CLINICAL REHABILITATION

Practical advice on writing scientific articles

This document aims to help aspiring authors write an article that is likely to be accepted for publication and that will be read by and influence others. It combines direct suggestions of a practical nature relating to the process of publication with general suggestions that relate to the process of writing effectively. It is based on 25 years of reading badly written articles!

The primary messages are:

- You are telling a story, so make it interesting and have a logical sequence
- You must remain focused on your topic and message
- Your reader is like you, and prefers simple clear sentences using plain language
- Your article should be as short as possible, but as long as necessary

This document discusses:

- Structure of scientific articles; why and what
  - The title; make informative, and interesting
  - The abstract; make it informative, include data
  - The introduction; why did you do the study (and why should the reader read it)?
  - The methods; what did you actually do?
  - Ethics; were actions morally acceptable?
  - Results; what did you find?
  - Discussion; what does it mean, and what does it not mean?
  - Clinical messages; so what? *[This is particular to **Clinical Rehabilitation**]*
  - Accompanying statements; thanks, who influenced us, who did what?
  - References; the historical context
  - Illustrations; tables and figures
  - Appendices, supplementary information; additional detail
- Writing style
- Some (otherwise) unwritten rules;
  - Length of article
  - Authorship *(see also our separate document)*
  - Copyright?
  - Malfeasance *(immoral or illegal behaviour)*
    - Plagiarism
    - Duplicate publication
    - Misrepresenting data or data analysis
- Where to get help
  - structure and content
  - writing English well

INTRODUCTION

Writing badly is easy; writing well requires effort and time. Authors have to compete for readers; they have no right to be published or read. This document is written to guide authors towards success, especially success in getting published in (scientific) journals.

Structure

Stories are structured. Long stories are published in several books; books may have sections or parts; then there are chapters. Chapters have paragraphs; paragraphs have sentences; sentences have clauses, and phrases, words, and punctuation. Structure keeps the reader aware of where he (or she) has been, where they are, and where they are going.

The structure also includes a logical, predictable flow of ideas from the beginning to the end. A good story has a beginning (a puzzle is set out), a middle (taking you towards the resolution of the puzzle), and an end (the solution of the puzzle). Every document is a story, albeit not all documents are fiction, nor are all documents interesting. Scientific articles are no different from any other document.

Most scientific journals request a similar structure for their articles. This is not just chance! The structure has evolved to be the most efficient and effective way to communicate scientific research. Please use the suggested, standard structure (Abstract, Introduction, Methods, Results, Discussion) unless you have good reasons not to. Readers, including editors and reviewers are familiar with the standard layout, which is given below. The essential feature is that the reader must know where she is going.

A clear **structure within each section** is also important. Make the article flow in a logical and coherent way so that the reader can understand both what he has learned so far and where the article is going. The structure should be apparent without excessive use of subheadings. Subheadings often lead to an illogical, unstructured document. They should only be used to start a completely fresh set of ideas.

Occasionally a different or even a new structure is better. You should feel able to use or invent a structure for papers that do not easily fit into the standard structure. Forcing your paper into an inappropriate structure is not good. But there must be a clear logic to the structure, and this is best set out early on.

The title

A book has a title that is aimed to grab your attention **and** to tell you what to expect inside. Do the same with your title. The priority is for the title to be informative, but it should not be too long. If it can also attract attention, then that is a bonus. Avoid any wordplay, jargon and abbreviations. The title should be clear to any reader. Remember, your title will determine whether or not your paper is found by search engines such as Google, so make it explicit. (Google does not (yet) understand jokes.)

Title page

After the title, books give you some boring factual information at the beginning. Similarly your article will have a **title page**, which should give, in addition to the title of the paper, a running title, the names and initials of all authors, the order of the authors, and the name, address and email of the author responsible for all correspondence. It is helpful to give telephone and fax numbers if possible, and giving a backup author to contact or email to use is wise. Please make sure that the information given is accurate and up-to-date. Sometimes it impossible to make contact with some authors, whose articles therefore cannot be published.

The abstract
Most books have a synopsis, to entice you to buy the book. Your abstract fulfils that purpose. Your abstract is going to be available in electronic data-bases and will be subject to searches; Google is now the primary route to articles. Make your abstract as informative as you can. You should be specific, giving facts and data not vague statements or measures of statistical significance alone. Clarity is best achieved by using a **structured abstract** of no more than 250 words.

The abstract is important for many reasons. Editors and reviewers often reject papers on the abstract alone, and research shows that this is fair in most cases. Many readers will only read the abstract, especially if undertaking searches of computer data-bases. They help the reader (and the author) establish the main messages. Clinical Rehabilitation requires **structured abstracts**, because research shows that structured abstracts are usually more informative.

A structured abstract involves using some or all of the following headings; not every heading is appropriate in every case, and other headings may be used if necessary.

Objective.	The purpose of the study; what did you hope to discover?
Design.	How was purpose achieved?
Setting.	Where was study undertaken? A general not specific description.
Subjects.	Who was studied?; what types of patients?
Interventions.	What was done?
Main measures.	All measures used. Name them if they have names.
Results.	Main data. Please always give number of patients, and some data.
Conclusions.	Should be related to the objective. **Not** a discussion.

Sometimes different headings may be used. Some journals use other headings (e.g. Background, Methods, Results, Conclusions). Some types of article require more appropriate headings. For example we give specific guidance on systematic reviews as a different set of headings should be used when reporting a systematic review. A good source of guidance on the appropriate headings to use is the EQUATOR website (http://www.equator-network.org/?o=1001) which has links to most important guidelines and recommendations.

Most research articles should follow the standard layout and be presented in this order.

Introduction - why did you start on this study?
This sets up the puzzle; why was this study necessary? The first sentence should attract the reader and must indicate what the paper is about. The introduction should encourage the reader to continue reading.

The introduction can usually be covered in three or four paragraphs which should:

- Specify the general topic and field of study with a broad justification of its relevance
- Outline important earlier work, including any systematic reviews or meta-analyses
  - the introduction is **not** the place for a detailed review of previous work).
- Identify gaps or uncertainties in existing knowledge that require more research.
- Conclude with a **brief** statement of the main hypotheses you are testing, or your research questions.

Common mistakes are:

- To start with a non-specific general statement (e.g. "*Osteoarthritis is the commonest disabling condition seen in primary health care, with the exception of mental health problems.*"

    - Always mention your specific question in the first sentence (e.g. "*Osteo-arthritic knee pain reduces mobility and quality of life and is not well controlled by existing non-surgical treatments.*")
- To make the introduction too long, giving detailed reviews of all previous work,
- To give information about the methods used and/or results found.

The introduction should answer four questions:
- What question or topic is this article or research about?
- What is already known?
- What is not known, or still reasonably uncertain and why is this important?
- What is this research investigating specifically?

Methods – what did you actually do?
You now **describe** how you set about solving the problem posed in the introduction. It is a very necessary if slightly boring part. It should allow the reader to understand exactly what you did. This part should describe what you did in sufficient detail to enable replication, at least in principle. It should not describe or discuss (a) what you did **not** do or (b) why you did what you did.

It is good to start with a 'bureaucratic paragraph' covering, as appropriate:
- registration of the study, if appropriate (e.g. of a trial or systematic review);
- name of local ethical committees with their registration number for your study;
- funding source;
- start date and end date;
- organisation responsible for integrity and conduct of the study;
- give a single sentence summarising the design.

Thereafter, please describe the methods in a logical order. You should describe in detail, as appropriate:
- how subjects were recruited and selected, including where from
    - and how they were allocated into groups in any controlled study
- how data were collected (i.e. who did it, where, when)
- what data were collected (i.e. the measures used),
- what intervention(s) were used (if relevant)
- how bias was countered (both patient and experimenter bias),
- what types of analysis were undertaken. Describe the statistical methods used.

Flow diagrams are often helpful, and should be given for all studies of interventions. (see Rennie, JAMA 1996; 276: 637-39 or Altman, BMJ 1996; 313: 570-71).

If you are evaluating an intervention (treatment) then Clinical Rehabilitation is happy to give you reasonable space to describe both the experimental and control intervention either within the text or, if long, in an appendix published as a supplementary document on the web. Alternatively, you may submit your description as a 'Rehabilitation in Practice' article.

There are some common errors to avoid.

Do not justify in detail every choice made, and do not describe in detail every data collection tool used. Use references to allow readers access to details when references are readily accessible. Only give detail if you are using a technique or tool that is new or difficult to find using references.

Do not give results (data) in the methods section; this is a common error. Data belong in the results section. This includes the number of participants.

Do not fail to describe accurately **what was done.** You must give detail on all important matters. The commonest failing is explaining in tedious detail what was not done, and why, or what might have been done but was not etc. without explaining what was done.

Do not present the description in an illogical or muddled and mixed order. Failure to use a logical order is a frequent failure. Do not cover a single topic in multiple parts of the text. It is often simplest just to work through the journey of a single patient.

Do not start teaching, using the section to teach the reader about statistical methods, the WHO ICF, psychometric theory etc etc.

Do not use subheadings. You should use paragraphs which clearly start with a sentence indicating the content. Then start a new paragraph to move to another topic. A subheading can be used to indicate a complete change, such as describing statistical methods used.

Do not fail to review your **description** of the method carefully - is it complete, clear and accurate? Asking someone not familiar with the project to read your methods section is a good way to check it is clear.

Ethics – were your actions morally acceptable?
Clinical Rehabilitation only wants to publish ethically sound research. This basically means that the subjects (patients or healthy people) must be treated with respect. They should be informed of the nature of the project, given choices, especially on whether to participate, and subject to as little risk or unpleasant procedures as possible on account of the research. Usually protocols are considered by ethical committee (Institutional Review Boards) before being started, but the journal's view is that consideration by an ethics committee does not guarantee ethically sound research nor does failure to seek help from an ethics committee inevitably imply unethical practice. The journal will always consider the ethical aspects of submitted papers. Discussion of ethical issues relating to a project may legitimately be included in an article.

Results – what did you discover?
This is where you present your data. This is the denouement, where the reader finds the answers. Of course most people skip over this, but you should try to attract their attention. Clear presentation of basic, summarised data in tables that are well laid out is vital. A flow chart is essential when reporting a controlled clinical trial or systematic review. They are also very useful in any large complex study.

Always present results in a logical order. Give actual numbers and avoid percentages. When used, they must be accompanied by actual numbers and should never have decimal points.

Tables are usually the best way to show data. Tables should primarily contain summarised data such as means (which should always be accompanied by standard deviations), medians and ranges, or, rarely, the modes. Always give a title to each figure and table, and always enlarge upon all abbreviations used in a table or figure under the table. A table should be self-contained and able to be understood in isolation.

Figures, such as scatterplots and other graphs, are often very informative. Other figures, such as Forest plots of a meta-analysis, are also good. Histograms should not be used; Box plots may be useful.

Please place all tables and figures on separate sheets, placed after the references (figures, then tables). It helps the reviewer if you show in the text where they belong. *(Some journals now suggest incorporating tables and figures within the text, but **Clinical Rehabilitation** does not, believing that most reviewers prefer to find tables and figures separate)* Every figure and table must:

- Start on a new page
- Have a title that states its contents clearly
- Avoid use of shading
- Make it clear what the numbers represent (mean (SD)? Median? number?)
- Make it clear which measure the data come from
- Have **all** abbreviations used in it explained underneath it

The results of complex statistical analysis are **not** results in themselves. They help the reader interpret the data, and inform the reader how much weight can be given to an interpretation. The text can give the results of more complex analysis.

However statistical analyses help in understanding and interpreting data. Therefore they are an important **additional** set of information. They can be indicated in tables using symbols.

Do not discuss the interpretation of data, or other matters in the results section.

Discussion – so was it worthwhile? [General points.]
Stories do not have discussions! But storytellers usually try to include a moral within the story itself. You have an opportunity to make that more explicit. Note that research shows that most readers start with the discussion. Therefore your discussion should:

- be interesting and informative
- be fair, balanced and not one-sided
- work towards to some conclusion – it is also a story, starting with the facts and establishing **so what?**

In ***Clinical Rehabilitation*** it is particularly important that the discussion focuses on the clinical relevance of a study. How should this study influence the clinical practice of rehabilitation teams?

It is also important to **structure** your discussion. It should have a logical flow moving from topic to topic, and **it should be working towards your main conclusion or message**. A generic structure has been suggested [Smith R. The case for structuring the discussion of scientific papers. British Medical Journal 1999;**318**:1224-1225], and the component parts suggested are:

- Statement of principal findings
- Discussion of strengths and weaknesses of the study itself
- Discussion of the strengths and weaknesses in relation to other studies, discussing particularly any differences in results
- Explanation of the meaning of the study particularly:
    - How it helps understand possible mechanisms of illness, or
    - How it might alter clinical practice and/or health care policies
- Highlighting some of the unanswered questions and suggested future research

Discussions in *Clinical Rehabilitation*
For ***Clinical Rehabilitation*** we strongly suggest that you consider carefully what your main message or conclusion is, and **what story your discussion is going to tell**. Once you have done this then you should write the discussion.

We require the discussion to include:

- **Summary first paragraph.** This must present your main findings (**not** what you intended to do), and should also highlight any very important weaknesses and/or implications especially for clinical practice. It should, implicitly or explicitly, set the theme for the discussion.
- **Context**. Set your findings in the context of other knowledge. You do not need to consider every single other study, but do point out how your findings support, develop, or refute previous research findings. You can point out how your study is better than, or different from other studies.
- **Weaknesses and limitations**. Avoid the temptation to overstate your study. You will, or certainly should, know the main weaknesses of your own study. Tell the reader, so that they do not draw inappropriate conclusions. You also have an opportunity to respond to potential criticisms, and to point out any relative strengths. **The major flaw in articles submitted is a total failure to acknowledge any weaknesses.**
- **Implications**. You may also take the opportunity to speculate on the consequences of your findings. This should be restrained, and realistic. For this journal, Clinical Rehabilitation you should certainly relate your findings to the **clinical practice** of rehabilitation. You may also consider what next **research** step is needed. Sometimes there may be implications for **theory**.

It is not necessary to use subheadings. In general the text should flow logically with relatively short paragraphs that provide structure. However we do not have a fixed rule.

We do not have a section entitled 'conclusions', nor do we require a final summarising paragraph. The first paragraph and the Clinical Messages encompass this. The first paragraph outlines the story; the rest of the discussion tells the story; and the messages are its outcome.

Clinical message – so what?

Increasingly, journals encourage a very short summary of important points as part of an article. The style varies, but generally they help readers to judge, "Should this research have any impact upon my clinical practice?"

In Clinical Rehabilitation, we ask for **Clinical Messages**, which should encapsulating the main clinical findings from the study. They should be limited to no more than 50 words and should comprise 1-4 bullet points. The clinical messages must arise from the study. They should be complete in their own right, and should not depend upon reading the article. They should not be summaries of other evidence, or recommendations.

An example clinical message

Clinical messages

- Three months of cardiac rehabilitation in patients after coronary artery bypass grafting improves recovery of heart rate after exercise, and resting heart rate
- Three months after the end of the programme, the benefits were no longer detectable.

Accompanying statements

Unlike novels and short stories, journal articles follow from the work of many people, and often the work is paid for by others. Clinical Rehabilitation, in common with many other journals, wants to maximise openness and to reduce the risks of hidden influences.

Consequently, **on a new page**, we would like to see the following.

Acknowledgements. (not essential)
This is your opportunity to say thank you to everyone who contributed to the article. This can include people who have given advice, people who helped in the running of the study, patients and relatives, people who provided resources including money, etc. If you have more than six authors, you could consider whether some should simply be acknowledged instead.

Funding, and any other resource support. (essential)
This includes any direct financial support for this project, or general financial support to the research team or department. It also includes donation or free supply of equipment, equipment, or other resources such as data-handling or writing.

Competing interests. (essential)
If you feel that there are any interests that readers should be aware of, please state them; they will not affect the decision to publish.

Competing interests are wide. They obviously include the source of funding and support for the reported work (which must be stated, together with a statement on what influence they had over the analysis, interpretation and reporting of data) and any financial interests that any author may have in the results. However they also include any other influences that others might believe could affect the way you set up the study, collected and analysed the data, or interpreted the results. Ask yourself, in relation to the paper, *"would I be embarrassed if this fact became known?"* If so, report it.

If you do not think there are any competing interests that readers should know about, state "none declared".

Contributors. (essential) *(See also separate document on authorship)*
Please indicate (using the initials of authors) what each author contributed to the study and paper. The activities involved usually include writing the paper itself, initiating the study, designing it, monitoring progress, and deciding on the analytic strategy. One author should be the **guarantor**, the person who takes ultimate responsibility for the accuracy and honesty of the report and the morality of the study.

All named authors need to be aware that each author carries full responsibility for all aspects of the study, including the accuracy of the paper and data presented, disclosure of interests, disclosure of all material facts, and so on.

References – where can the reader find other parts of the greater story?
References are important. They allow you to:

- ❖ put your work in the context of other work
- ❖ be brief and concise, simply referring readers to other sources for some details (e.g. about measures)
- ❖ use other evidence to justify or support your arguments, decisions and conclusions.

They should always be restricted to those that are relevant; more is not necessarily better.

They should be numbered in the order in which they appear in the text in the 'Vancouver style' [1]: for articles, give names and initials of **all** authors, the title of the article, the journal title abbreviated according to Index Medicus, year of publication, volume number and first and last page number; for chapters in books give authors, chapter title, editor(s) of the book, the book title, place of publication, publisher, year of publication and first and last page number.

It is easiest to place them in the text using square brackets, one for each reference number (e.g. as - [2][5][12]). This is not compulsory, but it makes life easier!

STYLE
This refers to how you write, and use of tables and figures.

Illustrations – making it more interesting
Text is informative, but large expanses of text can be off-putting. Most scientific studies have sufficient data to warrant the use of tables or figures both to break the text up, and to allow more efficient presentation of the results.

Tables are rarely needed for a single column of figures. Histograms are very rarely useful or appropriate; avoid overuse of fancy computer packages! Think carefully about how to present your data. Each table should be typed on a separate sheet with an explanatory caption, and be numbered. Indicate in the text where tables should be positioned.

Figures can present data in a clear and informative way, but equally can be badly used. Flow diagrams showing how patients (or papers, in a systematic review) progressed through the study are often helpful. Scatterplots and others graphs are often very informative. Histograms are rarely useful. Photographs may occasionally help. Figures in colour can be used as supplementary data, online only.

Writing style
Please remember that you are trying to attract and maintain the interest of a busy reader. Make your article interesting. Tell a story. Do not wander from the main theme or focus of your story. Avoid jargon, avoid long words, and avoid long and complex sentences.

Abbreviations should not be used. They are extremely difficult to read, and are usually ambiguous. We generally tolerate:

- Mean (SD) – for mean (standard deviation)
- 95% CI – for 95 % confidence interval
- IQR – for inter-quartile range
- ADL – for activities of daily living
- FIM – for Functional Independence Measure

We do not tolerate many other abbreviations!

Presentation and layout.
Your submitted paper will be read as you present it. Make it attractive. The overall layout and presentation of the article will determine the attitude and expectations of the reader, and the reviewer. It will often greatly increase or reduce the probability of the editor and the reviewers reading the article and accepting its content.

Therefore spend time and effort in making your submission look attractive. For example it is important to:

- use a reasonable sized type and font-size (12 is OK)
- double-space all text
- break text up into relatively short paragraphs
    - a paragraph should cover only one idea.
- start the introduction on a new page
- put each table and figure on a new page
- indicate whereabouts in the text each table and figure should be

There are also some more technical requirements:

- Please submit the article in **double spacing**, and with a reasonable font size (**font size 12)**
- Abbreviations (if used) should be typed with no full point.
- **Scientific measurements** should be given in SI units, but blood pressure should be expressed as mmHg and haemoglobin as g/dl.
- All **numbers** under 10 should be written as words, except when attached to a unit of quantity (e.g. 1 mm or 3 kg), and that numbers of 10 or more should be written as digits except at the beginning of a sentence.
- Generic names should be used for **drugs**. Authors should be aware of different drug names and availability in the UK, North America and Australia, and give alternative names or drugs in the text.
- Avoid excessive **capitalization**. For the titles of books and articles, capitals should be used for the initial letter of the first word only. However, for the titles of journals and series, the initial letter of all principal words should be capitalized.
- Use **italics** for emphasis sparingly.

Some unwritten rules
There are some unwritten rules that apply to a greater or lesser extent in most scientific journals.

Length of articles
Clinical Rehabilitation does not have any rigid rule. My advice is *"Articles should be as long as necessary and as short as possible."* As a guide for ordinary articles, 1,500-2,000 words of text is good and 4,000 seems rather too long.

James Cauraugh drew my attention to a better quote: "*If anything at all, perfection is finally attained not when there is no longer anything to add, but when there is no longer anything to take away*" [Antoine de Saint-Exupery]

Authorship.
Clinical Rehabilitation in common with most journals wishes to restrict authorship to those who warrant it. To quote the BMJ (1994; 309:1456-57): "*authorship should be based only on substantial contributions to: (a) conception and design, or analysis and interpretation of data; (b) draft an article or revising it critically for important intellectual content; and (c) final approval of the version to be published*." Conditions (a), (b), and (c) must all be met and all people meeting these conditions should be included as authors. Activities such as fund-raising, collecting data, and simple supervision do not qualify for authorship on their own. It is acceptable and best to acknowledge people in the acknowledgement section who have helped in various ways.

Copyright.
Authors must obtain copyright permission to reproduce all maps, diagrams, figures and photographs - forms are available from the publishers. As a rule, it is also necessary to obtain permission for single passages of prose exceeding 250 words, or scattered passages totalling more than 400 words from any one work. EU copyright extends to 70 years after the death of the author or 70 years after publication of a scholarly edition, whichever is longer. Please supply the publisher with full information for all work cited, including author, date published, publisher and page references. All text (more than a few words) taken from any other published sources should be clearly identified as such by the appropriate use of quotation marks and a corresponding reference.

Malfeasance
Malfeasance is practice that falls below an acceptable moral standard, and/or is illegal.

Clinical Rehabilitation has a responsibility to maintain a standard of science and authorship that complies with any legal requirements that apply (in the home country of the authors) and that is of a high moral standard. We will be alert to:

- Authorial malfeasance
  - Plagiarism and duplicate publication
- Data-related malfeasance
  - Alteration or even fabrication of original data
  - Manipulation and analysis of data knowingly to achieve results that do not reflect the truth
  - Failure to report known data or results that would materially alter the conclusions
- Moral (and legal) malfeasance
  - Breaking the laws in the country where the research occurred
  - Treating participants without due respect for their well-being and autonomy

The editor asks reviewers to consider every article from this point of view, and considers it himself. We adhere to the Committee of Publication Ethics (COPE) guidelines, and we may report malfeasance to the appropriate person in an author's employing organisation or professional body.

Additional sources of help
There are many ways to improve your writing. The best is to practice, and look for and accept gracefully all critical feedback offered.

A close second best is to read extensively, and outside science. Try novels by Dickens or Cormac Mccarthy (to name two of many great writers), poetry, or any novels that you enjoy. Read many articles and consider how easy you found them, and what features helped you. It is particularly helpful to think about papers (or books) that you found difficult or stopped reading; try to work out why the paper was difficult or why you stopped reading. Then avoid doing the same when you write.

It is essential to practice writing. Writing is not easy and (just like rehabilitation) continued practice with continued constructive feedback (from a friend or relative who is outside your immediate research group) is best. You should constantly be reviewing and revising your paper (most of my editorials go through 10-15 versions, often ending quite different from the first version).

Read about writing. Amazon have 2,575 books on 'how to write a paper' and 784 on 'writing plain English' (searched 14th October 2014), so there is no shortage!

Use the Internet. The National Health Service in the UK and other national, governmental organisations fund the **EQUATOR Network** (http://www.equator-network.org/?o=1001) as a resource centre for good research reporting. It is an excellent resource. It lists and has links to most important guidelines and recommendations. It has guidance on writing, reviewing, researching etc. Visit it.

There are commercial sites that offer a service to improve the written English of articles. In my experience some are not good, and there is a risk that they may alter the meaning substantially. Consequently, I recommend ensuring that you use a well established and high quality service if using this type of resource, and checking the final product carefully to ensure accuracy.

There are undoubtedly many other such sites. Indeed many other journals have guidance on writing and reporting.

Derick Wade, Editor Clinical Rehabilitation. 30th December, 2020

Books that may help:

Oxford Guide to Plain English *This is the cheapest, and probably the best buy*
Martin Cutts
OUP 2004

Improve Your Writing Skills
Collins 2004

The Complete Plain Words
Sir Ernest Gowers
Penguin books

Fowler's Modern English Usage
R W Burchfield
OUP

A web-site with resources to help with English: http://www.sagepub.com/journalgateway/engLang.htm