How to Write a Paper

How to Write a Paper

FIFTH EDITION

Edited by

George M. Hall
Professor of Anaesthesia
Department of Anaesthesia & Intensive Care Medicine
St George's
University of London
London, UK

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111 River Street, Hoboken, NJ 07030-5774, USA

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List of Contributors

Robert N. Allan
Editor, *Clinical Medicine*
Royal College of Physicians
London, UK
Formerly: Consultant Physician and Gastroenterologist
University Hospital Birmingham NHS Foundation Trust
Birmingham, UK

Mark W. Davies
Senior Staff Specialist in Neonatalogy
Associate Professor of Neonatalogy
Royal Brisbane & Women's Hospital
Queensland, Australia

Michael Doherty
Professor of Rheumatology
University of Nottingham
Nottingham, UK
Formerly: Editor, *Annals of the Rheumatic Diseases*

Gordon B. Drummond
Honorary Clinical Senior Lecturer
University Department of Anaesthesia and Pain Medicine
University of Edinburgh
Edinburgh, UK
Formerly: Editor, *British Journal of Anaesthesia*

Kevin W. Eva
Senior Scientist, Centre for Health Education Scholarship
Associate Professor, Director of Education Research & Scholarship
Department of Medicine
University of British Columbia
Vancouver, Canada
Editor-in-Chief, *Medical Education*

Paul Glasziou
Director
Centre for Research in Evidence-Based Practice (CREBP)
Bond University
Queensland, Australia
Formerly: Editor, *Evidence-Based Medicine*

Chris Graf
Editorial Director
Health Sciences
Wiley
Richmond, Australia

George M. Hall
Professor of Anaesthesia
Department of Anaesthesia &
Intensive Care Medicine
St George's
University of London
London, UK
Formerly: Chairman, *British Journal of Anaesthesia*

Charles W. Hogue
Professor of Anesthesiology &
Critical Care Medicine
The Johns Hopkins University
School of Medicine
Baltimore, USA
Associate Editor, *Anesthesia & Analgesia*

Richard Horton
Editor-in-Chief/Publisher,
The Lancet
London, UK

Simon Howell
Senior Lecturer in Anaesthesia
University of Leeds
Leeds, UK
Editor, *British Journal of Anaesthesia*

Jennifer M. Hunter
Emeritus Professor of Anaesthesia/
Honorary Clinical Fellow
University of Liverpool
Liverpool, UK
Formerly: Editor-in-Chief, *British Journal of Anaesthesia*

Luke A. Jardine
Senior Staff Specialist in
Neonatalogy
Associate Professor of Neonatalogy
Royal Brisbane &
Women's Hospital
Queensland, Australia

Sharon Leng
Technical Editor, *BJU International*
Wiley
Oxford, UK

Domhnall MacAuley
Editor, *Primary Care*
BMJ
London, UK

Liz Neilly
Medical Librarian
University of Leeds
Leeds, UK

Martin Neil Rossor
Professor of Clinical Neurology
Editor, *Journal of Neurology, Neurosurgery and Psychiatry*
Dementia Research Centre
Institute of Neurology,
University College London
The National Hospital for
Neurology and Neurosurgery
London, UK

Gavin Sharrock
Publisher
Health Sciences Journals Editorial
Wiley
Oxford, UK

Richard Smith CBE
Director
Ovations, UnitedHealth Group
London, UK
Formerly: Editor, *BMJ*

Mark Ware
Vice President & Lead Analyst
Outsell (UK) Ltd
London, UK

Elizabeth Whelan
Associate Editorial Director
Health Sciences Journals Editorial
Wiley
Oxford, UK

Michael Willis
Editorial Services Manager
Wiley
Oxford, UK

Elissa Wilson
Associate Journal Publishing Manager
Life Sciences
Wiley
Richmond, Australia

Preface to the Fifth Edition

For the fifth edition, it is a pleasure to welcome Mark W. Davies, Kevin W. Eva, Chris Graf, Charles W. Hogue, Luke A. Jardine, Sharon Leng, Gavin Sharrock, Elizabeth Whelan and Michael Willis as new contributors. A new chapter 'How to Write a Book Review' has been added.

I am grateful to all the authors for revising their chapters and, in particular, to Robert N. Allan, Michael Doherty, Gordon B. Drummond and Richard Smith for contributing to all five editions.

George M. Hall

Preface to the Fourth Edition

For the fourth edition, it is a pleasure to welcome Paul Glasziou, Jennifer M. Hunter, Liz Neilly, Martin Rosser and Mark Ware as new contributors. An additional chapter 'Open Access' has been added.

I am grateful to all the authors for revising their chapters and, in particular, to Robert N. Allan, Michael Doherty, Gordon B. Drummond, Richard Smith and Alex Williamson for contributing to all four editions.

George M. Hall

Chapter 1 **Structure of a scientific paper**

George M. Hall
Department of Anaesthesia & Intensive Care Medicine, St George's, University of London, London, UK

The research you have conducted is obviously of vital importance and must be read by the widest possible audience. It probably is safer to insult a colleague's spouse, family and driving than the quality of his or her research. Fortunately, so many medical journals now exist that your chances of not having the work published somewhere are small. Nevertheless, the paper must be constructed in the approved manner and presented to the highest possible standards. Editors and assessors without doubt will look adversely on scruffy manuscripts – regardless of the quality of the science. All manuscripts are constructed in a similar manner, although some notable exceptions exist, like the format used by *Nature*. Such exceptions are unlikely to trouble you in the early stages of your research career.

The object of publishing a scientific paper is to provide a document that contains sufficient information to enable readers to:

- assess the observations you made;
- repeat the experiment if they wish;
- determine whether the conclusions drawn are justified by the data.

The basic structure of a paper is summarised by the acronym IMRAD, which stands for:

Introduction	(What question was asked?)
Methods	(How was it studied?)
Results	(What was found?)
And	
Discussion	(What do the findings mean?)

The next four chapters of this book each deal with a specific section of a paper, so the sections will be described only in outline in this chapter.

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Introduction

The introduction should be brief and must state clearly the question that you tried to answer in the study. To lead the reader to this point, it is necessary to review the relevant literature briefly.

Many junior authors find it difficult to write the introduction. The most common problem is the inability to state clearly what question was asked. This should not be a problem if the study was planned correctly – it is too late to rectify basic errors when attempting to write the paper. Nevertheless, some studies seem to develop a life of their own, and the original objectives can easily be forgotten. I find it useful to ask collaborators from time to time what question we hope to answer. If I do not receive a short clear sentence as an answer, then alarm bells ring.

The introduction must not include a review of the literature. Only cite those references that are essential to justify your proposed study. Three citations from different groups usually are enough to convince most assessors that some fact is 'well known' or 'well recognised', particularly if the studies are from different countries. Many research groups write the introduction to a paper before the work is started, but you must never ignore pertinent literature published while the study is in progress.

An example introduction might be:

> It is well known that middle-aged male runners have diffuse brain damage,[1–3] but whether this is present before they begin running or arises as a result of repeated cerebral contusions during exercise has not been established. In the present study, we examined cerebral function in a group of sedentary middle-aged men before and after a six month exercise programme. Cerebral function was assessed by . . .

Methods

This important part of the manuscript is increasingly neglected, and yet the methods section is the most common cause of absolute rejection of a paper. If the methods used to try to answer the question were inappropriate or flawed, then there is no salvation for the work. Chapter 3 contains useful advice about the design of the study and precision of measurement that should be considered when the work is planned – not after the work has been completed.

The main purposes of the methods section are to describe, and sometimes defend, the experimental design and to provide enough detail that a competent worker could repeat the study. The latter is particularly important when

you are deciding how much to include in the text. If standard methods of measurement are used, appropriate references are all that is required. In many instances, 'modifications' of published methods are used, and it is these that cause difficulties for other workers. To ensure reproducible data, authors should:

- give complete details of any new methods used;
- give the precision of the measurements undertaken;
- sensibly use statistical analysis.

The use of statistics is not covered in this book. Input from a statistician should be sought at the planning stage of any study. Statisticians are invariably helpful, and they have contributed greatly to improving both the design and analysis of clinical investigations. They cannot be expected, however, to resurrect a badly designed study.

Results

The results section of a paper has two key features: there should be an overall description of the major findings of the study, and the data should be presented clearly and concisely.

You do not need to present every scrap of data that you have collected. A great temptation is to give all the results, particularly if they were difficult to obtain, but this section should contain only relevant, representative data. The statistical analysis of the results must be appropriate. The easy availability of statistical software packages has not encouraged young research workers to understand the principles involved. An assessor is only able to estimate the validity of the statistical tests used, so if your analysis is complicated or unusual, expect your paper to undergo appraisal by a statistician.

You must strive for clarity in the results section by avoiding unnecessary repetition of data in the text, figures and tables. It is worthwhile stating briefly what you did not find, as this may stop other workers in the area undertaking unnecessary studies.

Discussion

The initial draft of the discussion is almost invariably too long. It is difficult not to write a long and detailed analysis of the literature that you know so well. A rough guide to the length of this section, however, is that it should not be more than one-third of the total length of the manuscript (Introduction + Methods + Results + Discussion). Ample scope often remains for further pruning.

Box 1.1 Writing the discussion

- Summarise the major findings
- Discuss possible problems with the methods used
- Compare your results with previous work
- Discuss the clinical and scientific (if any) implications of your findings
- Suggest further work
- Produce a succinct conclusion

Many beginners find this section of the paper difficult. It is possible to compose an adequate discussion around the points given in Box 1.1.

Common errors include repetition of data already given in the results section, a belief that the methods were beyond criticism and preferential citing of previous work to suit the conclusions. Good assessors will seize upon such mistakes, so do not even contemplate trying to deceive them.

Although IMRAD describes the basic structure of a paper, other parts of a manuscript are important. The title, abstract and list of authors are described in Chapter 6. It is salutary to remember that many people will read the title of the paper and some will read the summary, but very few will read the complete text. The title and summary of the paper are of great importance for indexing and abstracting purposes, as well as enticing readers to peruse the complete text. The use of appropriate references for a paper is described in Chapter 8; this section is often full of mistakes. A golden rule is to list only relevant, published references and to present them in a manner that is appropriate for the particular journal to which the article is being submitted. The citation of large numbers of references is an indicator of insecurity – not of scholarship. An authoritative author knows the important references that are appropriate to the study.

Before you start the first draft of the manuscript, carefully read the 'Instructions to Authors' that every journal publishes, and prepare your paper accordingly. Some journals give detailed instructions, often annually, and these can be a valuable way of learning some of the basic rules. A grave mistake is to submit a paper to one journal in the style of another; this suggests that it has recently been rejected. At all stages of preparation of the paper, go back and check with the instructions to authors to make sure that your manuscript conforms. It seems very obvious, but if you wish to publish in the *European Annals of Andrology*, do not write your paper to conform

with the *Swedish Journal of Androgen Research*. Read and reread the instructions to authors.

Variations on the IMRAD system are sometimes necessary in specialised circumstances, such as a letter to the editor (Chapter 11), an abstract for presentation at a scientific meeting (Chapter 12) or a case report (Chapter 13). Nevertheless, a fundamental structure is the basis of all scientific papers.

Chapter 2 **Introduction**

Richard Smith
Ovations, UnitedHealth Group, London, UK

Introductions should be short and arresting and tell the reader why you have undertaken the study. This first sentence tells you almost everything I have to say and you could stop here. If you were reading a newspaper, you probably would – and that is why journalists writing a news story will try to give the essence of their story in the first line. An alternative technique used by journalists and authors is to begin with a sentence so arresting that the reader will be hooked and likely to stay for the whole piece.

I may mislead by beginning with these journalistic devices, but I want to return to them: scientific writing can usefully borrow from journalism. But let me begin with writing introductions for scientific papers.

Before beginning, answer the basic questions

Before sitting down to write an introduction, you must have answered the basic questions that apply to any piece of writing:

- What do I have to say?
- Is it worth saying?
- What is the right format for the message?
- What might be right for the paper edition of the publication and what for the Web edition?
- What is the audience for the message?
- What is the right journal for the message?

If you are unclear about the answers to these questions, then your piece of writing – no matter whether it's a news story, a poem or a scientific paper – is unlikely to succeed. As editor of the *BMJ*, every day I saw papers where the authors had not answered these questions. Authors are often not clear about what they want to say. They start with some sort of idea and hope that

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the reader will have the wit to sort out what is important. The reader will not bother. Authors also regularly choose the wrong format – a scientific paper rather than a descriptive essay or a long paper rather than a short one.

Increasingly journals and other publications have separate paper and electronic editions. You may have to think about two formats at once. Usually the paper version is shorter and intended for more casual readers. There may be no limit on the length of the electronic version, which can be a terrible curse for authors who are unable to restrain themselves.

Not being clear about the audience is probably the commonest error, and specialists regularly write for generalists in a way that is entirely inaccessible.

Another basic rule is to read the instructions to authors (or advice to contributors, as politically correct journals like the *BMJ* now call them) of the journal you are writing for. Too few authors do this, but there is little point in writing a 400-word introduction when the journal has a limit for the whole article of 600 words.

Tell readers why you have undertaken the study

The main job of the introduction is to tell readers why you have undertaken the study. If you set out to answer a question that really interested you, then you will have little difficulty. But if your main reason for undertaking the study was to have something to add to your curriculum vitae, it will show. The best questions may arise directly from clinical practice and, if that is the case, the introduction should say so:

> *A patient was anaesthetised for an operation to repair his hernia and asked whether the fact that he used Ecstasy four nights a week would create difficulties. We were unable to find an answer in published medical reports and so designed a study to answer the question.*

or

> *Because of pressure to reduce night work for junior doctors we wondered if it would be safe to delay operating on patients with appendicitis until the morning after they were admitted.*

If your audience is interested in the answer to these questions then they may well be tempted to read the paper and, if you have defined your audience and selected the right journal, they should be interested.

More commonly, you will be building on scientific work already published. It then becomes essential to make clear how your work adds importantly to what has gone before.

Clarify what your work adds

Editors will not want to publish – and readers will not want to read – studies that simply repeat what has been done several times before. Indeed, you should not be undertaking a study or writing a paper unless you are confident that it adds importantly to what has gone before. The introduction should not read:

> *Several studies have shown that regular Ecstasy use creates anaesthetic difficulties,[1–7] and several others have shown that it does not.[8–14] We report two further patients, one of whom experienced problems and one of whom did not, and review the literature.*

Rather it should read something like:

> *Two previous studies have reported that regular Ecstasy use may give rise to respiratory problems during anaesthesia. These studies were small and uncontrolled, used only crude measurements of respiratory function, and did not follow up the patients. We report a larger, controlled study, with detailed measurements of respiratory function and two year follow up.*

Usually, it is not so easy to make clear how your study is better than previous ones, and this is where the temptation arises to give a detailed critique of everything that has ever gone before. You will be particularly tempted to do this because, if you are serious about your study, you will have spent hours finding and reading all the relevant literature. The very best introductions will include a systematic review of all the work that has gone before and a demonstration that new work is needed.

The move towards systematic reviews is one of the most important developments in science and scientific writing in the past 20 years [1]. We now understand that most reviews are highly selective in the evidence they adduce and often wrong in the conclusions they reach [2]. When undertaking a systematic review, an author poses a clear question, gathers all relevant information (published in whatever language or unpublished), discards the scientifically weak material, synthesises the remaining information and then draws a conclusion.

To undertake such a review is clearly a major task, but this ideally is what you should do before you begin a new study. You should then undertake the study only if the question cannot be answered and if your study will contribute importantly to producing an answer. You should include a brief account of the review in the introduction. Readers will then fully understand how your study fits with what has gone before and why it is important.

'In 2012 you should not worry that you cannot reach this high standard because the number of medical papers that have ever done so could probably be numbered on the fingers of one hand'. I wrote the same sentence in the first edition of this book only with the year as 1994. I then wrote in the first edition: 'But by the end of the millennium brief accounts of such reviews will, I hope, be routine in introductions'. I was – as always – wildly overoptimistic. Summaries of systematic reviews are still far from routine in introductions in scientific papers. Indeed, a paper presented at the *Third International Congress on Peer Review* in September 1997 showed that many randomised controlled trials published in the world's five major general medical journals failed to mention trials that had been done before on the same subject.

This means that authors are routinely flouting the Helsinki Declaration on research involving human subjects. The declaration states that such research should be based on a thorough knowledge of the scientific literature [3]. Repeating research that has already been satisfactorily done is poor practice. As the CONSORT statement on good practice in reporting clinical trials says: 'Some clinical trials have been shown to have been unnecessary because the question they addressed had been or could have been answered by a systematic review of the existing literature' [4,5].

In 2012 my advice on systematically reviewing previous reports remains a counsel of perfection, but it's still good advice. Perhaps you can be somebody who moves the scientific paper forward rather than somebody who just reaches the minimum standard for publication.

Another important and relevant advance since the first edition is that, as I have mentioned, scientific journals almost all now have web sites and publish synergistically on paper and on the Web [6,7]. This at last opens up the possibility of simultaneously being able to satisfy the needs of the reader–researcher, who wants lots of detail and data, and the needs of the reader–practitioner, who wants a straightforward message. The *BMJ*, for example, introduced in 2002 a system it called ELPS (electronic long, paper short) [8]. The *BMJ* has now taken this concept a stage further, and reports in the paper edition of the journal are only one page long. Furthermore, that one page has a strict format that no longer includes an introduction. The one page begins with questions that even when writing for other journals it will be useful for you to answer in one or at most two sentences: What is the study question? What is the summary answer? What is known and what does your paper add? In the context of introductions, this synergistic publishing might mean that a proper systematic review might be published on the Web, while the paper version might include a short and simple summary. Usually, however, a full systematic review is probably best dealt with as a separate paper.

One interesting feature of revising a chapter 18 years after you wrote the first version is to reflect on how much scientific papers have changed. We might have expected that the appearance of the World Wide Web in the early 1990s would have changed everything. Space is no longer a problem. Video and sound can be added. Hyperlinks are easy. Full data – and the software used to manipulate them – could be included. But the overwhelming impression so far is that very little has changed [9]. In 2004 the *BMJ* published the 50-year results of the British doctors study [10], providing an opportunity to compare the paper with that giving the first set of results half a century ago [11]. Making the comparison I wrote: 'In the 50 years during which men have landed on the moon, computers and the Internet have appeared, television and cars have been transformed, the scientific article has changed hardly at all. Does this reflect the robustness of the form or a failure of imagination? I suspect the latter' [9].

My suspicion is that new technology will eventually lead to dramatic changes and that if I live to write this chapter again I may have to start completely afresh.

Following the best advice

An important development in medical writing in recent years has been the appearance of suggested structures for certain kinds of studies. These have appeared because of considerable evidence that many scientific reports do not include important information. There are guidelines for randomised controlled trials [4], systematic reviews [12], economic evaluations [13], studies reporting tests of diagnostic methods [14] and now other studies. The EQUATOR web site brings all these together and includes other useful material on scientific writing [15]. More guidelines will follow and many journals, including the *BMJ*, require authors to conform to these standards. They will send back reports that do not conform. So authors need to be aware of these guidelines. The requirements for introductions are usually straightforward and not very different from the advice given in this chapter.

Keep it short

You must resist the temptation to impress readers by summarising everything that has gone before. They will be bored, not impressed and will probably never make it through your study. Your introduction should not read:

> *Archaeologists have hypothesised that a primitive version of Ecstasy may have been widely used in ancient Egypt. Canisters found in tombs*

of the pharaohs . . . Sociological evidence shows that Ecstasy is most commonly used by males aged 15 to 25 at parties held in aircraft hangars. The respiratory problems associated with Ecstasy may arise at the alveolar–capillary interface. Aardvark hypothesised in 1926 that problems might arise at this interface because of?

Nor should you write:

Many studies have addressed the problem of Ecstasy and anaesthesia.[1–9]

With such a sentence you say almost nothing useful and you've promptly filled a whole page with references. You should choose references that are apposite, not simply to demonstrate that you've done a lot of reading.

It may often be difficult to make clear in a few words why your study is superior to previous ones, but you must convince editors and readers that it is better. Your introduction might read something like:

Anaesthetists cannot be sure whether important complications may arise in patients who regularly use Ecstasy. Several case studies have described such problems.[1–4] *Three cohort studies have been published, two of which found a high incidence of respiratory problem in regular Ecstasy users. One of these studies was uncontrolled*[5] *and in the other the patients were poorly matched for age and smoking.*[6] *The study that did not find any problems included only six regular Ecstasy users and the chance of an important effect being missed (a type II error) was high.*[7] *We have undertaken a study of 50 regular Ecstasy users with controls matched for age, smoking status, and alcohol consumption.*

A more detailed critique of the other studies can be left for the discussion. Even then, you should not give an exhaustive account of what has gone before but should concentrate on the best studies that are closest to yours. You will also then be able to compare the strengths and weaknesses of your study with the other studies, something that would be wholly out of place in the introduction.

Make sure that you are aware of earlier studies

I've already emphasised the importance of locating earlier studies. Before beginning a study, authors should seek the help of librarians in finding any earlier studies. Authors should also make personal contact with people who are experts in the subject and who may know of published studies that library searches do not find, unpublished studies or studies currently under way. It's also a good idea to find the latest possible review on the subject and

search the references and to look at the abstracts of meetings on the subject. We know that library searches often do not find relevant papers that have already been published, that many good studies remain unpublished (perhaps because they reach negative conclusions) and that studies take years to conduct and sometimes years to get into published reports.

Editors increasingly want to see evidence that authors have worked hard to make sure that they know of studies directly related to theirs. This is particularly important when editors' first reaction to a paper is 'Surely we know this already'. We regularly had this experience at the *BMJ*, and we then looked especially hard to make sure that authors had put effort into finding what had gone before.

In a systematic review the search strategy clearly belongs in the methods section, but in an ordinary paper it belongs in the introduction, in as short a form as possible. Thus it might read:

> *A Medline search using 15 different key phrases, personal contact with five experts in the subject, and a personal search of five recent conferences on closely related subjects produced no previous studies of whether grandmothers suck eggs.*

Be sure your readers are convinced of the importance of your question, but don't overdo it

If you have selected the right audience and a good study, then you should not have to work hard to convince your readers of the importance of the question you are answering. One common mistake is to start repeating material that is in all the textbooks and that your readers will know. Thus, in a paper on whether vitamin D will prevent osteoporosis, you do not need to explain osteoporosis and vitamin D to your readers. You might, however, want to give them a sense of the scale of the problem by giving prevalence figures for osteoporosis, data on hospital admissions related to osteoporosis and figures on the cost to the nation of the problem.

Don't baffle your readers

Although you don't want to patronise and bore your readers by telling them things that they already know, you certainly don't want to baffle them by introducing, without explanation, material that is wholly unfamiliar. Nothing turns readers off faster than abbreviations that mean nothing or references to diseases, drugs, reports, places or whatever that they do not know. This point simply emphasises the importance of knowing your audience.

Give the study's design but not the conclusion

This is a matter of choice, but I asked authors to give a one-sentence description of their study at the end of the introduction. The last line might read:

> *We therefore conducted a double blind randomised study with 10-year follow up to determine whether teetotallers drinking three glasses of whisky a week can reduce their chances of dying of coronary artery disease.*

I don't like it; however, when the introduction also gives the final conclusion:

> *Drinking three glasses of whisky a week does not reduce teetotallers' chances of dying of coronary artery disease.*

Other editors may think differently.

Think about using journalistic tricks sparingly

The difficult part of writing is to get the structure right. Spinning sentences is much easier than finding the right structure, and editors can much more easily change sentences than structure. Most pieces of writing that fail do so because the structure is poor and that is why writing scientific articles is comparatively easy – the structure is given to you.

I have assumed in this chapter that you are writing a scientific paper. If you are writing something else you will have to think much harder about the introduction and about the structure of the whole piece. But even if you are writing a scientific paper you might make use of the devices that journalists use to hook their readers.

Tim Albert, a medical journalist, gives five possible openings in his excellent book on medical journalism [16]: telling an arresting story, describing a scene vividly, using a strong quotation, giving some intriguing facts or making an opinionated and controversial pronouncement. He gives two examples from the health page of *The Independent*. Mike Hanscomb wrote:

> *In many respects it is easier and less uncomfortable to have leukaemia than eczema?*

This is an intriguing statement and readers will be interested to read on to see if the author can convince them that his statement contains some truth. Jeremy Laurance began a piece:

> *This is a story of sex, fear, and money. It is about a new treatment for an embarrassing problem which could prove a money spinner in the new commercial National Health Service.*

Sex, fear, and money are emotive to all of us, and we may well want to know how a new treatment could make money for the health service rather than costing it money. My favourite beginning occurs in Anthony Burgess's novel *Earthly Powers*. The first sentence reads:

> *It was the afternoon of my eighty-first birthday, and I was in bed with my catamite when Ali announced that the archbishop had come to see me.*

This starts the book so powerfully that it might well carry us right through the next 400 or so pages. (I had to look up 'catamite' too. It means 'boy kept for homosexual purposes'.)

To begin a paper in the *British Journal of Anaesthesia* with such a sentence would be to court rejection, ridicule and disaster, but some of the techniques advocated by Tim Albert could be used. I suggest, however, staying away from opinionated statements and quotations in scientific papers, particularly if they come from Shakespeare, the Bible or *Alice in Wonderland*.

Conclusion

To write an effective introduction you must know your audience, keep it short, tell readers why you have done the study and explain why it's important, convince them that it is better than what has gone before and try as hard as you can to hook them in the first line.

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Chapter 3 **Methods**

Gordon B. Drummond
University Department of Anaesthesia and Pain Medicine, University of Edinburgh, Edinburgh, UK

You must describe, in logical sequence, how your study was designed and executed, and how you analysed the data. Guidelines and checklists abound, with acronyms such as CONSORT, ARRIVE, SQUIRE, STROBE and perhaps most usefully EQUATOR [1]. (There now seems to be a specialty of methodologist.) Although these guidelines are usually aimed at medicine, they are generally useful. A checklist only works if it is read, before the event. Do not leave writing the methods until the study is done! Proper planning detects mistakes before they happen. Write the methods section, in full, *before you start the study*. Ask an experienced colleague to look it over. The challenge of setting down what you intend to do is also a very useful exercise – far better than discovering predictable flaws after months of hard work. Therapeutic trials *must* be registered before they start. Journals should not publish unregistered studies.

Testing hypotheses

When readers turn to the methods section, they look for more than what was done. The methods section should answer the questions 'who, what, why, when and where'. Even more important, it should state the hypothesis that was tested – for example, that a treatment has a particular effect, such as increased survival or improved outcome. Traditionally, statistical testing supposes that the treatment has no effect (the null hypothesis) and then expresses how probable the observed results would be. Naturally, we would hope that this probability would be small (much less than 1, which is complete certainty). We state how small this probability (*P*-value) has to be to disprove the null hypothesis. This is the 'mission statement' of the study. A study of two antibiotics might compare cure rates. The null hypothesis supposes

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no difference between these rates. The statistical tests used indicate the likelihood that the observed rates would have been found if the drugs had identical effects, as if both samples were from one population. A *P*-value of less than 0.05 (out of a total probability of 1) shows that the possibility that such samples would have been found is less than 1 out of 20, if the experiments had been done over and over again. Many papers merely say '$P < 0.05$ was considered significant', but this is merely convention and you may wish to choose, and justify, another threshold. If the *P*-value is small, this shows that the effects are unlikely to be the same, but you may still have to show that the difference is important. Non-equal is not necessarily relevant. Other questions may be more appropriate. Better? Not worse? Different criteria should be set and tested.

The other side of the coin of probability, often neglected, is the *power* of the study. If the null hypothesis survives attempts to destroy its credibility, you must not conclude that no difference exists. You have only concluded that the rates are statistically indistinguishable. Are your methods sufficiently exacting to test the null hypothesis properly? A true difference might indeed be present, but it could be small. Another common possibility is that there is a difference, but measurement variations swamp the effect you seek. In both cases, a small 'signal-to-noise' ratio is present. You must decide the power of the study to detect what you are looking for, and estimate the possibility of a false negative result. This is the β error. These decisions depend on factors such as the precision of the answer needed and the consequences of an incorrect conclusion. A β-value is often taken as 0.2, which implies a *power* of 0.8 to avoid a false negative result. In practice, the power of a study depends on the size of the effect, the variability of the data and the number of observations. A power of 0.8 is often taken as adequate. If the impact of a false negative result could have important consequences, a different power may be needed. Always state clearly the a priori hypotheses – if only to be sure that you collect appropriate and relevant data and do the correct statistical tests. Logical errors in statistical thinking abound: a clear hypothesis allows clear thinking.

Statistics

State the exact tests used to analyse the data, and include an appropriate reference if the test is not well known. State the software, and the version, that you used. State clearly the assumptions made about the data that justify the tests chosen, such as normal distribution. The statistical test used depends on these assumptions. Sometimes the distribution of the data may not be clear before the study is over, so the a priori tests should be chosen conservatively.

Design

The study design can often be described with a few well-chosen words, particularly in the layout of groups or events. Studies are usually *prospective*, and groups *independently* allocated to different treatments. Designs are often *parallel*, where each group receives a different treatment and all groups enter at the same time. In this case, comparisons will be between groups. Participants who receive different treatments may be paired to reduce the effects of confounding variables, such as weight or sex. The effects of a treatment on each participant may be assessed before and after; such comparisons are *within subject*. The simplest study design is a *randomised parallel design*, with a comparison of outcome between groups (Box 3.1).

Randomisation to treatment is a crucial part of many clinical trials. The method used should be stated explicitly. Describe any specific aspects such as blocked randomisation (to obtain roughly similar group sizes) and stratification (to reduce the effect of confounding variables, such as age or sex, in each group). Correct methods involve the use of random number tables or closed envelopes. If assessment of the outcome is blinded, describe how the

Box 3.1 What to include in the methods section

How the study was designed
- Keep the description brief
- Say how randomisation was done
- Use names to identify groups or sections of a study

How the study was carried out
- Describe how the participants were recruited and chosen
- Give reasons for excluding participants
- Consider mentioning ethical features
- Give accurate details of materials used
- Give exact drug dosages
- Give the exact form of treatment and accessible details of unusual apparatus

How the data were analysed
- Use a *P*-value to disprove the null hypothesis
- Give an estimate of the power of the study (the likelihood of a false negative – the β error)
- Give the exact tests used for statistical analysis (chosen a priori)

assessor was kept unaware of the treatment allocation. If blinding is important, you should be able to show that all who took part remained unaware of the allocation. To do this, ask them to guess the allocation after the study is over, and then test to see if the guess rate is better than that expected by chance alone.

A diagram can help a lot to describe a complex study design or sequence of interventions. Help your readers to follow the results by using explicit names for separate groups or parts of a study sequence. Initials, or even short names, are a clearer way to refer to groups or events, and less confusing than calling them 1, 2 and 3.

Participants and materials

Readers should know how and why the participants were recruited and chosen. A study of healthy, non-pregnant (probably male) volunteers may not indicate the effects of the drug on old ladies. Did you exclude patients with specific diseases, and if so, how were these diseases defined and detected? Were subjects already on medication excluded from the study? Alcohol and tobacco use can alter drug responses, and it is tempting to exclude participants who drink and smoke, but the results in such cases would be less applicable to clinical practice. List the inclusion and exclusion criteria as you would for ethical approval.

Journals require ethical approval as a prerequisite for acceptance, but some ethical features of the study design may need to be mentioned. For example, you may need to describe some of the practical problems of obtaining informed consent or a satisfactory comparative treatment. Keep a note of eligible participants who are approached and then decide not to take part. Are there many of these? Could they be systematically different from the participants who agree to take part?

In a laboratory study, you must detail the source and strain of animals, bacteria or other biological material, or the raw materials used [2]. Such information is necessary to allow comparisons with other studies and to allow others to repeat the study you have described. Give exact drug dosages (generic name, chemical formula if not well known and the proprietary preparation used) and how you prepared solutions, with their precise concentrations.

The exact form of treatment used has to be described in a way that allows replication. If the methods, devices or techniques are widely known or can be looked up in a standard text – for example, the random zero sphygmomanometer or a Vitalograph spirometer – further information is unnecessary. Similarly, a widely used apparatus, such as the Fleisch pneumotachograph,

does not require further description, but less well-known apparatus should be described by giving the name, type and manufacturer.

Describe fully any methods that are uncommon or unique, or provide an adequate accessible reference to the method. Readers will justifiably object if a reference is only to an abstract or a limited description in a previous paper. If in doubt, provide details and indicate how the methods were validated.

Describe the apparatus used in sufficient detail to allow the reader to be confident of the results reported. Is the apparatus appropriate, sensitive enough, specific in its measurement, reproducible and accurate? Each aspect may need to be considered separately. Bathroom scales may fulfil all of these criteria when used to estimate human body weight, as long as they have been checked and calibrated recently. On the other hand, an inadequate chemical assay may be non-specific because it responds to other substances, gives different results when the same sample is tested twice (poor reproducibility) or gives results that vary from a standard (inaccurate) or are consistently different from the true value (biased). The method may not detect low concentrations (insufficient sensitivity). Any of these faults could invalidate a study.

You may need to describe how you calibrated, standardised and checked the linearity and frequency response of the measuring devices used. Do not merely repeat the manufacturer's data for accuracy of a piece of apparatus, particularly if it is crucial to the study: the standard used for calibration must be stated and the results of the calibration quoted. If analogue to digital conversion is done for computer analysis, the sampling rate and the accuracy of the sampling must be given.

Adequate descriptions are needed for all methods of assessment and follow-up. Methods such as questionnaires should have been validated, and data collection and transcription should be checked (Box 3.2).

Box 3.2 A good methods section can answer these questions

- Does the text describe
  what question was being asked
  what was being tested
  how trustworthy are the measurements?
- Were the measurements recorded, analysed and interpreted correctly?
- Would a suitably qualified reader be able to repeat the experiment in the same way?

Summary

Advice on methods is frequent and easily found: but as usual, the pitfalls and traps are far less well described than the signposts. Take advice from an interested and experienced colleague: you will find it is invaluable.

References

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Chapter 4 **Results**

Charles W. Hogue
Department of Anesthesiology & Critical Care Medicine,
The Johns Hopkins University School of Medicine, Baltimore, USA

The results section reports objectively the findings of a laboratory or clinical investigation. This section consists of text, tables and figures. In general, it should be concise, avoid interpretation and report the data necessary to prove or disprove the study's hypothesis. Furthermore, this section should follow a logical sequence, often congruent with the sequence of the study outlined in the methods. Before writing this section, it is helpful to first organise the tables and figures in the sequence that they will be presented. Finally, one should check the guide to authors of the intended journal for specific instructions on length, number of tables and figures allowed, and formatting requirements.

The text

The external validity of a study, or how the findings can be generalised, is dependent on the population studied. Thus, the results section should first adequately describe the subjects studied. Account for all subjects, including those who were enrolled but were not included or withdrew from the study. Reasons should be provided for patients who withdrew to assure the reader that no bias was present in selecting which subjects completed the study. The final population included in the analysis should be clearly stated. The reader will need to know the completeness of data collection and how missing data are accounted for (i.e. data excluded vs. interpolation of results). If the study involved more than one group, provide information on whether the groups were comparable in important characteristics such as age, gender, body weight, medical conditions or medications. Be concise and emphasise important findings. Do not repeat information provided in the tables. The results section typically should not include references. Avoid the use of all

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Table 4.1 Key elements of a well-written results section

- Account for all subjects in the study and double check that the number of subjects is consistent in the abstract, text, tables and figures.
- Be concise and emphasise the important findings.
- Do not repeat information provided in the tables.
- Minimise abbreviations.
- Describe the results from each table or figure in a separate paragraph.
- Begin each paragraph with a topic sentence but do not simply repeat the table or figure legend.
- Importantly, the results should be interpreted in the discussion, not in the results section.

but common abbreviations. Excessive use of abbreviations makes the text cumbersome to read (Table 4.1).

Begin each paragraph with a topic sentence that gives the reader information on the set of data that will be revealed. This can be a summary of the data that is forthcoming with reference to the table or figure where the results can be found. An example of a topic sentence is 'Myocardial infarction size versus the area at risk for the controls and intervention animals is shown in Figure X' or 'Myocardial infarction size versus area at risk was smaller in the intervention compared with the control animals (Figure X)'. The topic sentence should not simply repeat the table or figure heading. It is preferable to provide the results that answer the study's hypothesis or primary outcome before addressing secondary outcomes. Usually, data are summarised (e.g. mean or median values for normal or non-normal distribution, respectively) or transformed (e.g. relative to baseline). The variability of the results must be included as standard deviation or standard error, interquartile range and/or 95% confidence intervals. In some situations, raw data are provided. Data derived from human subjects must be devoid of patient-identifying information (e.g. initials, age, day of surgery and domicile).

The data provided in the tables and illustrations should not be repeated in the text. Rather, the results are provided in the text. The following is an example of over-presentation of data rather than results: 'Myocardial infarction size in animals given sevoflurane was $25 \pm 3\%$ of the area at risk. Myocardial infarction size in controls was $40 \pm 3\%$ of the area at risk'. This sentence not only repeats data better presented in a table or illustration, it requires the reader to interpret the findings. A more appropriate approach would be to first direct the reader to where the data are listed and state 'Myocardial infarction size was less in animals given sevoflurane than in controls ($P = 0.004$)'.

Carefully check for consistency of numerical results between sections of the manuscript such as the abstract, tables/figures and discussion section. Remember to ensure consistency in the reported numerical values and precision of the measurement. Actual *P*-values should be reported (e.g. $P = 0.014$) rather than relative significance (e.g. $P < 0.05$). The exception is when statistical software report low *P*-values (e.g. $P < 0.001$).

The past tense is used in the results section, as the experiment has been completed. Data relations are used while avoiding terminology that implies mechanisms or implications. For example, terms such as 'associations' or 'correlations' are suitable in the results section. Why these variables are 'associated' or 'correlated' should be reserved for the discussion section, where the results are interpreted. Avoid qualitative terms such as 'markedly'. 'Significant' should not be used as substitute for 'substantial'. These terms are open to individual interpretation as to what constitutes 'marked' or 'substantial'. 'Significantly' or 'significant' can be used, if in reference to the *P*-value defined as significant in the methods section. For example, the sentence 'The size of the myocardial infarction was *significantly less* in sevoflurane-treated animals than in control animals' is vague as to what constitutes 'significant'. A more appropriate sentence would be 'Myocardial infarction size was less in animals given sevoflurane than in controls ($P = 0.004$)'.

Tables

Tables should provide readers with a narrative of the study results in a manner that is visually easy for the reader to follow. Some journals may allow the use of colour to highlight or organise data to optimise this aim. Each table should be on a separate page and sequentially numbered in the order to which it is referred in the text. Check each journal's instructions on how to number the tables. Tables should be kept to the minimum necessary to answer the hypothesis. Do not repeat data in subsequent tables or figures. The use of a table from another publication should be appropriately referenced in the legend and permission to reproduce the table supplied to the journal's editor.

In tables, one can present a large amount of data that would be too unwieldy to include in sentence format. By the same token, it is generally unnecessary to include a table for only two or four data values that can be easily placed in the text of the paper. However, a table is used not only to present data, but also to show relationships. Therefore, one should not confuse a table with a series of lists, in which the content of one cell has no relation to the content in the adjacent cell.

Table 4.2 Hints on constructing tables

- Make the tables visually easy to read.
- Begin each table on a separate page and number in the order referenced in the text.
- Do not repeat data in more than one table or figure.
- Place only one value in each table cell.
- Provide a concise legend that summarises the content of the table.
- Provide definitions of each abbreviation in the table legend or footnote so the reader does not have to refer to the text.
- Include a heading for each column and clearly denote the number of subjects in each group ('*n*').
- *P*-value for comparison as an annotation with the actual value provided in a footnote may be appropriate when there are few comparisons.
- More detailed comparisons warrant a separate column that lists all *P*-values.
- Provide the actual *P*-value, not terms such as '*P* = NS' or '*P* > 0.05'.
- Provide units of measurement, preferably within parentheses after the variable in the row heading.

The table is composed of a legend or title, body and footnotes. The legend should be concise and deliver the main context of the table content. The body contains columns and rows of cells. For tables of numerical values, each cell should contain only one value. Each column should have a heading that describes its contents. The first column typically lists the independent variables in rows with subsequent columns presenting dependent variable data. The number of subjects ('*n*') of each group is listed under the column heading. Subheadings can be used in select situations as long as clarity of the study groups is maintained (Table 4.2).

The style used for the table depends on its content. Often, annotations with symbols are used to denote *P*-values. The actual *P*-value associated with a symbol is then listed as a footnote. This approach, though, can become difficult to follow when there are many comparisons. Furthermore, many readers will like to know the actual *P*-value associated with a comparison even if it does not meet the predefined level of significance. For example, a *P*-value of 0.06 may have a different meaning to a reader than a value of 0.86 for an important comparison. The former may imply inadequate sample size or simply a true non-significant finding. A column that lists individual *P*-values for comparisons is often the most efficient way to deliver the results of the statistical analysis. Tables can become complex when multiple comparisons are carried out. The units of measurement need to be adroitly listed lest the reader become confused. If the units are the same for each cell in the

column, they can be listed in the column heading. In other instances, the units are placed in parentheses next to the variable in each row heading (also called the stub). Also listed in the row with each variable should be the numerical definition, for example, the mean ± SD for normally distributed data or median with interquartile range for non-normally distributed data. For dichotomous data, the percent of subjects with the variable is listed. Refer to the guide to authors for the preferred units of the particular journal. In most instances, the International System of Units is used, but the exact units may vary, particularly between continents. The fewest decimal places needed for an accurate reporting of the results is advised. Be consistent in the number of decimal points used in different columns, in the standard deviation and in the text for a particular measurement. The exact number reported should reflect clinically relevant values. For example, some measurements, such as blood pressure in mmHg, are reported as whole numbers not as fractions. Summary data in these instances should not be reported in fractions of the main unit (e.g. 60 mmHg, not 59.9 mmHg).

The reader should not have to refer to the text for any information when viewing a table. Each abbreviation should be defined for each table either in the legend or as a footnote. Avoid the excessive use of abbreviations, especially non-traditional abbreviations. It is cumbersome for the reviewer of a manuscript to have to refer back to the first page of such a table to understand the column heading. Listing the same column heading on each new page of a multipage table can circumvent this issue.

Figures

Illustrations are used to visually display results as graphs, charts, pictures and videos. When preparing figures, be mindful that they will be reduced in size for publication. The use of charts and graphs should facilitate the reader's interpretation of the results. Therefore, ensure that all axes are labelled accurately and completely, and avoid using unnecessary ornament (e.g. do not use three-dimensional bars on a two-dimensional graph). Many journals now publish figures in colour. Do not use colours such as yellow that may be difficult to see, and keep backgrounds white. Tints should typically be no lower than 15%. Programs for creating scientific graphs should be used (e.g. Prism and SigmaPlot) rather than simply submitting graphics generated from spreadsheets. Graph axes should be black and labels large enough to make viewing easy. Line weight should be kept consistent and no less than 0.25 pt. If a line drawing is scanned in from a hard copy, submit it as a TIFF or JPEG of at least 600 dpi where the width is about 15 cm/6 inches. Avoid submitting figures in PowerPoint format. If photographs are used, a label

Table 4.3 Advice for preparing figures and illustrations

- Use scientific graphics programmes, not simple graphics generated from a spreadsheet.
- If using colours, keep the background white, and avoid yellow and other colours that are difficult to see.
- Axes of line drawings should be black and not less than 0.25 pt.
- If scanning a hard copy of a figure, submit as TIFF or JPEG (not PowerPoint) with at least 600 dpi and 15-cm/6-inch margin.
- Label all axes clearly.
- Figures should be numbered in the order that they appear in the text.
- Provide a legend for each figure that describes the data and all annotations.
- Figures should stand alone; the reader should not need to refer to text for definitions.
- Permission to reproduce a figure is necessary, and the source should be stated clearly in the figure legend.
- Consider including supplemental tables, graphs, appendices and video or audio material to augment the results and understanding of a study.
- Video formats are usually MPEG-4, QuickTime or Windows Media Video.
- Limit video clips to 15–25 s with resolution of 480 × 360 and 640 × 480 pixels.
- Preferred audio formats include WAV or MP3.
- Refer to journal preference for submitting video or audio material (i.e. CD or DVD).

should be affixed to the back of the photo that identifies the figure number and top of the figure. If part of a book, include the chapter number on this label. Duplicate photos are usually required (Table 4.3).

The figures should be numbered in the order that they appear in the text. A legend that describes the data in each figure is needed. Abbreviations, annotations and other notations should be defined in each figure legend even if used for more than one figure and even if used in the text. As with tables, figures should be able to stand alone, and the reader should not have to refer to the text to interpret the data. If a figure has several parts (e.g. A–D), they should generally be presented in the order that we read, that is left to right and top to bottom. Description of the figure in the legend should follow the same order. Permission to reproduce a figure from another publication should be obtained from the publisher and the source appropriately referenced in the legend.

Supplemental data can be included with the manuscript for viewing on the journal's web site. Such data can take the form of additional tables, graphs, appendices and video or audio material. The latter is increasingly used to provide material that augments understanding of a study and

its results. Examples include echocardiography recordings or ultrasound images. Any patient-identifying information, including date of surgery, should be carefully removed from clinical material. The supplemental material should be cited in the text when first referenced. For example, an echocardiography clip should be referenced 'see video clip 1 in supplemental data'. Consult the guide to authors of the journal for specific information on preparing figures and video supplements and the preferred format. Widely used video formats such as MPEG-4, QuickTime or Windows Media Video are preferred. Audio supplements are typically WAV or MP3 format. Video suppression is recommended to reduce video size to <10 MB, and video clips are limited to 15–25 s. Resolution can be optimised by using video frame dimensions of 480 × 360 pixels and 640 × 480 pixels.

Conclusion

The results section of a paper may be the most important part of a manuscript yet the easiest to compose. Writing a scientific manuscript is often compared with writing a short story. Using the analogy of a crime mystery, the introduction and methods sections provide the setting, the characters and motives of the story, and the discussion is the epilogue that ties all the information together. The results section, though, is what the reader has been waiting for. It answers the question of 'who's done it'? The skilful use of text, tables and illustrations will provide the reader with the essence of the study (story) in an organised and concise manner.

Recommended reading

Anesthesia & Analgesia, Guide for Authors. 2012. Available at: http://www.aaeditor.org/GuideForAuthors.pdf (accessed 24 July 2012).

Chipperfield L, Citrome L, Clark J, *et al.* Authors' submission toolkit: a practical guide to getting your research published. *Curr Med Res Opin* 2010;**8**:1967–82.

Kiefer JC. Science communications: publishing a scientific paper. *Dev Dyn* 2010; **239**:723–6.

O'Connor TR, Holmquist GP. Algorithm for writing a scientific manuscript. *Biochem Mol Biol Educ* 2009;**37**:344–8.

Chapter 5 **Discussion**

George M. Hall
Department of Anaesthesia & Intensive Care Medicine, St George's, University of London, London, UK

Many authors find this section of the paper to be the most difficult. However, it should be an exercise in logic and discipline, and a satisfactory discussion can be based on the format shown in Box 5.1. Poor discussions have no structure, try to cite all publications found during the literature search and induce acute boredom in the reader. Keep it short, snappy and relevant. A useful rule is – if in doubt cut it out. You are most unlikely to have a manuscript rejected just because the discussion is too short.

Principal findings

The reader has just finished a detailed presentation of the results so it is important to remind them of the key findings. A good start to the discussion is two or three sentences that summarise the results. These should be clear and unambiguous, the 'take home message', and can often be used in the abstract. Further analysis of the data should not be undertaken in the discussion. If you missed something important out of the results then you will have to go back and rewrite this section.

Methodology

It is most unlikely that the methods used in the study were perfect so a brief appraisal is necessary in the discussion. A common problem is the sample size, and the power calculation described in the methods may have been optimistic. There is no point in trying to hide this from editors and assessors. It may be necessary to downgrade your study from the definitive clinical trial in this area to a pilot or preliminary study that will enable other researchers to undertake a correctly powered investigation.

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Box 5.1 Discussion: overall format

- Statement of principal finding(s)
- Appraisal of methods
- Comparison with previous work
- Clinical and scientific implications (if any)
- Further work
- Conclusion (optional)
- Acknowledgements

Unusual study designs often alarm assessors so you should explain precisely why you chose this design and, if possible, provide supporting citations using similar methodology. To use a sporting analogy, 'get your retaliation in first'. In essence, you are trying to deal with any criticisms from editors and assessors by showing that you had already thought of the difficulties inherent in the study design.

On the other hand you may be able to emphasise here any strengths of the methods used. For example, you may have developed a more sensitive and specific assay for plasma rhubarb concentrations that has enabled you to find changes during routine surgery that other investigators failed to observe. Criticism of the methodology of previous investigators may be appropriate, but make sure that you remain objective and scrupulously fair.

Previous work

A key part of the discussion is the comparison of your results with other published studies. You should cite only major relevant work, both confirmatory and contradictory. Do not simply repeat the sentences you used in the introduction when defining the research question, and never, never quote what you have not read. There is the temptation to cite every paper written on the subject to show the assessors the thoroughness of your literature search. Resist the temptation; a surfeit of references is a sign of insecurity not scholarship. You will know who are the major research groups so concentrate on them. Do not ignore previous literature that disagrees with your findings. This 'selective citation' will be spotted very quickly by assessors and you will lose credibility as a consequence. When dealing with previous work, be impartial; there are often good reasons why results cannot be exactly replicated, and you may be able to explain some of the discrepancies.

Implications

If your results may change clinical practice, then this should be discussed. Most investigators never make a major breakthrough, so do not exaggerate the importance of your work. It is likely to be just a small contribution to a limited area of knowledge, but it is still important to state how our understanding has increased as a result of your work. If there has been no progress, it indicates that the study was of little value. Similarly, if the study was non-clinical, any basic scientific implications should be discussed.

Further studies

After you have dealt with your findings in relation to previous work and any clinical or scientific implications, you are ready to suggest further work in the area. Some editors dislike the speculation that this entails, and you may find that this paragraph(s) is subsequently deleted. For other research workers this is often the most interesting part of the discussion as it gives ideas for future research. However, before you parade your best ideas in public, you are advised to have started the work; otherwise you may find that other research groups publish first. If you do not intend to continue working in the area, then this part of the discussion may be useful for claiming precedence of ideas.

Conclusion

It has been traditional to finish the discussion with a brief concluding paragraph, which is a succinct résumé of the major findings. This is increasingly omitted, or deleted by the editor, as it often repeats information that has already appeared in the structured abstract, results and at the start of the discussion. Many authors still prefer to finish the discussion in this way, but you need to ensure that it is not a direct repetition of previous parts of the manuscript.

Acknowledgements

Many journals expect the source of funding for the research and any conflict of interest to be given at the beginning of the paper, even the title page. If the instructions to the authors are not explicit about the matter, then these should be stated clearly in the acknowledgements. Funding bodies must be listed and any commercial links given. If you are unsure whether the study could have been influenced by any current or previous commercial

undertakings, then declare everything and let the editor decide what should be included.

You should also acknowledge any person who enabled the study to proceed but did not achieve authorship (see Chapter 7 by Richard Horton). For example, medical colleague, technician, research nurse and statistician, and permission to cite these people should be obtained before the paper is submitted. Do not use the acknowledgements to flatter colleagues, such as the head of the department.

Finally, sometimes assessors and editors feel that they have made a greater contribution to the final published manuscript than the authors and yet they are never acknowledged!

Chapter 6 **Titles, abstracts and authors**

Kevin W. Eva
Department of Medicine, University of British Columbia, Vancouver, Canada

Read this chapter carefully. It is without a doubt the most important section in this book.

Unfortunately, that has nothing to do with the chapter's author. In fact, given the august colleagues with whom I am writing, it is somewhat embarrassing that the crucial portion of the book was handed to me. Rather, I say with absolute confidence that the shortest components of most academic work are the most important because if you do not write an effective title and abstract, there is little reason to invest in writing the rest of your paper.

Pre-submission, the title and abstract should focus, define and refine the author's thoughts and, as a result, should have a major impact on the writing process.

Post-submission, the title and abstract convey massive amounts of information to reviewers and editors. They set the reviewers' and editors' expectations regarding the likelihood that the paper will contain important, relevant, rigorously collected, timely and clear information.

Post-publication, the title and abstract serve as the trailer to the movie that is the article itself. First, they strongly influence whether or not potential readers find the paper. Next, they govern the accuracy of the inferences readers will draw about the paper and determine whether or not attention is captured to the point that they even take the time to download and read the full article [1]. Each of these factors is a fundamental determinant of the paper's impact.

This chapter will review the contents expected in abstracts and titles, discuss issues of style and offer words of advice on how to go about crafting a title and abstract. It will describe who should be included as an author and how to use that group and others to improve these essential components of a scientific paper. In reading this chapter you should keep in mind that it is

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written from the perspective of one editor, albeit one who formally reviews over 1,500 abstracts per year. There are no absolutely right answers regarding how an abstract should be written, and there are likely dozens of ways any given paper can be summarised in abstract form well (along with many other sources for advice) [2,3]. As such, my hope with this chapter is merely to offer some insights into traps that you will want to avoid as you work to find your own writing style.

What information belongs in an abstract and title?

Let's get the boring stuff out of the way first: The core answer to this question is 'whatever the journal's author guidelines tell you'. Different journals have different styles, and it is your responsibility as the author to meet the journal's expectations. Choose the journal you intend to submit to before you start writing, visit its web site, click on the author guidelines (see Box 6.1) and educate yourself about how long the abstract/title can be, whether the journal uses structured or unstructured abstracts and, if structured, whether or not specific subheadings are required. Scour recent issues of that journal and browse published articles with the intent of searching for similarities/points of variability in the titles and abstracts to determine what the common style is for that journal. Especially useful are articles that address a similar

Box 6.1 Links to author guidelines indicating requirements for abstracts and variability with respect to specificity of expectations

BMJ (scroll down to 'Structured abstract'):
http://www.bmj.com/about-bmj/resources-authors/article-types/research

European Journal of Epidemiology (click 'Instructions for authors' -> 'Title page')
http://www.springer.com/public+health/journal/10654

JAMA
http://jama.ama-assn.org/site/misc/ifora.xhtml#Abstracts

Medical Education (Scroll down to 'Original Research')
http://onlinelibrary.wiley.com/journal/10.1111/(ISSN)1365-2923/homepage/ForAuthors.html

Psychological Science (Scroll down to 'Types of Articles Published')
http://www.psychologicalscience.org/index.php/publications/journals/psychological_science/ps-submissions#PM

Box 6.2 Information that should be included in your abstract

Do:

- Provide a clear indication of what the reader can expect from your paper.
- Indicate why the reader should care to read further.
- List the key methodological details required to understand both how your study addresses the research question and what to expect of the results.
- Describe the results that directly answer the research question (usually including actual values for quantitative studies).
- Summarise the paper with the take home message of greatest importance.

Do NOT:

- Meander into peripheral issues.
- Attempt to comprehensively describe every feature of your methodology.
- Present the first section of your results. Generally the results section in the body of your paper will offer a description of your participants. While that is important it is not usually the focus of the study.
- List generic statements that could apply to any paper (e.g. 'We will conclude with a discussion of our results').

topic to the one that you intend to address with your paper. Do not, however, fall into the trap of simply using other authors' words and replacing their data with yours. You should be aware that most journals use plagiarism detection software and will discover segments of borrowed text.

Having said that, there are commonalities across journals that can be considered universal. Understanding the generic aspects of what information belongs in an abstract comes from awareness that a primary purpose of the abstract is to convey information (see Box 6.2) and to do so accurately. Whether structured or unstructured, scientific or otherwise, your abstract should offer a succinct summary of what the reader can expect to get out of reading your full article. What is the problem (or research question) your paper is going to address and why is it important? How did you go about collecting the data that empower you to speak to that problem? What did you find? What is the key message the reader should take away from your article?

Most journals expect abstracts in the 150- to 300-word range. Most professional writers and editors recommend sentences in the 15- to 20-word range. That requires addressing each of the questions raised in the preceding paragraph in two to four pithy sentences. Do NOT waste space. Common

ways in which authors waste space include attempting to offer a full-fledged literature review in their introductory statements, including minor details like how participants were recruited in the methods, and including data that are less central to the research question (e.g. demographic information and response rates) in the results. Concluding with statements like 'More research is needed' might be absolutely accurate, but they can generally be assumed to be true and, as a result, sound hollow in an abstract given that there is no room to elaborate. All of the information included in these examples is crucially important in the body of the paper, but your abstract needs to focus on only the most critical details. If that charge is not daunting enough, the need to distill the key messages is amplified further when it comes time to write the title, a topic that will be covered more extensively in the next section.

How should your title and abstract be written?

While conveying information is important, the other primary purpose of your abstract is to advertise your work (see Box 6.3). As romantic as it is, the notion that science is objective and rational and that data speak for themselves is simply misguided [4]. It is well recognised nowadays that there are more published scientific articles than any scholar could hope to read in a lifetime dedicated to doing nothing but keeping up to date [5]. We may

Box 6.3 Selling your work through your title and abstract

Do:

- Follow the journal's format/length requirements.
- Write in plain English.
- Use terms that are likely to be used by colleagues when searching for papers.
- Be provocative and enticing.
- Concentrate on distilling the essence of your paper.
- Indicate how your data fill a void in the literature.
- Think carefully about who you hope will read your paper (i.e. identify your audience) and write for them.

Do NOT:

- Promise things your data cannot provide.
- Use jargon extensively.
- Be too cute with your title. Catchy is good, but not at the expense of occluding the content of your paper.

routinely browse a few journals, but when it comes to searching for information on a particular topic, off to a search engine we go. Type 'abstract writing' into Google and 154,000,000 results are returned in 0.22 s. Plug the phrase into Medline and 2,323 articles are returned just as quickly, most of which have nothing to do with the focus of this chapter. So, what do we do (other than refine our search)? We start combing through the list in search of titles that appear relevant, clicking to access the abstract *only* when the title offers sufficient promise.

It is for this reason more than any other that the greatest care should be placed on crafting the title of your article. Again, different styles are appealing to different individuals and different journals have different expectations, but there are some universal questions that you should ask yourself. Do you want your title to be catchy or descriptive? Do you want to identify an issue, illustrate your research question, or convey the conclusion your paper will lead the paper towards? Is a subtitle appropriate? In the spirit of having my cake and eating it too, I am personally partial to using colons as they enable one to be catchy *and* descriptive. Others disagree and I admit that there are times when the title can be too cute and, hence, fail to convey the focus of the paper. Following are a few examples from my own work, not because I think of myself as a particularly talented title writer, but to illustrate that you needn't use the same style with every paper. That is, context matters:

- Diagnostic error in medical education: Where wrongs can make rights.
- What factors, personal or external, most influence students' generation of learning goals?
- Are all the taken men good? An indirect examination of mate-choice copying in humans.
- Swapping horses midstream: Factors related to physicians' changing their minds about a diagnosis.
- 'I'll never play professional football' and other fallacies of self-assessment.

Again, the general point here is that you need to find your style while keeping in mind the audience for whom you are writing. Avoid using jargon in your title and abstract that might be familiar only to those working at the core of the field unless you want to deliberately limit your readership. At the same time, be sure to embed phrases and terminology that are commonly used in the literature you want to address to increase the likelihood that a search engine will include your paper when experts in the field conduct their database searches. Keeping the reader (and, more to the point, the potential reader) in mind is no more and no less important than identifying the essence of the message you are trying to convey. While I sometimes write my titles after completing the paper there have been many situations in which

the title came first and was so directly on the mark of what I wanted to say that the rest of the paper readily flowed from the title. Regardless of whether you choose to write the abstract and title first or last, constructing an appropriate abstract amounts to boiling down the key take home points from your paper into a few sentences and then boiling that information down again into a single idea that can be played with until words are found that stand out as being informative, attention grabbing and accessible.

Authorship issues

It is strange to people outside of scientific writing that there can be many individuals listed as authors on short articles (and, at an extreme, on abstracts that are published without a full article). I've seen some articles in which more words were used in the author list than were used in the abstract. For those working inside a scientific field, it is broadly recognised that authorship does not correspond literally to the writing of the text itself. Rather, it corresponds to authoring the project or idea that is described in the paper.

This creates considerable confusion and conflict in the scientific community as it takes time to learn what contributions count as having played a substantive enough role that authorship is warranted. Mistakes made by excluding people who deserve authorship misattribute credit for the work, fail to support the career growth of all who contributed and damage personal relationships in ways that could derail further fruitful collaborations. Mistakes made by including people who do not deserve authorship dilute the currency of the academic enterprise, misattribute credit for the work and place the inappropriately included authors at risk by giving them responsibility for the claims included in the paper.

There are authorship criteria that have been agreed upon by the International Committee of Medical Journal Editors (ICMJE) [6] and other issues/conventions to consider that will be touched upon in a later chapter in this book. For now I will simply say that the best way to deal with authorship issues is to discuss them with your team as soon as it becomes clear that a goal is to disseminate your findings and be sure that every member of the team understands the ICMJE criteria because they must be followed. Contributorship and acknowledgement offer alternatives that recognise individuals who enabled the project but do not qualify for authorship. Albert and Wager, from the Committee on Publication Ethics, describe authorship activities that are considered unethical while offering good advice on how to reduce the incidence of problems and resolve them when they arise [7].

How can your title and abstract be improved?

Make no mistake: like any other skill, abstract writing is hard work and takes practice. I have attempted throughout this brief chapter to offer advice on how to write abstracts well. Those pieces of advice and traps to avoid have been summarised in Box 6.4 for ease of retrieval. By way of closing though I would offer three additional suggestions for strategies that you might implement to improve your title and abstract writing:

1. *Plan.* Spending time thinking about what messages you would like to convey and how to convey these messages effectively with minimal words may seem unproductive because of the low 'pages filled' to 'time spent' ratio. The time spent planning though will almost inevitably be recovered by time savings when your actual writing starts. Concretely crafting an outline or mind map of the paper before starting will help you identify the key messages and the centrality of those messages. That information is invaluable in helping one write a concise and cohesive abstract that accurately foreshadows the larger work.

Box 6.4 Advice for improving your abstracts and titles

- Browse articles published by the journal to which you want to submit to identify implicit expectations of the journal that might extend beyond the explicit expectations included in the journal's author guidelines.
- Write your title and abstract a few different ways to determine which one best aligns with the way you want to represent your paper.
- Read a lot in a deliberate attempt to identify and craft the style with which you are most comfortable.
- Read through your paper and highlight the crucial sentences, then use that list to confirm that the key details (and only the key details) are included in your abstract.
- Set deadlines well in advance of the external deadline you are trying to meet. You need time away from your abstract after drafting it to enable you to appreciate how well it flows to someone who was not inside your head when you were writing it.
- Take advantage of the wisdom of crowds by asking many people with diverse backgrounds and variable degrees of expertise to offer independent opinions on your title/abstract. Again, make sure you do so early enough that you can revise based on their feedback.

2. *Write, rewrite, take a break and rewrite again.* Writing is an iterative process. It creates ideas as much or more as it reflects them. You should routinely write five or six distinct titles for your paper as a way of deliberately comparing and contrasting options to help you select and refine the best one. Similarly, just because an abstract is short does not mean it can be written quickly. Get the ideas down on paper without regard for wording or length, consider the flow and linkage between ideas, and then start wordsmithing. Delete unnecessary words, explicitly look for jargon and make sure you include key phrases. Put your abstract aside for awhile (ideally a week or more), reread it to see if it still feels fluent and hits the key points clearly, then start the process of refinement over again.
3. *Get peer review.* Before you ever submit your abstract or paper to a journal or conference, share it with as many trusted colleagues as you can. To claim authorship every member of your team needs to read and critically comment on the text, but there is great benefit to also going outside the authorship group as those inside often have difficulty separating the text from their implicit understanding of the project. You may get conflicting messages from different peers, but the aggregation of those messages should help you identify the rough spots that need more attention [8]. Reviewing as a peer does not qualify one for authorship, but constructively critiquing the work of others is a great way to discover what aspects of abstracts cause problems and to start developing a style with which you are comfortable.

In sum, while a well-written title and abstract alone will not get your paper accepted or lead it to become a citation classic, writing these brief sections of a paper poorly is a sure-fire way to ensure that the value of your work is never realised. I confess to not always taking the advice literally, but I routinely advise people to 'spend as much time on your title and abstract as you spend on the rest of the paper'. Those sections are just that important.

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Chapter 7 **Who should be an author?**

Richard Horton
The Lancet, London, UK

Regrettably this question is impossible to answer. Fifteen years ago, I could have confidently referred you to the standard definition provided by the International Committee of Medical Journal Editors (otherwise known as the Vancouver Group) (Box 7.1) [1]. All was clear back then. The criteria that had to be satisfied for you to qualify as an author (to be, shall we say, Vancouver Group positive) were unambiguous.

And they needed to be. Authorship is the currency of academic life. Citation provides the intellectual credit that fuels promotion and career success; it gives an independent estimate of a researcher's contribution to science. Authorship is the foundation of our system for judging academic value and assigning reward.

Before I ruin this picture of serene harmony, I should point out that most biomedical journals adhere to the Vancouver Group definition [2]. Their editors will require you to be Vancouver Group positive. In other words, to confirm in either a covering letter or a separate signed statement that you fulfil the Vancouver definition. You are likely to say you do even if you know that you or a co-author does not. To provide your signature confirming that you qualify as an author is something you do automatically, perhaps without even thinking very much about the implications of what you are doing.

Nowadays, though, the certainty that editors of leading medical journals once possessed lies in shreds. Our happy consensus has been destroyed. Following a conference on authorship in biomedical science, held in Nottingham, UK, in 1996 [3], first the *Lancet* [4] and then the *BMJ* [5] abandoned the Vancouver Group definition (although their editors are part of the group). In its place we put the concept of contributorship, an idea first described by Fotion and Conrad [6] but developed more fully by Drummond Rennie and colleagues [7,8]. This shift away from traditional notions

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Box 7.1 How to be a Vancouver Group positive author

All persons designated as authors should qualify for authorship. Each author should have participated sufficiently in the work to take public responsibility for the content.

Authorship credit should be based only on substantial contributions to (1) conception and design or analysis and interpretation of data; (2) drafting the article or revising it critically for important intellectual content; and (3) final approval of the version to be published. Conditions 1–3 must all be met. Participation solely in the acquisition of funding or the collection of data does not justify authorship. General supervision of the research group is not sufficient for authorship. Any part of an article critical to its main conclusions must be the responsibility of at least one author.

Editors may ask authors to describe what each contributed; this information may be published.

Increasingly, multicentre trials are attributed to a corporate author. All members of the group who are named as authors, either in the authorship position below the title or in a footnote, should fully meet the above criteria for authorship. Group members who do not meet these criteria should be listed, with their permission, in the acknowledgements or in an appendix.

The order of authorship should be a joint decision of the co-authors. Because the order is assigned in different ways, its meaning cannot be inferred accurately unless it is stated by the authors. Authors may wish to explain the order of authorship in a footnote. In deciding on the order, authors should be aware that many journals limit the number of authors listed in the table of contents and that the US National Library of Medicine (NLM) lists in Medline only the first 24 plus the last author when there are more than 25 authors.

of authorship is the most important recent crack to appear in the architecture of academia. It has the potential to threaten the entire structure of modern science. Why? And where does that leave you, someone who simply wants to get your work published?

First, most scientists ignore editors and most so-called authors are likely to test Vancouver Group negative. For example, Shapiro *et al.* [9] found that a quarter of the 'authors' they surveyed contributed nothing or to only one aspect of the published work.

Eastwood *et al.* [10] discovered that a third of the US postdoctoral fellows they questioned were happy to list someone as an author even if he or she did not deserve it, provided that the inclusion of their name would make

publication more likely. Given this widespread cynicism about the meaning of authorship, to cling to a definition that no one uses seems crazy.

There is a second, more sensitive reason for questioning our existing beliefs about authorship. Several recent instances of scientific fraud [11,12] have revealed that the flipside of authorship *credit* – namely, authorship *responsibility* – is often overlooked. When individual researchers have their names listed on the byline of a paper, it can be difficult to dissect out who did what if an aspect of the work is questioned. Instances of fabrication or falsification of data have revealed the importance of assigning the precise and explicit parts played by individual investigators in a research project.

These two forces make it hard to resist two ensuing interpretations. First, researchers should be allowed to list whoever they wish on the byline of a paper, Vancouver Group positive or negative. And second, editors should ask for and publish a clear description of the contributions made by the authors. Rigid, unenforceable and widely ignored definitions should be abandoned. This is the new policy of the *BMJ* [5] and the *Lancet* [4]. The *BMJ* has gone further than the *Lancet* and asks each group of contributors to select one or more guarantors who will take overall responsibility for the integrity of the entire work.

The reaction to contributorship has been mixed. At the *Lancet*, we have found that most authors readily accept the idea that contributors should be cited at the end of each paper (Box 7.2). But some have voiced concerns that unethical authorship practices – inappropriate credit in the form of guest

Box 7.2 An example of contributorship

Byline: A, B, C, D, E, F, G, H

Contributors: A carried out the trial, helped in data analysis and wrote the paper. B was involved in the design, implementation and data analysis, and contributed to the writing of the paper. C was involved in the execution of the trial, data management and analysis, and quality assurance of the turnip assay. D was involved in the trial execution and data entry, management analysis and quality assurance. E was involved in the trial execution and data management with emphasis on analysis. F and G were involved in the design and contributed to the writing of the paper. H was involved in the design, implementation, analysis and biochemical interpretation, and contributed to the writing of the paper.

Guarantors: A and H

authors or the unacknowledged contributions of ghost authors – are likely to continue [13].

Still, other journals are likely to follow the move to contributorship. Even if contributor lists are not always embraced, the principle of complete disclosure and personal responsibility is accepted [14]. You need to be aware which journals prefer traditional Vancouver Group positive authors and which prefer contributors. For all practical purposes, you can freely ignore the rules set by the former group. Everybody else does.

An additional issue that also defies easy rules is the acknowledgement section of your paper. Whom you choose to thank can be impossible to separate from whom you choose to cite as an author on the byline. Not surprisingly, the Vancouver Group has something to say about acknowledgements (Box 7.3). The likelihood is that contributor lists and acknowledgements will eventually fuse, and the whole subject of academic reward based on research contributions will be overhauled [15].

Given this confusing state, there is only one rule to bear in mind when deciding who is an author, a contributor, a guarantor or an acknowledgee. Decide who is to be what before you start your study. Most authorship disputes arise when the work is completed and a paper has to be written, then comes the jostling for a place (and position) on the byline. Primary prevention is always better in the end.

Box 7.3 Acknowledgements according to Vancouver

At an appropriate place in the article (the title page footnote or an appendix to the text; see the journal's requirements), one or more statements should specify (1) contributions that need acknowledging but do not justify authorship, such as general support by a departmental chair; (2) acknowledgements of technical help; (3) acknowledgements of financial and material support, which should specify the nature of the support; and (4) relationships that may pose a conflict of interest.

Persons who have contributed intellectually to the paper but whose contributions do not justify authorship may be named and their function or contribution described – for example, 'scientific adviser', 'critical review of study proposal', 'data collection' or 'participation in clinical trial'. Such persons must have given their permission to be named. Authors are responsible for obtaining written permission from persons acknowledged by name, because readers may infer their endorsement of the data and conclusions.

Technical help should be acknowledged in a paragraph separate from that acknowledging other contributions.

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Chapter 8 **References**

Simon Howell[1] *and Liz Neilly*[2]
[1]Senior Lecturer in Anaesthesia, University of Leeds, Leeds, UK
[2]Medical Librarian, University of Leeds, Leeds, UK

Introduction

The references of your paper are the foundation on which your work is built. They provide the scientific background that justifies the research you have undertaken and the methods you have used. They provide the context in which your research should be interpreted. They should not be collected as an afterthought when your research project is complete. A literature search and reading of the relevant references should be the starting points of any research project. Undertaking research to confirm the findings of another study of course is entirely justified. It is futile, however, to invest many hours of time and effort in a research project, only to discover that your findings are well-established facts that have been confirmed in many previous studies. In some cases, such a study could be argued to be unethical, in that it subjects animals, volunteers or patients to research that leads to no new knowledge or understanding.

Searching the literature

The advent of electronic bibliographic databases of the medical and scientific literature transformed the exercise of performing a literature search. These databases have stored within them the details of many thousands of references from hundreds of journals. The records are usually indexed in various ways to facilitate searching and provide tools that allow simple and more sophisticated interrogation of the database. A search that previously required many hours in a library ploughing through the large volumes of the *Index Medicus* can now be completed in a few minutes sitting at a computer. The speed and range of these tools are such, however, that the searchers may find

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themselves swamped by an avalanche of citations. Some thought and practice are needed to get the best from these powerful systems.

Many bibliographic databases cover various aspects of the medical and scientific literature and may be relevant to the medical researcher. Probably the two most widely used are Medline and EMBASE. Medline is produced by the United States National Library of Medicine and covers the fields of medicine, nursing, dentistry, veterinary medicine, the healthcare system and the preclinical sciences. It contains over 11 million citations from approximately 5,400 journals, dating back to the mid-1940s. EMBASE, the Excerpta Medica database, is produced by Elsevier Science. About 30% of journals that may be searched through EMBASE also appear in Medline, but EMBASE has a more European emphasis than Medline and is useful for identifying citations in non-English language journals. EMBASE has a strong emphasis on psychiatry, pharmacology and biomedical engineering, and it is particularly valuable for identifying citations in these areas. To complete a comprehensive search, you need to explore both these databases and further resources that may yield valuable results. For clinical research, and especially for those planning a clinical trial or systematic review, a visit to the Cochrane Library (http://www.thecochranelibrary.com) is essential. At the core of the Cochrane Library is its database of systematic reviews. It also contains a number of other valuable resources, including its Clinical Trials and Economic Evaluations databases.

A large number of other databases are available (Box 8.1). Among these, CINAHL covers the nursing and allied health literature, PsycINFO is a useful gateway to the psychological and psychiatric literature and HMIC is a valuable resource for research in health management. It is easy to be overwhelmed by the extent and complexity of what is available. Start by searching the 'mainstream' databases discussed earlier and, if you find it is essential to venture more widely, seek the advice of medical librarians. They will be able to tell you what databases are available locally, which may be relevant and how best to search them.

Box 8.1 Common databases

Allied and Complementary Medicine Database (AMED); Applied Social Sciences Index and Abstracts (ASSIA); British Nursing Index (BNI); Cumulative Index to Nursing and Allied Health Literature (CINAHL); ProQuest Dissertations and Theses; Health Management Information Consortium (HMIC); Popline (population database); PsycINFO (psychology database); Sociological Abstracts; Toxline (toxicology database)

The various databases have a number of different search interfaces. Among the most widely used are PubMed and OvidSP. The former gives access to a free, easy search version of the Medline database via a service maintained by the United States National Library of Medicine. It can be found at http://www.ncbi.nlm.nih.gov/entrez. Although PubMed is freely available on the Internet and has a more user-friendly interface than OvidSP, it only provides access to one bibliographic database. In contrast, OvidSP is a commercial organisation that offers access to a wide range of bibliographic databases including Medline, EMBASE and PsycINFO. The precise databases available via OvidSP vary according to subscriptions arranged by your institution. The OvidSP user interface is more complex than that provided by PubMed, but it is a powerful tool better designed to support sophisticated searches. Ask your local medical library for details of which databases are available and how to access them.

Conducting a basic search in these databases is not difficult. The user is provided with a box into which to type keywords, authors' names or the title of a journal. Such a query may produce the response that no matches were found, but more frequently, a list of citations is returned. This may be several hundreds of references in length and could include material that is highly relevant, as well as citations that do not ultimately prove relevant at all. For this reason, you should gain some skill in searching these databases, as time invested in doing this will be repaid many times over in the future. OvidSP itself provides extensive help pages that explain how to get the best from a database. PubMed has help pages and a series of tutorials designed to provide an excellent introduction to using the database. Training and support may also be available from your local medical library.

All entries in Medline are indexed with a detailed set of medical subject headings or 'MeSH' terms – over 15,000 of which cover the whole range of medical subjects. Most MeSH terms have associated subheadings that can be used to focus on areas of special interest within your search topic, such as epidemiology or therapeutics. A search using MeSH terms is likely to be more successful and comprehensive than a general keyword query alone, but for those aiming to carry out the most effective searching, a combination of the two techniques is strongly advised. PubMed provides a browser of MeSH terms, so you can identify and use the relevant terms. In OvidSP, the 'mapping' function helps the user locate the most appropriate heading(s). EMBASE uses a similar set of subject headings, which may again be accessed using the mapping facility provided by OvidSP. If you are unsure of the relevant MeSH terms or subject headings for your search, use the database to identify a reference you know to be relevant, look inside the record at the

MeSH field and note the terms used to index that reference. You can then build those headings into your own search to develop your strategy.

Both OvidSP and PubMed allow the history of the current search strategy to be examined and the search to be refined. The 'My NCBI' facility in PubMed and the 'Save search history' facility of OvidSP allow details of the search to be saved, so it can be run again at a later date. Some systems also enable the user to be alerted by email to newly added references that match their search criteria throughout the life of their research project, known in OvidSP as 'auto-alerts'. This can save the busy researcher from having to carry out regular independent checks for newly published material. Other tools allow limits to be set on what citations are returned by a given search: for example, a date range can be specified, the type of reference to be returned can be selected (e.g. review or randomised controlled trial), studies of animals or of humans may be requested and the search may be limited to English language references only.

A particularly useful feature of these databases is the facility that allows searchers to find references that cover the same material as a given citation. Below each reference identified in a PubMed search is a link labelled 'Related citations'. Clicking this link initiates a search that identifies references that cover similar material to the original citation. In OvidSP, the same feature is available and is called 'Find similar'. OvidSP also enables the user to locate references that have cited the original paper – this is performed using the appropriate 'Find citing articles' link.

Apart from a formal search strategy consisting of medical subject headings and a series of keywords, often it is useful to search for papers written by known workers in the field of interest. When you identify references through Medline, you may discover that, in some cases, the title carries the suffix 'see comment' and links to correspondence about the paper. Such correspondence may offer useful pointers to the interpretation of the paper and may be an indicator of current debate in the field of interest.

In both OvidSP and PubMed, the abstracts of the references found can be displayed (assuming an abstract is available). You should scan these online and select relevant ones for further investigation. The 'clipboard' facility of PubMed allows selected references to be stored online, while further searches are conducted. The results of these further searches can be added to the clipboard, the contents of which can be downloaded and printed or saved when searching is complete. Both PubMed and OvidSP offer the facility to view, save, print or email results. Alternatively, you may wish to save references in a format that can be exported to reference management software. This is discussed further below in the section on Managing references.

Although bibliographic databases are immensely powerful, they are not the only source of relevant articles. Most electronic journals will have a search box on their home page where entering a topic of interest will result in a list of potentially relevant articles. Full text availability will be dependent on access via local subscriptions, unless the journal is freely available. Finally, do not neglect the citations in the reference lists of the relevant papers and reviews that you find.

After you have completed your initial literature search and identified relevant references, obtain and read the papers. The abstract of a paper should be an accurate rendition of the contents of the paper, but this is not always the case. A study, originally published electronically and described subsequently in *New Scientist*, modelled the way in which errors in citations spread through the literature [1,2]. The study suggested that 78% of citations are 'cut and pasted' from a secondary source. The only way to be sure of what a paper says is to read it!

You may find that, no matter how focused you make your bibliographic search, you end up with an unmanageably large number of references. In this case, reading one or two good review articles may provide a gateway to the literature, by explaining the direction of current thought and placing the references you have found in context. If a carefully conducted search yields a large number of references, however, this often indicates that your field of interest is complex and researched widely, rather than being indicative of a poor search. It is always wise to seek the advice and support of experts before embarking on new research. If the relevant literature is extensive, expert help is essential.

Managing references

You will find that it does not take long to accumulate a considerable number of paper references. Although storing these in a pile on the corner of your desk keeps them accessible, sooner or later this system will become unmanageable, and your references will start to find their way mysteriously into other piles of paper, on to the floor and even into the waste bin. Few things are more frustrating than being unable to find a reference that took two weeks to arrive through an interlibrary loan. Devise some simple system for filing and retrieving your papers. One method is storing papers in alphabetical order by the name of the first author. An alternative system involves numbering and storing papers sequentially, and keeping a record of the number in an alphabetical card index or in the database of an electronic reference manager (see below).

Considerably more is involved in managing references than simply keeping track of the paper copies, however. You need to know the relevance of each reference, which references you have cited in your manuscript and the order in which these references come together to form the bibliography of your paper. Traditionally, writers and researchers have done this using a card index system. Each reference is given a numbered index card and the numbers on these cards can be used to indicate citations in a manuscript and to bring together the references for the final bibliography. This system works well, but is labour intensive, and it can become cumbersome when managing a large number of references. The task has been much simplified by the advent of reference management software. A number of different software titles are available; the two most commonly used products are EndNote and Reference Manager – both of which are produced by Thomson Reuters.

When you choose which product to use, you should ensure that it is compatible with your word processing software, so that the reference management software and word processor work together to allow you to insert citations in the text and produce a bibliography. You should also be able to import citations from EMBASE, PubMed and other databases into your reference management database. These and other tasks are discussed in more detail below. It is often wise to find out which products colleagues use, as they may be able to offer help and support. Local support and licensing arrangements may be available for one or another product. Your library may also be able to offer training and troubleshooting.

Reference management software

An electronic reference manager is basically an electronic database that has been adapted to a particular task. It allows you to build up and work with a personal library of references, and this library is therefore at the core of the product. You should be able to view a list of the references that you have stored, sort them by various criteria (such as first author or year of publication) and search them by various criteria. Most reference managers provide a notes section within each reference, into which you can type your own notes as to the relevance and importance of the reference.

One of the great benefits with this software is that references can be imported directly into the reference manager rather than having to be typed in by hand. Most reference managers can recognise and import a variety of different reference formats. The reference or references to be imported are identified in a bibliographic database, or other compatible electronic source, and are displayed and saved in an importable format. In this format, each field is given a tag that allows it to be identified by other programmes

(e.g. AU for author and TI for title). The software is then instructed to import the references using the appropriate import format – for example, 'Medline' plus the name of the particular supplier (such as OvidSP) for references identified in Medline. In this way, references may be added to your own library with the minimum of effort and a smaller chance of error than if the references were typed in by hand.

Despite the ease of this process, you need to be aware of some pitfalls. It is easy to import the same reference from different databases and hence end up with several duplicate copies in your library. It is possible, however, to ask the software to de-duplicate on such occasions. Check that the authors of each reference are given correctly. If a committee prepared the paper or review, it may be listed in Medline as having no authors. Be aware that the title of the reference given in Medline may carry the suffix 'see comment', which refers you to correspondence about the paper. This will have to be removed manually from the reference before it can be exported to your final bibliography. Finally, beware the temptation to transfer every reference that you find into your library. Enter only relevant and useful references, because there is no point storing citations that you may never look at again. Databases such as Medline and EMBASE exist to allow you to find such references when you need them.

Referencing your paper

After you have completed your literature search, designed your study, obtained ethical approval and completed your research, you will finally have reached the stage of writing. In your manuscript, you will need to refer to the works of those who have gone before or perhaps to your own previous research in this field, placing markers in the text that refer the reader to references cited in the reference list or bibliography at the end of your paper. Some of your citations will appear in the introduction to explain why you have undertaken the research, and some may have a place in the methods section to justify and support the methods you have used, but most almost certainly will belong in the discussion, where you seek to explain and interpret your results. You must be selective in your use of references. Most journals limit the number of references that may be appended to a paper. Certainly, no editor will welcome a 1,500-word manuscript with 60 references attached. On the other hand, you should cite such material as is necessary to support your work and attempt to produce an inclusive discussion that acknowledges viewpoints other than your own.

It is in the task of referencing a manuscript that reference management software comes into its own. If you use the index card system, each citation

has to be marked on the manuscript with an index card number and, when the manuscript is complete, all of the citations have to be collated by hand and a final reference list typed up. An electronic reference manager greatly reduces both the labour involved and the opportunity for error. If the referees request the inclusion of extra references, these can be inserted and the reference list renumbered automatically. If your manuscript, unfortunately, is rejected by one journal and you need to reformat it for submission to another, such reformatting can be done quickly and easily by the software.

The reference management software and word processor are run in parallel. When the need to cite a reference or references arises, these are highlighted in the reference manager database, and, with the click of a mouse, unique identifiers for the references are pasted into the text. When the manuscript is complete, the reference manager is instructed to produce a formatted bibliography. The reference manager replaces each citation in the text with an appropriate reference number (for Vancouver and related styles) or the name of the first author (for Harvard and related styles), and an appropriately formatted reference list is appended to your document. In many programmes, your original file will be overwritten by the new version, so take care to save your original manuscript under a new file name before using the format bibliography command. If you have not kept a version with the citation markers in the text, when the time comes to make corrections to your paper, you may have to go through the manuscript and insert the markers all over again.

Reference formats

Two main formats exist for referencing papers: the Vancouver and the Harvard formats. The former increasingly is preferred for scientific literature. It arose from an informal meeting of a group of editors of medical journals held in Vancouver in 1978. The requirements for manuscripts laid down by the Vancouver Group were first published in 1979. The Uniform Requirements for Manuscripts Submitted to Biomedical Journals, as these guidelines have become known, have been through a number of revisions, and journals are now asked to cite a version published in 1997 or later in their instructions to authors [3,4].

In the Vancouver format, references are numbered consecutively as they appear in the text and are identified by Arabic numerals in brackets. (Some journals require a different arrangement for review articles, in which the references are arranged alphabetically in the bibliography and numbered accordingly in the text.) In the Harvard system, references are cited in the

text by giving the name of the author and the year of the publication in brackets. When a number of references are given together, they should be listed in chronological order separated by semicolons. In the bibliography, the references are listed in alphabetical order by author.

In your manuscript, the reference list at the end of the paper should begin on a new sheet of paper. The fine details of how references should be presented vary from journal to journal, and you should be sure to read the instructions for authors and examine the reference format for the journal to which you plan to submit your manuscript. Many of the reference manager software packages have built into them 'output styles' that make the format of citations and references match a specific journal's requirements. In the following sections, the usual conventions for the most common forms of citation are given. Conventions also exist for referencing theses, conference proceedings and web pages.

Journal article

Surnames and initials of authors. Full title of paper. *Title of journal*. Year of publication; **Volume number**: First and last page numbers of article.

Example

Nunn JF, Bergman NA, Coleman AJ. Factors influencing the arterial oxygen tension during anaesthesia with artificial ventilation. *British Journal of Anaesthesia*. 1965; **37**: 898–914.

Book or monograph

Surname and initials of authors. *Full title of book*. Number of edition. Town of publication: Publisher; Year of publication.

Example

Robinson PN, Hall GM. *How to Survive in Anaesthesia*. 2nd ed. London: BMJ Books; 2002.

Chapter in a multi-author book

Chapter author (surnames and initials). Chapter title. In: Book authors or editors (surnames and initials). *Book title*. Town of publication: Publisher; Year of publication. First and last pages.

Example

Goodman NW. Evidence based medicine: cautions before using. In: Tramer M, editor. *Evidence Based Resource in Anaesthesia and Analgesia*. London: BMJ Books; 2000. pp. 3–22.

Conclusion

Preparation of the references for a paper takes care and organisation. It is not a task that should be neglected; rather the search for relevant references should be the starting point for any research project. Failure to conduct a proper literature search at the outset may lead to embarrassing and potentially serious oversights. It is important not only to obtain the relevant papers, but also to read them! When the time to start writing comes, attention to detail in referencing your manuscript and preparing the bibliography is essential. Modern software aids have made the task of managing references much easier, but diligence and care are still necessary. Failure to present an accurate reference list looks sloppy and may encourage the manuscript's assessors to be more critical.

Finally, and perhaps most importantly, finding, reading and understanding references can be onerous, but do not deny yourself the hidden intellectual pleasures that can come with the task. Discussing the 'state of the art' and the formulation of research questions with knowledgeable colleagues may lead you into some fascinating conversations. Furthermore, as time passes and your work progresses, you may come to realise that you have developed quite an authoritative understanding of the state of knowledge in your area of interest. These are quiet, but real, pleasures.

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Chapter 9 **Electronic submissions**

Michael Willis
Wiley, Oxford, UK

Setting the scene

Submitting manuscripts electronically, whether by email or (as I focus on in this chapter) by upload to a submission and peer review web site, has become the norm, and journals are fast becoming rare whose instructions to authors demand a number of copies of a manuscript, typed double spaced and posted to a physical address.

This is probably more true in the fast-paced and technologically rich fields of physical and life sciences than in social sciences and humanities, and more true of Western journals than of those published in developing countries, where technological infrastructure is typically less able to allow for reliable Internet connections and data bandwidth is more costly. That aside, two of the leading vendors of online submission and peer review web sites between them now claim to represent over 7,000 academic journals[1] and over 500 societies, publishers and university presses.[2]

Who benefits?

Electronic submission may justifiably be perceived to be of greater benefit to the publisher than to authors. After all, it reduces the administrative

1. Most estimates of the number of current, peer-reviewed academic journals range from around 20,000 to 25,000.

2. ScholarOne: 365 societies/publishers/university presses, 3,400 journals, 1.3 million submissions pa, 13 million registered users (http://scholarone.com/media/manuscripts_fs.pdfm, accessed 25 July 2012). Editorial Manager: 4,200 journals, 200 societies/publishers/university presses (http://www.editorialmanager.com/homepage/home.htm, accessed 25 July 2012). A single publisher may of course use more than one vendor.

How to Write a Paper, Fifth Edition. Edited by George M. Hall.

Box 9.1 Benefits to authors of online submission systems

- 24/7/365 access from anywhere with an Internet connection
- Immediate visibility of manuscript status
- Ability to submit files directly and instantly to the journal
- Facility to submit multimedia files
- More efficiently managed peer review process
- Direct transfer of accepted papers to production team
- Ability to ensure greater compliance with publication ethics
- Wide range of statistics used to inform authors of journal policy/scope

burden for the editorial office, with consequential savings in paper and postage costs, and space required for archiving and storage of documents is minimal. The editorial office can also more effectively screen new submissions, ensuring that they comply with the journal aims and scope, and that any missing materials are supplied with minimal delay.

As far as editors and peer reviewers are concerned, access to exactly the same documents and to the same versions of those documents at any time of day or night, from anywhere in the world connected to the Internet, is of paramount importance. A '24/7/365' access is both possible and taken for granted. There are constraints, of course: the editorial staff who can often provide web site assistance are unlikely to be so constantly available, and one longs for the day when peer review web sites never throw up any technical difficulties such as software incompatibilities, time-outs or server failures. Naturally they also expect a reasonable level of computer expertise on the part of submitting authors.

But the benefits to authors of electronic submission are themselves immense by comparison with non-electronic means (Box 9.1). Submitting manuscripts online may not be a panacea for all ills alleged to fester in the peer review process,[3] but authors themselves appreciate its advantages. Back in 2005, a landmark survey of authors discovered that 81% of those surveyed agreed with the statement that 'All else being equal, I prefer to use online systems rather than other means of submission' [1]. This is endorsed by my own experience; if they submit a manuscript 'offline' authors are easily persuaded that it is better for them to submit the manuscript afresh, online.

3. Frequent arguments against the traditional model of pre-publication peer review are that it is subjective, prone to bias, inefficient and insufficiently rigorous.

Speed

Fast peer review turnaround time is rated highly among authors when selecting a journal for submission. It is therefore critically important to authors that a submission can, within a matter of hours or even minutes, receive a preliminary assessment by an editor for immediate rejection or approval for peer review; that a reviewer can both be invited to review and, upon agreement, receive the complete manuscript, all in a matter of minutes; and that an accepted paper can be transferred instantly to the production team for typesetting. Such speeds are just not possible in a non-electronic environment. It is possible for a first decision after external peer review, even employing reviewers thousands of miles distant from the editorial office, to be reached within a few days of submission. Throughout the process authors can also view the status of their manuscript, being reassured that it is not lost in a 'black hole' as they might have feared for their typed copies in pre-electronic days.

Publication time is also accelerated in the so-called cascading peer review model, whereby manuscripts rejected by one journal can be cascaded to one of the next tier of journals within the field for further consideration by that journal. Motivations behind this development include reducing the burden on reviewers and speeding up peer review time – thereby benefiting authors. The Neuroscience Peer Review Consortium involving a number publishers has in many respects led the way here,[4] but PLoS, BioMed Central and Wiley-Blackwell are among publishers that offer transfer between their own journals, in the latter case allowing authors whose manuscripts have been rejected by a 'feeder' journal to be submitted directly to an appropriate open access journal. The authors usually benefit further as they avoid the trouble of having to resubmit their manuscript themselves – this is taken care of by the publishing team.[5] Given that a major reason for establishing the cascade model is to reduce administrative workload, managing submissions electronically is a vital component in its success.

Beyond the peer review process, accepted articles can be exported seamlessly to the publisher's production system from many online submission web sites. Disks need no longer be posted on one day, to be dealt with and keyed in to a production database the next. Errors in manual rekeying of

4. The Neuroscience Peer Review Consortium (http://nprc.incf.org, accessed 25 July 2012).

5. For Wiley's 'Manuscript Transfer Program' see http://www.wileyopenaccess.com/details/content/12f25d2979e/Authors.html (accessed 25 July 2012).

data and delays in shipping hard copies of accepted articles can be avoided in an electronic environment.

While lauding the faster speeds available through electronic submissions, it is, however, important to note that certain delays are no more avoidable in an electronic peer review system than in a non-electronic one. For example, reviewers may be difficult or impossible to contact; reviewers have other, conflicting demands on their time, and in some cases a paper may need to be sent out to more than the usual number of reviewers, for example, when two reviewers have offered conflicting opinions.

Ethics

Further benefits associated with electronic submission include managing publication ethics more assiduously. Ethics in publication and research have a higher profile now than in the past, assisted by organisations such as COPE[6] and the ICMJE.[7] Publishers and editors are increasingly aware of the need to maintain integrity in these areas, helped by online tools that are only possible in the era of electronic databases. CrossCheck,[8] for example, enables editors to check for duplication of text across a wide range of published materials, allowing them to spot instances of possible plagiarism. Interpretation of the search results can be time-consuming and requires an expert eye, and even then the results may not be conclusive. Online submission forms and reviewer scoresheets enable editors to capture information about conflicts of interest, funding sources and compliance with publication and research ethics. Such information could of course be made available in the pre-electronic era, but electronic submission processes enable it to be captured more consistently and more routinely, and easily stored for future reference should that be required.

Statistics

A more tangential benefit to authors comes through the ability of the editorial office to generate statistics on submissions, easily achieved where a

6. Committee on Publication Ethics (http://www.publicationethics.org, accessed 25 July 2012).

7. International Committee of Medical Journal Editors (http://www.icmje.org, accessed 25 July 2012).

8. CrossCheck is a tool developed by CrossRef, using software supplied by iThenticate (http://www.crossref.org/crosscheck.html, accessed 25 July 2012).

mechanism for electronic submissions is in place. Of course it has always been possible to provide figures on turnaround times and acceptance ratios, but the fact that in an electronic milieu they are available at the push of a button (or close thereto) impels publishers and editors to refine editorial policy and develop strategy more sharply. Such statistics can then be used by a journal's editors to determine the journal's focus and thereby to make clear and helpful decisions to authors about their submissions.

Multimedia

Hand-in-hand with wider technological developments, in some fields multimedia files are increasingly encouraged as supplemental material for manuscript submissions, from films demonstrating surgical procedures to sample musical soundtracks. Making use of the range of audio and video formats adds a new dimension to research papers and adds to the reader experience. Submission web sites can easily cater for this, the main restrictions being the bandwidth and data transfer speed necessary to upload files, which are typically large. Within our in-house editorial offices we still occasionally receive a DVD containing figures or videos, which authors have had difficulty uploading to the web site.

Drawbacks

Naturally there may be disadvantages to authors with an electronic submission process for manuscripts. Not all authors may have ready and reliable access to the Internet. Not all authors feel confident at submitting papers electronically and would much rather submit a hard copy by post. Submitting the same paper to a second journal following rejection by the first is theoretically easy in a world of electronic submissions; yet, baffled by the many demands imposed on them by the submission guidelines of differing journals, authors whose manuscript has been rejected by one journal may face immediate rejection when they attempt to submit exactly the same documents to another, solely on the grounds of failure to comply with instructions to authors. Generally speaking, though, the advantages for authors are clear and journals have little reason not to move towards a policy of accepting only electronic submissions.

Into the future

There are at least two major areas in which I suspect electronic submissions will face change in the short to medium term:

1. Development of mobile applications ('apps'). In 2011 the third most common activity on a mobile device for users in the United States was to use a mobile app.[9] In the United Kingdom, figures from April 2011 show that 40% of mobile Internet users accessed a mobile application.[10] It is estimated that by 2012, 57% of professionals in the United States will use a smartphone or tablet (as opposed to a PC) as their primary computing device. The picture seems clear: systems that handle electronic submissions will probably be expected to meet the demands of a growing community of editors, reviewers and authors for whom mobile devices are the mode of preference for Internet access, and in whose 'mobile user experience' apps play a prominent role. This may range from the ability for authors to submit and track manuscripts reliably and quickly while on the move (using cut-down versions of the standard web sites), through apps that enable editors to manage submissions and authors to track their submissions. Submission web sites are largely configured at present around the desktop or laptop environment, and it will be fascinating to see how the vendors of online submission systems rise to the mobile challenge.[11]
2. Changing models of peer review. The discussion so far is predicated on the model of closed, pre-publication peer review, but some journals are experimenting with open and/or post-publication models. The Internet revolution and the development of community-created web sites have no doubt precipitated this: an article can easily be posted online and submitted to the scrutiny of peers and, indeed, the general public, without the formal peer review and publication processes of traditional journal models. The very possibility of electronic submission therefore impinges on the debate surrounding quality control and availability of scientific communication. Again, watching how the online submission system vendors tailor their products to the direction of the scientific community will make for an interesting study.

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9. Data are taken from the 'US Mobile Ecosystem' (available at http://econsultancy.com/uk/reports/mobile-ecosystem, accessed 25 July 2012).

10. Data are taken from the GSMA Mobile Media Metrics (MMM) Application Key Measurements report (summarised at http://mobilemarketingmagazine.com/content/google-maps-leads-way-connected-uk-mobile-app-usage, accessed 25 July 2012).

11. Interestingly, a whole session at the 2011 ScholarOne European User Conference was devoted to the topic of developing mobile apps: 'What ScholarOne Manuscripts Mobile Apps Might Look Like' (the agenda is at http://scholarone.com/media/pdf/2011UCAgenda.pdf, accessed 25 July 2012).

Reference

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Chapter 10 **Open access**

Mark Ware
Outsell (UK) Ltd, London, UK

What is open access?

Put simply, open access is the idea of providing unrestricted online access to scholarly literature, so that anyone can make use of it without having to pay for a subscription, site licence or per-article fee.[1]

To expand a little, to qualify as fully open access, the material needs to be freely available online:

- without payment or access barriers such as registration,
- immediately on publication,
- in perpetuity,
- without restrictions on its (reasonable) reuse.

Open access is an attribute of individual articles, not necessarily the journal. Journals can, and do, contain a mixture of open access and restricted material.

Making an article open access is not the same as putting it into the public domain, which involves the author giving up all rights over how the material is used. By contrast, with open access the author usually *retains* the copyright but grants a set of rights to anyone wishing to make use of it. This grant of rights is done through a *licence*. Under the licence most commonly used for open access academic papers,[2] users are permitted to download and save a copy, print it, read it, circulate copies and use it for teaching or research, in fact more or less anything a scientist or clinician might want to do, except that he or she *must* attribute the original author and (in some cases)

1. Open Access Overview, by Peter Suber, provides a clear introduction to the subject (http://www.earlham.edu/~peters/fos/overview.htm, accessed 25 July 2012). There are also links on Suber's web site to lots of further reading.
2. That is, the Creative Commons licences or equivalent.

How to Write a Paper, Fifth Edition. Edited by George M. Hall.

commercial reuse is also prohibited. Instead of 'All rights reserved', for open access it is a case of 'Some rights reserved'.

Open access is particularly relevant for authors who want their work to be widely read, circulated, cited, debated and built upon. It is thus a good match for the authors of journal articles, who are not seeking direct financial reward from the sale of their work (unlike a book author, say).

Why should I care about open access?

There are four main reasons:

1. You believe it will benefit you, through the greater visibility and use of your work, leading to more citations and increased reputation.
2. You believe it will benefit others and/or society at large.
3. You are required by your research funder or employer to make your articles openly accessible.
4. Increasingly it will simply be a practical matter: the journal that you wish to publish in (because of its prestige, relevance, speed of publication or whatever) happens to be an open access journal.

We shall discuss these in more detail below.

How do I make my articles open access?

There are two main ways of making an article open access: open access *publication* (sometimes known as the 'Gold' route) and deposit by the author in an open online repository (the 'Green' route, also called *self-archiving*).

Open access publications ('Gold' open access)

Open access journals do not rely on subscriptions or other kinds of payments by readers or their libraries for their income, and can thus make their content freely available.

Instead, one of the revenue sources is to levy a per-article publication charge. Article charges typically range from $1,000 to $3,000, though some charge less and a few charge up to $5,000. Journals with publication charges usually have arrangements to reduce or waive these charges for authors unable to afford them (e.g. those from less developed countries). Many research funders allow such publication costs to be charged to the grant and some institutions will have budgets that can be used.

By no means all open access journals, however, levy publication charges. Perhaps surprisingly, a slight majority of journals have no such charges. They rely instead on a variety of funding streams such as grants, sponsorship,

advertising, subscription to the print edition and support by the host institution. Because the larger open access journals and publishers use publication charges, however, the majority of open access articles (as opposed to journals) are published this way.

The Directory of Open Access Journals (DOAJ) lists (in December 2011) about 7,360 journals, which can be searched or browsed by subject category.[3] As one indication of growth of the open access publishing, the equivalent figure was 2,560 at the time of writing the last edition of this book (late 2007).

Hybrid and partially open access journals

In addition to fully open access journals, there are a large number of journals offering hybrid or partial open access. The main variants are as follows:

- *Optional open access.* Subscription journals that will allow authors (in return for a publication charge, similar in size to that charged by fully open access journals) to make their individual articles open access. This is probably the most numerous type of open access *journal*. Take-up by authors has been, however, low to date (around 1–2% of journal articles annually), so this currently represents a small fraction of open access *articles*.
- *Delayed open access.* Subscription journals that make their content open access after a set period (anything from 2 to 24 or more months). There are some 2.1 million such DOA articles hosted on HighWire alone.
- *Hybrid journals.* These offer open access to some kinds of content, typically research articles, while still requiring a subscription to access the other types of content (e.g. review articles or journalistic content).

Broad-scope open access journals and peer review innovation

The online-only, publication charge model, combined with search and other discovery tools, makes possible journals with very broad subject scopes that would have been impractical under a subscription model. Some such open access journals (the best-known example is *PLoS ONE*) have also pioneered a new approach to peer review in which the criterion for acceptance is 'soundness not significance': that is, the reviewer makes a judgement on the technical standard of the work and not on matters such as the long-term importance of the work or its suitability for a particular journal. It is argued

3. The Directory of Open Access Journals (DOAJ) lists over 7,360 journals, searchable or browsable by subject area (http://www.doaj.org/, accessed 25 July 2012).

that this is better because it eliminates a more subjective element in the review and that the importance of an article is better determined after publication by the readership, and because it speeds up publication by reducing multiple peer reviewing.

Self-archiving ('Green' open access)

The other route to open access is for authors to deposit a copy of their journal articles in an open repository.

There are two kinds of repository. *Subject-based repositories* offer a centralised resource for a particular discipline. *Institutional repositories* host the outputs (not just research) of a particular body, such as a university. In theory, it should not matter much which an author chooses, because the repository software is designed to support interoperability, allowing all repositories to be searched through a single search interface. In practice, researchers in a particular field may be accustomed to using a well-known repository (such as PubMed) but be unaware of ways to find content from institutional repositories, and second, a centralised service like PubMed can impose discipline on the metadata (such as keywords or subject headings) used to describe articles, permitting a more effective search interface. Improvements in, and more widespread use of, services like Google Scholar and Microsoft Academic Search may tend to negate these advantages.

Authors frequently worry that deposit in a repository will contravene the assignment of copyright they have made to the journal publisher. Perhaps surprisingly, this is often not the case – the majority of publishers and journals permit authors to archive some version of the article. Typically this version is the accepted manuscript (sometimes confusingly called a *post-print*), that is, the final draft following refereeing but prior to copy-editing by the publisher. Some journals may also allow the final published version to be archived.

Many journals also attach some conditions to self-archiving. Many will require an embargo period between publication and the earliest the article can be made open access. Others will require a URL linking to the official version on the publisher's web site.

Publishers' policies with regard to self-archiving can be conveniently checked at the ROMEO web site.[4]

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4. ROMEO – this web site maintains a database of publisher policies regarding self-archiving (http://www.sherpa.ac.uk/projects/sherparomeo.html, accessed 25 July 2012).

Arguments in favour of open access

We have seen a little of how making an article open access might benefit you as an author by gaining a wider audience, perhaps leading to more citations, thereby increasing your reputation and attracting new research partners.

Let's now step back and look at some broader arguments in favour of open access.

First, it is argued that open access gives greater visibility and accessibility to the literature, and thus leads to greater impact from research. There is evidence that open access increases impact by substantially increasing the number of times an article is downloaded. The evidence for a consequent increase in citations is less clear-cut, however, with some debate on the extent to which these increases are due to the open access status itself versus other factors (such as authors preferentially archiving their better work).

Second, open access may promote the more rapid and efficient progress of research, partly a consequence of easier access and partly due to self-archiving ahead of publication.

Third, open access could facilitate the better assessment, monitoring and management of science. Bibliometric tools that allow the study of the web of citations within a field have existed for some time, but it is argued that such tools would be much more effective if all the scientific literature were open to them.

Fourth, data and text mining may be facilitated by open access. Although this can be done with paid-for content (e.g. under licence from the publisher), it is argued that it would be easier and more effective if the literature were transparently open to the software tools.

Fifth, it is argued that open access journals offer economic gains over subscription-based journals. For example, when the marginal cost of supplying another electronic copy of an article approaches zero, it is more efficient not to charge for access, because any price, however low, deters some potential users. Economic cost–benefit studies also appear to support open access models in certain circumstances.

Lastly, it is felt by many (particularly in the United States) that the public should have the right to access outputs of research that were funded by the taxpayer.

Arguments against open access

The benefits of open access are, however, not uncontested.

First, some are sceptical as to whether the available business models for open access journals are appropriate to (or sustainable in) all subject areas or all journals. For example, open access uptake is much greater in the life

sciences, where research grants are common, than in fields such as social sciences where such funding is rarer. A related criticism of the publication charge model is that a widespread move to it from the present subscription model would require large and impractical shifts of funding within academia, and involve a transition period in which total system costs were higher.

In practice it seems likely that open access will develop at different rates within different disciplines for a combination of these and other factors.

Turning to the self-archiving option, critics charge that it is parasitic on the existing subscription journals. Authors still want to be published in reputable and relevant journals. If funding bodies then require them to archive their articles, the concern is that when the level of archiving reaches some critical point, libraries will abandon their paid subscriptions in favour of the free versions. There is evidence that journals in subjects where a high fraction of the literature is available via repository (like high-energy physics) see usage migrating from the journal web site to the repository.

Proponents of self-archiving say this fear is unfounded because evidence (e.g. from physics) shows that journals can coexist with archives even when the latter contain the same articles, or that if subscription journals do become unsustainable the transition will be manageable.

It has been said that article publication charges may discriminate against those without research funding, or at poorer institutions, or in poorer countries. Most if not all open access journals, however, offer reduced rates or free publication to such authors.

Another criticism is that open access journals may have a financial incentive to accept poor quality work, because the more articles are published, the more publication charges are levied. In fact, subscription journals face a similar temptation because bigger journals sell for higher subscription prices. In practice, good journals of either persuasion depend crucially on the quality of their published content to attract authors and readers, and will isolate their peer review and editorial decision-making processes from the business side of the journal.

Self-archiving does raise some concerns about the proliferation of different versions of the same article. The accepted manuscript should not differ materially (in its scientific content) from the final publisher's version but the copy-editing process will have introduced some changes, and in some cases these could be important. The introduction of the CrossCheck scheme should help to clarify which version is being viewed.

Research funders' policies

Research funders have recently started to introduce policies requesting or requiring researchers funded by them to make the articles resulting from the

funded research openly accessible. This requirement can normally be met either by publishing in an open access journal (or by utilising the optional open access feature in subscription journals) or by depositing a version in an in open archive.

There are a mixture of reasons for this but essentially the funders appear to have accepted the argument that they will get greater value from their investments in research the more widely the results are made available.

These policies are increasingly becoming mandatory, because experience shows that when deposit is voluntary, the proportion of authors choosing to self-archive is small (around 4–15%). Surveys of authors, by contrast, have shown that around 95% say they will deposit if required to do so by an employer or funder (although in practice compliance rates are currently well below this figure).

The funders' policies vary in five main ways: whether deposit is voluntary (but encouraged) or compulsory; which version of the article must be deposited (typically it is the accepted manuscript); the maximum delay after publication before the article is freely available (if specified, this is typically either 6 or 12 months; an alternative formulation is 'as soon as possible while complying with the publisher's policies'); whether or not they will fund open access publication charges; and the place of deposit (NIH and Wellcome specify PubMed Central and UK PubMed Central, respectively; other funders allow the author to select an appropriate subject or institutional repository).

If you have been funded by a body with a deposit policy in force, their requirements will have already been communicated to you. You can if you wish, however, look up the policies of research funders on at least two web sites, ROARMAP or (probably preferable for most readers of this book) JULIET.[5]

5. JULIET – an online database of research funder policies on research self-archiving (http://www.sherpa.ac.uk/juliet/, accessed 25 July 2012). ROARMAP (http://www.eprints.org/openaccess/policysignup/, accessed 25 July 2012) has similar information and also includes university policies.

Chapter 11 **How to write a letter**

Michael Doherty
Department of Rheumatology, University of Nottingham, Nottingham, UK

General considerations

When you think of submitting a letter to a journal, first consider the following basic questions:

- What is the purpose of your letter?
- Is a letter format appropriate for this particular journal?
- Does what you want to say justify a communication?

The purpose of a letter varies between journals (Box 11.1). Most letters are comments in response to a previous publication, although brief communications that do not justify an extended or concise report are sometimes appropriate as letters. It is always wise to read the 'Instructions for Authors' and to examine the correspondence section of recent issues of the journal to gain a feel for the style and scope of successful (i.e. published!) letters. Because the amount of information provided in a letter is necessarily limited, rarely is there justification for a long list of authors. Always question whether the information you wish to convey truly justifies publication – minor comments or observations are unlikely to be accepted.

If the purpose and content of your communication seem appropriate as a letter, two other major considerations are its length and the style of presentation. With respect to length, always be brief. Editors like concise communications. They would rather publish 10 short letters on 10 different topics than two lengthy ones on only two topics. Think how you react as a reader – messages are always more effective if put succinctly. Some journals impose firm restrictions on word count, number of references and use of accompanying tables or figures, and these restrictions will be outlined in their instructions to authors. Even if not overtly stated, however, all editors favour a 'Raymond Chandler' over a 'Charles Dickens'. For example, compare the following two introductory paragraphs to the same letter:

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Box 11.1 The purpose of a letter

Usual

- Comment (positive or negative) in response to a previous publication
- Concise communication of clinical or investigative data
- Communication of case report(s)

Less common

- General medical or political comment (e.g. 'guild issues')
- Comment concerning the nature or format of the journal
- Advertisement of interest to collaborate or to gain access to patients or study material

Sir,

I feel I must put pen to paper with respect to the recent communication by Dr Peter Jones and colleagues in your August issue,[1] to draw the attention of your readers to possible misinterpretation of the data that they present. Although these excellent workers have an internationally renowned track record in the field of complement activation (not only in rheumatoid arthritis but in other inflammatory diseases as well), in this present study, they seem to have omitted to properly control for the varying degrees of inflammation in the knee joints of the patients that they aspirated – not only those with rheumatoid arthritis but also those with osteoarthritis. Such inflammation of the knee joint could have been assessed readily either by local examination and scoring of features such as temperature increase, effusion, synovial thickening, anterior joint line tenderness, duration of early morning stiffness, and the duration of inactivity stiffness, with addition of the different scores to a single numerical value (that is, the system devised and tested by Robin Cooke and colleagues in Alberta[2]) and/or by simultaneous measurement and comparison to levels of other markers of inflammation, for example, the synovial fluid total white cell and differential (particularly polymorphonuclear cell) count or local synovial fluid levels of various arachidonic acid products such as prostaglandins or leukotrienes . . .

(Dr C Dickens)

Sir,

In their study of synovial fluid complement activation Jones *et al.*[1] made no assessment of the inflammatory state of aspirated knees. Such assessment could have been attempted using the summated six-point clinical scoring system of Cooke *et al.*[2] or by estimation of alternative indicators of inflammation (for example, cell counts, prostaglandins, or leukotrienes).

(Dr R Chandler)

Both convey the same message. The second is more 'punchy', however, and gets straight to the point by omitting unnecessary description and detail. As with any scientific writing, keep sentences short. Make each of your points separately. Reference short statements rather than provide extended summaries of previous work.

Etiquette and style for letters in response to an article

A letter is the accepted format for comment relating to a previous publication in the same journal. Occasionally it may relate to a publication in another journal. Note that letters are always directed to the editor, never to the initial author. The editor in this situation is an impartial intermediary between authors, particularly those in potential conflict.

The usual purpose of a responding letter is to offer support or criticism (most commonly criticism) of the rationale, method, analysis or conclusion of the previous study. If this is the case, make specific, reasoned criticisms or provide additional pertinent data to be considered in the topic under consideration (Box 11.2). Do not reiterate arguments already fully covered

Box 11.2 Guidelines for a letter in response to an article

- Be courteous and interested – not rude or dismissive
- Make specific rather than general comments
- Give reasoned argument, not biased opinion
- Do not repeat aspects already covered in the original article
- Introduce a different perspective or additional data to the topic
- Attempt to make only one or a very few specific points
- Be concise

or referenced in the provoking publication. Your letter should raise new points that were not addressed adequately or should provide additional information that supports or refutes the contentions of the other authors. However prestigious you may think yourself, merely offering your personal dissent or approval is not enough. You should use the letter to argue a reasoned perspective. It should not be a vehicle for biased opinion. Always be specific. General comments unsubstantiated by reasoned argument ('I think this a great publication' or 'I think it is rubbish') are unacceptable.

If you are offering criticism, always be professional and courteous – never rude, arrogant or condescending. Apart from common decency to fellow investigators, politeness in correspondence will serve to enhance and safeguard whatever reputation you have. This is the same golden rule that applies to question time at oral presentations. No one likes a rude critic, even (or more especially) one who is right. A polite, understated question or comment inevitably has more critical impact than arrogant dismissal. For example, compare the following two styles of presentation. Both letters make the same points:

Sir,

I was greatly surprised that the paper on synovial fluid complement breakdown products (C3dg) by Jones *et al.* managed to get into your journal. Firstly, Jones *et al.*[1] obviously forgot to control for the inflammatory state of the knees that they aspirated, even though our group previously has drawn attention to the importance of this in any study of synovial fluid.[2] Secondly, they made no attempt to determine levels of C3dg in synovial fluid from normal knees. Since they only compared findings between knees of patients with either rheumatoid or pyrophosphate arthritis, it is hardly surprising that they jump to the wrong conclusion in stating that complement activation is not a prominent feature of pyrophosphate arthropathy. Thirdly, they only reported crude C3dg concentrations, with no correction for synovial fluid native C3 levels. If these investigators had only taken the time to read the existing literature, they would have realised that we previously have shown that such correction is of paramount importance for correct interpretation of C3dg data. That such a majorly flawed paper, which does not even reference our seminal work,[2] should be published at all – let alone as an extended paper – must seriously question the effectiveness of the peer review system that you operate.

(A Pratt)

Sir,

I was interested in the study of synovial fluid breakdown products (C3dg) by Jones *et al.*[1] in which they conclude, contrary to our previous report,[2] that complement activation is not a feature of chronic pyrophosphate arthropathy. Such discordance most likely relates to differences in clinical characterisation and expression of C3dg levels rather than to estimation of C3dg itself. Unlike Jones *et al*. we assessed and controlled for the inflammatory state of aspirated knees, included normal knees as a control group, and corrected for native C3 concentrations (expressed as a ratio C3dg/C3), as well as reporting C3dg concentrations. By employing these methods, we were able to demonstrate complement activation in clinically inflamed, but not quiescent, pyrophosphate arthritis knees. Such activation was less marked quantitatively than that observed in active rheumatoid knees. We would suggest that clinical assessment of inflammatory state, inclusion of normal knee controls, and correction for native C3 levels be considered in future studies of synovial fluid.

(A Diplomat)

Remember that the original authors will usually be invited to respond to your criticisms. It is much easier to respond to a rude than a polite letter, and even potentially damning points that you raise may get lost in the 'noise' of confrontation. For example, Dr Jones would be able to centre his reply to Dr Pratt's letter on the defence of the peer review system. He would be hard pressed, however, to sidestep the same specific criticisms levelled by Dr Diplomat. Furthermore, the original authors have the last word, and if your criticisms are misplaced (it happens!) you may not be given the opportunity to rescind before publication. You may then find yourself publicly ridiculed, appearing as a rude ignoramus rather than an interested and inquiring intellectual. For example:

Sir,

We are grateful to Dr Pratt for his comments. We in fact had carefully considered all the points he raises. Because all knees included in our study were clinically inflamed, the question of correcting for differing degrees of inflammation does not arise. We also considered aspiration of normal knees, but this was not approved by our research ethics committee. We included estimation of native C3 and expression of C3dg/C3 in our original manuscript.

This made no difference to the results and, because the main thrust of our paper dealt with the method – not the demonstration – of C3 activation in rheumatoid knees (with original data on C4d and factor B activation), we were asked to delete these data by the expert reviewers. We of course were aware of the study by Dr Pratt and colleagues, but we were limited in the number of references we could include. We referred therefore to the first report of synovial fluid C3dg in normal, rheumatoid, and pyrophosphate arthritis knees by Earnest *et al.*[1] which predated that of Pratt *et al.* by six years.

Other forms of letter

In many journals, the correspondence section is an appropriate site for short reports that have a simple message but do not necessitate a full paper. This is particularly true if a study uses standard techniques that are readily referenced and require no detailed explanation.

Studies

Presentation of a study as a letter is rather similar to writing an extended abstract (Box 11.3). Normally there should be three clear divisions: an

Box 11.3 Presentation of a concise report as a letter

Introduce the topic
- Briefly explain the rationale and objectives of study.

Present methods and results
- Reference methods as much as possible to reduce length of their description.
- Include only essential data.
- If possible present data in a table and/or figure.

Present conclusions
- Emphasise only one or a few major conclusions.
- Place findings in the context of previous literature.
- Highlight caveats and strengths of the study.
- Suggest future studies that are still required in this area.

Avoid extrapolating too far from data.

Avoid repetition of data or conclusions.

Be concise.

introduction relating the rationale and objectives of the study; a section stating the methods, analysis and results; and, finally, a conclusion. The conclusion should assess the validity and importance of the findings in the context of other work, highlight the caveats and strengths of the study, and indicate the direction of future-related research. Unlike concise or extended reports, section headings are not enforced, and an abstract is unnecessary. Nevertheless, subheadings may be used to good effect and often assist the clarity of presentation.

Although often considered a 'second-rate' way of reporting data, a letter format is quite appropriate for brief reports and can still be prestigious, especially in high-impact journals. If you are presenting original data in a letter, carefully consider whether this will compromise subsequent publication of the same data in a more extended form. Remember that letters can be referenced and that 'redundant' or duplicate publications must be avoided.

Case reports

Case reports are often presented as letters. They are particularly suitable for single cases that do not justify a full or concise report. Some journals have no specific slot for case reports and publish all cases as letters. Most editors only publish cases that give novel insight into pathogenesis, diagnosis or management. To report the sixth case of concurrence of two diseases in the same patient is of no scientific interest – only a formal study, not further case reports, can answer whether this is chance concurrence or a true association that may give clues relating to pathogenesis of either disease. As with short reports, cases are best divided into a brief introduction, a description of the case itself and then a discussion of its interest, with no section headings. Be particularly careful not to repeat the same information by summarising the case at the beginning and the end. This is a common and easy mistake.

General or political comment

General or political comment occurs mainly in major weekly journals or in specialist journals that are the official outlet of learned societies. In this situation, humorous comments may be permitted. Humour is always risky, however – especially for an international audience with diverse perspectives on what, if anything, is funny. Letters may be used to advertise an interest in particular cases or investigational material for research purposes or a service on offer (e.g. DNA repository). Such advertisements should be very brief and are more usually found in a notes or news section.

Chapter 12 **How to prepare an abstract for a scientific meeting**

Robert N. Allan
Royal College of Physicians, London, UK

Introduction

How could anyone insist that your work, which is at the forefront of scientific development and has consumed your life in recent years, should be minimised to the size of an abstract box? Pause, recover your equilibrium and muster a little sympathy for the organisers of the meeting where you plan to present your original work.

The scientific programme will have been planned several years in advance. The lectures and symposia will have been agreed, the national and international speakers invited and the venue selected. The programme will also include a limited number of spaces for presentation of abstracts, either as oral communications or as posters.

Selection of abstracts

The number of abstracts submitted nearly always exceeds the number that can be included so that some sort of selection procedure must be adopted. A panel of reviewers, each an expert in their own field, is asked to assess each abstract. Each has a large number of abstracts to assess, so the time allocated to your own precious abstract may well be short. Furthermore, the secretariat organising the meeting will know that authors often ignore instructions and submit abstracts that are over length, illegible, incomplete or late. They will be determined on this occasion only to consider abstracts that conform to the published guidelines. Be warned!

Online submission of abstracts

Online submission is now the norm. The web site of the society organising the meeting will include detailed information, and many meetings have a

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site dedicated to preparation of abstracts. For example, the British Society of Gastroenterology's home page (http://www.bsg.org.uk, accessed 25 July 2012) provides direct access to the meetings web site. Click on 'abstracts' for online preparation and submission.

Guidelines for online submission

Specific guidelines must be followed – only use the specified area and include the title, list of authors, institution and address. Do not modify the page setup with respect to dimensions or font (print) size. You must declare originality or previous publication.

Snail mail submissions

Guidelines

A few meetings still use postal submissions. The instructions may look (and usually are!) tedious, but they are designed to ensure high-quality reproduction of your work. Abstracts are no longer edited and typeset. For speed and efficiency, abstracts will be reproduced exactly as they first appear. The abstract must therefore be typed within the prescribed area. An appropriate size typeface and a high-quality laser printer should be used to ensure good reproduction. Direct reproduction of the camera-ready abstract will mean that any errors in spelling, grammar or scientific fact will be reproduced exactly, so take care. Vain hopes that the photographic process might in some way enhance your abstract must be abandoned.

Send the appropriate number of copies. Anonymous copies – without the names of the author and the institution where the work was carried out – are often requested to ensure that the marking system is independent and fair. Make a careful note of the deadline – preparation of abstracts always takes longer than expected. Late entries or those not conforming to the guidelines may be rejected out of hand, without evaluation. The abstract form commonly includes a number of subject categories. Identify the most appropriate category for your work to ensure that the selected reviewer is an expert in your field. Mark whether the abstract will be presented as a poster or oral presentation. You must declare that the abstract is completely original or submit details if the abstract has been submitted to another meeting or for publication. Full information must be provided.

Preparation of the abstract

The abstract should be prepared with a number of headings – even though the headings themselves may eventually be deleted from the final text.

Title

The title is a concise summary of the abstract and must demonstrate that the work is important, relevant and innovative. Define the key features of your work and link them together until the title effectively conveys that message.

Authors

Include authors who have really contributed to the work. It is assumed, if the abstract is accepted, that the first author will present the work. The author presenting the work must be identified. The name and address of the institution at which the work was carried out are included, with a contact email address. For example, your abstract may be selected for a plenary session, and the organisers will need to confirm that the presenter speaks fluent English and that the work is sufficiently important to include in the session.

Background

Start with a sentence or two that summarises previous work relevant to the presentation. Highlight any controversies that your work has helped to resolve.

Aims

What is the point of the study? What is the hypothesis that is being addressed? How is your work different from previous work? Is it useful, exciting and worthwhile? Does it make a new and significant contribution? To encapsulate these ideas in a sentence or two takes time and practice.

Patients

If patients were studied, how were they selected? Did they give informed consent? Was the selection of patients random? Why were patients excluded? Confirm that ethical committee approval was obtained.

Methods

The techniques employed must be summarised and novel methods described in greater detail. Minimise the use of abbreviations, which may confuse the reader and assessor. Include the methods used to test for statistical significance.

Results

Data about patients should be described first, including the numbers studied, sex, age, distribution and duration of follow-up. The key results

should then be summarised, usually in four or five sentences that identify the positive features; ensure that any claims can be substantiated. Highlight new developments.

Discussion

What has the work added to the existing body of knowledge? In what way are these new findings important? Could the findings have occurred by chance or are they statistically significant?

Conclusions

Why is the work important? How might the work be developed further?

From draft to final version

The draft abstract is now complete. It will be hopelessly over length. To edit this information to an abstract of less than 200 words is a challenge. Delete any duplicated, superfluous or irrelevant information. Can the same idea be conveyed in fewer words? If the abstract is still over length, what are the most important results? Can some points be omitted and only presented at the meeting?

It will take time and many drafts to produce the final version. Start early and aim to complete and submit the abstract well before the deadline. The abstract must summarise the work, but must also excite the reviewer in that 'brief moment of time' when your abstract is being assessed.

Reread the guidelines and ensure that you have conformed completely with the instructions. Circulate the draft abstract to your colleagues and obtain their approval before submission.

Final preparation

The abstract can now be completed and the final version prepared. Do not duplicate submissions – two or more abstracts that describe similar results from the same study are both likely to be rejected. Include an email address for future communication.

Outcome

In due course, you will hear the outcome of the assessment and experience the joy of acceptance or the depression of rejection. Few abstracts are outstanding, and few are awful. The marks for most abstracts hover around the mean, and abstracts are either just accepted or just rejected. Temper the joy of acceptance with modesty. The depression of rejection can be minimised by knowing that the abstract was probably only just rejected.

Presenting the data

The accepted abstract has to be converted into an oral presentation or a poster – another exciting challenge. Submission of an abstract implies that one of the authors will present the paper or poster in person at the meeting. Late withdrawal of an abstract gives both the individual and his or her unit a bad name.

Conclusion

An abstract that effectively summarises your work clearly and concisely with an apparently effortless presentation can only be achieved with meticulous preparation. In doing so, however, you will share in the excitement of contributing at the forefront of new scientific developments.

Chapter 13 **How to write a case report**

Martin Neil Rossor
Dementia Research Centre, Institute of Neurology, University College London, The National Hospital for Neurology and Neurosurgery, London, UK

In the hierarchy of evidence-based medicine, single anecdotal case reports are at the very bottom, and yet case reports can be the vehicle for novel observations be they associations of diseases, unusual presentations, side effects of therapeutic interventions or even rarely new diseases [1]. Although there is legitimate concern about the selectivity of reporting, case reports can generate hypotheses for subsequent systematic research leading to a more secure evidence base. Individual case reports can also be educational and thus illustrative of what may be already well known but often forgotten. The large capacity of online publishing, and the introduction of new publishing models of open access and author pays, makes it likely that publication of case reports will increase rather than decrease.

For many clinicians the case report has been their first successful publication. The task of preparing a case report is often delegated by busy clinicians to a junior member of the team. Case reports are not easy to write, but a well-written report can be a delight to read.

Why publish a case report?

Having been involved with a patient that you think may be the basis of a report, it is important to be clear why the case should be published. This will help structure the article, help you to target the journal and will be important to include in a cover letter to the editor. Listed below are some of the reasons for publishing a case report.

A very rare disease

Rarity is often cited in covering letters to journals as the reason for reporting a particular case. However, rarity per se is seldom of interest to editors. Gaining information and experience about rare diseases is often better

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served by a report on a series of cases together with a more extensive literature review. Two patients with a very rare disease as a case report would be of more value than a single case.

Associations of diseases

This is also a commonly stated reason for reporting a particular patient. However, the chance association of common or rare diseases is again of little interest. For associations to be of interest, they need either to generate hypotheses about underlying causation or to create a particular challenge in management or diagnosis.

Rare presentations of more common diseases

A very unusual or previously unreported presentation of a common disease is likely to be of interest and publishable. The challenge is to substantiate your diagnosis and to exclude other explanations or coexistent disease.

Reporting a particular outcome

Reporting unexpected outcomes can be valuable, for example, an unanticipated good prognosis of a fatal disease or an unexpected side effect of an intervention. Although the case reporting of new side effects provides a poor evidence base because of publication bias, it nevertheless points the way to more systematic investigation.

Outcome of a novel treatment

It is the selective reporting of individual patient's responses to an intervention that has given case reports a bad name in evidence-based medicine. Many journals will not consider single case reports of therapeutic interventions unless the outcome is so striking, for example, treatment of a hitherto fatal disease, or unless there has been a placebo phase.

Mistakes and lessons

Many journals will publish case reports purely for educational purposes. Lessons learned need not relate to rarities and indeed are often more educational if the problem is likely to be encountered in everyday practice.

A new disease?

This is perhaps the least likely basis for a case report but is a most compelling reason for publication. However, claims of precedence in case reports are often proved wrong.

Choosing your journal

Once you have decided what the main reason is for your case report, it is worth considering possible journals before starting to write. In many cases you will need to target a specialist journal. Journals may publish case reports under a number of headings rather than just case reports, for example, as a letter, as a 'lesson of the week' or as a 'picture'. Read through published case reports in the journal and read the instructions to authors very carefully and follow them precisely. Journals will vary on their requirements for case reports, but, as a general guide, around 1,000 words is a common length with one or two figures or tables. Although there is an argument for standardising case reports, this has yet to be achieved [2].

The structure of the case report

Most journals will expect you to follow a standard format of abstract, introduction, the case report itself and then discussion and perhaps conclusion followed by the references. It is important to remember that whereas cases are examples of the disease, patients are persons.

Not all journals will require an abstract, and this is often the most difficult to write. It may be easier to wait until the main body of the article has been written and may just be a very brief sentence to summarise what is being reported and why. If the case report is in the format of a letter, it will often start with 'we report a 38-year-old man with extremely rare case report syndrome . . .'.

The introduction will need to say why the case is being reported, with a brief introductory background. Some authors will include here a brief literature search, but this may be better dealt with in the discussion.

The common format of the clinical details is to provide the history with the presenting features, the medical history, social history and family history together with drug history. This is then followed by the physical examination, investigations, the differential diagnosis and then the treatment and outcome. However, it is important to present the information chronologically, and this should tell a story. One may therefore need to set the scene with the presenting features, the medical history, social history and family history and then to detail the chronology that will inevitably intersperse symptoms, signs and investigation as the story unfolds. Remember to avoid jargon, and if acronyms and abbreviations are used, they should be explained in the text. Normal values of laboratory results should be provided except for the routine. Important negatives should be mentioned both in the history, the examination and the investigation but only if essential to the message.

It is important to anonymise the patient as far as possible, but this can never be complete. Clearly names and initials must be avoided, although unrelated initials are widely used, especially in the neuropsychology literature where detailed study of a single patient may constitute a major research paper. Identification by coded initials helps in cross-referencing if the patient is part of more than one paper. Non-essential personal details should be omitted.

A table of results can be helpful, and pictures of clinical signs or radiology can be invaluable. The faces of patients can be digitally masked to help preserve anonymity. In some instances, recognisable pictures may be important and are acceptable, provided fully informed consent is obtained (see below).

The discussion should be used to clarify the key issues, and this may be the best place to refer to other cases and a summary of the literature. However, the case report is not the vehicle for an extensive review of the literature. Where a literature search has been done, the methodology should be briefly stated. The final message should be summarised, and this is where the claim must have been substantiated.

If new to medical writing it is important to get advice early and particularly with respect to the key message and reason for writing the case report. It is valuable to get other people to read the article and often helpful if they have not been involved in the patient's care. It is very easy to overlook an important point because one is too close to the case.

Consent

You will need the consent of the patient to publish. This is essential, and many journals will not even send your article out for review unless a consent form accompanies the article when submitted. Many journals will have their own consent form, and if not, you should create your own using one of the other journal templates as a guide. In Europe the EU privacy laws make it illegal to publish confidential information without consent whether this is in print or online. A common misconception is that if no photograph or personal details are provided, then there is no need for consent. This is not true. It is extremely difficult to anonymise completely, and indeed for an individual case report, this is essentially impossible as the key features would be lost. It is important, therefore, to contact the patient at the earliest opportunity and to explain that one would hope to publish a case report. Once patients understand that they will not be referred to by name and personal details minimised, then consent is usually forthcoming. Clearly with photographs, particular care needs to be taken. It is good practice to give a copy

of the final article to the patient and then one can be secure in the knowledge that consent has been fully informed and given.

A duty of confidentiality persists even if the patient has died, and in these instances the next of kin should be contacted.

Occasionally it may be difficult to obtain consent because the patient was seen a number of years ago, as may well happen if one is reporting two instances of a particular disease and it may be many years between the two cases. Patients may also move away and die. Rarely publication can go ahead but certain criteria need to be met. First, publication should be in the public interest, and if that cannot be met then one should not be writing the case history in the first place. Second, every effort should have been made to contact the individual or next of kin. Third, every effort should be made to anonymise the case report. Fourth, one should assure oneself that the average person in this situation would be unlikely to withhold consent.

One should also consider the assent to publish from other clinicians involved in the care of the patient. Often these will be co-authors. Certainly agreement should be obtained from the main clinicians involved in the care of the patient, and they should see a copy of the article before submission.

Authorship

Journals offer guidance on authorship. Merely having the patient under one's care does not justify authorship; there needs to be intellectual input into the case report itself. The many clinicians involved in the care of the patient can be acknowledged, but be aware that some journals require a letter from those you acknowledge confirming their involvement and agreement to acknowledgement. It is important to avoid a football team of authors, and indeed many journals will restrict the number of authors for letters, lessons of the week or pictures.

Submitting the article

Before submission, ensure again that you have all the appropriate consents and assents to publish. Ensure that all the instructions and guidelines on the journal webpage are followed, particularly with respect to the length of the article and numbers of figures and format. Do write a cover letter, which journal editors find very helpful. This should be succinct and state why this case report is of particular interest.

Good luck!

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Chapter 14 **How to write a review**

Paul Glasziou
Centre for Research in Evidence-Based Practice (CREBP),
Bond University, Queensland, Australia

With the growth in the medical research literature, reviews have become common and a well-cited form of publication [1]. In 2011, Medline tagged over 70,000 articles with the publication type 'review'. Of these, about 4,200 were tagged as 'systematic reviews' (though actually Medline labels these as 'meta-analysis', which is closely related). Being able to undertake a careful and critical review is an essential skill for every researcher.

Before asking 'how' to do a review, it is wise to first ask 'why'. The main reason for doing a review is to provide a readable synthesis of the best of the current research literature on an important question or topic. This simple definition of a review contains the three crucial elements we will explore in detail in this chapter:

1. the question or questions addressed in the review;
2. the methods to find and select the best of the research relevant to answer those questions;
3. the methods to compare and synthesise the disparate studies found.

Determining the important questions to answer usually requires some preliminary scoping of the literature, discussions with others in the field and time spent in reflection. Tempting though it is to move on to writing the review, time spent clarifying which are the important questions is always time well spent [2]. Some tricks to doing this are asking 'why' five times: ask why is the answer to the question important (and why is that answer important, etc.). You might also try drawing a causal schema – an arrow diagram of the chains of causation – showing what are the causes and consequences of the problem you are trying to address. Then do a quick search for studies addressing each causal link, which may result in a broadening or modification of the schema. A few iterations should lead to a sufficient and stable schema from which to focus the questions of the review.

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However, a review can never be 'complete' as questions are fractal: as we examine them there are further smaller questions that arise. For example, we can ask if cholesterol reduction reduces the risk of stroke, but then wonder about the many subgroups of patients, and many ways of lowering cholesterol, or the mechanism, or the duration of therapy needed, and so the list goes on. It is best to sketch out the broader scope, but then narrow down to the most crucial issues.

The content and format

Before we look at the writing process, it is worth understanding what a good review might look like. There are several varieties of review, each with a legitimate role, for example:

(i) The answer to a single focused question, such as 'do statins reduce the risk of stroke' or 'can raised b-natriuretic peptide accurately diagnose heart failure'?

(ii) An overview of several related single questions, such as 'which treatments can lower the risk of stroke' or 'what is the relative value of ECG, b-natriuretic peptide and chest X-ray in the diagnosis of heart failure'?

(iii) A topic review, such as the diagnostic processes for specific conditions (the *JAMA* series on the Rational Clinical Examination are good examples of these [3,4]).

Whichever the type, an important distinction is between a systematic and a non-systematic review. The difference between these is largely in the methods used to identify the literature. A non-systematic review will use the papers that you happen to have collected over the years or that colleagues have mentioned, whereas a systematic review begins with the questions and then systematically searches for the best research available to answer those questions.

Unfortunately such a systematic process is not the norm: a check of reviews in six general medical journals in 1998 found that less than a quarter described how evidence was identified, evaluated or integrated; a third addressed a focused clinical question, and only half provided an estimate of the magnitude of potential benefits [5].

Good review methods are important to give the reader an unbiased view of the state of current knowledge. Two problems occur in using research to answer specific questions: bias and underpowered studies. The first problem, bias, can arise from either our choice of which research to use, or within the research itself. So to minimise this, our review methods should attempt to identify and use the research with least bias. A problem with non-systematic reviews is the potential for considerable bias in answering questions: we may choose the studies with the results we like or happen to know about rather

Table 14.1 Structure for reporting a systematic review

Section	Contents
Introduction	Sets out the problem and the specific questions addressed in the review
Methods	Describes the search and appraisal processes Often describes the number of studies checked and found eligible
Results	Describes the quality and results of eligible studies
Discussion	Summarises findings and their limitations and the implications for practice and research

than the best quality research. The second problem, underpowered studies, occurs because much research is based on samples that are too small, so we are at risk of type II errors, that is, concluding that a treatment or factor has no effect when the sample was too small to reliably rule out an important effect. The statistical methods of meta-analysis aim to combine studies to provide greater statistical power to answer a specific question.

For a systematic review of a single question, the usual format is the same as for most research papers, that is, Introduction, Methods, Results, And Discussion (IMRAD – see Chapters 1–5). Table 14.1 shows the likely elements of these sections. Though the other types of review may not fit this simple IMRAD structure, it is still worth considering each of these in developing and writing the review, even if the final structure varies from this. However, a review needs to be easily readable, and you may need to deviate from the IMRAD structure for the sake of readability, but make sure these elements are still present.

The reviewing process

The steps and objectives in producing a good systematic review are listed in Table 14.2, but similar principles and processes apply to all types of reviews. This chapter will give a brief description of each, but there are also several good texts that provide more extensive descriptions of the processes involved [6–9].

Formulating questions

It can be helpful to break a research question down into components. For questions about treatment, the usual format is to identify the patient group, the intervention of interest, suitable comparison and appropriate outcome measures (PICO). For example, P – in patients with a history of stroke or transient ischaemic attacks, are I – statins effective compared with C – no

Table 14.2 Steps in a systematic review

Step	Processes
Formulate researchable questions	Set out the answerable 'PICO' question(s)
Find relevant primary studies	Databases and search terms
Appraise quality and extract data	Quality criteria used to select studies and data extraction template
Synthesise	Methods of interpreting and/or combining results
Interpretation	Set in context of the clinical or research problem, and previous reviews

cholesterol-lowering treatment for preventing O – the risk of ischaemic stroke, or P – in amyloid precursor protein (APP) transgenic (Tg) mice, do I – statins compared with C – no treatment reduce changes in O – the neurovascular unit?

While this seems a little artificial, it is a good discipline for clarifying the exact question addressed. The structure is less applicable to non-treatment questions, but can be adapted so that for diagnostic questions, the 'I' is an index test, and for prognosis, the 'I' is an indicator (or more traditionally an exposure, giving PECO).

Before proceeding to a full search of the question, you should first check if there has been a recent review. However, many systematic reviews are not tagged as such in Medline, so it is best to use a search 'filter' to find them. Several good options have been developed [10], and one with reasonable sensitivity and precision is

> Medline[tiab] OR (systematic[tiab] AND review[tiab]) OR
> meta-analysis[ptyp] OR CDSR [so].

(Note: In the MeSH – Medical Subject Headings – [tiab] means 'title or abstract', [ptyp] is 'publication type' and [so] is 'source' or journal.)

Finding the studies

A systematic review of a focused question should clearly set out the search methods used.

Ideally the description of search methods should be included in the final report and briefly state the databases searched and the terms used for searching. The databases used will depend on the topic. For most clinical topics Medline is clearly essential but others such as EMBASE or CINAHL might also be relevant.

To devise appropriate search terms, it is helpful to use the PICO elements of the question to guide the search. Usually the P and I are the key elements as we may be interested in several outcomes. So the general process is to think of synonyms (which we combine with OR) for the P and I elements and combine these (with AND). For each synonym consider both text words and MeSH terms.

To reduce the searching workload, a useful technique is a 'methodological filter' that aims to find the best study type for each research question. A good example of this can be found on the PubMed interface to Medline: the Clinical Queries tool. This provides empirically derived filters for five types of questions: aetiology, diagnosis, therapy, prognosis and clinical prediction guides. If you are interested in the detailed terms used and their justification, see the Filter Table linked on the Clinical Queries page.

To help find studies you might have missed, supplement the above search with a check of the references of the includable articles (which you will screen in with the next step), and also a forward citation search. The forward citation search will find articles beyond the databases you might have searched in, and can be using Web of Science, Scopus or Google Scholar.

Assessing study quality

A crucial element of the review process is sifting the good from the poor research, and basing conclusions, where possible, on the better research. To do that requires knowing what is the best possible evidence for each type of question. The first element of quality is the overall study design: was it a trial or a cohort study or a collection of cases?

Table 14.3 shows a hierarchy of evidence for different types of research questions. But this hierarchy is just a first cut – a useful time saver so that if you find good quality high-level studies, you may not need to read all the other papers [11].

Using Table 14.3 as a guide can save considerable time by reducing the number of articles you need to carefully examine. But be aware that there are times when a single case report can be convincing evidence of a treatment effect [12].

Synthesise

It is rare for all studies to reach the same conclusion, so a means of resolution is needed. However, a simple majority vote is dangerous. It will give as much weight to a large well-performed study as a small weaker study. For example, in the first systematic review of streptokinase for treating myocardial infarction, only 5 of the 24 individual trials were 'statistically significant', but this was because almost all the trials were small and underpowered to detect

Table 14.3 Designation of levels of evidence according to type of research question

Level	Intervention	Diagnosis	Prognosis	Aetiology
I	Systematic review of level II studies	Systematic review of level II studies	Systematic review of level II studies	Systematic review of level II studies
II	Randomised controlled trial	Cross-sectional study among consecutive presenting patients	Inception cohort study	Prospective cohort study
III	One of the following: non-randomised experimental study (e.g. controlled pre- and post-test intervention study), comparative (observational) study with a concurrent control group (e.g. cohort study, case-control study)	One of the following: cross-sectional study among non-consecutive patients, diagnostic case-control study	One of the untreated control patients in a randomised controlled trial, retrospectively assembled cohort study	One of the following: retrospective cohort study case-control study (*Note*: These are the most common study types for aetiology, but see level III for intervention studies for other options.)
IV	Case series	Case series	Case series, or a cohort study of patients at different stages of disease	A cross-sectional study

the benefit [13]. So ideally, you should undertake a meta-analysis to resolve apparent differences. But a minimal alternative would be to focus initially on the largest high-quality study first and then contrast other studies with this main study.

However, even the largest study is sometimes insufficient. For example, in a systematic review of self-monitoring of anticoagulation [14], no single study showed a significant mortality benefit, but when combined the results were significant. Figure 14.1 shows the typical 'forest plot' of a meta-analysis,

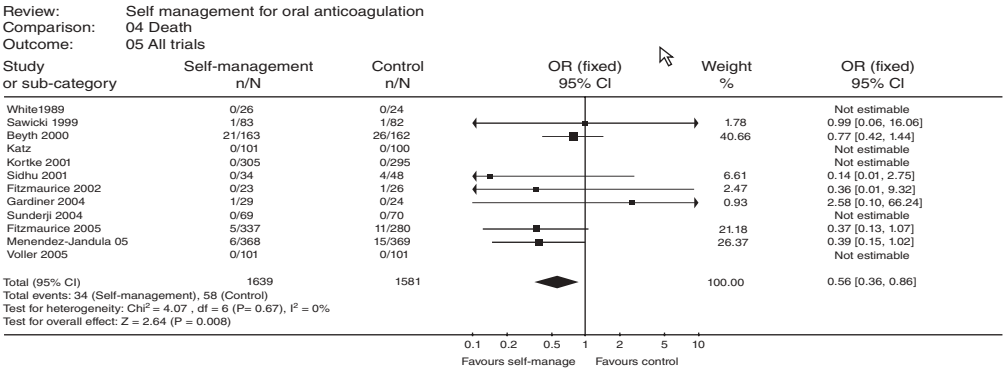

Figure 14.1 Meta-analytic 'forest plot' of the effects seen in trials of self-monitoring of international normalised ratio (INR). (Reprinted from the *Lancet* [14] Heneghan C, Alonso-Coello P, Garcia-Alamino J, Perera R, Meats E, Glasziou P. Self-monitoring of oral anticoagulation: a systematic review and meta-analysis. 2006;**367**:404–11. Copyright © (2006), with permission from Elsevier. Updated by Rafael Perera.)

where we can see the confidence intervals of the individual trials cross the centre line (and hence are not statistically significant) but that the 'diamond' giving the pooled results doesn't include the odds ratio of 1, and hence is significant. Even if results are not pooled, such a graphical illustration of individual trial results is very helpful to readers.

Of course, numerical meta-analysis can only be undertaken for quantitative data, but it is also possible to be systematic in combining qualitative data [15]. The main principle is to avoid basing conclusions on your prior preferences, but instead to base statements on the best quality evidence.

Conclusions

In conclusion, the review process might be summarised as follows: empty your mind of fixed opinions, take a methodical and critical approach to research literature, then describe what you found in an engaging manner.

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Chapter 15 **How to write a book review**

Mark W. Davies and Luke A. Jardine
Department of Neonatalogy, Royal Brisbane & Women's Hospital, Queensland, Australia

Introduction

Medical journals are frequently sent textbooks for review and most journals have a book review section. Book reviews are often used as 'fillers' in medical journals. Textbook publishers hope that a review of a book in a medical journal will bring the textbook to the notice of journal readers, and a positive review will help increase sales.

Purpose

The purpose of a book review is to introduce a recently published book (or new edition) to potential readers. The review should describe the book's contents and convey the reviewer's opinion of it; especially, its quality and usefulness to a variety of readers. One of the reviewer's goals is to inform the reader about the book so they can make a decision as to whether it is worth buying or not; either for themselves, their work place or perhaps to recommend to colleagues, students or their local library. Book reviews may also be useful to textbook editors and authors when preparing future editions.

Process

Textbook publishers send books to journals, and journals will have a process of inviting reviewers to review the books. Potential reviewers are usually chosen from a journal's editorial board or peer-reviewer database. Ideally the chosen reviewer is someone who is a member of the intended target audience of the book. Specialty textbooks should be reviewed by specialists

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in the field. If you are asked to review a textbook you should ensure that the book is in your area of expertise or practice. Occasionally, however, it may be reasonable for you to take a wider view, especially if a specialist book is intended for a more general readership. If the book is outside your area of expertise or scope, then you should decline the invitation. If there is any potential or real conflict of interest, you should notify the journal.

Once you have accepted the invitation to do the review, it is a simple matter of reading the book and then writing your review.

Read the book

Read the introduction and preface; this will often indicate the book's purpose and intended target audience. Look at the contents and index to get an idea of the book's scope and coverage. Check whether the chapter titles cover the intended contents or not. Keep in mind the readers of the journal you are doing the book review for. Is the book relevant to that audience?

Who are the authors? What apparent expertise do they bring to the party and do they appear to be appropriate? What perspective do they appear to be writing from?

Do you have to read the whole book? In this day and age it is probably unreasonable to expect an unpaid reviewer to read a large textbook in its entirety. You should probably read all or most of a book of less than a few hundred pages. For large textbooks and reference works select a few chapters and read each thoroughly. Focus on chapters that are in your area of expertise or far from your area of expertise; look at topics that you know are usually done poorly.

Read with a pencil handy and make notes as you read either in the contents page or in a separate notebook.

Check the references for the chapters. How old are the references cited? Have the authors missed any relevant articles that you are aware of?

Write the review

Most journals will give you a word limit; if not, less than 1,000 words is a laudable aim. Unless specified there is no strict format or style. Have a look at other reviews written for the journal; they may be a useful guide. A timely review helps prospective buyers make timely decisions. Aim to have the review done within four to six weeks.

Know your audience. Write well. Use plain language. The review should not be a showcase of your writing prowess but a guide to whether the book is useful or not.

Journal readers have limited time. Your review should only be as long as it needs to be and no longer. Don't pad it out gratuitously.

Describe the contents and the scope of the book and the authors' purpose (stated or implied). Use specific examples to highlight points.

Describe any major criticism, especially if any important content has been left out or if there are significant inaccuracies. Major errors need to be identified. Overlook a few minor errors or typographical errors if the rest of the book is good.

Give your overall opinion of the book. Is it understandable or hard to read? Is it comprehensive or patchy? Interesting or dull? Should it be read from cover to cover or dipped into? Or should it just be on your bookshelf for reference? Is it worth having? What did you like about the book? What are its best features? What aspects troubled you about the book? Would you recommend the book? How does it stack up against its competition?

The main contents of a review are listed in Table 15.1. This is a guide only, and there is no need to detail everything for every review.

Table 15.1 The elements of a book review

- Description of the book
  - is it a handbook/workbook/textbook/reference book?
  - hardback/paperback – can be read in bed?
- Stated intended audience and whether this matches with reviewers' impressions – who do you think the book would suit?
- At what level is it pitched – student/beginner to postgraduate to expert
- Price – and suitability for targeted audience, is it value for money?
- No. of pages, sections, chapters
- Scheme/layout of sections/chapters – logical, systematic (avoid just listing contents)
- Readability – does it flow in a logical manner?
- What it covers and what it doesn't – strengths and weaknesses. Brief examples. Anything missing?
- Navigation – contents and index
- Pictures any good? Brief examples.
- Usability – size (pocket size?), able to be carried around, too big, too heavy, too fragile
- Is it current?
- References appropriate?
- Is it unique or one of a crowd? Does it compare favourably to others of its ilk?
- Font and font size OK?
- Paper
- Any changes since last edition
- How is controversial material handled?
- Overuse of non-standard abbreviations or jargon?

Why review books?

Writing book reviews can help you develop critical appraisal and writing skills. You also get to read books you may not normally read in detail. A book review is also another publication for your curriculum vitae and you usually get to keep the copy of the book you have reviewed.

Further reading

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Chapter 16 **The role of the manuscript assessor**

Domhnall MacAuley
BMJ, London, UK

Introduction

Reviewing a paper. How can you help the editor, help the author and get the most out of the experience? This chapter will look at the process of assessment so that your review will be of most value to an editor when he or she makes a decision about acceptance, rejection or revision. If the decision is to reject, it will also help the author improve his or her manuscript for resubmission or future submission to another journal. But, it is not just that simple. The entire concept of peer review is changing rapidly with variations in the process to include rapid reviews, open publication of the peer review opinions and different timings in the peer review process.

Every manuscript is important. For the author, it is the final stage in the long and increasingly complex process of undertaking a research project. It is not just the communication of findings but also important in the context of individual career enhancement and institutional esteem. After endless hours of work – drafting and redrafting, negotiating with co-authors, checking tables and graphs, collating signatures and massaging egos – the paper is finally completed and dispatched. To help make a decision, the editor contacts you asking if you would be willing to give an opinion.

Remember, you were once that author. If you have been asked to review a paper, you have, almost certainly, achieved some success in your own research career and published a number of papers. You will remember how you sent off your very first paper – nervous, anxious and excited – and awaited the editor's response and reviewer's opinion. You read every detail of that review, studying the nuance of every word, analysing and reanalysing their meaning. You grumbled if the reviewer did not appear to understand

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your work, were thrilled at words of encouragement, were irritated if they did not seem up to date with the latest literature and argued with their interpretation of the findings. So, be kind. It is a privilege to be asked to give an opinion on someone else's work, but with this invitation is a responsibility to do it well. While the author may be a senior and experienced academic, it may equally have been submitted by an inexperienced author setting out on his or her career. This may be his or her first tentative step into the world of academia. Be helpful. Be the reviewer that you would have liked to review your first paper. Don't try to show how good you are. Be thorough and detailed. Above all, be fair and honest.

The role of a reviewer gives little monetary reward. Academic publishing is based on the generosity and altruism of researchers and requires a lot of work with little return. Most journals do not pay for reviews, and only recently has reviewing been recognised by universities as a measure of academic esteem. Some, including the *BMJ*, give you access to the electronic journal as a token recompense. Good reviewing requires idealism and is a thankless task that takes commitment and effort to do well [1]. The primary reward is in the contribution you make to the research community. It takes time, and reviewers, on average, spend two to four hours and review for 3.6 journals [2]. When reviewers decline, it is usually because of lack of time, or that the paper is not relevant to their area of interest or expertise [3].

Specialist versus generalist journals

Specialist and general journals may have different needs and expectations. In a specialist journal, the editor usually asks two or more reviewers to assess a paper. The editor's knowledge is unlikely to span the entire breadth of the journal's range, so they need an expert opinion. The final decision on how to deal with the paper will be made by the editor alone, but having two or more opinions gives editors more confidence in their decision.

In large general journals, although an editor may not be expert in a particular field, there is likely to be a larger editorial faculty, with the paper passing through more than one editorial committee and seen by a number of assessors before subsequent acceptance or rejection. The reviewer's opinion carries considerable weight in the final decision, but this opinion is only one part of the decision process and may be interpreted differently in different journals. Sometimes, although it is unusual, an editor may accept a paper of which the reviewer is unsupportive or reject a paper that the reviewer thinks should be published. In general, however, the reviewer has considerable influence on the editorial decision.

The process

Electronic publishing has revolutionised paper handling, and an invitation to review often comes by email. The abstract may be included in the invitation email but, more often, you retrieve the abstract using a web site or portal. You can then decide if you know enough about the topic to undertake the review – or have the time. This decision – to review or not – can be difficult. If you are not an expert in the field or know that you cannot complete the review in time, do let the editor know by return. If you have any doubts about your time availability, it is usually best to respond immediately and decline – few people find their days become less cluttered.

If you can review, however, please do. You will be asked to give your opinion by a particular date, usually three to four weeks from receipt, but sometimes more rapidly if the journal has a 'fast track' facility. When you reply you will receive an electronic response, often instantaneous, thanking you and giving you access to the full paper. You may need Adobe Acrobat to read the paper; if you do not have the appropriate software, the journal will usually give you guidance on how to download it. You may also have access to an electronic response form to submit your review. Alternatively, you may write your review on a word processor and attach or upload the file.

If you cannot complete the review in the time indicated, do let the editorial assistant and editor know as soon as possible. It is much better for an editor to know that a reviewer cannot help rather than be left waiting. Yes, we have all been guilty – a paper for review sitting at the bottom of a pile of work, or in the electronic queue, never quite making it to the top. Do try to complete your review on time; otherwise, the editorial assistant or computer will have to chase you. Sometimes it seems that the only way to get reviewers to produce on time is to remind them [4]. Computers are very good at this – reliable and relentless, if a little irritating.

You will, occasionally, be asked to review a paper where you know little about the topic. Major journals have large electronic databases that can be searched with keywords identified from the information that you, as a previous author or potential reviewer, have submitted yourself. Alternatively, the editor may have found your name on a database or identified you as an author on a paper on this or a related topic. Electronic journal databases may provide the email address of the corresponding author on a paper, and editors sometimes use this to seek reviewers. This may not always be the best method to identify potential reviewers. Young ambitious academics tend to move jobs and universities fairly regularly, and the email address may be obsolete. Interests change, so a paper published three years ago may reflect work carried out some years before and that the authors' interests evolved

so they are no longer interested in the topic or familiar with the contemporary literature. Indeed, the corresponding author may not always be the overall expert behind the work. Mistakes happen, so be patient with editors, and do let us know as soon as possible if we have made an error!

Finding a reviewer with relevant expertise is not always easy, and an editor may have difficulty identifying a reviewer in a particular specialist field. You may have been asked because you have a related, although indirect interest. If, in these circumstances, you can write a review, please do. It might be a bit more difficult because you might have to read around the topic, but do give it some thought. Some papers appear jinxed, in that every potential reviewer approached declines. In this case, the editor has a list of refusals and an increasingly anxious author who has waited a long time for an opinion. Be sympathetic to the editor.

Journals often invite authors to suggest potential reviewers. This may seem open to potential problems. But, it appears to be less flawed than one might anticipate. There is evidence that author- and editor-suggested reviewers do not differ in the actual quality of their reviews. But, author-suggested reviewers tend to be more favourable in their recommendations for acceptance. Editors can be confident in the assessment of the paper, but would be best advised to make their own judgement on acceptance [5].

And, please forgive the poor editor who forgot to scan the author list and mistakenly invites you to review a paper you have submitted yourself. In searching topic codes, it is easy to identify the perfect reviewer, someone who has written extensively on the subject and who would clearly be the ideal assessor. It happens.

The best and the worst reviews

The perfect review does not exist. Neither of course, does the perfect manuscript. But, the best review is one that informs both the editor and the author of the limitations and possible improvements to a piece of work.

The editor, primarily, needs to know if it is suitable for publication and how it can be improved. If the work has fatal flaws, usually in relation to the method, this makes the decision to reject much easier. If the paper could be acceptable with modification, the editor needs to know if this is possible. Minor problems can be corrected easily.

The best reviewer reads around the topic. With such easy access to electronic databases at hospitals, at universities and on home computers, an editor expects the assessor to do a brief search of the literature to be able to comment on the originality of the work. This occasionally produces

surprises, and the reviewer may identify misdemeanours or misconduct such as duplicate publication or plagiarism.

No strict guidelines exist on the structure of a review, but there is a general consensus that a review should be in three parts. The first part is usually a general comment on the paper – its originality, importance and validity. The second part deals with major problems, and the third part lists minor problems. This structure can be used in any review and is a delight to the editor and author.

A helpful review begins with a short summary that places the paper in context and essentially answers the twin questions: is it new and is it true? This means giving an opinion on the originality of a piece of work, if the findings have been reported previously and how much this particular manuscript adds to the current literature. The reviewers should indicate if, in the context of their specialist knowledge, the subject matter or research question is of sufficient importance and novelty that it merits publication. Asking if it is true is really a question about the method. It means deciding if the method used in the research is sound. This requires some knowledge of basic epidemiological principles but doesn't usually require statistical expertise. Most journals seek a statistician's further opinion. The assessor should also know enough about the journal to know whether the style and content fit within the remit or range of interest of the journal.

Example

Summary

This is an interesting and well-written paper on peer review. The authors have identified an important research question and have addressed it in an organised and well-structured manuscript. It is a useful and original contribution to the literature because it demonstrates that peer review does help improve the quality of a paper, and there is very little high-quality research on this topic. The paper is well written and fits with the style of the *Journal of Medical Writing*. I have some major concerns about the sampling method and some minor concerns about the accuracy of writing.

The second section of the review may identify major criticisms of the paper. It will address the relevance and appropriateness of the introduction, problems identified in the methods, the accuracy of the results, the interpretation of these results in the discussion and the objectivity and validity of the conclusion. Each problem should be referenced to the text of the paper by using the page number, paragraph number and line number if possible. Direct quotations included in the review should be in parentheses. This allows both

the editor and the author to look to the text and locate the problem immediately. Major criticisms should be highlighted as fatal flaws that would prevent the publication of the paper.

Example

Major Criticisms

Page 2, paragraph 2, line 3. The authors describe their sampling method. Allocation by day of arrival of a manuscript is not an acceptable method of randomisation in a randomised controlled trial.

Page 2, paragraph 2, line 7. The authors do not identify the inclusion and exclusion criteria.

The third section lists minor criticisms, and it may include advice on possible improvements to the introduction, suggestions for additional references and comments on the context of the paper and errors in spelling and grammar.

Example

Minor Criticisms

Page 1, paragraph 3, line 2. The introduction covers the literature appropriately, although the authors may like to look at two other papers on randomised controlled trials (Godlee *et al*. and van Royen *et al*.).

Page 1, paragraph 3, line 4. Misspelling of the word trial – spelt 'trail'.

Case reports are treated differently. Some journals publish case reports regularly and others only in special circumstances. The decision to publish a case report usually pivots on its originality. The authors may believe that theirs is an original observation, but reviewers should check the literature. Similar cases may have been reported in a different field, language or country and have not been reported previously in this specialty or geographical location. Different editors use different criteria, and the role of the reviewer is to provide enough information to allow the editor to make a decision. There are now a number of different electronic journals that publish only case reports.

Improving the quality

The peer review process has evolved as a method of objective selection on scientific merit. It is, however, at best, an inexact science, and there is poor

evidence that peer review gives a better decision in the end. Indeed, a recent systematic review from the international Cochrane Collaboration (http://www.nelh.nhs.uk) concluded that little hard evidence showed that peer review improved the quality of published biomedical research [6]. It is also difficult to measure the quality of peer review, with little agreement on measures of quality [7]. The journal *Nature* hosted a very useful series of articles looking at various aspects of the peer review debate, and this is a useful resource for further reading (http://www.nature.com/nature/peerreview/debate/index.html).

Different journals have different models. In the traditional model of peer review, reviewers knew the identity of authors, but authors did not know the identity of the reviewers. Some journals try to blind both authors and reviewers, but this is difficult as there are so many hints to the origin of a paper from the patients, database and location or type of research. Many journals now use a completely open peer review system so that the identity of authors and reviewers are known to each other.

There are some randomised controlled trials on blinding or open peer review [8,9]. Fiona Godlee, editor of the *BMJ* and one of the key researchers in the field, puts the case that open review is superior ethically to anonymous reviews and that open review increases the accountability of the reviewers, with less scope for biased or unjustified judgements or misappropriation of data under the cloak of anonymity. With blinded review, complete blinding is difficult and 23–42% of reviewers not told the identity of authors were able to identify them [10]. Papers nearly always include some reference to the location or special nature of the population being examined. Most researchers know the other researchers in their specialist field and can often identify their work.

In the interests of honesty and transparency, journals may opt for open peer review. Some argue that reviewers will be less likely to give an incisive and critical review, but this system also protects an author from the anonymous unscrupulous reviewer. Open peer review is likely to become more common in response to increasing pressure to open up the entire peer review process.

A recent RCT of telling reviewers that their signed reviews might be posted in the public domain on the *BMJ*'s web site had no important effect on review quality, although there were more refusals and more time was taken to write a review. The authors concluded that the ethical arguments in favour of open peer review more than outweighed these disadvantages [11].

Open review does have possible disadvantages. It may increase the number of reviewers who decline to review, the likelihood that reviewers will recommend acceptance and the time taken to produce a report. It is also possible

that junior reviewers would be less likely to give an honest criticism of work by senior colleagues. Threats – overt or covert – and bullying by more senior academics are possible. In order to protect reviewers, when the *BMJ* introduced its open peer review [12], it also introduced a system of anonymous notification of intimidation of reviewers. They termed this the yellow card system, because of its similarity to the drug adverse reaction notification system in the United Kingdom. The *BMJ* has received only a few yellow cards since introducing open review. With open review, the authors may occasionally try to take their complaint directly to the reviewer, rather than going through the editorial process. This, of course, is inappropriate. In such cases, the reviewer should not respond but should contact the editor directly. This allows both parties to take a step back from any confrontation and passes responsibility to the editor to settle any differences.

Bias – conscious or subconscious – is always a possibility. A reviewer may be tempted to favour a former collaborator's work or be more critical of the work of a competitor. But, when an author reads a review and feels his or her paper has been dealt with harshly, it may not be bias but simply that the reviewer, because of his or her specialist knowledge, knows more of the potential pitfalls and mistakes involved in research in that particular area.

Editors are very interested in exploring methods to improve the quality of peer review. Training peer reviewers through workshops, training programmes or direct feedback may all have something to offer. Direct feedback, however, appears to be ineffective and indeed, may have a negative effect [13]. When we look at the outcomes of training initiatives, the results may not be what we might have expected. Training packages have only a minor impact on the quality of reviews of manuscripts. When comparing self-taught training with face-to-face training, the self-taught package appeared, statistically, to be slightly more effective but was not considered editorially significant and the effects were short lasting [14].

If you would like to find out more about improving the quality of your peer review, you may like to look at guidance on the web site of the World Association of Medical Editors (http://www.wame.org/syllabus.htm #reviewers and http://www.wame.org/wamestmt.htm). You might be interested in attending a training programme in peer review [15]. Or, if you are interested in what is happening in research into peer review, you may wish to search at http://bmjresearch.com/.

Dealing with an appeal

There is an increasing tendency for authors to appeal an editor's decision. This creates a dilemma. Everyone makes mistakes, and editors, perhaps more

than most, are aware of the weaknesses of the peer review process and acutely aware that the system can fail. If there is an appeal, and an editor has any concern that a paper may have been rejected unfairly, he or she will usually re-examine the decision. That process may include asking for a further review. In such cases, the editor will usually send all correspondence, together with the previous review(s), to the new assessor and will ask for a further opinion. The assessor should go through exactly the same process of assessing the paper on its merits. The final decision will be with the editor, but as the reviewer, you are the consultant advisor, whose advice helps that decision.

Referee, reviewer or assessor

The deliberate use of the term assessor or reviewer in this chapter is an attempt to move away from the term referee. Sometimes assessors find the task difficult and are uncomfortable making decisions about the work of their peers. It helps to remember, however, that the final decision is with the editor, and it is his or her responsibility. The use of the term referee can be misleading as it implies you are the final arbiter, which is not the case as it is the editor who must make the final decision. Your role, as reviewer, is to give an honest assessment of the value of a piece of work in the context of your knowledge, experience and your brief review of the relevant literature.

Improving the quality of the review

Research suggests that the best peer reviewers are aged under 40 years old, trained in epidemiology or statistics, and live in North America [16]. The quality of a review depends greatly on how much time and effort the reviewer is prepared to invest.

Do authors care? It is difficult to know, but one study of 897 corresponding authors of the *Annals of Emergency Medicine*, with a 64% response rate, showed modest satisfaction with peer review [17]. Those authors whose papers were accepted were most satisfied with peer review, and authors of rejected manuscripts were dissatisfied both with the time taken to decision and the communication from the editor. Authors were happy if their paper was accepted irrespective of review quality.

Conflict of interest

Reviewers do have an ethical responsibility. Assessors are chosen because of their interest in the particular field, so you may find yourself appraising the work of your former colleagues or your competitors. If this creates a conflict

of interest, do let the editor know. The peer review process is based entirely on trust. It depends on your integrity and, just as you would expect an honest and true assessment of your work, so do your colleagues – even if they are your competitors. Authors sometimes submit their manuscripts with a request that the editor not use certain reviewers, whom they feel may not give a fair assessment. Although we expect assessors to have the utmost integrity, most editors would consider such a request to be reasonable.

You also have a responsibility to maintain the integrity of the peer review system itself and, if you think an author could possibly have any concern about your independence, do contact the editor. Editors are especially keen that authors disclose any potential conflicts of interest such as involvement with the pharmaceutical industry. Similarly, reviewers should declare any potential or perceived conflict that may include collaboration or competition for grants, involvement with pharmaceutical companies or other bodies that may benefit or be harmed by a decision on publication. Disclosure is the best protection against an accusation of conflict of interest. Sometimes, however, you may be the person best qualified to review a paper. If you inform the editor and try to give an honest appraisal of the paper, you have done everything that you can do. The editor may disclose to the author, if appropriate, that you highlighted a potential conflict of interest.

You also have a responsibility for intellectual integrity; you must not use other people's ideas. It does happen – and can happen even subconsciously – so it is important to be on your guard.

The web site of the World Association of Medical Editors (http://www.wame.org) is a very useful resource and provides extensive guidance on conflict of interest on its topic list. It also includes a discussion on a case submitted anonymously by an editor and discussed at the Fourth International Congress on Peer Review in Barcelona in September 2001. The case, relating to a reviewer's financial interest, was presented to the audience by Michael Callaham of the WAME Ethics Committee and was discussed by an expert panel, consisting of Richard Smith (*BMJ*), Richard Horton (*Lancet*) and Frank Davidoff (*Annals of Internal Medicine*).

Research misconduct

You may, at times, as an assessor, have doubts about a paper. It may be that you doubt the figures, the tables, the complete reporting of results, manipulation of sampling and so on. If you suspect research misconduct, it is important that you bring your doubts to the attention of the editor. You could be wrong, however, so this must be done in a sensitive manner. Do not contact the authors directly.

The editor has a number of options in such cases, but the most likely is that he or she will ask the author to supply the protocol, original data, information on sampling arrangements, a copy of the ethical approval and so on. This may uncover a mistake, a misreport, an error of judgement or a deliberate attempt to mislead. As a reviewer, it is important not to make a judgement or accusation without serious consideration and a degree of certainty. If there is a problem or doubt, the editor may ask the Committee on Publication Ethics (COPE) to consider the case [18]. The COPE web site is an excellent resource with a superb library of relevant cases (http://publicationethics.org/).

If you are concerned about duplicate or 'salami' publication, it is helpful if you send copies of other relevant papers so the editor can identify the degree of overlap. Academic departments are under huge pressure to publish as many papers as possible, and there is the temptation to try to split a piece of work into multiple manuscripts in order to maximise the number of publications from research and increase the number of papers on a curriculum vitae. In the current academic climate, such salami publishing is understandable but inappropriate. It clutters up the literature and makes it difficult to identify the true message in any piece of work. Recent changes to the RAE, now known as the Research Excellence Framework (REF) in the United Kingdom, may help.

New concepts in peer review

Peer review has traditionally meant pre-publication peer review. Changes from paper to electronic platforms allow a much more flexible approach to publication. Many journals now post articles as advance publications on their web site in advance of the paper journal. Readers can respond electronically with their critique and interpretation almost immediately. This is a form of post-publication peer review. And, because the research and comments are posted in advance, it is sometimes possible to publish them together in the same issue of the paper journal.

Electronic platforms also allow journals to alter the method, timing and sequence of peer review. Some electronic journals, mostly open access journals, have opted for light touch peer review. Their peer review system is focused on ensuring the method is sufficiently robust to answer the research question (http://www.plosone.org/static/review.action).

When the paper is published it may then be judged on its merits by the academic community. In some cases, the journal will publish the peer review comments online together with the journal article. With BioMed Central, for example, the pre-publication history of each paper (submitted versions, reviewers' reports, authors' responses) is posted on the Web with the

published article (http://www.biomedcentral.com/info/about/peerreview/). *BMJ Open* has been listing pre-publication histories since its launch. A molecular biology journal, *EMBO* publishes a peer review process file alongside each article. This includes the timeline and all the relevant correspondence such as referee reports from each round of review, author responses, editorial decision letters and additional correspondence. While their reviewers remain anonymous, they actively encourage comments on each other's reports (http://www.nature.com/emboj/index.html).

Some scientific journals use a different model (http://publications.copernicus.org/services/public_peer_review.html) where the initial submission is reviewed by peer reviewers, and a draft submission is posted electronically for critique by the academic community. After a defined period of consultation, the modified draft paper is formally accepted for publication.

With the increase in the numbers of academic journals, it can be increasingly difficult to recruit reviewers. One option is that chosen by the Neurocience Peer Review Consortium (http://nprc.incf.org/reviewers) where articles are reviewed once, but if the article is sent to another journal within the group, the reviews may follow.

Some journals pre-screen articles before sending for peer review. The *BMJ*, for example, has adopted a variation on standard peer review (http://resources.bmj.com/bmj/authors/peer-review-process). All articles are seen by two editors before a decision to send to peer review, and approximately 70% are rejected without review. This reduces the overall peer review workload and facilitates a more rapid initial decision.

Some journals, like the *BMJ*, give very specific advice to peer reviewers and provide access to other resources (http://resources.bmj.com/bmj/reviewers/peer-reviewers-guidance). When asked to review, there will usually be a link to the journal guidance.

Journals may also ask authors to supply copies of various checklists (CONSORT, PRISMA, MOOSE, etc.), which are very useful in helping reviewers. Others request copies of the original protocol so that reviewers can check if the study conforms to the original protocol, that the authors report the primary and secondary outcomes appropriately and retain the sample size calculation. These checklists, together with other useful materials, are available on the EQUATOR web site (http://www.equator-network.org/resource-centre/editors-and-peer-reviewers/editors-and-peer-reviewers/).

Conclusion

It is an honour and a privilege to be asked to give a pre-publication opinion on a colleague's work. The academic world depends on the altruism of researchers to ensure the continued existence of peer review. There is also a

responsibility to do it well, however. Try to invest the time and effort into providing the type of review that you would like from an assessor if they had been asked to review your work.

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Chapter 17 **The role of the editor**

Jennifer M. Hunter
University of Liverpool, Liverpool, UK

Editors are simple souls: they have to be to survive the heavy workload of a never-ending round of new manuscripts, revised manuscripts, letters to the editor, ethical issues and complaints, to name but a few. But they must also be well-organised individuals, with significant administrative skills, a degree of impetuosity and a huge work ethic. They must try to maintain, at all times, clarity of thought and a clear vision. They also very much need a sense of humour.

Authors must appreciate that, whatever they submit to the editor-in-chief (EIC) of a scientific journal, however long or short, it is just a small moment in that editor's life. More importantly, that editor is so busy that he or she wants every new arrival in his or her mailbox (electronic or hard copy) to be problem free. Thus he or she approves Guidelines to Authors to be published in each issue of the journal, for authors to follow meticulously, paying significant attention to detail.

The EIC is the pivotal link between the author and the expert assessor: they will at all times attempt to ensure that fair play is maintained, and that the author's voice is heard. To encourage such behaviour, authors should in every way possible provide the EIC with exactly what is required of them. (Always try to humour an editor – it pays dividends in profusion.) It is wise to ask a senior colleague with significant publishing experience to read over a manuscript before it is submitted to an editor. None of us, however experienced, fails to benefit from this approach.

In this short chapter, I will cover the commonplace aspects of an editor's role: to them alone will the real anguish, frustrations and anxieties of the job be known [1].

How to Write a Paper, Fifth Edition. Edited by George M. Hall.

New manuscripts

Every morning begins in an active editorial office by considering newly submitted manuscripts. With the aid of expert secretarial support, each new manuscript must be checked in detail. Has it been submitted correctly? Are the subsections correctly named (Summary, Introduction, Methods, Results, Discussion, etc.)? Are the tables and figures legible, and presented if necessary in the correct electronic format? Are the figures and tables actually mentioned in the text (a common omission), and are they labelled correctly? Often the number of tables and figures provided by an author does not correspond to the number mentioned in the text. Is the word count within the maximum permitted by the journal, and are the Declarations of Interest and completed Copyright forms provided? Have all the authors signed the Conflict of Interest form and submission letter, if appropriate? Indeed, do all the authors know that they have contributed to this paper?

On receipt of a new manuscript that meets all the necessary submission criteria, EICs will allocate the manuscript to one of their editorial team who has some knowledge of the subject under discussion. Alternatively, they will take responsibility for the manuscript themselves. The responsible editor will invite at least two and probably three expert assessors to comment on it. (Even numbers of assessors produce the problem for editors of split decisions; if an odd number of assessors is used, then a majority recommendation is likely.)

Immediate rejection

Occasionally, it is immediately obvious to an EIC that the manuscript has been submitted inappropriately: the topic would be more suitably considered by another speciality journal, or the standard of the science or the use of English is well below the minimum required by that journal. Not more than 5% of new manuscripts fall into this category. In such an instance, the EIC will not hesitate to take an immediate decision, which is usually 'Reject'. However, a thoughtful editor will often accompany this decision by detailed advice to the author on how the manuscript could be improved significantly.

Revised manuscripts

As the number of revisions of a manuscript increases so does the detailed contribution of the editor to it. Once you have been asked by an editor to submit a revision of your manuscript, always take on the task eagerly and

Box 17.1 How to please an editor

- Adhere strictly to the Guidelines for Authors throughout the text.
- Do exactly what the Guidelines dictate: no more, no less. Make the editor's life easier.
- Avoid basic errors such as incorrect numbering of figures or tables, forgetting to attach figures and using the wrong reference format.
- If invited to submit a revision, attend to every detail raised by the editor and assessors in a structured, unemotional manner.
- Contact the editorial office if you are concerned that your manuscript is not being dealt with efficiently.
- Communicate courteously and correctly with the editorial office, arguing your case coherently and professionally.
- Never submit a manuscript to more than one journal simultaneously: editors find out, and they loathe the practice.
- Make sure that all the authors have read and contributed to the manuscript. Would they be willing to stand up in public to defend their work?

with delight – your foot is through the door! Do not be discouraged if the demands seem extensive and excessive; consider each of them in detail, and act on at least some of them. Ultimately, you will reply to the editor, detailing systematically how you have responded to each of the assessors' comments. The editor will not expect you to do exactly what each assessor suggests – not every comment or criticism can possibly be completely apt – but you must be prepared to argue your point in each instance. At this stage, the editor acts as a 'go between': he or she will hear the author's voice as much as the assessor's. At all times, try to be courteous in your response, whatever the frustrations you experience. By approaching this exercise in a balanced, professional manner, you will make greater progress (Box 17.1).

Never submit a manuscript labelled 'revised version' when it is almost unchanged from the first draft. Few things irritate an editor more than an author asking for a revised version to be considered when it is in essence the same as the first version. It does happen. How could an author possibly think that an editor would be so foolish as not to notice?

Problem manuscripts

Some authors respond rapidly to the request for a revision of a manuscript; others do not reply for many months. It is the EIC's role to check when

replies from assessors or authors are not received. Have they gone missing in the post or on the web site? Has the author or assessor changed his or her address or email address (a common problem with trainee doctors in particular)? Always help an editorial office to keep fully up to date with all your contact details. Every EIC has, among the hundreds of manuscripts received each year, a very few that are almost 'jinxed': where, for instance, all the assessors take a very long time to reply, and then provide an inane or inadequate critique. It is the editor's responsibility to provide the authors in every instance with a critical appraisal of their paper: one which will help to improve the quality of the manuscript, or possibly the research in question. An editor may therefore have on occasion to ask for a rapid yet thorough appraisal of a manuscript, for which he has not yet obtained a satisfactory report. This is one example of the role of an editorial board to a scientific editor: it should be possible for an editor to ask a board member to produce such a report proficiently in these circumstances.

Thus members of an editorial office will, with the help of modern electronic manuscript tracking systems, be able very regularly to check that every manuscript under active review by their journal is being handled expeditiously. They must set time aside at least once a month to check that no manuscript has been delayed unacceptably when undergoing peer review. An EIC owes that to an author, if nothing else. Authors should, however, never hesitate to contact an editorial office if they have had no contact about their manuscript for several weeks (Box 17.1). Errors do happen even in the most efficiently run editorial office.

Rejected manuscripts

Most speciality journals have a rejection rate of over 60%. Thus a significant number of manuscripts will be rejected, not because they make no scientific contribution, but because they are not in the top 40% of submissions scientifically. Rejection is a disappointment to any author: editors know that for they have usually experienced it themselves. Authors are often angry and frustrated when their manuscript is rejected and retort vociferously to the editor. The more senior the author, the greater is the aggression. Try not to be too personal or rude in your response in such circumstances. You have the right of reply, but it will be considered more fully if it is balanced and logical. Often another assessor (who is unaware that your manuscript has already been rejected) will be asked to review it. In general, however, it is unusual for such a decision to be completely overturned on appeal.

Editorials, reviews and correspondence

An EIC must ensure that for each issue at least one editorial and scientific review are published. These contributions come from experts who can usually write well and with ease. They are not therefore difficult to edit. But they can be difficult to obtain, for international authorities are exceptionally busy, and used to missing publishing deadlines. An EIC must approach such experts with care and respect, knowing that their journal and its impact factor will very possibly be improved by such a contribution. An EIC will therefore have a list of editorials and reviews to hand, all at various stages of development. The members of the editorial board of a journal are expected to regularly support the EIC in this respect, by producing such manuscripts themselves, and by inviting contributions of a high standard.

Books are also submitted very regularly by publishers to an editorial office for review. This is not a particularly arduous task for an EIC, although again, experts who agree to review books must often be cajoled into returning their report expeditiously. EICs want to have new books reviewed rapidly in their journal, and to beat their competitors into publishing them.

Letters to the editor in contrast, flow in, day after day, hour upon hour, without any invitation. The standard of writing is often poor, even when a valid point or contribution is being made. The EIC, or one of his or her editorial team, takes responsibility for editing this constant stream, which is a significant part of the day-to-day running of a scientific journal. Letters are now often submitted electronically to a journal web site. This approach has the advantage of more rapid handling and turnover, which is particularly important when comments are being made about a prospective scientific study, or when an equipment fault or adverse drug reaction is reported. The editor can then speed up the submission to publication time. An electronic web site also encourages more readers to comment, which is important to any editor [2]. It has the disadvantage, however, of encouraging submissions to which insufficient attention to detail has been given. It is worth authors making significant effort if they wish to get their letter into print. The selection of letters from the web site for publication in print will be decided not only by the message contained therein but also by the ease of understanding it.

Occasionally, an editor will ask for an expert opinion on a letter to the editor, especially when it is not written about a recently published article in a journal. Do not be surprised therefore to receive a full scientific assessment of your correspondence.

Handling correspondence is a significant burden to any editor: it never goes away. But it must be done well for readers to enjoy a vibrant

correspondence section in any journal. It is often the most commonly read part of an issue.

Assembling an Issue

One of the more creative and hence enjoyable tasks for EICs is to put together the monthly contents of their journal. They must encourage and cajole their editorial team into editing manuscripts accurately, yet efficiently, so that the Acceptance to Publication intervals are kept as short as possible. In this respect too, editors are competing with other scientific journals in their field: if authors know that a journal has a good reputation for handling manuscripts efficiently, they are more likely to submit papers to it. Hence that journal will receive higher-quality articles for consideration and publication, which will hopefully improve its impact factor. Publication ahead of print on the journal's web site has shortened the Acceptance to Publication time significantly for many journals [3]. In addition, by a process known as *open access*, many journals now invite authors to pay for the full text of their article to be available on the journal web site as soon as it is accepted for publication. Larger journals, such as the *BMJ*, do not even charge a fee for this facility [3].

Impact factor

Editors must believe in the principle of the impact factor, and at all times aim to improve it for their journal, whatever its limitations [4]. No better measure of a journal's scientific content is available and every editorial board works to improve it for their journal. Thus, despite their busy daily routine, EICs must set aside time for detailed consideration with their editorial team and board of how the contents of their journal can be improved. Will, for instance, removing short reports, which are rarely cited, or case reports, improve their journal's impact factor [5]? If so, and it is possible for editors to study the effect of such changes on their journal's impact factor, then changes must be effected to a journal's content, and rapidly. It is difficult for EICs not to become oppressed by adverse changes in their journal's impact factor: their attitude to it must in many ways be schizoid. They must be fiercely keen to improve it, but recognise its statistical limitations and quirks.

Appearance of a scientific journal

Editors realise that 'beauty is in the eye of the beholder'. Any journal, whether it be scientific, political or a leisure magazine, must be attractive to the eye.

The readers must enjoy handling it and know their way around it. Yet readers appreciate small, subtle, but regular changes that catch their attention. They do not want the image of any journal to be the same year on year. Thus the EIC must consider with his or her editorial team, board and publisher regular changes to the appearance of the journal and its layout. These are items that the scientific publisher can often advise upon, and can detail the limitations under which the editor must work in this respect.

Advertisements in scientific journals, which are often an important source of regular income, must also be checked by the EIC with the publisher – to avoid embarrassment over inaccuracies, outrageous claims or factual errors. Each scientific journal has its own rules, of which the publisher must be fully aware, as to where it is acceptable to place advertisements in an issue. For instance, few EICs will allow an advertisement to break up the text of a research paper, but some will allow one between sections, for example, between the editorials and scientific reviews.

Team play

An EIC is the leader of a team of highly intelligent editors, who have busy professional lives stretching far beyond the journal. An EIC must ensure that no editor or assessor is overburdened, or else that member of the team will perform their journal work less well [6]. The EIC must also ensure that the relationship between the editorial and publishing staff is harmonious, and effective and efficient, and must detect disquiet early so that it can be rapidly corrected. Despite the many heavy pressures of their office, an EIC must, as with any senior administrator, ensure at all times that his or her team is content. They must meet regularly to discuss problems, in circumstances where they cannot be easily disturbed.

Transparency

An EIC must also ensure, in this present climate, that the daily functioning of his or her journal is completely transparent [7]. An author or reader should be able to access the journal's web site, which is usually written with the publisher, to obtain full details of the journal's policies on such issues as conflicts of interest of authors, assessors and editors; the assessment process; appointment and payment of the editorial team; and appointment of the editorial board. It is ultimately the EIC's responsibility to ensure that all these aspects of a journal's image are up to date and of the required standard.

Complaints

Authors must always sense that an editorial office has 'an open door' policy, that it is easy to contact and communicate with. An EIC should lead this office by example, rapidly and reliably answering all queries that are received each day, and they do pour in, by telephone, email (increasingly), facsimile and post. The image of any journal is not enhanced if the authors receive no response to their enquiry; the author's voice must always be heard.

Complaints are extremely time-consuming for an EIC. They must be investigated in detail and an appropriate response made, if necessary by a published apology such as an erratum notice in the journal. Errors in a busy editorial office are inevitable, and the EIC must take full responsibility for them even if they have been made by one of his or her team. An EIC must track down the cause of the error and correct it as rapidly as possible. They can be made by the publisher, the author or the editorial team.

In contrast, an EIC must at all times be wary of the author who is trying to fool or confuse any of the editorial team and without doubt such authors, often very intelligent ones, exist. Their motive may be mischievous or personal, competitive or exhibitionist: an EIC must be able to deal with a huge range of personalities. Ideally, EICs will have a broad albeit at times shallow knowledge of their speciality. Experts in a small even if important subspeciality are not as easily able to deal with the breadth of scientific and ethical challenges presented to them.

Ethical issues

At any time, an EIC will be dealing with several examples of poor conduct by authors, or indeed by assessors or editors. These must be dealt with strictly and to the highest standards. The Committee on Publication Ethics (COPE) [8] publish detailed guidelines to help editors to handle such issues (http://www.publicationethics.org).

Confirming that the correct details have been established in issues of plagiarism, dual or redundant publication, or fraudulent data (misconduct) are very time-consuming for an EIC, but must at all times be dealt with propitiously [9]. Liaison is often necessary with editors of other scientific journals who perhaps have published the article first (and whose first language may not be English). International handling of confidential information requires patient attention to detail, and the highest of moral standards.

Authors also have the right to know that their manuscript is undergoing such investigation. They must be kept fully informed of the process of any

EIC's investigation, and be given the right of reply. EICs have no legal authority; they can only request clarification and take such appropriate action as they consider reasonable to maintain the highest ethical standards of publishing for their journal [10]. This often involves publishing a formal apology in a clear position such as at the end of the editorials in their journal. It also often requires contacting the employers of the offenders, such as the dean of their medical school, to keep them fully informed of the problem [7].

Confidentiality

All communications received by an EIC must be considered confidential, whatever their nature. An EIC owes it to an author not only to treat his or her work with such respect but to ensure that all his or her editorial team, of whatever grade, appreciate this too.

Conclusions

Being an EIC of a scientific journal is a highly privileged albeit onerous role. One EIC has compared it to having a demanding mistress [1]! EICs spend all their professional hours in the public, indeed international eye. They must at all times strive to maintain the highest possible scientific and ethical standards for their journal. Inevitably, there will be times when they fail, but hopefully these will be few in number.

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Chapter 18 **What a publisher does**

Gavin Sharrock and Elizabeth Whelan
Health Sciences Journals Editorial, Wiley, Oxford, UK

Once a paper has been accepted for publication in a journal, it will be passed to the publisher. While some authors will be aware of the publishing process and the work undertaken on their behalf, many others will not. Journal publishers add value in a number of different ways, many of which are not of direct concern to the author but, nonetheless, essential to the success of the business as a whole. The services that a publisher provides generally fall into a number of broad categories: editorial, production, marketing and promotion, subscription fulfilment, distribution (both online and print), finance and archiving.

Editorial

Unlike many professions, there are, within publishing a bewildering number of job titles with many roles performing the same function, and this is especially so for editorial (please also see 'Production'). Journal publishing managers (also known within the profession as journal editors and/or journal publishers) perform a pivotal role, liaising with external and internal colleagues alike. As the main point of contact, the journal publishing manager is the link between the journal's academic editor(s), authors, learned society (where appropriate) and relevant internal publishing departments. External academic editors, the 'name' on the journal, are a rare breed of dedicated professionals who are often full-time clinicians, academics or both. Devoting many hours to editorial activities, often for little, or no, financial reward, they look to the publisher for unfailing help, support and expertise.

The editorial department often also provides support to the journal editor through the services of a managing editor and/or editorial assistant. The managing editor and/or editorial assistant assume full responsibility for the running of an editorial office, dealing with the day-to-day management

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of the manuscript submission and peer review process, while the journal publishing managers are, in essence, the publisher's business account managers.

Managing editors and editorial assistants

The Internet has completely changed the way in which the manuscript submission and peer review process is managed, and it is very rare these days to find a journal that does not have a Web-based system to deal with its manuscripts. Web-based manuscript handling systems have made it very easy for journal editors and their editorial teams to deal with the peer review process 'on the move' as it were, and this, together with the elimination of postage, has led to a significant reduction in the time from submission to first decision. The migration from the paper-based editorial office also renders its location largely irrelevant, and it could be the case that the publishing house is in one country, or even continent, while the journal editor resides in another with the managing editor in a third. Because of this, it is now not uncommon for the publisher to appoint a freelancer to carry out this role, as the work can equally easily be managed from home.

Journal publishing managers

The main function of a journal publishing manager is the care of a portfolio of journals, often linked by a specialty. The role consists of the financial management and business development of each title, management of the relationship with the learned society as appropriate and liaising with, and providing support for, the academic editors and their editorial teams. The journal publishing manager also assumes responsibility for the performance of the internal publishing team and, albeit indirectly, oversees the various component parts of the publishing process, from manuscript submission, marketing and sales, production (i.e. online and print publication), subscription fulfilment and distribution.

The journal publishing manager keeps in regular contact with the editor and, if applicable, society officers, and will guide the development of the journal while offering guidance and expertise on publishing practice. This necessitates the requirement to be fully up to date with the ever-changing market developments, including technical advances as well as developments in publishing business models.

The vast majority of scientific, technical and medical journals now have an online presence as well as, or in place of, a print version. The journal's online version now also includes a range of 'added-value' components, such as search engines, supplementary data, archives of back issues, thematic collections, email alerts, RSS feeds, social networking functionality and

much, much more. Indeed, in many cases, the online version is becoming the main focus of any journal, with the printed copy being relegated to a marketing tool.

In addition, the journal publishing manager will often also have a business development responsibility. This will involve not only analysing and researching the market for new journal opportunities but also, as indeed is more often the case, being cognizant of the potential to acquire an established title currently published by a direct competitor. Not surprisingly, new journal launches require a substantial investment from the publisher, in terms of both time and money and, again not surprisingly, the number of new journals appearing in the marketplace is relatively small. That said, the barriers to entry have lessened somewhat with the advent of open access journals. A decade since the debate began, publishers have faced increasing pressure to produce an alternative to the traditional, and long-established, 'subscriber pays' model. Responding to this pressure has, by and large, resulted in publishers now offering two main open access options, both based on the 'author' pays model, the first being a hybrid option and available to those authors wishing to make their articles available to non-subscribers upon publication, or whose funding agency requires grantees to archive the final version of their article. The second option revolves around an increasing proliferation of fully open access journals, with many such titles attracting both direct submissions and those referred from the so-called supporter or feeder journals.

Copyright

At some point during the publishing process, the author may be required to assign copyright to the journal or publisher, the accepted legal document for this being the *Copyright Transfer Agreement* (CTA). As, under European copyright law, it is a requirement for publishers to receive a signed CTA before an article can be published online, an increasing number of journals are making this a prerequisite of the manuscript submission process. Timely submission of the CTA is of great importance to author and editor alike as, without this authority, the publisher would be prevented from publishing an article in electronic format, thus seriously limiting the amount of exposure that it could receive.

Offprints

Although the purchase of paper offprints remains an option for authors, free access to their final PDF offprint or article has effectively rendered the provision of free paper offprints redundant.

Production

Following acceptance for publication, the manuscript will be forwarded to the publisher's production team. The manuscript will then be copy-edited and proofs produced for the author to check. Many publishers are now offering an 'online first' service, whereby the author's accepted article is published online, in its either raw, unedited version or final version, having been both typeset and corrected. This means that the paper can be indexed by PubMed within a week of acceptance, clearly of great benefit to the author. Once the print issue has published the final formatted and edited version of the article, this 'version of record' replaces the previously published version.

Part of the production editor's role – also known within the industry as technical editor, sub-editors or copy editors – is to prepare the accepted manuscript for publication, with part of this preparation involving editing the material to ensure that it is grammatically correct and adhering to the individual journal's house style. Formerly carried out exclusively by the in-house production editor or freelance copy editor, increasingly this part of the job now falls within the remit of the typesetter. Nonetheless, the publisher retains complete responsibility for the quality of the finished product, always keeping a tight control of the process throughout. Invariably, much of the editing is now done on screen, using the author's original file, which has often already been through some editing software to remove extraneous formatting and apply some styling. The production editor also ensures that spelling, grammar, punctuation, capitalisation and mathematical conventions follow approved practice, and that paper is styled appropriately. They also look for accuracy and consistency and are responsible for identifying discrepancies, omissions and possible contradictions. Any such problem or concern is brought to the author's attention by way of a query on the proof. The production editor will also deal with illustrations and tables, including correctly sizing them, positioning them within the text and suggesting, as appropriate, the need to redraw or re-letter.

The edited manuscript will be sent to the typesetter for proofs to be produced. A set of proofs will be sent to the author and editor, after which the proofs will be read by the production editor and any corrections made. Due primarily to constraints on both time and resulting costs, the author and editor are gently discouraged from making substantial changes to an article at proof stage. Journal production follows a previously agreed schedule, and it falls to the production editor to ensure that this is adhered to, and he or she will need to chase any author or editor who is tardy sending in corrections.

Although issue compilation is usually undertaken by the editor, this task can, on occasion, also fall to the production editor. Once the issue has been compiled, the production editor will 'pass' the final proofs for press, and it is at this point at which the online and print files take divergent paths.

Print-ready files are sent for printing, and the production team is responsible for appointing appropriate printers and for ensuring that the journal is published on time and in a cost-effective manner. In association with the editor, this team is also responsible for selecting text paper and cover board and for the overall quality and look of the journal.

Publishers will either appoint a third party to host and maintain their journal web site or will undertake this in-house. On completion of an issue, the electronic files are sent to hosting service to be uploaded onto the web site. As this process is faster than the printing process, it is usual for an issue to appear online a little before the print copy reaches the subscriber.

Fulfilment and distribution

Following its publication, the publisher is responsible for distributing the issue, in print or online, to all those subscribing to the journal. In some cases, publishers will handle all distribution from their own warehouse, but, increasingly, the publisher generates mailing lists that are sent to the printers who will, in turn, arrange for the issue's dispatch. For large overseas consignments, these are often shipped in bulk by air to a mailing house for onward distribution by use of that country's mailing service. The publisher will also be responsible for fulfilling claims for missing issues, back issues and single copy sales and will, therefore, arrange for extra copies of the journal to be held in storage.

Sales and marketing

Institutional, member and individual subscriptions

Typically, the bulk of journal revenue will be derived from the sale of paid subscriptions – the so-called author pays model – whether to an institution, a member organisation such as a learned society or an individual.

In addition to the sale of traditional stand-alone subscriptions – print-only, online-only, print and online – print and online versions can be offered 'bundled' together or separately depending on the individual publisher's sales strategy. Institutional subscriptions can involve an extra level of complexity depending on simultaneous users, tiers dependent on institutional size, deeply discounted print when online is taken, upselling of the publisher's full portfolio of titles online at a deeply discounted rate, the so-called

Big Deal. Understandably, however, the purchase of an entire portfolio proved extraneous to the needs of many librarians and, increasingly therefore, publishers moved away from the 'Big Deal' preferring to offer smaller, bespoke subscription 'suites', tailored to the needs of individual libraries. For many publishers, licensing deals are now central to their journal sales strategy. By and large, the licensing model is comprised of two elements, 'subscribed' and 'unsubscribed'; the major component being 'subscribed' whereby libraries pay for an online-only subscription under a multi-year, capped-price licence. The minor component, 'unsubscribed', represents income generated from top-up fees paid by libraries for additional titles accessed through collection sales, outside their core holdings. Librarians now have good usage statistics for their holdings, and journals not being used are in real danger of being cancelled.

The majority of sales for institutional or library subscriptions will be handled via a subscription agent, who acts as a conduit between librarian and publisher. With librarians frequently purchasing thousands of subscriptions, dealing with a single agent simplifies the process.

For journals owned by, or affiliated to, a learned society, their members will often receive an automatic, or mandatory, subscription to the journal, with the cost incorporated into their annual society membership subscription. One of the advantages to the publisher of dealing with a society is that the society will be responsible for the annual subscription renewals.

For individuals not affiliated to a learned society, many journals offer a reduced rate personal subscription.

It is still customary for complimentary copies of the journal to be provided to the editor and members of the editorial board, also to the large abstracting and indexing services such as *PubMed (Index Medicus)*, *Current Contents* and *Scopus* as well as to the British Library and other major libraries.

Advertising sales

Subject to circulation covering the right areas and of equal importance, the readership being perceived as having 'buying power', it is possible for higher circulation general and specialist clinical journals to attract substantial revenue from the sale of display and classified advertising space in each issue. Advertising can be a sensitive issue in a learned journal, and the amount, content and placement of the advertisement should, therefore, remain under the control of the editorial team as they are responsible for the overall look and feel of the publication. The advertising team, which usually sits within corporate sales, will work closely with the editorial team to ensure that the right balance is maintained at all times.

The largest advertising 'spend' comes from the pharmaceutical industry, but equipment manufacturers, conference and event organisers, and publishers will also use a journal to advertise their products.

Although online advertising has become increasingly prevalent in recent years, it has yet to deliver substantial journal revenue, outside the United States.

Reprint sales

Pharmaceutical companies are often also interested in purchasing bulk copies of individual papers that support their interests, examples being articles reporting results of clinical trials or new indications for an existing drug. Forming part of a pharmaceutical company's marketing campaign for a particular drug reprints are frequently given to potential prescribers. The sale of electronic PDF reprints has increased in recent years as pharmaceutical companies explore ways of extending their marketing reach while, simultaneously, reducing costs.

Supplements

Journals will occasionally publish an extra, or supplemental, issue, often themed or on a 'hot topic' and usually sponsored by the pharmaceutical industry. Although supplements can be an important revenue stream, they can also attract much criticism if they are not of the right editorial quality. It is, therefore, imperative that the journal has a very strong editorial policy for accepting sponsored supplements and that the editorial team remains in control, retaining the right to reject any contribution that falls short of the peer review process.

Rights and 'pay-per-view'

Journal sales are not restricted to the purchase of annual subscriptions but also include the sale of subsidiary rights. The Internet has increased the opportunity for developing revenue from these subsidiary rights to produce a translated issue of a journal or article, rights to produce an English language edition modified for a foreign market, rights to reuse tables and illustrations, and rights to produce inexpensive reprints of articles in countries where purchasing power is low. Much of the processing of rights is now done electronically, with many users now able to seek permission and pay for content online. Publishers also look for opportunities to increase a journal's circulation by selling rights to host the journal content or header information to third-party aggregators such as Ovid or Ingenta, which may provide penetration into markets not covered by a journal's subscriber base.

The Internet has made access to individual articles even easier and with the advent of the 'pay-per-view' or 'pay-for-service', it is now becoming increasingly easy for a non-subscriber to be able to either access an article or to have access to the whole site for a defined period of time.

Marketing

The journal model is unusual in that often the journal 'user' – researchers, physicians, learned professionals and academics – is not the journal 'purchaser'. A key indicator of a journal's success is the online usage, or number of abstracts and full-text articles downloaded, and increasingly, this metric is being used to help librarians to make decisions on whether or not to renew a subscription. Why retain an online journal subscription when the content is not being downloaded (please see 'Institutional, Member and Individual Subscriptions')? Consolidation of library collections together with budgetary constraints means that the attrition rate for an established learned journal can be anything up to 10% per annum and publishers are, therefore, very keen to maintain high usage.

In order to maintain and increase usage, a journal must be promoted to those potential users as yet unaware of its existence, with relevant content also promoted to existing users.

In addition, a publisher's subscription and fulfilment department must actively encourage lapsed subscribers to review subscriptions. Most publishers invest heavily into maintaining an international sales force that has face-to-face contact with institutional librarians or representatives of the major consortia (groups of libraries coming together to increase their buying power).

The marketing department conducts market and product research and is responsible for promotional material, publicity and advertising. Journal marketers 'listen' to the market and 'speak' to the market. Depending on the strategy of the publisher and the number of journals published in a particular subject area, marketing campaigns are developed at journal level and/or subject level. Journals are promoted in a number of different ways including email campaigns, direct mail and advertisements in relevant publications, all of which are underpinned by displays at appropriate specialty meetings and symposia. Email campaigns have become a very effective marketing tool in that they can reach a large target audience both quickly and cheaply, with the success of the marketing measured accurately through 'click-through' rates and download figures. The Internet provides marketers with a very useful and cost-effective way of gathering information about a journal's

'user' while usage statistics from a journal's web site can be used to influence both editorial and marketing strategies.

Finance

The publisher is responsible for managing all financial aspects of the journal business, including collecting revenues, raising invoices, controlling cash flow, maintaining records and paying suppliers. Good financial management and reporting are central to the long-term strategic development of a journal.

Conclusion

Having enjoyed 200 years of uninterrupted growth, due in part to the invention of the steam press in the nineteenth century, publishing has moved into an era of unprecedented change. The advent of the Internet has resulted in publishers being forced to defend much of the tradition and well-established practices enjoyed up to this point.

These changes notwithstanding, we very much hope that this chapter illustrates the added value the publisher continues to bring to the written word, however this be disseminated.

Chapter 19 **Style: what it is and why it matters**

Sharon Leng
BJU International, Wiley, Oxford, UK

Once upon a time . . . an unusual start to a piece of technical writing, but perhaps apt, as it highlights how writing style is associated with different genres; you immediately associate the opening phrase with a 'fairy tale' and not with the introduction to a scientific paper. The writing style is important and should reflect the content, but there are few absolute rules, and sometimes breaking a rule can mean that you can make a point more effectively. Ultimately, good scientific writing is just about getting your message across clearly.

'Style' in the context of a medical/scientific paper is not something you normally have to surmise, as most journals give detailed 'Instructions to Authors'. However, these are just a framework, and your task is to write in a way that can be understood easily by as many readers as possible. A scientific paper must be accurate and precise, but this does *not* mean it has to be turgid.

For a paper to have greatest impact, it needs to be:

- logical
- clear
- accurate
- concise.

Every journal sets some specific rules, for example, about paper composition and reference style. It is also worth looking through a recent issue of your chosen journal to familiarise yourself with its general 'house style'. You can then concentrate on how to achieve clarity, accuracy and rigor. For the reader, you should allow for the limitations of short-term memory and (for many readers) a lack of familiarity with the subject matter, so the sentence structures and vocabulary should be as simple as possible. Many people seem compelled to write a paper in a complicated fashion, thinking that this makes it/them sound scholarly and authoritative; however, invariably the opposite is true.

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Logical presentation

For most publications this comprises:

- *Title.* Make it concise but informative; it should describe the topic, but not declare the conclusions.
- *Authors and affiliations*
- *Correspondence address.* Provide an email address for your proofs to be sent to; this should be the address of someone who can take overall responsibility for the content of the paper.
- *Keywords.* A list of three to six keywords; think about the *searcher*, what keywords, not in the title, are they likely to use?
- *Abstract.* The cogent points given as succinctly as possible, as those needing the details can read the rest of your paper. This should be <300 words.
- *Introduction.* The background information and rationale for your study; do not mention results or conclusions here.
- *Methods.* Include the necessary information for anyone wishing to repeat the study or conduct a similar study, so give precise details of instrumentation, materials/drugs used, patient cohort if a clinical study, data analysis and so on.
- *Results.* Use tables and figures to present your results and do not repeat information in the text; instead, refer to the relevant table/figure. Separate objective findings (results) from their interpretation (discussion) and avoid discussion in the results.
- *Discussion.* Your platform to present the conclusions of the study and to expound any theories and discuss them and how they relate to the results of others. The introduction and discussion should mirror each other; in the introduction you set out the question, so in the discussion you return to that question and reflect on how well you have answered it. You should finish with a short concluding statement.
- *References.* In the style required by the particular journal. Make sure you have cited work accurately; to mis-cite authors is a good way of losing their respect.
- *Figures.* Provide figure legends in the text file, in case they need to be edited. It is also advisable to provide the picture file separately and in a format recommended by the journal. Ensure that axes and keys are labelled.
- *Tables.* These should be as simple as possible, and provided as text files to allow them to be edited by the journal's editing team. Units should be put in column/row heads and not repeated in the table body. The table body should be as clear as possible (remove %, ±, etc.). Take particular care to check the table at proof stage, as errors can easily be introduced in editing.

Clear and accurate presentation

I suggest that you produce a rough draft of the paper, leaving the abstract until last. Then revise your draft, probably several times, considering the following points:

- For many readers, English will not be their first language, so avoid clichés and idioms, which are particularly difficult for them to understand. The simpler the vocabulary and construction of the sentences, the better. To write a 'good' paper you do not need to be an English scholar – it may even be a hindrance!
- Do not contract words in the body of the text, for example, 'will not' to 'won't' and 'do not' to 'don't'.
- Phrasal verbs, with the liberal use of apparently random prepositions, should be avoided, as these are difficult for those who are not native English speakers (Table 19.1).
- Be careful of tautology, that is, the needless repetition of the same sense in different words, for example, 'a 24-h time period' should be 'a 24-h period', 'was red in colour' should be 'was red'.
- Be restrained with the 'non' prefix; many authors use it too often and incorrectly. For example, a tumour is not 'nonpalpable' but 'impalpable' and it is not 'a nonobstructed view' but 'an unobstructed view'. Often, a simple phrase is better; for example, 'was non-diagnostic in 21 patients' would be better as 'was not diagnostic in 21 patients'. If the language used is nonperfect, it can make understanding nonpossible.
- 'Pre' and 'post' are also often used when 'before' and 'after' would be better; for example, 'painful voiding was present in 18 of the 30 patients post

Table 19.1 Common phrasal verbs and alternatives

Phrasal verb	Alternative
Consisted of	Comprised
Drawn up	Devised
Trade off	Compromise
Look at	Assess
Prop up	Support
Zeroed in	Focused
Cut off	Threshold, limit
Prior to	Before
Rule out	Exclude
Build up	Accumulate
Clear up	Resolve
Work-up, check-up	Evaluation

flexible cystoscopy' should be 'painful voiding was present in 18 of the 30 patients after flexible cystoscopy'.

- Keep the vocabulary as simple as possible given the need for accuracy.
  - Why use 'modality' instead of 'method' or 'utilized' instead of 'used'?
  - Patients have 'symptoms' not 'symptomatologies' and biopsies should be 'taken' rather than 'performed'.
  - Change '. . . a reduction/change in x was observed/found' to 'There was a reduction/change in x . . .'.
  - 'A Medline search was performed' should be 'Medline was searched'.
- Do not start a sentence with a numeral; instead, restructure the sentence or, for example, '24 patients were assessed' could be changed to 'In all, 24 patients were assessed'.
- Use a hyphen or hyphens to link words in a compound modifier, to make clear the modifier and the object being modified. For example, 'the patient had a small-bowel tumour'; without the hyphen, it would not be clear whether the patient had a *small tumour* of the bowel or a tumour of the *small bowel*.

Consistency of description

- For example, within a paper, 'subjects', 'patients', 'cases', 'men' and 'group' might all be used interchangeably. Adopt a single mode of description and apply it consistently throughout. To call the same thing by different names in different places guarantees confusion.
- In clinical papers do not classify patients by their ailment; so rather than 'prostate cancer patient' use 'patient with prostate cancer'.
- 'Parameter' and 'variable' are often used as though they are interchangeable; they are not. A 'variable' is something that is measured in a study; a 'parameter' is a specific numerical value that qualifies or scales a variable.
- Some papers report scores relating to categorised variables, for example, 'sadness'. Where the text implies this specific meaning, the variable should always be in inverted commas; thus 'sadness was higher in group A than in group B' should be changed to 'scores for "sadness" were higher in group A than in group B'.
- Keep tense consistent.

Rigor and accuracy

- Prefer specific terms to general terms, for example, 'rabbits' not 'animals', 'concentrations' not 'levels', 'boys' not 'subjects'.

- Reserve 'significant' for statistical meaning, and this should be associated with a stated *P* level; the test used and the groups compared should be made clear. Generally, use the terms such as 'substantial' or 'marked' rather than 'significant' unless implying statistical significance.
- 'Increased' or 'decreased' is used correctly when successive measurements have been made within a group, but replaced by, for example, 'higher' and 'lower' when the comparison is between different groups.
- 'Prostate-specific antigen (PSA) was higher . . .' is wrong, change to 'Serum PSA concentrations were higher' and so on. Be careful of overuse of 'level' because of its multiple meanings – use specific terms, for example, 'concentration' (for blood biochemistry) or 'expression level' (for mRNA measurement), or 'content' (for tissue measurement).
- Keep relevant data together, for example, mean, standard error of mean (SEM), standard deviation (SD), range and interquartile range. For example, the age data of a particular patient cohort should be written 'the mean (SD, range) age of the patients was 61.4 (9.8, 43–80) years'.
- Never give percentages for totals of less than ≈20, as they are statistically invalid and misleading. The best policy is to give the *N* values and percentages, if appropriate, that is, *n*/*N* (x%).
- Ensure that the *N* values cited are consistent throughout the paper including the tables and figures, and that any percentages you provide are correct.
- Do not give *P*-values to more than three decimal places; all *P*-values below 0.001 should be given simply as $P < 0.001$.
- Data values should generally be truncated to two significant figures; so 0.03572210 should be rounded to 0.036.
- Check that you have cited any tables and figures in the text and that you have numbered them in the order that they are cited.

Units

- For numbers of objects, use words written in full up to nine and numerals from 10 upwards, for example, five patients, 12 studies, whereas all quantities (with units of measure) are given in numerals, for example, 6 years, 2 m.
- Always include the units of your data, for example, '. . . with a BMI of 32' should be '. . . with a body mass index (BMI) of 32 kg/m^2'.
- Generally, quantities should be expressed in Système International d'Unités (SI) units. However, for many medical variables, non-SI units are permissible, for example, mmHg for blood pressure and cmH_2O for bladder pressure. The principle is simple; use the units that are most recognisable by your intended readership.

Concise presentation

- Commonly used phrases, a few examples of which are given in Table 19.2, can be shortened, many to just one word, reducing verbosity and increasing readability.
- Using abbreviations (shortened form of a word or phrase) and acronyms (words formed from the initial letters of a phrase) can be helpful, especially when something is better known by its abbreviation than by its full form. They must be defined on first mention in parentheses (even those you consider obvious), used consistently throughout the text and listed at the end of the paper. Never assume that the reader knows what an abbreviation is, you should not burden them with the task of finding the definition.
  - However, the use of abbreviations should be minimised, or avoided if used fewer than four times in a paper (unless it replaces a long definition, e.g. vascular endothelial growth factor receptor (VEGFR)), as you do not want to interrupt the 'flow', often caused by overzealous abbreviating.
  - Single-letter abbreviations (e.g. T for testosterone) are seldom desirable and easily misinterpreted; it is much better to use the word in full.

Table 19.2 Common phrases that can be shortened

Common phrase	Suggested alternative
Kept in mind	Considered
The majority of	Most
A number of	Several
A variety of	Various
In line with	Comparable, similar, conform
With regards to	Concerning, about, for
Low cost	Inexpensive
Matter of debate	Contentious
With the exception of	Except for
Make up for	Compensate
Of note	Notably
In order to	To
Not the same	Different
Small number, not many	Few
In spite of	Despite
Due to	From
Not often	Rarely
It is possible that	May, might
Has the ability to	Can
On the occasion of	When
Despite the fact that	Although
Due to the fact that	Because

- Avoid repeating data between the text, tables and figures.
- A table should have several rows and columns; otherwise, place the data straight into the text or bullet point as a list.

A second opinion

When you have a final draft, it is wise to ask someone who is preferably not too familiar with the data to read it. Often papers contain undefined, obscure abbreviations or lack clear instructions/descriptions in the methods section, not because the authors are careless, but because they are too familiar with their work.

Why style matters

The presentation of your data is as, if not more, important than data collection and analyses. A well-written paper will proceed through the referee, editing and publication processes faster, and you will be able to convey your data/message to as wide an audience as possible, especially pertinent in this 'computer age'. The key style points to remember are:

- FOLLOW 'INSTRUCTIONS TO AUTHORS'
- USE SIMPLE LANGUAGE
- BE CONCISE

Thus, if you adhere to the journal style guidelines, endeavour to keep your paper as clear, consistent and concise as possible, you and those involved in the process should all . . . *live happily ever after! :)*

Further reading

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Chapter 20 **Ethics of publication**

Chris Graf [1] *and Elissa Wilson*[2]
[1]Health Sciences, Wiley, Richmond, Australia
[2]Life Sciences, Wiley, Richmond, Australia

Introduction

We wrote this chapter to present the 'ethics ideas' that we think you need to consider while you write your paper. We examine the process of writing a paper. We discuss how to reduce bias, how to encourage complete and transparent reporting, and how to ensure appropriate attribution and accountability. We start with your paper's roots in a grant or funding application (Figure 20.1) and follow its life through the research process. The authors' opinions are scattered throughout, but this isn't intended to be an opinion piece nor a discussion of ethical principles (which can be found in many other places, including the references at this web site: http://wwwjp.blackwellpublishing.com/bw/publicationethics/#_Toc149460095).

Instead this chapter intends to provide you with a practical guide to the areas in which you need to think about publication ethics while you conduct your research and write your paper. The order in which these need to be addressed may vary (e.g. you may need to design your study prior to seeking funding) but we have attempted to follow a timeline of sorts.

A great place to observe the shortcuts and mistakes that journals and researchers make, many of which are ethical shortcuts, is the Retraction Watch web site (http://retractionwatch.wordpress.com/). Retraction Watch is a web site devoted to retraction statements published in journals. By definition this means that reports on Retraction Watch with ethical components link research ethics with publication ethics. These problems often have roots at the very beginning of the research process and implications throughout.

How to Write a Paper, Fifth Edition. Edited by George M. Hall.

Figure 20.1 Ethics at the centre of research and its publication.

Getting your funding

If you received a grant or another form of funding to conduct your study (or, indeed, to write your paper), then you should state the source of funding in your manuscript.

Some funders ask that researchers conduct, as part of their grant application, a systematic review [1]. This helps funders to assess the novelty of your funding application, the need for an 'answer' to the questions your research might provide, which is an ethical consideration particularly in biomedical research. If your funder requires this kind of systematic review, then you should also put it to good use later in your research project, as preparation for writing your paper.

Designing your study

You may have been required to submit your study design for ethical review board approval within your institution, perhaps for regulatory purposes, and particularly if your study involves people or animals. You should describe these aspects of your study briefly in your paper.

It is good practice to define (and register) your study protocol and to specify your data analysis plan before you start your study. You should describe these aspects of your study design in your paper and, if you registered your study design, give information on this. These approaches are designed to help reduce bias in the resulting research (like those that are introduced by post hoc analysis, for example, or by under-reporting of negative or inconclusive results). We encourage you to follow them!

While you are designing your study it is possible that you will be able to identify who will become a named author on your paper (or papers). We address authorship later. But it is worth stating here that the intellectual input required during study design means that those who make that kind of input are either most (or all) of the candidates for co-authorship, or should have their contributions listed in an acknowledgement. It is a good idea to discuss and agree your authorship criteria with your research collaborators at this stage, to avoid confusion and possible disagreement later [2].

Collecting your data, analysing your data, deriving your results

If your study design changed while you were conducting your study, you should explain how (in an ideal world your design wouldn't change, but if it did then you must clarify). You should describe how your data analysis was performed and whether this was in accordance with or differs from your initial plan (again, it shouldn't differ). If you did perform analyses that you did not specify in your original research design, you should provide details and ensure that the results of these analyses are clearly identified as 'post hoc'. This extra level of explanation is to help editors and readers assess the impact of these possible sources of bias.

Writing your paper

Authors

Working out who is and who isn't an author is important, given the rewards that authorship can bring and the importance of appropriate attribution

and accountability (see Chapter 7). Some simple principles include the following:

- Your authors should be those who actually did the work.
- You shouldn't give or accept gift authorship.
- You should demand that everyone who meets your authorship criteria is listed as an author.
- You should require that everyone who has made a significant contribution, but who does not quite meet your authorship criteria, is acknowledged.

There are differences between disciplines in the approaches that researchers use to decide who is named as an author. In biomedicine there is a gold standard that most researchers and journals seem to be comfortable with, which allows a degree of flexibility. This is the definition begun in 1978 (in Vancouver, hence the name this definition sometimes takes) by the International Committee of Medical Journal Editors (ICMJE) and incorporated into their guidance in 2009 [3].

A short passage from this definition is directly below, and these authors recommend you use this to decide who should be listed as the authors of your paper. The other guidance and thoughts from the ICMJE on group authorship, 'guarantors', public responsibility and acknowledging contributions are also worth reading [4]:

> Authorship credit should be based on 1) substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; 2) drafting the article or revising it critically for important intellectual content; and 3) final approval of the version to be published. Authors should meet conditions 1, 2, and 3. [4]
>
> All persons designated as authors should qualify for authorship, and all those who qualify should be listed. [4]

Reporting standards

You should follow established approaches to report your study completely and accurately. The EQUATOR network curates a central resource for reporting standards in biomedical research (Box 20.1) [5]. Using these reporting standards will help you ensure that you include all the information that is needed to report your work fully and clearly. It will also help you write an easy-to-understand paper, from an editor's, peer reviewer's and a reader's point of view. This may ease your journey through peer review and improve your chances of rapid acceptance and publication.

Box 20.1 Types of reporting guidelines curated by EQUATOR

- Biospecimen reporting
- Diagnostic accuracy studies
- Economic evaluations
- Experimental studies
- Mixed methods studies
- Observational studies
- Qualitative research
- Quality improvement studies
- Reliability and agreement studies
- Reporting data
- Sections of research reports
- Specific conditions or procedures
- Statistical methods and analyses
- Systematic reviews and meta-analysis

How many papers from one research study?

How long is a piece of string? We believe that you should make a decision to publish your results in usefully sized pieces, not the smallest possible publishable unit. More than one paper is fine, if each paper stands alone. You should take care to reference the original (primary) paper in any papers that follow, and to explain the relationships between the multiple papers and the results they present.

Duplicate publication causes confusion among readers, may distort results of meta-analyses and practice guidelines, and can cause legal problems by infringing copyright. You must avoid publishing the same results in more than one paper without making it clear to readers that you have already published those results elsewhere.

You should treat ideas for analyses that you specify after collecting and analysing your data with caution and, if you do decide to take this path and write a new paper to present that analysis (which we recommend that you don't), you must make this potential source of bias clear in your manuscript to journal editors and readers.

Can I present my work at a conference and still publish it in a journal?

If only the abstract was published in conference proceedings you will have no concerns. However, if a full paper was published you will need to make

sure that the paper you submit to a journal is not identical to the paper published in conference proceedings. The amount that these should differ will vary from journal to journal so you should check with the journal editor, and you should always fully disclose previous publication. You will be free to publish your results on your own web site or blog and your institution's digital repository; however, guidelines will vary so you should follow the copyright information for each journal.

References

You should provide as complete a reference list as is practical, focusing particularly on research that's related to your own that will help readers put your findings in context. There are many reasons why people choose particular references to include in their papers, not all of which are ethical or sensible. An interesting exploration about this is archived on the World Association of Medical Editors record of listserve discussions (http://www.wame.org/wame-listserve-discussions/authors-quoting-themselves-extensively-in-the-references), from which reference [6] makes interesting reading.

If you conducted a systematic review as part of your funding application, then the references you collected for that review may be too many to include in your research paper itself. Nevertheless your systematic review will be a useful source of information. We think you should consider your systematic review as a separate paper in itself, for publication prior to your results, and for reference in your research paper.

Avoiding plagiarism

You should attribute all previously published material whether it is someone else's work or indeed your own. While having to reference your own words from previous publications may seem unnecessary, it is important to remember that the copyright may now be held by the owner of those publications so you must acknowledge prior publication. Most publishers will use programs like CrossCheck to analyse levels of duplication (see 'Surviving Peer Review'). It is advisable to attribute all recycled material.

Funding statement

You should describe the grant or other funding sources that support your research, or the absence of such funds.

Disclosures

Conflicts of interest continue to be a hot topic, particularly financial conflicts. You should report potential sources of conflict related to your research

Box 20.2 Sample authorship description/acknowledgement

Drs A, B and C designed and conducted the study, including patient recruitment, data collection and data analysis. Dr A prepared the manuscript draft with important intellectual input from Drs B and C. All authors approved the final manuscript. (Insert name of organization) provided funding for the study, statistical support in analyzing the data with input from Drs A, B and C, and also provided funding for editorial support. Drs A, B and C had complete access to the study data. We would like to thank Dr D for her editorial support during preparation of this manuscript.

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that are not only financial, but also political or personal. We think that reporting conflicts of interest should be treated separately from reporting research funding, and that this information should be reported separately in your manuscript. But different journals take different approaches, and you will be doing an ethical job if you report both funding sources and potential conflicts of interest no matter how you report them.

Acknowledgement

You should publish a short acknowledgement to the people who made contributions to your research (Box 20.2). It's important to get permission from these people before acknowledging them, which is another reason to consider authorship while you are designing your study.

Images, data

We think that you should submit uncropped, unedited, original images alongside images that you have prepared for publication to the journal (e.g. for Blots or gels). You should also, where appropriate, deposit these original images and original numerical data in an accessible database [8].

Choosing your journal

You should submit your paper to one journal at a time, and wait for the decision from that journal before moving on to submit to a second journal. You should not, generally speaking and as discussed above, publish the same results and analysis more than once [9].

Surviving peer review

When you submit your paper to a journal, its editors and peer reviewers will assess the quality of your work according to their journal's particular criteria (usually a mix of soundness of methods, novelty of results, relevance to their audience and priority or possible impact).

As well as assessing the quality of your work, the editors and peer reviewers will assess the ethical aspects of your research and how you have reported these in your manuscript.

Some journals have begun using computerised plagiarism detection systems at this stage, such as CrossCheck (iThenticate), to help prevent plagiarism and address duplicate publication before it happens. These systems compare submitted manuscripts with already published material (in journals and on the Internet) and identify possible cases of plagiarism by matching strings of related text. Human intervention, usually from the journal's editorial team, is then needed to interpret the algorithm-derived results and to address possible problems appropriately. The Committee on Publication Ethics (COPE) has published flow charts that illustrate how investigations often proceed [10].

If your paper doesn't make it through peer review at the first journal you submit to, is it ethical to submit to a new journal without addressing the peer reviewers' comments? We believe that if a peer reviewer has correctly identified a flaw in your work, then it is ethically important for you to address it before continuing. In simple cases this may mean recognising the limitations of your research.

But the flaw that a peer reviewer identified may not be important, the peer reviewer may have asked for additional work that is not possible or you may disagree with the editor's decision and peer reviewers' comments entirely. And your appeal to the journal about its decision may have been turned down. Even so, anecdote suggests the chances are reasonably high that the same peer reviewer will see your paper again when you submit it to your next journal, especially if you work in a specialised area. So addressing comments before submission to your next journal seems to us to be both pragmatic and ethical.

Dealing with the press and embargoes

Some journals have embargo policies that you will need to follow when discussing your soon-to-be-published paper. These embargoes exist to ensure that the general public is presented with accurate, peer-reviewed research in complete form, rather than in snapshots in a newspaper. However,

embargoes may still allow you to talk about your research findings in general terms on a personal web site or blog, for example [11].

Publishing your paper

Congratulations. You published your paper in a top journal. You have included your new reference in your next grant application. And editorials discussing your paper, not to mention citations from your peers around the world, are stacking up.

It doesn't stop there. You must be ready to correspond with readers who have valid questions or comments, either through letters to the editor or, increasingly, in 'comments' on journal web sites. You must also be ready to correct mistakes that you or your readers identify, by working with the journal to publish a correction (or erratum).

When something particularly significant has gone wrong, a retraction is in order. These are usually reserved for major flaws in a piece of research that mean that the results are unreliable. Sometimes they are published because of intractable disputes between authors. Most seriously they are published for proven cases of research misconduct (typically defined as research that's fabricated, falsified or plagiarised).

Conclusion

Writing your paper is when it all comes together. You know your results. You listened to suggestions from the people you spoke with when you presented your work at a congress. You're ready to share what you've found with your peers, your competitors, your research funders (in fact, with everyone). Your paper will become an important (and measurable) output from your research and may help you secure your next round of funding, or a new job.

Much rides on getting your work published in a good journal.

And much rides on reporting your work ethically.

We wish you the best of luck.

Disclosures

Chris Graf and Elissa Wilson are employed by John Wiley & Sons, and as such benefit from the success of the company's publishing programme. Chris publishes clinical and research journals including a number for Societies and Royal Colleges in Australia and New Zealand, the International Journal of Clinical Practice and the global Wiley open access journals in health sciences, is the treasurer of the COPE (a UK registered charity), and leads the

Wiley-Blackwell publication ethics programme. Elissa publishes a number of life science journals for societies in Australia and is involved in the Wiley-Blackwell publication ethics programme.

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Page numbers in *italics* refer to figures, those in **bold** refer to tables, and those underlined refer to boxes.

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