Publishing a Scientific Manuscript on Manual Therapy

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The publication of a scientific manuscript is intended to communicate new information to a willing audience¹. Most scientific manuscripts are published in peer-reviewed journals, which are journals that incorporate a process by which an author's peers (recognized researchers or expert clinicians in the content area) evaluate a manu-

script and recommend its publication, revision, or rejection. Peer-reviewed journals are the primary source of new information² that impacts clinical decision-making and practice^{2,3}.

Since the primary source of new information is derived from peer-reviewed publications, failure to publish information substantially diminishes the poten-

tial impact of that information. Unfortunately, most healthcare practitioners who generate novel ideas that could potentially change and improve clinical practice often fail to publish their work³ or never consider publication due to fear of, or unfamiliarity with, the publication process.

A recent survey indicated that one of the four reasons clinicians do not pursue publication is that they are unable to think of a strong idea that motivates them for publication⁴. Developing a strong idea (usually from clinical practice queries) is the first and most important stage in the publication process. Sharing the idea with those that have a publication history, the editors of a targeted journal, or other colleagues helps refine the idea to a working model. Because so much time is devoted to the publication process, it is essential that the idea be an interesting one for the authors.

Other noted barriers to publication include writing skills and confidence with the process of publication⁴. Peer-reviewed manuscript publication requires technical writing skills that improve with practice⁵. Technical writing traditionally is composed of component parts: introduction, methods, results, discussion, and conclusion. Although confidence with the process improves

ABSTRACT: Publication in peer-reviewed journals is the way to introduce new information that has clinical implications. However, clinicians may be reluctant to embark on the publication process because of lack of confidence or uncertainty about the process. The aim of this paper is to summarize the requirements of that process and to provide tips for successful publication to encourage potential clinical authors of manual therapy articles. In general, articles should contribute knowledge, corroborate or contradict previous knowledge, or summarize existing knowledge. Articles should be clearly structured, with abstract, introduction, methods, discussion, conclusion, and references; and often include tables and figures. The content of each of these sections is described. The use of standardized checklists is encouraged and the format should adhere to each journal's author guidelines. Submission is electronic and typically first the editor or deputy editor reviews for suitability, adherence to journal format, and quality of writing. If deemed suitable, the article is then sent out for blinded review by two reviewers with expertise in that area. Review typically takes 6–8 weeks, and all communication is via the editor. A decision is made then to either accept, accept with amendments to be made, reject but with advice to resubmit, or reject outright. In any re-submissions, the review teams' comments should be diligently addressed, either making the recommended changes or justifying why they have not been adopted. Common reasons for rejection of articles are given. Finally, the authors provide some tips for publication to help readers with successful submission of articles.

KEYWORDS: Manual Therapy, Manuscript Preparation, Peer Review, Publication, Technical Writing

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with time and accomplishment, understanding the process and structure associated with publication improves the likelihood of a successful outcome. The goal of this paper is to outline the necessary steps for publication of an article about a manual therapy-related topic in a peer-reviewed journal.

The Necessities for Publication

There are over 25,000 biomedical journals worldwide⁶, which account for the publication of approximately 2 million unique articles per year⁷. For this reason alone, publication of meaningless information should not be attempted⁷. In essence, a publication should provide value through 1 of 4 possible mechanisms: 1) contribution, 2) corroboration of information, 3) contradiction of the literature, and 4) critical review of the literature (Table 1). If a paper does not capture one of these four elements, it is likely that there is little need for publication and dissemination of this information.

Contribution is generally considered the strongest of the four, specifically if the information is novel and has

the opportunity to change practice. Contributions may take the form of original research, first-time systematic reviews, description of treatment on a rare or unique case, or any mechanism that alters current practice patterns. A recent example of a manual therapy contribution to the literature was the finding that between-session changes following manual therapy intervention were associated with long-term improvements in impairments of range of motion and pain but not with long-term improvements in function⁸.

Corroboration of information is necessary to lend support to earlier research findings. Corroboration studies may investigate whether findings from a previous study can be replicated in new populations using different clinicians. Although corroboration of information is not considered as influential as contribution to the literature, there is still considerable benefit to this form of publication. Recently, Schomacher⁹ and Aquino et al¹⁰ corroborated earlier findings associated with manipulation of the cervical spine¹¹ that a non-specific mobilization was as effective as a specific mobilization for producing immediate

changes associated with pain. Both authors used variants of mobilization versus manipulation in a new population using different clinicians.

An interesting manuscript type is a contradiction to the current literature. In most cases, a contradictory paper is a corroboration study that fails to find similar results. This type of publication is useful in that it indicates the need to reconsider the results of earlier findings carefully. Contradictory papers can help identify if the variations in findings are due to setting differences, design biases in earlier studies, or random variations that remain unaccounted for. Contradictory papers generate further interest in the topic discussed and are imperative when practice improvement is the goal of the profession. A notable contradiction to the literature was the recent publication by Hancock et al¹² concerning independent verification of a clinical prediction rule for low back pain. The study outlined how subtle variations to the therapy or the population may challenge the validity of the rule, despite earlier verification.

Lastly, a critical systematic review of findings is useful when summarizing

TABLE 1. The 4-C model for assessment of publication necessity.

Criteria	Description
Contribution	The manuscript should provide a novel contribution to existing literature. This demands new or previously unpublished information that is related to practice patterns and care of the healthcare professional.
Corroboration of information	The manuscript should corroborate existing information or lend support to recently published or singularly published findings. Of particular value are studies that involve larger sample sizes and reduction of biases in comparison to the previously published works.
Contradiction of the literature	The manuscript should outline faults in theories, contradictory findings from other studies, or other mechanisms that are clinically accepted but have yet to be systematically explored. Contradictory studies are actually healthy for clinical growth and are necessary to reduce publication bias from earlier studies.
Critical review of information	A critical systematic review article allows a global summary of information for the reader and is considered a valuable source of synthesized information. A critical review should indeed be critical and should follow systematic steps in the assessment of the findings.

information in a usable format. One of the most significant roadblocks to the use of evidence-based information is the sheer quantity of evidence available. Success in delivering evidence-based healthcare relies heavily on the ability to integrate new information and use it in clinical practice with each individual patient. Systematic critical reviews that evaluate the quality of the published information and synthesize the information in a usable format for the reader are an important and necessary form of publication. Recently, May and Rose-dale¹³ critically reviewed derivation and verification studies for clinical prediction rules for treatment prescription in low back pain. The authors' summary of the information allowed readers to synthesize findings.

Manuscript Structure

Since the 1980s, most scientific journals have adopted the IMRaD format for the body of the manuscript. IMRaD, which stands for introduction, methods, results, and discussion, is now so common that reviewers and editors will likely not publish a paper that falls outside these boundaries. In addition to the body, an abstract, references, tables, and figures are components of a well-written manuscript. While no written rule exists on the structure within each component (e.g. methods, results), most reviewers/editors look for a specific flow for each section. Our focus is to introduce the reader to the sub-structures within each of the IMRaD components as well as the abstract, tables, and figures. Much of the structural content was extracted with permission from "<http://www.rar.duhs.duke.edu/wiki/index.php/Discussion>"

Abstract

The abstract is a precise summary of the article, written in a passive voice (in third person), that allows readers to quickly understand the contents of the paper¹⁴. Abstracts are challenging to write as they require brevity, conciseness, and accuracy of information. Abstracts are either structured (broken into headings of introduction, methods, results, and discussion) or unstructured (a

narrative paragraph that contains the previously stated elements in that order but does not use headings). The structure required is provided by the author guidelines for that journal. The abstract is written last after the paper has been completed, as the abstract may change as the content of the manuscript is developed.

Introduction

The introduction of a paper is particularly difficult to write. Within the introduction, past studies are used as a set-up for the necessity of your work, and the objectives should flow from the set-up. Further, the reader should believe that your clear and concise research question (or purpose of the study) is obvious, based on your introductory statements and previous research.

Structurally, the introduction should be short and specific. The writer should target approximately four paragraphs that include four specific concepts: a) significance of the topic, b) the information gap associated with the topic, c) literature review in support of the key question, and d) subsequent objectives and hypotheses. The significance paragraph should make clear why the topic of focus in the paper is important. This statement has to convince readers that they should continue to read the manuscript since it is highly relevant. The second paragraph, the information gap, should state that despite your subject matter's significance in your field (as made clear in the previous section), there is an important information gap in the field. In other words, this section should sell the idea of the importance of your paper to the reader. The third paragraph, which includes literature to support the information gap, should help outline how the current knowledge provided by your paper will improve on the gaps in this area. It's important to note that the role of this section is *not* to review all the knowledge in the field; that responsibility is the purpose of a review article or a book chapter. Instead, the literature search is focused on the surroundings of the gap, while making the gap evident to the reader. The last section, the objective

and hypotheses, concludes the introduction by stating the main objective of the paper and respective hypotheses. Of importance, the objective fills the information gap previously stated in the second section of the introduction. With certain manuscripts, such as mechanistic studies, author guidelines sometimes indicate to include a statement of how the new basic science knowledge impacts clinical practice.

Methods

The methods section is the "recipe" of the study and will differ depending on the study design. Much work has gone toward standardizing design and reporting to the point where most study types have a checklist or pattern that is advocated. For example, the CONSORT guidelines¹⁵ are advocated when developing and reporting a randomized controlled trial. The STARD checklist¹⁶ is advocated when designing a diagnostic accuracy study. The QUOROM standards¹⁷ should be used when performing a systematic review.

Within the methods section, the writers should demonstrate complete transparency when describing the procedure and statistical analyses. The focus of this section is not to justify the process but to explain it. As with a recipe, the intent of the methods is to allow replication in the future. Further, a statement supporting adherence to standardized ethics and institutional review board approval is required for most peer-reviewed journals. Comprehensive reporting of the analysis types, how data were gathered, who was blinded to what, and where and when the data were collected are essential. Justification of the methods selected should be minimal and covered in the discussion, but studies supporting aspects of the methods might be referenced, such as the original description and validation of outcome measures.

Results

The results section should be a non-opinionated, non-emotional presentation of the results of the study. This section should not contain new information

or analyses that were not discussed in the methods section. The results require a detailed description of the baseline characteristics of the subject(s) and the outcomes expressed within the earlier stated statistical analyses. Although some may argue that the results should go from weakest to strongest, in truth, a careful, detailed, synopsis of all findings in a study are required and the order is less imperative than the detail provided. One method commonly used to improve communication of the detail provided is the inclusion of tables or figures germane to the results of the study; these tables or figures should not repeat detail that is in the text. Make sure the results address the stated aims and do not include any redundant or extraneous material.

Discussion

It is our contention that the discussion is the most difficult aspect of the paper to write. Subsequently, following a structure for the discussion of information is of considerable importance. We suggest the use of approximately 4–5 paragraphs, each with a specific purpose.

Paragraph one should summarize the main results and state the strength of the paper. The paragraph should state how the manuscript is unique compared to competing literature, outlining how the findings are important within the given field of study. Use of statements such as, “to our knowledge, this is the first paper that has studied. . . .”, or “in contrast to previous studies, we found no significant differences. . . .” are useful to help support the need and importance of your work.

Paragraph two (or more) should discuss the details of how your findings agree or do not with earlier studies, and why this might be so. Most importantly, as the writer, you should attempt to provide explanations for the different findings in the study, emphasizing the qualitative and quantitative aspects of the results. You should make sure to create a distinction between your work and the works of others when describing contradictory findings in the literature. The reviewer will look for your ability to outline differences and will be knowl-

edgeable enough to recognize which study design or procedure was actually the best.

The next paragraph should discuss the possible reasons for the outcomes or findings associated with your study. This section differs from others in that it allows for more freedom in the discussion. The discussion also functions to provide ideas for future studies and should reflect on the clinical importance and implications of the original topic you investigated.

A paragraph dedicated to study limitations is essential for any study. A proactive method for outlining weaknesses in your study is to point out the limitations and what you have done to minimize those limitations (if nothing can be done to minimize them, explain how the limitations did not have much of an influence on the results). Ideas for subsequent studies that may complement the results should be mentioned as well. Some authors will include the research's strengths in this section as well in an attempt to balance the limitations.

Conclusions

The conclusions section should state your main conclusions based on your main findings, including policy implications, potential changes in clinical practice, and future research opportunities. Nonetheless, the conclusion section should not be a reiteration of your results nor include expanded or generalized statements that are outside the boundaries of your study. Do not include additional material or speculation.

References

References are used to lend support to information provided within the manuscript. Each journal will have a standard method of referencing within the text (in the body of the manuscript) and at the end of the manuscript; again consult author guidelines and review a recent publication in the journal. References should be used judiciously, with recognition that more is not always better. Nonetheless it is critical to recognize the contribution of ideas, findings, and

comparative values from other sources to your study, and it is the authors' responsibility to ensure that all references are cited completely, accurately, and appropriately.

Tables

Each journal will also have a standard method for reporting tables; nonetheless, some consistencies do exist across journals. First, tables should be able to stand alone and be understandable at first glance, without requiring careful review of the manuscript. A title must be provided that reflects the full content of the table. Viewing previously published tables improves the likelihood of providing a “useable” table for publication.

Figures

Each journal will have a standard method for reporting figures as well. Figures should also be able to stand alone and have a title placed at the bottom of each. Most manual therapy journals do not publish in color, thus coding items within a figure by color or colored shading is typically not effective. The quality of the figure for clarity and reproduction is essential and should be considered during the time of photo capture.

The Self-Review

Self-review is a difficult but necessary process in publication that involves two critical steps. First, a self-review of grammar, tense, and spelling is a must as poorly written papers often lead to rejection and ire from reviewers despite the content of the study itself. Spelling and grammar errors suggest that the manuscript was created in haste; and it may lead reviewers to think that the material provided is potentially erroneous as well. By convention, articles are written in the past tense. An outside review is also critical as colleagues and a second set of eyes will often find problems missed by the research team. Authors for whom English is not the primary language will benefit from an outside English reviewer to improve the flow of the manuscript.

Secondly, our team strongly supports the use of checklists such as CONSORT, QUOROM, STARD, etc.) during development of a study and writing a manuscript. Checklists have been created to improve the standards of scientific reporting¹⁸. Use of checklists not only improves the homogeneity of the final product but also, when used prospectively, improves the design and validity of a study. Currently advocated checklists are continuously refined to strengthen the tools and are required for most journals, including *JMMT*.

Checklists can either be used prospectively or retrospectively. Prospective tools include the CONSORT checklist and flowchart used for randomized controlled trials, the QUOROM checklist and flowchart used for systematic reviews, the MOOSE checklist and flowchart used for meta-analyses of observational studies, the STARD checklist and flowchart used for studies of diagnostic accuracy, and the STROBE checklists for observational studies. A very good resource for currently used checklists is available at: <http://resources.bmj.com/bmj/authors/types-of-article/research>

The Submission Process

Understanding the submission process can reduce the anxiety associated with publication. Adhering to the submission requirements of each journal, including format, sub-headings, and referencing style described on the "Information for Authors" page is a must. Topics should be germane to the interests of the chosen journal. Submission and subsequent communication is always electronic and is typically performed through the editor.

The first vetting process is the initial submission, which is almost always read by an editor or deputy editor to determine the appropriateness for publication. If the format is incorrect, the manuscript is typically returned. On rare occasions, if the topic is not appropriate to the journal, the manuscript is not placed into review. Additionally, If a manuscript is written very poorly or the study design is significantly flawed, the

paper may be returned without a full review.

Although the review time of all journals varies, the review process is typically similar. The journal will acknowledge receipt of the article and it will be reviewed by a minimum of two external reviewers with expertise in the relevant area, and also by the editor or associate editor. Most journals still use a blinded review format in which the authors are blinded to the identity of the reviewers and the reviewers are blinded to the identity of the authors. Only the editor is knowledgeable of the authors; and likewise, the authors are aware of the reviews from the editor.

Once in review, authors can expect a stepwise format of communication. Generally, after 6 to 8 weeks, the authors are provided with the detailed comments of the review team and the editorial team. In all cases, the authors will be informed that their paper is 1) accepted with no revisions (rarely happens), 2) accepted with revision, 3) recommended to revise and resubmit, 4) recommended to reject and resubmit, or 5) outright rejected. Only "outright rejected" is associated with termination of the review process.

If the authors are invited to revise and resubmit, they will be required to outline responses to each area identified by the reviewers and editor. It is appropriate to copy and paste reviewers' comments and then go through each one giving your responses and amendments, as you make changes to the manuscript. Underlining (or highlighting) changes in the manuscript also allows the reviewers to focus on the changed elements of the manuscript. Authors may make changes associated with the reviewers' comments or may decide to keep their original statements and explain to the reviewers why they have decided to go against recommendations.

Responding to reviewers requires a balancing act of graciousness, humility, and tact. In truth, the primary reason that a manuscript is rejected or criticized is that the manuscript is genuinely flawed¹. Reviewers are content experts who *donate* their time to review manuscripts, often for a number of journals. If

the reviewers fail to understand some element within your paper, there is a strong chance that further explanation is needed. A good editor will most often direct the authors to focus on specific aspects of the review as there are instances in which some of the suggestions from reviewers will not improve the final product.

Because of space, content, and other requirements, *all* peer-reviewed journals reject some of the papers submitted to them. In addition to a manuscript that is fatally flawed, the most common reasons for rejection include⁷ the following: 1) the content was not important enough to be published; 2) the content was not of interest to that specific journal; 3) the same or a similar study was published (with no improvements in design) and the findings were similar; 4) the manuscript was poorly written and did not follow the author guidelines; 5) the manuscript has an inappropriate study design (true errors); and 6) the sample size is too small. It is also important to note that the competition for space in selected journals is very high and good papers, even those that do not contain any of the issues just cited, may be rejected. In essence, manuscripts are triaged to capture the ones that are of most interest to the journal's readers.

The Editors' Tips for Publication

The publication process is complex and challenging. However, in our experience, certain ideas, when followed, can increase the chance of getting published. Following these tips should improve the outcome of the submission.

1. The title and topic of the manuscript need to be relevant to manual therapy and representative of the content of the study/manuscript.
2. Single case design studies should be used only for rare or unusual cases, or for new techniques for uncommon diagnoses. If the condition is common, the authors should perform a clinical trial.
3. For clinical trials, make sure to register the trial. Trial registration is a requirement of the Uniform Re-

quirements for Manuscripts Submitted to Biomedical Journals (<http://www.icmje.org/>).

4. Select a good idea, one that concerns a gap in the literature. Pick a topic to investigate that can impact manual therapy clinical practice. Make sure the study aim is clear and the design is suitable to answer the question.
5. The abstract is a critical part of the submitted material and should meet the requirements for word count and structure. If it includes a population of subjects, it is helpful to indicate if the subjects were symptomatic or asymptomatic, plus the gender and the age range of the population. It should accurately summarize information and contain the primary findings of the manuscript, including whether statistically significant results were obtained. The abstract is crucial; do not create it as an afterthought.
6. Authors need to point out in the introduction/background what is new and original about their study. It should be brief, be relevant to the purpose(s) of the study, and include a clear statement of the purpose(s) of the study.
7. Follow the format of the journal for all sections of the manuscript, including word count, numbering of references, and numbering and quantity of tables and figures. Be sure to have the manuscript proofread by someone fluent in the English language.
8. Follow dedicated guidelines (e.g., CONSORT, QUOROM, MOOSE) and indicate that the document was created with the guidelines. For *systematic reviews*, ensure reliable data extraction. Study details should be presented in tables, whereas the text should summarize overall findings. Use qualitative (i.e., Cochrane levels of evidence) or quantitative (meta-analysis) methods to summarize the results, which are related to study quality. For *qualitative studies*, use purposive sampling and saturation for numbers; validate data analysis (i.e., blinded coding), define how a theme was developed (i.e., >50% of participants), provide definition and examples of final themes, and include a clear audit trail.
9. The Methods section should provide adequate information to allow duplication of the study. Information concerning institutional review board acceptance and obtaining informed consent should be included if the study involves human subjects.
10. There should be no interpretation in the Results section of the manuscript.
11. The Discussion is often a weak spot in manuscripts. Keep the discussion short and focused. The discussion should cover the implications of the key findings, comparison to previous literature, strengths and weaknesses, and possible mechanisms and explanations for the findings. However, avoid unsubstantiated claims not supported by the data. Avoid repeating what is in the previous sections but do explain the findings and emphasize the study's contribution to the larger body of evidence. Focus on effect sizes and clinical importance, not just statistical significance. The clinical applicability of the findings should be discussed in the Discussion section.
12. If you are not sure if a discussion point is needed, do not include it. Reviewers can always ask for more discussion on a point.
13. Don't assume your study explains everything. Use the Limitations section to outline weaknesses and methods you have used to control for those weaknesses.
14. The Conclusion should be succinct and include only those statements that are supported by the study's findings. Avoid irrelevant extrapolations and personal opinions.
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