 45 CFR 46.102(d) and (f) of the Department of Health and Human Services' Code of Federal Regulations and therefore was not subject to Institutional Review Board oversight. We applied relevant Statistical Analyses and Methods in the Published Literature guidelines for reporting descriptive statistics.

Locating Conference Abstracts

We located the AHPBA abstracts from 2011 to 2013 through the AHPBA website.("AHPBA - Annual Meeting - Past Meeting Archives" n.d.) We selected this time period based on previous literature describing the need to allow adequate time for a conference abstract to be published.(Durinka et al. 2016) After locating the AHPBA abstracts we began the search process.

Search Strategy for Published Manuscripts of Conference Abstracts

Using a predefined search algorithm, we attempted to locate the published report of conference abstracts (Figure 1). The search algorithm was developed by two investigators (JS and MV) and pilot tested on 25 abstracts. We assessed the optimal order in which to search databases (for example, Google first, Google Scholar second, and PubMed third). We also varied the searches by using combinations of keywords and author names and used full title searches to determine

which strategy would most precisely locate published reports. Ultimately, our search was completed using three databases: PubMed, Google Scholar, and Google. One investigator (CM) first searched these three databases using the full conference abstract title. If this strategy failed, this investigator performed searches using an author's last name and keywords from the abstract. When CM could not locate a published report, a second investigator (KF) repeated the search strategy.

If the second investigator (KF) could not locate the published report, CM sent a standardized email to an author of the conference abstract (see Appendix 1). This email gave authors the opportunity to comment whether the study had reached publication and provide the reference for the publication. If the author indicated the report was not published, abstract authors were asked to provide a reason for nonpublication. Our standardized response options for nonpublication were based on a systematic review by Song et al.(Song, Loke, and Hooper 2014) which analyzed 38 survey reports on investigator-reported reasons for nonpublication.

For studies that were not found to be published and also contained negative findings, we also searched for them on Faculty of 1000 (F1000), BioMed Central (which includes the archives of the Journal of Negative Results in Biomedicine), and Cureus, as these sources publish studies with negative findings.

Data Collection

Our search dates ranged from June 13, 2017 to June 20, 2017. Once a published study that was thought to be a conference abstract was located, we compared the author list, methods, and results between them. If at least two of the following criteria were met, we considered the abstract published: (1) results in both reports matched; (2) the methodology was similar; and (3) the first author of the conference abstract was included in the author list of the published study.

Data were extracted from the published studies by CM using a Google form. The following information was extracted: publication title, institution of first author, date submitted to journal (when available), date accepted for publication (when available), date of in print publication (when available), date of online publication (when available), sample size (when available), journal name, number of citations, and whether there was a significant outcome ($P < 0.05$). The time to publication was calculated based on the number of months between the first date of the conference and the publication date in print or online, whichever occurred first. Descriptive statistics are reported as both means and medians. The reporting of means allows for interpretation of our findings in the context of other studies. Medians are reported due to the non-normal nature of the time to publication and citation count variables. A Mann Whitney U test was used to evaluate for differences on citation count between studies with positive and negative results. For this analysis, we included sample size and study design as potential predictors of publication. Logistic regression was used to evaluate the associations of sample size and study design with publication. We classified abstracts according to study design, which included such designs as: cohort studies, case studies, and randomized controlled trials. For study design, the investigators retained all study designs that represented at least 10% of abstract

presentations for stability of the regression coefficients. Data analyses were performed using Microsoft Excel and Stata 13.1.

Results

A total of 12 abstracts were found to be published before presentation and were therefore excluded from this study. A *P* value was reported in 297 (52.2%) of 569 abstract presentations. Of those with a reported *P* value, 254 (85.5%) reported significant outcomes. Of the 254 that reported a significant outcome, 139 (54.7%) went on to reach publication. Of the 41 abstracts that reported negative outcomes, 15 (36.6%) went on to reach publication. No abstracts that reported only negative outcomes were found to be published on F1000, BioMed Central, or Cureus. Abstracts with at least one significant outcome were twice as likely to reach publication than abstracts with no significant findings (OR 2.10; 95% CI (1.06–4.14). The most common study design was retrospective analysis, with 313 abstracts. Of these, 150 (47.9%) reached publication. The least common study design was the randomized controlled trial with 3 abstracts; however, all reached publication. Full study design results can be found in Table 1.

From 2011 to 2013 there were 569 abstract presentations, of which 243 (42.7%) reached publication (Figure 2). The mean time to publication was 14.0 months and a median time of 9 months. For 2011, 79 of 168 (47%) abstracts reached publication, with an mean time of 12.5 months and a median time of 7 months. For 2012, 89 of 201 (44.3%) abstracts reached publication, with an mean time of 14.8 months and a median time of 12 months. For 2013, 75 of 200 (37.5%) abstracts reached publication, with an mean time of 14.5 months and a median time of 11 months. A graph displaying cumulative time to publication is presented in Figure 3. For

191 abstracts with significant findings, the mean time to publication was 12.1 months and a median
192 time of 8 months. For abstracts with negative findings, the mean time to publication was 13.6
193 months and a median time of 8 months.
194
195 Citation counts were not significantly different between studies with negative results (Median =
196 12, Interquartile range (IQR) 8-28) and studies with positive results (Median = 13, IQR 3-74; *Z*=-
197 .34, P>.05). Results from logistic regression indicated that sample size (OR 1.00, 95% CI: .99-
198 1.00) retrospective study design (OR .90, 95% CI: .46-1.76), or case reports (OR 4.70, 95% CI:
199 .61-36.35) were not predictive factors of publication status (model $\chi^2 = 4.91$, p>.05). Other
200 study designs were encountered too infrequently to include in this analysis.
201
202 Fifty-nine journals published abstracts presented at the AHPBA congresses from 2011 to 2013
203 (Table 2). There were 8 journals that published 5 or more full-text articles from the abstract
204 presentations, accounting for 70% of publications. The most frequent journal in which abstracts
205 were published was the conference's own journal, HPB, with 115 of the 243 publications
206 (47.3%). Other notable journals included *Annals of Surgical Oncology* 14 of 243 (5.7%) and the
207 *Journal of Gastrointestinal Surgery* 12 of 243 (4.9%). Table 2 also includes data on the
208 distribution of positive and negative results published in these journals.
209
210 Some 326 abstract presentations could not be found published as full papers. Email addresses
211 were obtained for 298 authors of these abstracts. Twenty-eight authors of the abstract
212 presentations could not be associated with an email address. Additionally, 42 emails were
213 returned as invalid addresses. Thirty-four authors (34/256, 13.3%) responded to emails. Of these

34, 10 authors provided information that their presentation was published, while 24 reported that it never reached publication. The most common reasons for not reaching publication were lack of time (7), lack of manpower (4), in preparation or under review (4), and results negative or not important (3).

Discussion

Our study, like others before it, revealed that investigations with at least one statistically significant outcome had a higher probability of reaching publication than those with insignificant or null findings.(Sally Hopewell et al. 2009; Tang et al. 2014) Furthermore, our findings on study design are consistent with Ball et al. for abstracts presented from 2005 to 2015 at the AHPBA.(Ball, Dixon, and Vollmer 2016)

It could cogently be argued that *P* values are misused in the medical literature. For example, Amrhein et al. reminds us that the dichotomization of outcomes into significant and non-significant may contribute to irreproducibility and that data dredging, p-hacking, and publication bias should be addressed by the elimination of significance thresholds.(Amrhein, Korner-Nievergelt, and Roth 2017) The majority of abstracts in our sample were retrospective in design - not adequately powered, well-conducted randomized trials. This misuse has been attributed to the mistaken understanding that *P* values are, “simple, reliable, and objective triage tools for separating the true and important from the untrue or unimportant” (Mark, Lee, and Harrell 2016). Alternatives to *P* value reporting are increasing in popularity. Reporting the effect size (for interpretation of clinical significance) and its confidence interval (for interpretation of the

237 precision of the effect estimate) are advocated by the American Statistical Association and many
238 journals (Piccirillo 2016). Hence, the study design should carefully be considered when
239 determining the appropriateness of calculating and reporting *P* values. The American Statistical
240 Association's recent position statement on *P* values (Wasserstein and Lazar 2016) is an excellent
241 starting point for understanding issues related to the misuse of *P* values.
242
243 Furthermore, results of our study could be attributed, in part, to the misapplication of statistical
244 analysis to underpowered studies. Publication bias, selective data analysis, and selective
245 reporting of outcomes are more likely to affect underpowered studies.(Button et al. 2013)
246 Additionally, editors and reviewers may be more likely to reject underpowered, negative studies
247 owing to their perception of being inconclusive or uninformative.(Evangelou et al. 2012)
248
249 Finally, a large body of evidence has focused on the consequences of publication bias pertaining
250 to randomized trials. In a systematic review of such trials, the omission of unpublished results
251 may alter pooled effect estimates. Oftentimes, the pooled effect estimate is altered to make the
252 intervention to appear more favorable. In our study, the most common study design was a
253 retrospective study. The effects of publication bias on these studies is still important, as
254 epidemiological outcomes, such as prevalence and incidence, may be misestimated and
255 correlational analyses may indicate inaccurate associations between clinical variables.
256
257 The publication rate of abstracts presented at the AHPBA from 2011 to 2013 was 42.7%. This
258 rate is higher than what was found for the 2007 to 2009 congresses (33.4%).(Durinka et al. 2016)
259 The rate of 42.7% is similar to the 44.5% rate reported by Scherer et al.(R. W. Scherer,
260 Langenberg, and von Elm 2007) in a systematic review of publication rates for 79 different

biomedical conferences. In the context of other gastroenterology conferences, the 42.7% rate of publication was not the lowest. Prendergast et al. found that the British Society of Gastroenterology (BSG) had a rate of 17.4% in 2005 and Raju et al. found a rate of 30.9% for abstracts at the United European Gastroenterology week (UEGW).(Prendergast et al. 2013; Raju et al. 2017) Reasons for not reaching publication were consistent with previous studies and most commonly pertained to lack of time, manpower, or negative results.(Pierson 2004)-(Roberta W. Scherer et al. 2015) Another consideration is that unpublished research may have never been submitted to a journal for review. Implications for not publishing are far reaching. With over $240 billion spent on health research each year, it is ideal to publish research to avoid unnecessary duplication, make data accessible, and prioritize future research.(Wolfenden et al. 2015) Additionally, not publishing has been shown to decrease the likelihood of future patient volunteers.(C. W. Jones et al. 2016)

The length of time to publication in our investigation (mean: 14 months, median: 9 months) is favorable in comparison with BSG's mean time of 18.6 months and the same as the mean 14 months reported by Durinka et al. from 2007 to 2009. (Durinka et al. 2016), (Prendergast et al. 2013) Furthermore, the AHPBA's median time to publication compares favorably to abstracts presented at other gastroenterology conferences.(Raju et al. 2017; Timmer et al. 2002) A Cochrane review found that the length of time for publication can be influenced by publication bias.(S. Hopewell et al. 2007) This review found that positive results were more likely to be published more quickly than those with null or negative results. Studies published earlier are made available to clinicians sooner and therefore have clinical important implications to patient care. For example, the quicker publication of positive findings may result in systematic reviews overestimating treatment effects.(R. W. Scherer, Langenberg, and von Elm 2007) Furthermore,

284 publication bias led to the widespread promotion of oseltamivir during pandemic seasons in 2005
285 and 2009.(Gupta, Meenu, and Mohan 2015) A systematic review highlighted this high risk of
286 reporting and publication bias in trials assessing oseltamivir, finding limited evidence for its
287 effectiveness in reducing symptoms, data unable to assess its effects on complications or
288 transmission, and an increase in adverse side effects.(Jefferson et al. 2014)

289 Publication bias is a cause for concern in the medical literature, as studies are often published
290 due to the large magnitude effect sizes reported by investigators. Such effects are not likely
291 reproducible in subsequent studies.(Baker and Dolgin 2017) Furthermore, systematic review
292 efforts are often hindered when only data from published studies are available for inclusion in
293 estimating summary effect estimates. For these reasons, it is important that action be taken to
294 limit publication bias in the gastroenterology literature. To accomplish this aim, we propose that
295 the following steps be taken:

296

297 1. Gastroenterology journals should pilot test, and work toward the adoption of, a two-stage
298 peer review process in which the first stage is to evaluate the study on the methodological
299 rigor of the study design before the outcomes of the study are known.
300 2. Gastroenterology journals and conferences need to place value on null and negative
301 findings, encourage authors to submit their research regardless of the nature or direction
302 of their findings.
303 3. Gastroenterology journals should consider including a negative results section of their
304 journals as has been done in other medical fields.(Dirnagl and Lauritzen 2010)

305

306 We note the following limitations. First, while extensive measures were taken to determine the

publication status of each abstract, it is possible that some were missed which could affect the results of this study. Changes in authorship, such as adding additional authors or rearranging the authorship order make matching abstracts with the published report more difficult. Changes to the title poses the same challenge. It is also possible that authors submitted interim results to the Congress yet published the final results, leading to incongruent aggregate outcomes and sample sizes. Other complicating factors include 2 abstracts being combined to form a single publication or a single abstract being parsed into multiple publications. Additionally, by excluding abstracts that did not report a *P* value from certain analyses could result in a bias in the reported estimate of incidence of significant results included in the studied publications. However, we feel confident that the abstracts identified as published by our search strategy are truly published versions of abstracts presented from 2011 to 2013 at the AHPBA annual congresses. While every effort was made to find author email addresses and make contact, we were unable to find a valid email address for authors of 70 presentations. Researchers only used Google, Google Scholar, and PubMed to find publications. Studies indexed in other databases that do not connect via Google may have been missed. However, given the exhaustive search and the efforts to email the authors, the number of omissions is likely very small. Given that 84% of abstracts were published in less than 24 months, our search interval was likely adequate. Therefore, we caution readers that our finding should be considered a lower bound estimate of the publication rate.

Conclusion

In conclusion, we found publication bias in the field of gastroenterological research. Abstracts with significant *P* values were more frequently published than those with negative results. In

addition, more than half of abstracts presented at the 2011 to 2013 AHPBA conferences failed to reached publication. Readers should take these finding into consideration when reviewing medical literature.

References

"AHPBA - Annual Meeting - Past Meeting Archives." n.d. Accessed July 2, 2017. https://www.ahpba.org/meeting/past-meeting-archives.phtml.

Amrhein, Valentin, Fränzi Korner-Nievergelt, and Tobias Roth. 2017. "The Earth Is Flat (p> 0.05): Significance Thresholds and the Crisis of Unreplicable Research." *PeerJ* 5. PeerJ Inc.: e3544.

Baker, Monya, and Elie Dolgin. 2017. "Cancer Reproducibility Project Releases First Results." *Nature* 541 (7637): 269–70.

Ball, Chad G., Elijah Dixon, and Charles M. Vollmer. 2016. "Trends in the Scientific Program of the Americas Hepato-Pancreato-Biliary Association (AHPBA) Annual Meeting over the Past Decade: The More Things Change, the More They Stay the Same." *HPB: The Official Journal of the International Hepato Pancreato Biliary Association* 18 (8): 697–99.

Barbui, Corrado, Toshiaki A. Furukawa, and Andrea Cipriani. 2008. "Effectiveness of Paroxetine in the Treatment of Acute Major Depression in Adults: A Systematic Re-Examination of Published and Unpublished Data from Randomized Trials." *CMAJ: Canadian Medical Association Journal = Journal de l'Association Medicale Canadienne* 178 (3): 296–305.

Button, Katherine S., John P. A. Ioannidis, Claire Mokrysz, Brian A. Nosek, Jonathan Flint, Emma S. J. Robinson, and Marcus R. Munafò. 2013. "Power Failure: Why Small Sample Size Undermines the Reliability of Neuroscience." *Nature Reviews. Neuroscience* 14 (5): 365–76.

Chong, Simon W., Neil F. Collins, Christine Y. Wu, Grace M. Liskaser, and Philip J. Peyton. 2016. "The Relationship between Study Findings and Publication Outcome in Anesthesia Research: A Retrospective Observational Study Examining Publication Bias." *Canadian Journal of Anaesthesia = Journal Canadien D'anesthesie* 63 (6): 682–90.

De Oliveira, Gildasio S., Jr, Ray Chang, Mark C. Kendall, Paul C. Fitzgerald, and Robert J. McCarthy. 2012. "Publication Bias in the Anesthesiology Literature." *Anesthesia and Analgesia* 114 (5): 1042–48.

Dickersin, K. 1990. "The Existence of Publication Bias and Risk Factors for Its Occurrence." *JAMA: The Journal of the American Medical Association* 263 (10): 1385–89.

Dirnagl, Ulrich, and Martin Lauritzen. 2010. "Fighting Publication Bias: Introducing the Negative Results Section." *Journal of Cerebral Blood Flow and Metabolism: Official Journal of the International Society of Cerebral Blood Flow and Metabolism* 30 (7): 1263–64.

Durinka, M. D., B. Joel, Tyler Wenzel, Christopher Ortiz, Lynn Choi, and Jorge Ortiz. 2016. "Fate of Abstracts Presented at the 2007-2009 Americas Hepato-Pancreato-Biliary Association Meetings." *Translation: The University of Toledo Journal of Medical Sciences* 3 (1): 1.

Easterbrook, P. J., J. A. Berlin, R. Gopalan, and D. R. Matthews. 1991. "Publication Bias in Clinical Research." *The Lancet* 337 (8746): 867–72.

Eloubeidi, M. A., S. B. Wade, and D. Provenzale. 2001. "Factors Associated with Acceptance and Full Publication of GI Endoscopic Research Originally Published in Abstract Form." *Gastrointestinal Endoscopy* 53 (3): 275–82.

Evangelou, Evangelos, Konstantinos C. Siontis, Thomas Pfeiffer, and John P. A. Ioannidis. 2012. "Perceived Information Gain from Randomized Trials Correlates with Publication in

High-Impact Factor Journals." *Journal of Clinical Epidemiology* 65 (12): 1274–81.
Eyding, Dirk, Monika Lelgemann, Ulrich Grouven, Martin Härter, Mandy Kromp, Thomas Kaiser, Michaela F. Kerekes, Martin Gerken, and Beate Wieseler. 2010. "Reboxetine for Acute Treatment of Major Depression: Systematic Review and Meta-Analysis of Published and Unpublished Placebo and Selective Serotonin Reuptake Inhibitor Controlled Trials." *BMJ* 341. British Medical Journal Publishing Group: c4737.
Fanelli, Daniele. 2010. "Do Pressures to Publish Increase Scientists' Bias? An Empirical Support from US States Data." *PloS One* 5 (4): e10271.
Frank, Rachel M., Gregory L. Cvetanovich, Michael J. Collins, Thomas A. Arns, Austin Black, Nikhil N. Verma, Brian J. Cole, and Brian Forsythe. 2017. "Publication Rates of Podium Versus Poster Presentations at the Arthroscopy Association of North America Meetings 2008-2012." *Arthroscopy: The Journal of Arthroscopic & Related Surgery: Official Publication of the Arthroscopy Association of North America and the International Arthroscopy Association* 33 (1): 6–11.
Gupta, Yogendra Kumar, Meenakshi Meenu, and Prafull Mohan. 2015. "The Tamiflu Fiasco and Lessons Learnt." *Indian Journal of Pharmacology* 47 (1): 11–16.
Harris, Petra, Andrea Takeda, Emma Loveman, and Debbie Hartwell. 2010. "Time to Full Publication of Studies of Anticancer Drugs for Breast Cancer, and the Potential for Publication Bias." *International Journal of Technology Assessment in Health Care* 26 (1): 110–16.
Hedin, Riley J., Blake A. Umberham, Byron N. Detweiler, Lauren Kollmorgen, and Matt Vassar. 2016. "Publication Bias and Nonreporting Found in Majority of Systematic Reviews and Meta-Analyses in Anesthesiology Journals." *Anesthesia and Analgesia* 123 (4): 1018–25.
Hopewell, Sally, Kirsty Loudon, Mike J. Clarke, Andrew D. Oxman, and Kay Dickersin. 2009. "Publication Bias in Clinical Trials due to Statistical Significance or Direction of Trial Results." *Cochrane Database of Systematic Reviews* , no. 1 (January): MR000006.
Hopewell, S., M. Clarke, L. Stewart, and J. Tierney. 2007. "Time to Publication for Results of Clinical Trials." *Cochrane Database of Systematic Reviews* , no. 2 (April): MR000011.
Jefferson, Tom, Mark A. Jones, Peter Doshi, Chris B. Del Mar, Rokuro Hama, Matthew J. Thompson, Elizabeth A. Spencer, Igho J. Onakpoya, Kamal R. Mahtani, David Nunan, Jeremy Howick, Carl J. Heneghan 2014. "Neuraminidase Inhibitors for Preventing and Treating Influenza in Healthy Adults and Children." *Cochrane Database of Systematic Reviews* , no. 4 (April): CD008965.
Jones, Christopher W., Valerie A. Braz, Stephen M. McBride, Brian W. Roberts, and Timothy F. Platts-Mills. 2016. "Cross-Sectional Assessment of Patient Attitudes towards Participation in Clinical Trials: Does Making Results Publicly Available Matter?" *BMJ Open* 6 (11): e013649.
Jones, Philip M. 2016. "Publication Bias in the Anesthesiology Literature: Shifting the Focus from the 'Positive' to the 'Truth.'" *Canadian Journal of Anaesthesia = Journal Canadien D'anesthesie* 63 (6): 658–63.
Lim, Byung Gun, Il Ok Lee, Hyeongsik Ahn, Dong Kyu Lee, Young Ju Won, Hyun Jung Kim, and Heezoo Kim. 2016. "Comparison of the Incidence of Emergence Agitation and Emergence Times between Desflurane and Sevoflurane Anesthesia in Children: A Systematic Review and Meta-Analysis." *Medicine* 95 (38): e4927.
Mark, Daniel B., Kerry L. Lee, and Frank E. Harrell Jr. 2016. "Understanding the Role of P Values and Hypothesis Tests in Clinical Research." *JAMA Cardiology* 1 (9): 1048–54.

Masic, Izet, Milan Miokovic, and Belma Muhamedagic. 2008. "Evidence Based Medicine - New Approaches and Challenges." *Acta Informatica Medica: AIM: Journal of the Society for Medical Informatics of Bosnia & Herzegovina: Casopis Drustva Za Medicinsku Informatiku BiH* 16 (4): 219–25.

Paulson, Kristjan, Mahwash Saeed, Jennifer Mills, Geoff D. E. Cuvelier, Rajat Kumar, Colette Raymond, Tracy Robinson, David Szwajcer, Donna Wall, and Matthew D. Seftel. 2011. "Publication Bias Is Present in Blood and Marrow Transplantation: An Analysis of Abstracts at an International Meeting." *Blood* 118 (25): 6698–6701.

Piccirillo, Jay F. 2016. "Improving the Quality of the Reporting of Research Results." *JAMA Otolaryngology-- Head & Neck Surgery* 142 (10): 937–39.

Pierson, David J. 2004. "The Top 10 Reasons Why Manuscripts Are Not Accepted for Publication." *Respiratory Care* 49 (10): 1246–52.

Prendergast, Sarah, Katharina Mattishent, Tom Broughton, and Ian Beales. 2013. "Is Gastroenterology Research in Decline? A Comparison of Abstract Publication Rates from The British Society of Gastroenterology Meetings between 1995 and 2005." *F1000Research* 2 (February): 59.

Raju, Suneil A., David S. Sanders, Rahim Akram, Rebecca Glover, Ammar Al-Rifaie, Elise Peever, Josh Purves, Emily Scanu, and Matthew Kurien. 2017. "United European Gastroenterology Week Scientific Abstracts and Their Progression to Full Publication." *European Journal of Gastroenterology & Hepatology* 29 (10): 1136–40.

Sackett, D. L., W. M. Rosenberg, J. A. Gray, R. B. Haynes, and W. S. Richardson. 1996. "Evidence Based Medicine: What It Is and What It Isn't." *BMJ* 312 (7023): 71–72.

Saeed, Mahwash, Kristjan Paulson, P. Lambert, David Szwajcer, and Matthew Seftel. 2011. "Publication Bias in Blood and Marrow Transplantation." *Biology of Blood and Marrow Transplantation: Journal of the American Society for Blood and Marrow Transplantation* 17 (6): 930–34.

Salami, Khadra, and Khaldoun Alkayed. 2013. "Publication Bias in Pediatric Hematology and Oncology: Analysis of Abstracts Presented at the Annual Meeting of the American Society of Pediatric Hematology and Oncology." *Pediatric Hematology and Oncology* 30 (3): 165–69.

Sartor, C. I., B. L. Peterson, and S. Woolf. 2003. "Time to Full Publication of Studies of Anticancer Drugs for Breast Cancer, and the Potential for Publication Bias." In *Proc Am Soc Clin Oncol*, 22:30–40.

Scherer, Roberta W., Cesar Ugarte-Gil, Christine Schmucker, and Joerg J. Meerpohl. 2015. "Authors Report Lack of Time as Main Reason for Unpublished Research Presented at Biomedical Conferences: A Systematic Review." *Journal of Clinical Epidemiology* 68 (7): 803–10.

Scherer, R. W., P. Langenberg, and E. von Elm. 2007. "Full Publication of Results Initially Presented in Abstracts." *Cochrane Database of Systematic Reviews* , no. 2 (April): MR000005.

Shaheen, N. J., M. A. Crosby, E. M. Bozymski, and R. S. Sandler. 2000. "Is There Publication Bias in the Reporting of Cancer Risk in Barrett's Esophagus?" *Gastroenterology* 119 (2): 333–38.

Song, Fujian, Yoon Loke, and Lee Hooper. 2014. "Why Are Medical and Health-Related Studies Not Being Published? A Systematic Review of Reasons given by Investigators." *PloS One* 9 (10): e110418.

Sukhal, Shashvat, Jaskaran Sethi, Malini Ganesh, Pedro A. Villablanca, Anita K. Malhotra, and Harish Ramakrishna. 2017. "Extracorporeal Membrane Oxygenation in Severe Influenza Infection with Respiratory Failure: A Systematic Review and Meta-Analysis." *Annals of Cardiac Anaesthesia* 20 (1): 14–21.

Takeda, A., E. Loveman, P. Harris, D. Hartwell, and K. Welch. 2008. "Time to Full Publication of Studies of Anti-Cancer Medicines for Breast Cancer and the Potential for Publication Bias: A Short Systematic Review." *Health Technology Assessment* 12 (32): iii, ix – x, 1–46.

Tang, P. A., G. R. Pond, S. Welch, and E. X. Chen. 2014. "Factors Associated with Publication of Randomized Phase Iii Cancer Trials in Journals with a High Impact Factor." *Current Oncology* 21 (4): e564–72.

Timmer, Antje, Robert J. Hilsden, John Cole, David Hailey, and Lloyd R. Sutherland. 2002. "Publication Bias in Gastroenterological Research - a Retrospective Cohort Study Based on Abstracts Submitted to a Scientific Meeting." *BMC Medical Research Methodology* 2 (April): 7.

Turner, Erick H., Annette M. Matthews, Eftihia Linardatos, Robert A. Tell, and Robert Rosenthal. 2008. "Selective Publication of Antidepressant Trials and Its Influence on Apparent Efficacy." *The New England Journal of Medicine* 358 (3): 252–60.

Wasserstein, Ronald L., and Nicole A. Lazar. 2016. "The ASA's Statement on P-Values: Context, Process, and Purpose." *The American Statistician* 70 (2). Taylor & Francis: 129–33.

Whittington, Craig J., Tim Kendall, Peter Fonagy, David Cottrell, Andrew Cotgrove, and Ellen Boddington. 2004. "Selective Serotonin Reuptake Inhibitors in Childhood Depression: Systematic Review of Published versus Unpublished Data." *The Lancet* 363 (9418): 1341–45.

Wolfenden, Luke, Anna Ziersch, Priscilla Robinson, John Lowe, and John Wiggers. 2015. "Reducing Research Waste and Improving Research Impact." *Australian and New Zealand Journal of Public Health* 39 (4): 303–4.

Table 1(on next page)

Study design of abstracts and number that reached publication

Table 1 Study design of abstracts and number that reached publication

Study Design	Abstracts by study type (n)	Abstracts reporting a significant P value by study type (n)	Abstracts reaching publication by study type (n)
Randomized Controlled Trials	3	2	3 (100%)
Cohort	17	8	11 (64.7%)
Retrospective Analysis	313	183	150 (47.9%)
Case Report	58	1	12 (20.7%)
Video Report	14	0	3 (21.4%)
Survey Report	8	5	2 (25%)
Basic Science	29	15	11 (37.9%)
Single Assignment	19	5	11 (57.9%)
Systematic Review/Meta-Analysis	7	3	2 (86.5%)
Prospective Analysis	40	24	23 (57.5%)
Animal Study	16	8	8 (50%)
Cost Analysis	3	0	2 (66.7%)
Technique Report	42	0	5 (11.9%)

Table 2(on next page)

Journals responsible for publishing abstracts

Table 2 Journals responsible for publishing abstracts

Journal	Abstracts published (n)	Abstracts with significant outcome (n)	Abstracts with negative outcome (n)	Abstracts with no reported P value reaching publication (n)
American Journal of Transplantation	1	1	0	0
Annals of Surgery	5	4	0	1
Annals of Surgical Oncology	14	8	0	6
Annals of Vascular surgery	1	1	0	0
Archives of Surgery	1	1	0	0
Arquvois Brasileiros De Cirurgia Digestiva	1	0	0	1
BMC Cancer	2	1	0	1
British Journal of Surgery	1	1	0	0
Canadian Journal of Surgery	1	1	0	0
Cancer	1	0	0	1
Cancer Biology & Therapy	1	0	0	1
Cancer Investigation	1	1	0	0
Clinical Transplantation	2	1	0	1
Diagnostics	1	1	0	0
Endoscopy	1	0	0	1
European Journal of Surgical Oncology	2	1	0	1
European Journal of Trauma and Emergency Surgery	1	0	1	0
European Surgical Research	1	0	0	1
Genetics in Medicine	1	0	1	0
Hepatobiliary & Pancreatic Diseases International	2	0	0	2
Hepatogastroenterology	2	1	0	1
HPB	115	74	7	34
International Journal of Hyperthermia	1	0	0	1
International Journal of Surgery	2	2	0	0

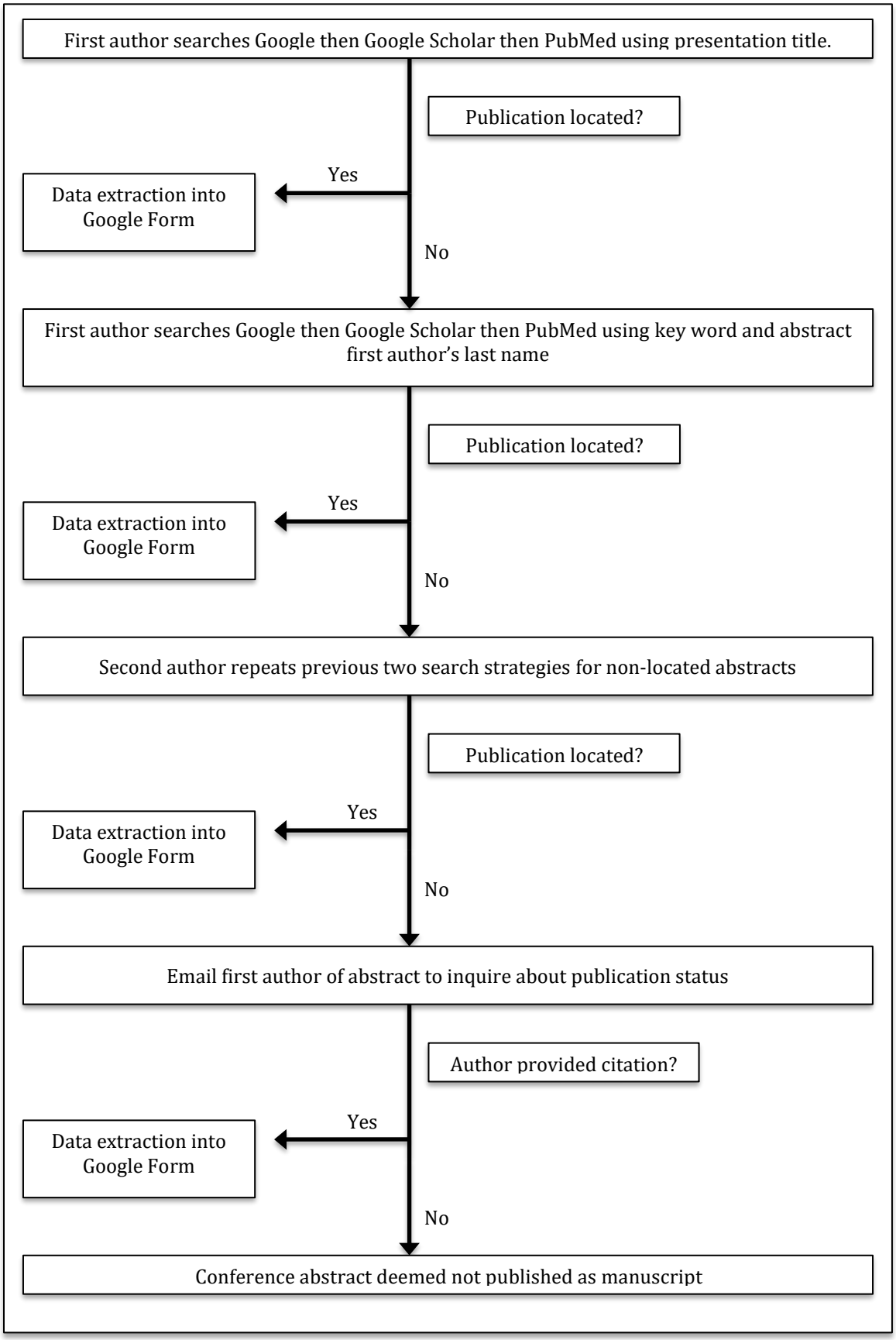
International Journal of Surgical Oncology	2	1	1	0
JAMA Surgery	1	1	0	0
Journal of Biomedical Materials Research	1	0	0	1
Journal of Clinical Investigation	1	0	0	1
Journal of Gastrointestinal Cancer	1	1	0	0
Journal of Gastrointestinal Surgery	12	8	0	4
Journal of Hepato-biliary-pancreatic Sciences	1	0	0	1
Journal of Liver: Disease and Transplantation	1	0	0	1
Journal of Laparoendoscopic & Advanced Surgical Techniques	2	0	0	2
Journal of microwave surgery	1	0	0	1
Journal of Robotic surgery	1	0	0	1
Journal of Surgical Oncology	7	5	0	2
Journal of Surgical Research	2	0	1	1
Journal of Surgical Resection	2	1	0	1
Journal of the American College of Surgeons	6	4	0	2
Journal of the Medical Association of Thailand	1	0	0	1
Journal of the Society of Laparoendoscopic Surgeons	3	0	0	3
Langenbeck's Archives of Surgery	1	1	0	0
Liver Transplantation	1	1	0	0
Molecular Oncology	1	0	0	1
Neoplasia	1	1	0	0
Open Journal of Organ Transplant Surgery	1	0	0	1
Pediatric Transplantation	1	0	1	0
PLOS one	2	0	1	1

Radiology Society of North America	1	1	0	0
Seminars in Liver Disease	1	1	0	0
Surgery	5	3	0	2
Surgical Endoscopy	6	3	0	3
Surgical Innovation	2	1	0	1
The American Journal of Surgery	4	3	0	1
The American Surgeon	2	0	1	1
Transplantation Proceedings	2	1	1	0
World Journal of Gastroenterology	3	1	0	2
World Journal of Gastrointestinal Pathophysiology	1	0	0	1
World Journal of Surgical Oncology	2	2	0	0

3

Figure 1(on next page)

Flow diagram for locating articles


First author searches Google then Google Scholar then PubMed using presentation title.
Publication located?
Yes
Data extraction into Google Form
No
First author searches Google then Google Scholar then PubMed using key word and abstract first author's last name
Publication located?
Yes
Data extraction into Google Form
No
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Publication located?
Yes
Data extraction into Google Form
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Conference abstract deemed not published as manuscript

Figure 2(on next page)

Flow diagram outlining search results

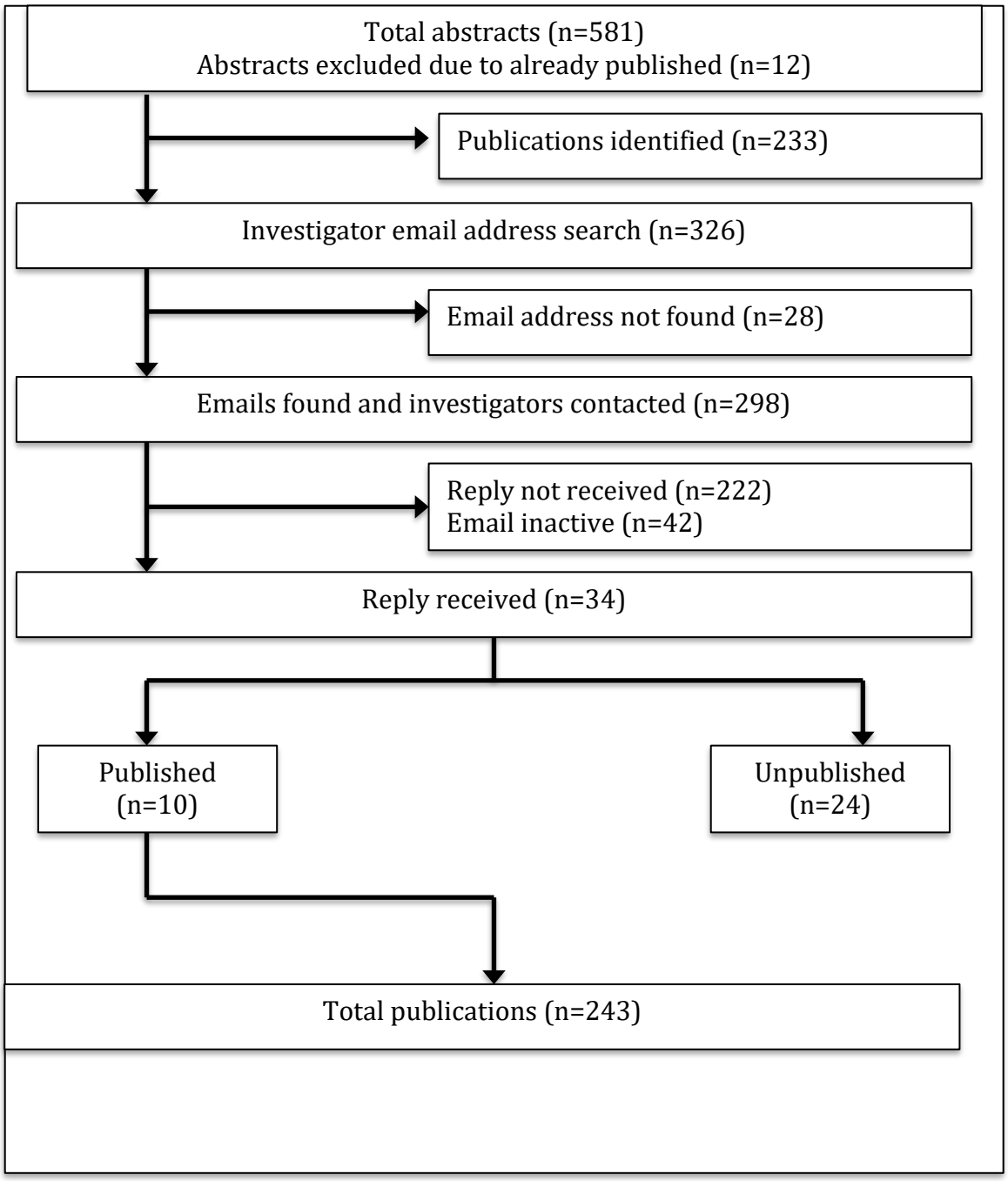
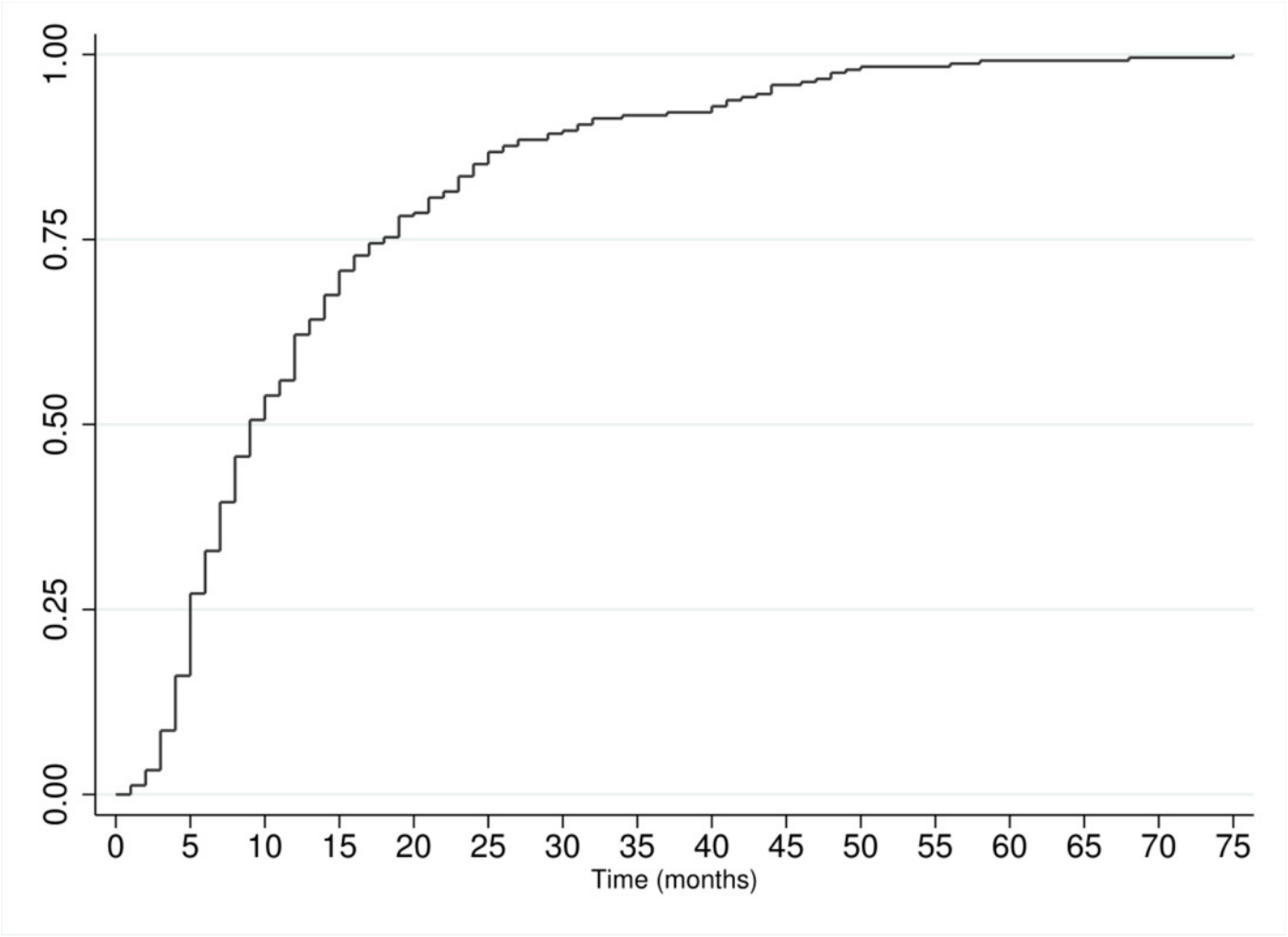

Total abstracts (n=581)
Abstracts excluded due to already published (n=12)
Publications identified (n=233)
Investigator email address search (n=326)
Email address not found (n=28)
Emails found and investigators contacted (n=298)
Reply not received (n=222)
Email inactive (n=42)
Reply received (n=34)
Published (n=10)
Unpublished (n=24)
Total publications (n=243)

Figure 3

Cumulative rate of publication