Comparison of Registered and Published Primary Outcomes in Randomized Controlled Trials of Orthopaedic Surgical Interventions

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Background: The selective reporting of a subset of the outcomes that had been originally reported to a registry is a potential threat to the validity of evidence-based medicine. The extent of selective reporting has not been described for randomized controlled trials (RCTs) assessing the effectiveness of orthopaedic surgical interventions. The objective of this study was (1) to determine the percentage of orthopaedic surgical RCTs published in high-impact orthopaedic journals that were reported to have been registered, (2) to evaluate the consistency between the primary outcome measures recorded in the registry and those reported in the article, and (3) to evaluate whether selective reporting favored statistically significant outcomes.

Methods: We searched PubMed for articles on RCTs assessing orthopaedic surgical interventions indexed from January 2010 through December 2014 and published in the ten orthopaedic journals with the highest impact factors. For every article in which the authors reported registration of the RCT, we extracted the number and nature of the outcome measures from the article and the corresponding information from the registry. We then evaluated the consistency between the primary outcome measures reported in the registry and those reported in the published article. Moreover, we evaluated whether selective reporting favored statistically significant outcomes.

Results: Of the 362 articles on orthopaedic surgical RCTs, ninety (24.9%) reported that the RCT had been registered and thirty-four (37.8%) of the ninety had been registered adequately (registered before the study end with a clear description of the primary outcome measure and its time frame, with no substantial change after the study end). Twenty-six reports were eligible for our evaluation of the consistency between the registered primary outcome measures and those reported in the published article. This analysis identified one or multiple major discrepancies for fourteen articles, eight of which favored statistically significant results.

Conclusions: Few articles on orthopaedic surgical RCTs reported registration of the trial, and even fewer of these trials were registered adequately. Inconsistencies between registered primary outcome measures and those reported in the published articles, as well as selective outcome reporting favoring statistically significant outcomes, were prevalent.

Clinical Relevance: Although trial registration is now the rule, it is currently far from optimal for orthopaedic surgical RCTs, and selective outcome reporting is prevalent. Full involvement of authors, editors, and reviewers is necessary to ensure publication of quality, unbiased results.
Despite being considered the best means of obtaining evidence, even RCTs are at risk for bias. Two important potential sources of bias are publication bias and outcome reporting bias. Publication bias is introduced by not submitting or publishing reports because of the direction and magnitude of the results of a trial. Selective reporting of a subset of the originally defined outcome measures on the basis of their results is known as outcome reporting bias. Selective reporting of results is a potential threat to the validity of evidence-based health care: first, because it increases the prevalence of false-positive results, and second,

**TABLE I Examples of Discrepancies Between Primary Outcome Measures Reported in Registry and Published Article**

<table>
<thead>
<tr>
<th>Discrepancy</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered primary outcome reported as secondary outcome in article</td>
<td>In trial about fracture treatment, registered primary outcome “time to healed fracture” was reported as a secondary outcome in published article. (WOMAC [Western Ontario and McMaster Universities Arthritis Index] hip function scores reported as primary outcome measure in published article)</td>
</tr>
<tr>
<td>Registered primary outcome omitted in article</td>
<td>In trial about total knee arthroplasty, registered primary outcome “International Knee Society score” was omitted in published article. (Blood loss reported as primary outcome measure in published article)</td>
</tr>
<tr>
<td>New primary outcome introduced in article</td>
<td>In trial about shoulder arthroplasty, a primary outcome “muscle strength” that had not been prespecified in registered protocol was introduced in published article. (Quality of life postoperatively was prespecified as primary outcome in registered protocol)</td>
</tr>
<tr>
<td>Published primary outcome described as secondary outcome in registry</td>
<td>In trial about rotator cuff repair, primary outcome “tendon healing” reported in published article was described as a secondary outcome in registered protocol. (Primary outcomes in registered protocol included two standardized shoulder outcome scales)</td>
</tr>
<tr>
<td>Different timing of assessment of primary outcome</td>
<td>In trial about fracture treatment, primary outcome “pain” was assessed at 3 and 12 mo in published article while it was prespecified that pain be assessed at 1 wk in registered protocol</td>
</tr>
</tbody>
</table>

*Specific details of primary outcome measures were omitted to maintain anonymity. In addition to the example of each discrepancy, information is provided in italics in the parentheses to support interpretation of the discrepancies.

**TABLE II Journals Used to Search for Orthopaedic Surgical RCTs and Their Policy Related to Trial Registration Requirement**

<table>
<thead>
<tr>
<th>Rank</th>
<th>Journal</th>
<th>2013 5-Yr Impact Factor*</th>
<th>Registration Policy†</th>
<th>ICMJE Policy‡</th>
<th>RCTs (no. [% of all RCTs in current study])</th>
<th>RCTs Registered (no. [% of RCTs in journal])</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The American Journal of Sports Medicine</td>
<td>5.0</td>
<td>No§</td>
<td>No</td>
<td>47 (13.0)</td>
<td>6 (12.8)</td>
</tr>
<tr>
<td>2</td>
<td>Osteoarthritis and Cartilage</td>
<td>4.6</td>
<td>Yes</td>
<td>Yes</td>
<td>3 (0.8)</td>
<td>2 (66.7)</td>
</tr>
<tr>
<td>3</td>
<td>The Journal of Bone &amp; Joint Surgery</td>
<td>4.4</td>
<td>Yes</td>
<td>No</td>
<td>76 (21.0)</td>
<td>57 (75.0)</td>
</tr>
<tr>
<td>4</td>
<td>Physical Therapy</td>
<td>3.9</td>
<td>Yes</td>
<td>Yes</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td>Arthroscopy</td>
<td>3.6</td>
<td>Yes</td>
<td>No</td>
<td>36 (9.9)</td>
<td>3 (8.3)</td>
</tr>
<tr>
<td>6</td>
<td>Journal of Orthopaedic Research</td>
<td>3.3</td>
<td>Yes</td>
<td>No</td>
<td>4 (1.1)</td>
<td>2 (50)</td>
</tr>
<tr>
<td>7</td>
<td>The Bone &amp; Joint Journal</td>
<td>3.3</td>
<td>No</td>
<td>No</td>
<td>44 (12.2)</td>
<td>3 (6.8)</td>
</tr>
<tr>
<td>8</td>
<td>Clinical Orthopaedics and Related Research</td>
<td>3.2</td>
<td>No</td>
<td>No</td>
<td>57 (15.7)</td>
<td>6 (10.5)</td>
</tr>
<tr>
<td>9</td>
<td>Physiotherapy</td>
<td>3.0</td>
<td>Yes</td>
<td>Yes</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>Knee Surgery, Sports Traumatology, Arthroscopy</td>
<td>2.9</td>
<td>No</td>
<td>No</td>
<td>95 (26.2)</td>
<td>11 (11.6)</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>362 (100)</td>
<td>90 (24.9)</td>
</tr>
</tbody>
</table>

*According to the Institute for Scientific Information Web of Knowledge. † “Yes” indicates that journal policy explicitly requested registration of the trial before submission of an article. ‡ “Yes” indicates that journal policy explicitly referred to the ICMJE guidelines with respect to trial registration. §Journal stated that “registration of clinical trials is strongly recommended in an appropriate registry.”
Because subsequent systematic reviews and meta-analyses using these false-positive results tend to overrate treatment effects. The worst possible situation for patients, health-care professionals, and policy-makers is when ineffective or harmful interventions are promoted. It is also a problem when expensive therapies that are thought to be better than cheaper alternatives are not truly superior.

In 2005, the International Committee of Medical Journal Editors (ICMJE) initiated the policy that member journals require investigators to register their trial in a public trials registry before the onset of patient enrollment as a condition for consideration for publication. The main objective of trial registration is to achieve full transparency with respect to performance and reporting of clinical trials. Complete transparency allows exploration of the full range of clinical evidence and decreases the risk of selective outcome reporting and publication bias.

Although outcome reporting bias has been investigated for general medicine and for general surgical interventions, it has not been evaluated for orthopaedic surgical RCTs to our knowledge. It is important for the orthopaedic scientific community to be aware of selective reporting, both for correct interpretation of results from RCTs and to ensure a sound basis for quality improvement. The objective of this study was threefold: (1) to determine the percentage of orthopaedic surgical RCTs published in high-impact orthopaedic journals that were reported to have been registered, (2) to evaluate the consistency between the primary outcome measures published in the registry and those reported in the article, and (3) to evaluate whether selective reporting favored statistically significant outcomes.

**Materials and Methods**

**Search Strategy and Selection of Studies**

On February 23, 2015, we searched PubMed for original articles concerning RCTs assessing orthopaedic surgical interventions. We combined the Cochrane search strategy for identifying RCTs with a search for all subheadings and entries categorized as either “orthopedic surgical procedures,” or “surgical procedures” combined with “musculoskeletal system.” This strategy was developed in collaboration with information specialists from the medical library of the Radboud University Medical Center, Nijmegen, the Netherlands. We limited our search to a five-year period from January 1, 2010, through December 31, 2014. Next, the search results were limited to the ten journals with the highest impact factors in the “orthopedics” subject category, according to the Institute for Scientific Information Web of Knowledge (2013). The detailed search strategy is provided in the Appendix.

During the initial screening phase, articles on primary RCTs assessing an orthopaedic surgical intervention were selected on the basis of their title and abstract. An orthopaedic surgical intervention was defined as a surgical procedure, conducted in an operating theater by an orthopaedic surgeon, used to treat and correct any deformity, disease, and/or injury to the musculoskeletal system, its articulations, and/or associated structures. A surgical intervention was defined as a physical intervention on tissue, involving cutting or closure of a previously sustained wound. An RCT assessing an orthopaedic surgical intervention was defined as a comparative study designed to test the efficacy or effectiveness of an orthopaedic surgical intervention with random allocation of participants to an orthopaedic surgical intervention in at least one study arm.

After the initial screening, full-text copies of all articles eligible for inclusion were reviewed. Articles not explicitly reporting trial registration were excluded from further analysis. If only a registration number without a corresponding trial registry or a trial registry without a corresponding number was responding, the entire publication was evaluated). An orthopaedic surgical intervention was defined as a surgical procedure, conducted in an operating theater by an orthopaedic surgeon, used to treat and correct any deformity, disease, and/or injury to the musculoskeletal system, its articulations, and/or associated structures. A surgical intervention was defined as a physical intervention on tissue, involving cutting or closure of a previously sustained wound. An RCT assessing an orthopaedic surgical intervention was defined as a comparative study designed to test the efficacy or effectiveness of an orthopaedic surgical intervention with random allocation of participants to an orthopaedic surgical intervention in at least one study arm.

The “instructions for authors” of the selected journals were searched for an explicit request for trial registration in a public trials registry as a condition for consideration for publication and to determine whether authors were being referred to the ICMJE guidelines on trial registration.

**Data Extraction**

In addition to the bibliographic details, the following information was extracted from the article and entered into a standardized extraction form: orthopaedic subspecialty, funding source, registry, registration number, whether it was explicitly stated that the article was reporting an ancillary analysis or follow-up of an earlier reported RCT, nature and number of reported outcome measures, and study time frame. Primary outcome measures were outcome measures explicitly described as primary in the published article. If no outcome was explicitly described as primary, we assumed that the outcome measure stated in the sample size calculation was the primary outcome measure. If both were absent, the published article was considered to have not reported a primary outcome.

Next, for each registered trial, the following information was extracted from the registry: registration date, current status, onset of participant enrollment, primary completion date (e.g., date of final collection of data for the primary outcome), nature and number of the reported outcome measures with their time frame for data collection, and registered changes in outcome measures with corresponding dates.

**Data Analysis**

Data analysis started with identification of the number of reports on orthopaedic surgical RCTs in which the authors stated that the trial had been registered.
in the published article, (4) the primary outcome reported in the published article, (3) a new primary outcome (not registered in the registry) was introduced, (2) the primary outcome in the trial registry was absent in the published article, (1) the time frame of assessment of the published and registered primary outcome measures differed (Table I). If the registry contained more than one primary outcome, we used these definitions to classify each. Each primary outcome that was considered to be a discrepancy, and each clear change in the registered outcome after the study end, was confirmed by the two of us, and disagreements were resolved by consensus.

Next, we assessed whether these discrepancies favored significant results, using the classification system of Chan and Altman for this purpose. We extracted the p values from the articles for both the registered primary outcome measures and the primary outcome measures reported in the article. A discrepancy was considered to favor significant results when (1) a new significant primary outcome was introduced in the article, or (2) a non-significant registered primary outcome was omitted or defined as nonprimary in the article.

### Results

The search strategy retrieved 1266 unique records (Fig. 1), and the subsequent selection procedure identified 362 RCTs of orthopaedic surgical interventions. The majority of the journals provided explicit requests for trial registration in their instructions to authors (Table II). However, the content of these requests for registration was not uniform, and only a minority of the journals explicitly referred to the ICMJE guidelines for trial registration (Table II).

The orthopaedic subspecialties of the identified articles were arthroplasty (47.8%), sports (23.3%), trauma (16.7%), spine (5.6%), hand/upper extremity (4.4%), foot/ankle (1.1%), and

<table>
<thead>
<tr>
<th>Year</th>
<th>RCTs (no.)</th>
<th>Reported Registration (no. [%])</th>
<th>Registration Before Study End (no. [%])</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>64</td>
<td>11 (17.2)</td>
<td>2 (3.1)</td>
</tr>
<tr>
<td>2011</td>
<td>71</td>
<td>14 (19.7)</td>
<td>7 (9.9)</td>
</tr>
<tr>
<td>2012</td>
<td>78</td>
<td>23 (29.5)</td>
<td>9 (11.5)</td>
</tr>
<tr>
<td>2013</td>
<td>68</td>
<td>19 (27.9)</td>
<td>10 (14.7)</td>
</tr>
<tr>
<td>2014</td>
<td>81</td>
<td>23 (28.4)</td>
<td>14 (17.3)</td>
</tr>
<tr>
<td>Total (2010-2014)</td>
<td>362</td>
<td>90 (24.9)</td>
<td>42 (11.6)</td>
</tr>
</tbody>
</table>

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**TABLE IV Year-by-Year Analysis of RCT Registration Rates**

| RCTs registered before study end (no. [% of RCTs reported registered)] | 42 (46.7) |
| RCTs adequately registered (no. [% of RCTs reported registered)] | 34 (37.8) |
| Adequately registered RCTs eligible for analysis (no. [% of RCTs reported registered)] | 26 (28.9) |
| Median reported primary outcome measures (range) (no.) | 1 (1-3) |
| Median registered primary outcome measures (range) (no.) | 1 (1-3) |
| RCTs with inconsistencies between primary outcome measure in registry and published article report (no. [% of adequately registered RCTs eligible for analysis)] | 14 (53.8) |
| 1. Registered primary outcome reported as secondary outcome in article | 9 |
| 2. Registered primary outcome omitted in article | 2 |
| 3. New primary outcome introduced in article | 5 |
| 4. Published primary outcome described as secondary outcome in registry | 1 |
| 5. Different timing of assessment of primary outcome | 4 |
| Discrepancies in primary outcome favoring significant results (no. [% of trials with inconsistencies)] | 8 (57.1) |

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**TABLE V Differences Between Primary Outcome Measures in Trial Registry and Published Article and Discrepancies Favoring Significant Results**

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Subsequently, to allow for objective and unbiased evaluation of the consistency between registered primary outcome measures and those reported in the published articles, we included only adequately registered trials—i.e., those registered before the study end with a clear description of the primary outcome measure(s) and the time frame during which they were evaluated and without clear changes in the primary outcome measure(s) after the study end. Trials registered after the study end were excluded because the trial could have been registered after data analysis, allowing selective registration of certain outcome measures dependent on the outcome direction. Trials with clear changes in the registered primary outcome measure(s)—i.e., those in which the current registered outcome measure(s) were clearly different from the previous registered primary outcome measure(s) after the study end—were excluded because those changes could have been made after data analysis, again allowing selective changes of certain outcome measures dependent on the outcome direction. Trials with imprecise outcome registration were also excluded because this impeded objective evaluation of inconsistencies with reported primary outcome measures. Outcome registration was classified as “imprecise” if an inconsistency between the registered and reported primary outcome measures was the consequence of a less accurate description of the outcome measure in the trial registry compared with that reported in the article (e.g., primary outcome measures reported as “safety” and “preliminary efficacy” of an orthopaedic implant in the registry but expressed in the paper in terms of therapeutic “responders” versus “nonresponders” based on a change in the KOOS [Knee injury and Osteoarthritis Outcome Score] pain score of ≥21.2 points and a change in the IKDC [International Knee Documentation Committee] function score of ≥20 points).

In addition to inadequately registered trials, articles that did not define a primary outcome measure were excluded from further analyses because this lack made it impossible to evaluate the consistency between the primary outcome measure reported in the article and the registered primary outcome measure. In addition, studies that were explicitly registered to be an ancillary analysis or a follow-up of an earlier reported RCT were excluded because such reports clearly inform readers of the intention to describe results that are different from their original primary outcome within its original time frame. Finally, to prevent the possibility of assigning too much weight to inconsistencies of one registered trial, we included only the first trial report if more than one article reported the results of one RCT.

For the included trial reports, we evaluated the primary outcome measure(s) registered in the trial registry and those reported in the published article for consistency. Outcome measures were classified as inconsistent if they were obviously different (e.g., an IKS [International Knee Society] score versus loss of blood) or had been evaluated at different time points (e.g., pain at six months versus pain at one week). Subsequently, these discrepancies were classified according to a modification of the classification system of Chan et al. (1) the primary outcome in the trial registry was reported as a secondary outcome in the published article, (2) the primary outcome in the trial registry was absent in the published article, (3) a new primary outcome (not registered in the registry) was introduced in the published article, (4) the primary outcome reported in the published article was described as a secondary outcome in the registry, and (5) the time frame of assessment of the published and registered primary outcome measures differed (Table I).
oncology (1.1%). Ninety (24.9%) of the 362 identified articles reported trial registration (Table III). The status of the trial was recorded in the registry as completed (68.9%), active but not recruiting (15.6%), recruiting (7.8%), terminated (4.4%), not reported (1.1%), withheld (1.1%), or recruitment planned (1.1%).

Of the ninety trials that were reported in the articles as having been registered, forty-two (46.7%) were registered before the end of the trial and only twelve (13.3%) were registered within the appropriate time frame specified by the ICMJE (e.g., before enrollment of the first participant). Year-by-year analysis demonstrated a modest improvement in the rate and timing of registration during the five years from 2010 to the end of 2014 (Table IV).

Evaluation of the forty-two trials that had been registered before the end of the trial showed clear changes in the primary outcome measures after the study end in four of them and imprecise outcome registration in four others. Altogether, thirty-four (37.8%) of the ninety trials that were reported in the article as having been registered had been adequately registered. Eight of

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**Fig. 1**
Flowchart of article selection, reported trial registration, and comparison of published and registered primary outcome measures.

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**Table 2**
1266 records identified through Pubmed

869 articles excluded based on Title and Abstract

397 full text articles assessed for eligibility

35 articles excluded based on full text
  - 16 no orthopedic surgical intervention
  - 18 no primary randomized controlled trial
  - 1 article retracted

362 articles included in analysis of trial registration and reporting

272 articles excluded
  - 266 did not report trial registration
  - 6 reported registrations not traceable

90 articles registered

48 articles excluded
  - 48 trials registered after study end

42 articles registered before study end

16 articles excluded
  - 7 ancillary analyses or follow up of an earlier reported RCT
  - 1 primary outcome not identifiable in article report
  - 4 clear changes in primary outcome after study end
  - 4 imprecise outcome registration

34 articles adequately registered and 26 eligible for comparison between the registered and published primary outcomes
these articles were excluded from the evaluation of the consistency between reported and registered primary outcome measures because, in seven, the authors had explicitly reported the results of an ancillary analysis or a follow-up of an earlier reported RCT and, in one, the authors had not explicitly reported a primary outcome.

In total, twenty-six trial reports were eligible for evaluation of the consistency between the primary outcome measure(s) registered in the registry and those reported in the published article. Of these twenty-six reports, fourteen (53.8%) were identified as having one or more discrepancies, eight of which favored significant results (Table V).

Discussion

Our results demonstrated inadequate registration of orthopaedic surgical RCTs and prevalent selective outcome reporting in articles on orthopaedic surgical RCTs.

In general, our results are in accordance with those of other studies, in other therapeutic areas, that also described considerable discrepancies in primary outcome measures between trial registries and/or trial protocols and published articles.

One of us (G.H.) and colleagues reported an overall registration rate of 218 (66.7%) of 327 identified surgical RCTs18. Of the 218 registered trials, 152 (69.7%) were adequately registered and seventy-five (49.3%) of the 152 were identified as having one or more major discrepancies between registered and reported primary outcome measures; twenty-one (28.0%) of the seventy-five favored significant results.

Mathieu et al. reported an overall registration rate of 234 (72.4%) of 323 identified surgical RCTs19. Of the 234 registered trials, 147 (62.8%) were adequately registered and forty-six (31.3%) of the 147 were identified as having one or more major discrepancies between registered and reported primary outcome measures; nineteen (41.3%) of forty-six favored significant results.

In our study, only twelve (13.3%) of the ninety orthopaedic surgical RCTs that were reported in the article as having been registered had been registered within the appropriate time frame specified by the ICMJE (e.g., before enrollment of the first participant). Califf et al. examined fundamental characteristics of interventional clinical trials in three major therapeutic areas included in the ClinicalTrials.gov registry (cardiovascular, mental health, and oncology)20. They reported that, from October 2004 to September 2012, only 41.7% (28,388) of 68,000 trials were registered before enrollment of the first participant.

Our study has limitations. First, by excluding all articles in which trial registration had not been explicitly reported in the text, we potentially missed trials that had been registered even though the authors did not report this in the article.

Second, only adequately registered trials could be included in our evaluation of consistency between the registered and published primary outcome measures. It was not possible to compare published primary outcome measures with primary outcomes reported to the research ethics committees for inadequately registered trials.

Third, we focused on the orthopaedic journals with the highest impact factors. Most of these journals required trial registration as a condition for consideration for publication in their instructions for authors. Consequently, our results might well overestimate the proportion of registered trials and underestimate selective outcome reporting for orthopaedic surgical trials.

Fourth, the included orthopaedic journals might not have endorsed guidelines in line with the ICMJE recommendations immediately after they were published in 2005. This might have led to improvement in the number of adequately registered trials beginning after 2005 because researchers, authors, peer reviewers, and editors were more likely to be aware of clinical trial registration policy. This was indeed demonstrated by our year-by-year analyses, although rates of improvement were only modest.

Even journals that required adequate trial registration before submission did not have a 100% rate of trial registration. This might be explained in part by a time lag in adopting requirements for trial registration by the journal and unclear language in the instructions for authors. It may also signal that peer reviewers and editors do not flawlessly monitor adherence to their own reporting guidelines.

Our results highlight several issues and demonstrate a need for improvement in adequate registration of orthopaedic surgical trials. First, all orthopaedic journals should require, as a condition for consideration for publication, trial registration as defined by the ICMJE, including provision of the minimum twenty-item trial registration data at the time of registration, before enrollment of the first participant in a trial. Next, journals should be clear in communicating this policy in their instructions to authors.

There is nothing inherently wrong with amendments and/or changes in a registered trial based on sound arguments. However, any such amendments and/or changes and their justifications should be transparently discussed by the authors so that editors, reviewers, and subsequently readers can judge their legitimacy.

Last, to obtain the full benefit of clinical trial registration, there must be active participation by different stakeholders (principal investigators, sponsors, editors, peer reviewers, and readers), who must routinely check the comprehensiveness and consistency of the registration and publication.

In conclusion, although trial registration is now the rule, it is currently far from optimal for orthopaedic surgical RCTs and selective outcome reporting is prevalent. Full involvement of authors, editors, and reviewers is necessary to ensure publication of quality, unbiased results.

Appendix

The search strategy used in this study is available with the online version of this article as a data supplement at jbjs.org.

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Horton R. Surgical research or comic opera: questions, but few answers. Lancet. 1996 Apr 13;347(9007):984-5.

Buchwald H. Surgical procedures and devices should be evaluated in the same way as medical therapy. Control Clin Trials. 1997 Dec;18(6):478-87.


Silagy CA, Middleton P, Hopewell S. Publishing protocols of systematic reviews: comparing what was done to what was planned. JAMA. 2002 Jun 5;287(21):2831-4.


Chan AW, Kréza-Jerić K, Schmid I, Altman DG. Outcome reporting bias in randomized trials funded by the Canadian Institutes of Health Research. CMAJ. 2004 Sep 28;171(7):735-40.
