Mastering the Art of Abstracts

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Abstracts are arguably the most important part of a scientific article. Often, abstracts are the only substantive portion of an article that readers are able to view in electronic databases[1] and on pay-per-view journal websites[2] and thus may be the only part of the article that is read. An abstract must therefore be well written, stand on its own, accurately portray the content of the full article, and capture readers' attention.[1-3] As authors are well aware, however, writing an abstract that meets all of these requirements—not to mention adheres to stringent word count limits—is easier said than done.

In this fifth part in our series on scientific writing,[4-7] I review key elements of abstract writing, including basic structure, required components, and tips for ensuring accuracy and meeting word count limits.

General Guidelines

An abstract is a short summary of an article. For research articles, abstracts include the objective and scope of the investigation, the methods, the primary results, and the principal conclusions.[3,8] Although readers usually read the abstract of an article first, authors should write this part of their manuscript last. Abstracts should contain the same information as the text of a manuscript—including methods, data, terminology, etc. Manuscripts often go through several revisions and rounds of corrections before a final draft is complete. If an abstract is written too early in the process, it may contain outdated or even incorrect information.[1,2]

In *How to Write and Publish a Scientific Paper*, Day and Gastel state, "Usually, a good abstract is followed by a good paper; a poor abstract is a harbinger of woes to come."[8] A quality manuscript describes a study, experience, or other type of finding by answering key questions about that study, experience, or finding. A quality abstract will accomplish the same goal by answering the same questions.[2] Before drafting their abstract, authors should determine which type of abstract is most appropriate for their manuscript—structured or unstructured—and ensure that they are familiar with conventional guidelines for that abstract type.

Structured Abstracts

Structured abstracts contain headings and briefly summarize the main sections of an article.[8] They are typically required for original research articles (*eFigure 1*), systematic reviews (*eFigure 2*), and meta-analyses. The exact names and number of headings will vary depending on article type and journal preferences. In general, abstracts for randomized controlled trials should follow the Consolidated Standards of Reporting Trials, or CONSORT, checklist for abstracts,[11] and abstracts of systematic reviews and meta-analyses

should follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses, or PRISMA, guidelines.[12] However, authors should adhere to abstract requirements of the journal to which they are submitting their manuscript. Word count limits for structured abstracts vary (the *JAOA*'s limit is 350 words).[13] Authors should keep in mind that some electronic databases also have word limits[14]; even if a journal allows a lengthy abstract, the full published abstract might not always be available to database researchers if it is truncated by the database.

The following sections detail general guidelines for original research article abstracts, as they are the most common type of structured abstract.

Context

The context of an abstract should answer the question, "Why is the current study important?" In other words, it should describe the rationale behind the study question and emphasize new and important areas addressed by the study.[1,13] Authors should limit this section to 1 sentence. Consider the following example[15]:

> XYZ has been studied in A population, but its prevalence in B population has not to our knowledge been investigated.

In the example, the context statement describes the importance of the study and why the study was initated: Research is lacking on the prevalence of XYZ in B population.

Objective

The objective section of an abstract should contain the study's primary objective. Key secondary objectives and a priori hypotheses are also appropriate for this section but may be omitted because of space constraints. The objective should be a "To…" statement.[3] For example[15]:

> To determine the prevalence of XYZ in population B and to compare findings with previously published data in population A.

Methods

The methods section of an abstract should state the study's design, setting, participants, intervention(s), and main outcome measures. For large or complex studies, it is often appropriate to break the methods into several sections (eg, participants, intervention, main outcome measures). It is unlikely that authors will be able to include every aspect of their study's methodology in the abstract. To keep the abstract concise, authors should list only key study criteria, essential features of the intervention, and primary outcome measures[3,15]:

> Participants (aged ≥18 y) from population B in the B region were recruited from March 2011 through December 2013. Participants were excluded if they had a history of ABC. The authors gathered data on XYZ from population B and compared them with data from population A.

Results

The results should contain the main outcomes of the study and their statistical or clinical significance.[1] Findings should be in the form of raw data (not just percentages) and be accompanied by relevant statistical information (eg, *P* values, CIs).[3] Authors should ensure that findings are included for all outcome measures described in the methods. Likewise, the results section should not contain findings for outcomes that were not already described in the methods section. Abstracts for survey-based studies should include response rates.[3,15]

> Of the XX participants recruited, XX met the inclusion criteria and completed the study. In this population, XX participants (XX%) had XYZ, compared with XX (XX%) in population A.

Conclusion

According to the *AMA Manual of Style*,[3] authors should "[p]rovide only conclusions of the study directly supported by the results." For example[15]:

> XYZ was found to occur in XX% of our population. These findings are consistent with previously published data in population A.

Supplemental information and in-depth evaluations of the findings should be reserved for the text of the manuscript,[16] but authors should note important limitations.[1] In addition, authors should take care to not overinterpret findings and refrain from recommending vast changes to clinical practice if additional research is needed. If applicable, clinical implications should be noted. Clinical trial registration numbers and registry names should appear at the end of the abstract (eg, ClinicalTrials .gov number 1234).

Unstructured Abstracts

Unstructured abstracts are usually appropriate for manuscripts that do not involve original research, such as case reports and narrative reviews. Authors should always check the requirements of the journal to which they are submitting; abstracts are not typically required for opinion pieces, essays, poems, and letters to the editor.[3] The word limit for unstructured abstracts is typically lower than that for structured abstracts. The *JAOA* requires unstructured abstracts to be 150 words or less.[13]

Although specific guidelines vary depending on the type of manuscript (eg, the CARE Guidelines[17] are helpful for case reports), unstructured abstracts should generally describe the context, findings or observations, conclusion, and implications of the information in the article.

Context

Unstructured abstracts should start with a brief, 1- to 2-sentence statement that describes why the topic is important and timely. For review articles, authors should include a clear objective statement.[13] For case reports, authors should describe why their case is unique and of interest to readers.

> XYZ is common in the US population, but to the authors' knowledge, no cases of XYZ in a patient presenting with ABC have been described.

Findings

The authors should describe their findings or observations. For case reports, authors should include the resolution of the case.

> A 32-year-old man presented to the emergency department with ABC. Examination findings revealed XYZ. After management of XYZ, the patient's symptoms resolved and he was discharged to home.

Conclusion

As with structured abstracts, unstructured abstracts should include conclusions directly supported by the authors' findings or observations.[3]

> As shown in the present case, XYZ is a potential underlying cause of ABC.

Implications

Unstructured abstracts should end with the clinical or other implications of the authors' findings.

> Physicians should consider XYZ in patients who present with ABC. Early detection and management can improve outcomes for these patients.

Using the above examples, the abstract for this case report would read as follows:

> XYZ is common in the US population, but to the authors' knowledge, no cases of XYZ in a patient presenting with ABC have been described. A 32-year-old man presented to the emergency department with ABC. Examination findings revealed XYZ. After management of XYZ, the patient's symptoms resolved and he was discharged to home. As shown in the present case, XYZ is a potential underlying cause of ABC. Physicians should consider XYZ in patients who present with ABC. Early detection and management can improve outcomes for these patients.

Additional Considerations

After the abstract is drafted, authors should ensure that all components of the abstract are consistent with those included in the text and graphic elements of the manuscript.[3] Terminology, presentation and rounding of data, and chronology of events in the body and abstract should match. The abstract should not contain any information that does not already appear in the text of the manuscript.

Conventional guidelines for abstracts differ from those for the main body of the manuscript in a few key areas. For example, abstracts often contain phrases rather than complete sentences for brevity. They should not cite references, tables, or figures.[3,16] Authors should avoid the use of acronyms and abbreviations unless a long term appears several times in the abstract.[8,16] In general, abstracts should be able to stand on their own without reference to the text or any other components of the manuscript.

Most guidelines for abstracts, however, are the same as those for the main body of the manuscript. It should have appropriate information, complete and accurate data, concise language, and good grammar. Authors should use nonproprietary drug names[3] and follow appropriate style guidelines when reporting tests used, units of measure, and statistical findings.

Authors commonly include extra, unnecessary information in their abstracts.[8] By adhering to abstract guidelines and including only required information, authors can keep their abstract's word count in check. For additional tips on keeping abstracts within a certain word count, see the *Table*.

Table.
Tips for Cutting Abstract Word Counts

Tip	Example	Revised
Eliminate redundant phrases	*period of time*,[3] *aged XX years old*,[18] *all of*[18]	*period*, *aged XX years*, *all*
Delete unnecessary adjectives and adverbs	*Students were divided into small groups of 3 to 5.*	*Students were divided into groups of 3 to 5.*
BUT, use adjectives and adverbs to replace lengthy phrases	*Treatment sessions occurred every other week for 3 months.*	*Biweekly treatment sessions occurred for 3 months.*
Instead of using conjunctions, use 2 separate sentences	*Inclusion criteria were ABC, and exclusion criteria were XYZ.*	*Inclusion criteria were ABC. Exclusion criteria were XYZ.*
Use symbols (ensuring the appropriate use of style)	*Patients aged 18 years or older were recruited.*	*Patients (aged ≥18 y) were recruited.*
Report statistical findings parenthetically	*Mean findings were XX for group A and XX for group B, with statistically significant differences noted.*	*Mean findings were higher for group A (XX) than for group B (XX) (P<.05).*
Use lists creatively	*Mean findings were XX for group A, XX for group B, XX for group C, and XX for group D.*	*Mean findings by group were as follows: A, XX; B, XX; C, XX; and D, XX.*
Avoid expendable words	*this report describes, the authors investigated*	Omit; such phrases add nothing.[3] Instead, state what is described or investigated.
Do not repeat information	Number of patients is listed in both methods and results.	Remove number from methods.

Conclusion

Authors should select the abstract type appropriate for their manuscript and ensure it follows basic structure and includes essential information. By adhering to conventional guidelines, authors can ensure that their abstracts are meaningful, concise, and representative of their full-length manuscript. (doi:10.7556/jaoa.2015.006)

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JAOA Submissions: Online-Only Content

The Journal of the American Osteopathic Association encourages authors to include additional online-only content (eg, videos, slides) with their manuscript submissions. Contact staff at jaoa@osteopathic.org for more information.

Context: Mobilization of a joint affects local tissue directly but may also have other effects that are mediated through the central nervous system.

Objective: To identify differential gene expression in the spinal cords of rats with or without inflammatory joint injury after manual therapy or no treatment.

Methods: Rats were randomly assigned to 1 of 4 treatment groups: no injury and no touch (NI/NT), injury and no touch (I/NT), no injury and manual therapy (NI/MT), or injury and manual therapy (I/MT). We induced acute inflammatory joint injury in the rats by injecting carrageenan into an ankle. Rats in the no-injury groups did not receive carrageenan injection. One day after injury, rats received manual therapy to the knee of the injured limb. Rats in the no-touch groups were anesthetized without receiving manual therapy. Spinal cords were harvested 30 minutes after therapy or no touch, and spinal cord gene expression was analyzed by microarray for 3 comparisons: NI/NT vs I/NT, I/MT vs I/NT, and NI/NT vs NI/MT.

Results: Three rats were assigned to each group. Of 38,875 expressed sequence tags, 755 were differentially expressed in the NI/NT vs I/NT comparison. For the other comparisons, no expressed sequence tags were differentially expressed. Cluster analysis revealed that the differentially expressed sequence tags were over-represented in several categories, including ion homeostasis (enrichment score, 2.29), transmembrane (enrichment score, 1.55), and disulfide bond (enrichment score, 2.04).

Conclusion: An inflammatory injury to the ankle of rats caused differential expression of genes in the spinal cord. Consistent with other studies, genes involved in ion transport were among those affected. However, manual therapy to the knees of injured limbs or to rats without injury did not alter gene expression in the spinal cord. Thus, evidence for central nervous system mediation of manual therapy was not observed.

eFigure 1.
Example of a structured abstract for an original research article.
Adapted from Ruhlen et al.[9]

Context: Irritable bowel syndrome (IBS) is a common and often lifelong functional gastrointestinal disorder. There is a scarcity of effective management options for IBS.

Objective: To assess the effectiveness of osteopathic manipulative therapy (OMTh; manipulative care provided by foreign-trained osteopaths) for managing the symptoms of IBS.

Data Sources: Articles without language or publication-date restriction were searched in PubMed, Embase, Cochrane Library, PEDro, OSTMED.DR, and Osteopathic Research Web. Search terms included *irritable bowel syndrome*, *IBS, functional colonic disease*, *colon irritable*, *osteopath**, *osteopathic manipulation*, *osteopathic medicine*, *clinical trial*, and *randomized clinical trial*. Experts in the field of visceral osteopathy were also contacted to identify additional studies.

Study Selection: The authors evaluated randomized controlled trials (RCTs) of OMTh for IBS in adults in whom IBS was diagnosed using Rome (I-III) criteria. If OMTh was not the sole intervention in the intervention group and if the same additional interventions were not applied to the control group, the study was excluded.

Data Extraction: Citation identification, study selection, and data extraction were independently undertaken by 2 reviewers with a data extraction form from the Cochrane Collaboration. A consensus method was used to resolve disagreements concerning the assessment of the methodologic quality of the RCTs that were reviewed.

Results: The search identified 10 studies that examined OMTh for patients with IBS; 5 studies (204 patients) met the inclusion criteria. All studies were assessed as having low risk of bias according to the Cochrane Collaboration criteria, although there was heterogeneity in the outcome measures and control interventions. Three studies used visual analog scales for abdominal pain, whereas others used the IBS severity score and the Functional Bowel Disorder Severity Index. A variety of secondary outcomes were used. All studies reported more pronounced short-term improvements with OMTh compared with sham therapy or standard care only. These differences remained statistically significant after variable lengths of follow-up in 3 studies.

Conclusion: The present systematic review provides preliminary evidence that OMTh may be beneficial in the treatment of patients with IBS. However, caution is required in the interpretation of these findings because of the limited number of studies available and the small sample sizes.

eFigure 2.
Example of a structured abstract for a systematic review article.
Adapted from Mueller et al.[10]