

Research Education Seminar Series

Lecture 4



Alex Stephens, PhD, Director of Research

Basic outline

1. *Research Overview*

- Overarching aims of the research office
- Why do we engage in research?
- Simplified research framework
- Research translation framework
- Evidence-based practice pyramid

2. *Robust study design*

- Epidemiological methods – study designs
- Key elements of study validity and critical appraisal
- Measures of association
- Determining sample size – power analysis

3. *Analysis*

- Basic biostatistical methods and analysis

4. *Writing for research*

- Writing grants, papers and scientific presentations

5. *Ethics, governance and software*

- Research ethics and governance
- Research software

Writing grants, papers and scientific presentations

Grant writing workshop and resources



- Health Education and Training Institute (HETI) rural research capacity building – opportunity to have one of the rural research capacity building staff run a workshop



- Researchers at our research partner institutions who have been successful in obtaining competitive grants have a wealth of knowledge in preparing grant applications, and may be able to share their experiences and provide advice/tips
- Access existing online resources – material developed by others

The Nine Key Elements of Successful Proposals by Jay Katz
<http://staff.lib.msu.edu/harris23/grants/nine.htm>

The art of grantsmanship by Jacob Kraicer
<http://www.hfsp.org/funding/art-grantsmanship>

Guide for writing a funding proposal by S. Joseph Levine
<http://www.learnerassociates.net/proposal/>

Advice on how to write an NIH grant
<https://grants.nih.gov/grants/how-to-apply-application-guide/format-and-write/write-your-application.htm>

- Elsevier series



Elsevier > Elsevier Connect > Six things to do before...

Six things to do before writing your manuscript

In this new series — “How to Prepare a Manuscript for International Journals” — a seasoned editor gives advice to boost your chances of acceptance

By Angel Borja, PhD Posted on 12 May 2014

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How to Prepare a Manuscript for International Journals — Part 1

In this monthly series, Dr. Angel Borja draws on his extensive background as an author, reviewer and editor to give advice on preparing the manuscript (author's view), the evaluation process (reviewer's view) and what there is to hate or love in a paper (editor's view).

This article is the first in the series.

1. Think about why you want to publish your work – and whether it's publishable

- Have I done something new and interesting?
- Is there anything challenging in my work?
- Is my work related directly to a current hot topic?
- Have I provided solutions to some difficult problems?

You should know this from your research proposal/protocol

2. Decide what type of the manuscript to write

Full articles, or original articles → most common type, and are typically composed of **original research** studies

Letters/rapid communications/short communications → these are short reports, and are intended for the communication of original studies but in a **rapid and condensed** format. These can be harder to write as information has to be condensed and clearly communicated in a very succinct way.

Reviews – systematic (critical analysis of all relevant studies) and narrative (more a general literature review)

3. Choose the target journal

This can be tricky. There are many journals out there of varying quality, reputation and readership (often measured by impact factor). **Open access** journals, where a fee is paid to allow the published article to be accessible (freely) online, is increasing in

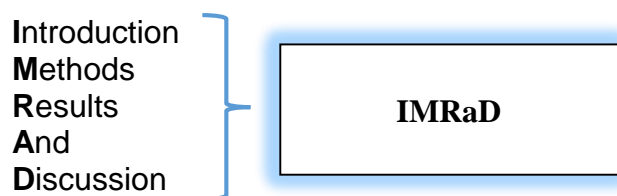
popularity. However, at the same time, a whole industry of “predatory” open access journals has developed, where publishers charge fees to authors but have limited and poor quality scientific review and editorial services. Becoming familiar with the literature and engaging with an academic collaborator is a good way to determine the journals to publish in.

4. Pay attention to journal requirements in the Guide for Authors

The “Guide for Authors” is a key source of information when drafting and formatting a manuscript. The guide will generally outline the required style and format of the journal (structure, figures, tables, text font and size, word and size limits, referencing style...), submission procedures, and publication fees. Journal styles and formats can be fairly tedious, but it is vital they are adhered to, otherwise the submitted manuscript will likely be returned until all conditions are met.

5. Be aware of the structure of the paper

It is very common for journals to have a particular structure for their articles. For example, the manuscript may be structured as:



There will also be an abstract, which can be as short as 200 words (challenging!), and sometimes other parts such as keywords, highlights or some other condensed summary (e.g. *BMJ Open* have several dot points covering the “Strengths and limitations of this study”)

6. Understand publication ethics to avoid violations

Do not: plagiarise, conduct research without appropriate human research ethics consideration and oversight (and approval if necessary), and fabricate and falsify data.

Review the manuscript

- Does the paper contain sufficient new material?
- Is the topic within the scope of the journal?
- Is it presented concisely and well organized?
- Are the methods and experiments presented in the way that they can be replicated again?
- Are the results presented adequately?
- Is the discussion relevant, concise and well documented?
- Are the conclusions supported by the data presented?
- Is the language acceptable?
- Are figures and tables adequate and well designed?
- Are all references cited in the text included in the references list?

11 steps to structuring a science paper editors will take seriously

A seasoned editor gives advice to get your work published in an international journal

By Angel Borja, PhD Posted on 24 June 2014

 Print  PDF

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How to Prepare a Manuscript for International Journals — Part 2

In this monthly series, Dr. Angel Borja draws on his extensive background as an author, reviewer and editor to give advice on preparing the manuscript (author's view), the evaluation process (reviewer's view) and what there is to hate or love in a paper (editor's view).

This article is the second in the series. The first article was: "[Six things to do before writing your manuscript.](#)"

Steps to organising your manuscript (Borja, 2014)

Step 1: *Prepare the figures and tables – these essentially form the basis of your results*

Step 2: *Write the Methods*

Step 3: *Write up the Results*

Step 4: *Write the Discussion*

Step 5: *Write a clear Conclusion*

Step 6: *Write a compelling Introduction*

Step 7: *Write the Abstract*

Step 8: *Compose a concise and descriptive title*

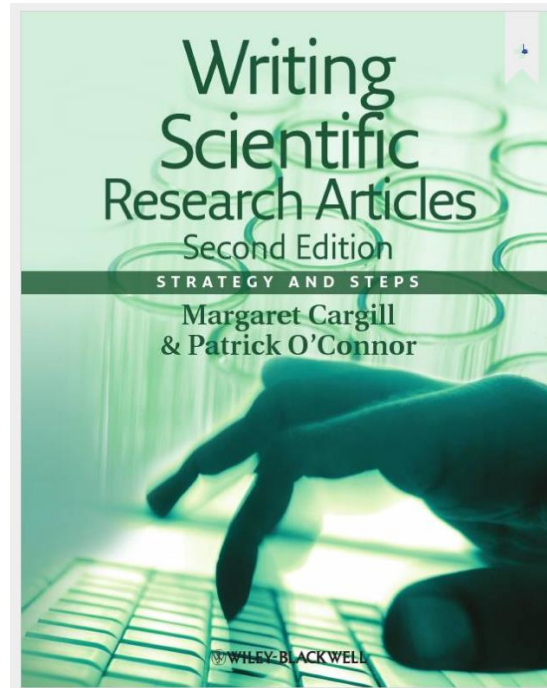
Step 9: *Select keywords for indexing*

Step 10: *Write the Acknowledgements*

Step 11: *Write up the References → use a referencing software with in-text citation functionality (e.g. EndNote, Zotero)*

These steps are just one way to approach organising a manuscript and you may choose to do it slightly differently. For example, it might be more practical to write the results directly after generating tables and figures while the study results are fresh in your mind. You might already have a title for the paper from your study protocol.

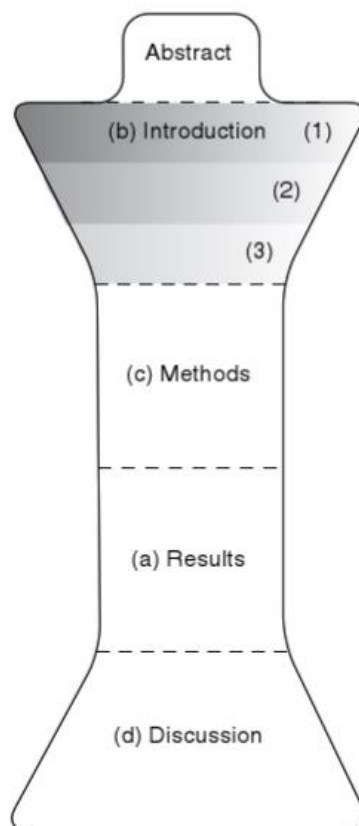
- Text books



Structure of original research articles

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A framework for success



- (a) The whole structure is governed by the Results box; everything in the article must relate to and be connected with the data and analysis presented in the Results section.
- (b) (1) The Introduction begins with a broad focus. The starting point you select for your Introduction should be one that attracts the lively interest of the audience you are aiming to address: the international readers of your target journal.
- (3) The Introduction ends with a focus exactly parallel to that of the Results; often this is a statement of the aim or purpose of the work presented in the paper, or its principal findings or activity.
- (2) Between these two points, background information and previous work are woven together to logically connect the relevant problem with the approach taken in the work to be presented to address the problem.
- (c) The Methods section, or its equivalent, establishes credibility for the Results by showing how they were obtained.
- (d) The Discussion begins with the same breadth of focus as the Results – but it ends at the same breadth as the starting point of the Introduction. By the end, the paper is addressing the broader issues that you raised at the start, to show how your work is important in the “bigger picture.”

From Cargill and O'Connor, *Writing Scientific Research Articles: Strategies and Steps, Second Edition*, 2013.

The most commonly used structure for original research articles is **AIMRaD** → representing **Abstract, Introduction, Methods, Results and Discussion**. There are a variety of other forms where certain sections are named differently, appear in a different order, are combined, or are included in supplementary material. However, a common element among most structures is that the results forms the centrepiece of the manuscript, with all other elements connecting to them.

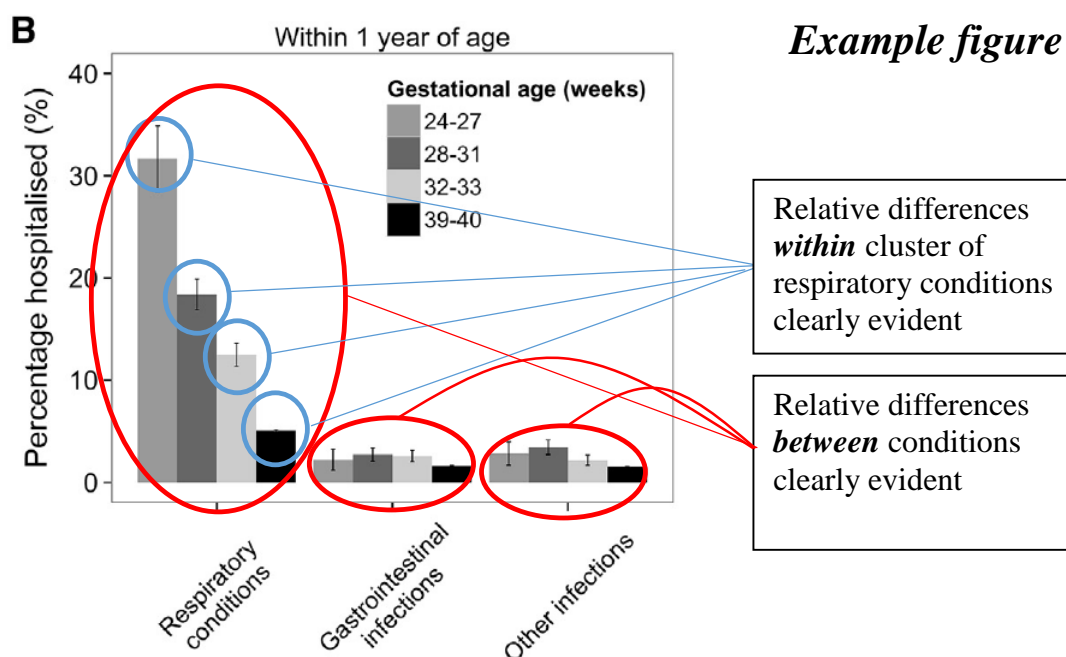
Writing each section of an article

1. RESULTS

As the centrepiece of a manuscript, the **results** is often the best section to start with. The idea here is to form a “story” based on your study that readers can engage with, and which is typically composed of a series of key-points or take-home messages made up of the main study findings. The elements that underpin the main study findings (and thus the “story”) are the figures and tables, and their associated figure legends and table titles. The bulk of the results in a paper should be found in the tables and figures, with only small amounts of results reported as text.

Key concept: draft tables and figures, and, from them, generate a series of bullet points of the main study findings that form the basis of the results section.

The purpose of data, statistics and study findings is to provide evidence to support or refute the study hypotheses. How this information is presented is very important, as it forms a crucial part of the overall story, and can be used as a tool to emphasize key points. Figures and tables both convey data, but are used for different purposes. **Tables** are good for displaying large amounts of actual data and statistics, which can be compared across a number of groups or classification variables. **Figures**, on the other hand, use a visual medium to convey study results with “size” and “magnitude” represented by shapes. Figures are useful for showing trends (e.g. scatter plot) and relative results (e.g. bar chart) whereas tables are useful for displaying actual values.



Example table

Table I. Maternal and infant characteristics by gestational age group, NSW, 2001-2011

Characteristics	Gestational age, wk								
	24-27		28-31		32-33		39-40		
	n	%	n	%	n	%	n	%	
Maternal age, yr									
<20	219	6.0	353	4.9	394	4.4	19 568	3.6	
20-34	2575	70.4	5165	71.4	6389	70.9	405 727	75.2	
≥ 35	865	23.6	1717	23.7	2222	24.7	114 153	21.2	
Parity									
Nulliparous	1842	50.4	3580	49.6	4268	47.5	220 404	40.9	
Multiparous	1813	49.6	3641	50.4	4725	52.5	318 438	59.1	
Plurality									
Singleton	2934	80.2	5239	72.4	6423	71.3	538 180	99.7	
Multiple	725	19.8	1996	27.6	2584	28.7	1451	0.3	
Marital status									
Married/de facto	2673	75.0	5331	75.8	6762	77.0	439 700	83.4	
Not married	892	25.0	1703	24.2	2017	23.0	87 365	16.6	
Smoking status									
No	2825	77.4	5636	78.1	7070	78.7	468 305	87.0	
Yes	825	22.6	1581	21.9	1914	21.3	69 977	13.0	
Remoteness									
Urban	3186	88.8	6366	89.2	8014	89.8	474 068	88.8	
Rural	401	11.2	773	10.8	909	10.2	59 527	11.2	
Socioeconomic status									
Disadvantaged	678	18.9	1346	18.9	1570	17.6	86 273	16.2	
Average	2235	62.3	4376	61.3	5495	61.6	321 187	60.2	
Advantaged	674	18.8	1418	19.9	1858	20.8	126 143	23.6	

Harder to detect trends

Vast amounts of actual values and statistics

Figure legends: Try to use informative titles (i.e. what is happening), with additional information allowing the figure to stand alone or be informative without reference to the text.

For example, for Figure B above, a legend could be: **Decreasing gestational age is associated with increased risk of hospitalisation for infections (the legend title).** Data represent percentage (%) of the birth cohort hospitalised within the first year of life for respiratory, gastrointestinal and other infections by gestational age at birth. Error bars represent 95% Confidence Intervals (of the estimated percentage) – *the legend text.*

Cargill and O'Connor (2013) suggest figure legends have a general form with five parts as follows:

1. A title which summarizes what the figure is about.
2. Details of results or models shown in the figure or supplementary to the figure.
3. Additional explanation of the components of the figure, methods used, or essential details of the figure's contribution to the results story.
4. Description of the units or statistical notation included.
5. Explanation of any other symbols or notation used.

Table titles: Also try to use informative titles, but might have to be more general given the nature of tables. Table symbols are commonly described in footnotes.

How to package study findings into sentences – 3 Key elements of results sentences

- Statements that **locate** figures and tables (where are the results)
- Statements that **highlight** and emphasize important findings
- Statements that **comment** on findings (but do not discuss)

Example

Table 1 displays maternal and infant characteristics by gestational age group (**location statement**). Young (<20 years) and older (≥ 35 years) maternal age groups were overrepresented in pre-term births (**highlight**), ³suggesting that pre-term birth may, in part, be explained by a lack of maturity/support (younger mothers) and increased risk of adverse conditions due to biological changes (older mothers) (**comment**).

Use of tense in Results sections

Generally, **past tense** should be used in the results section when content refers to the completed study (what was done and found). Present tense is used when describing facts or referenced material that is generally accepted to be “always true”.

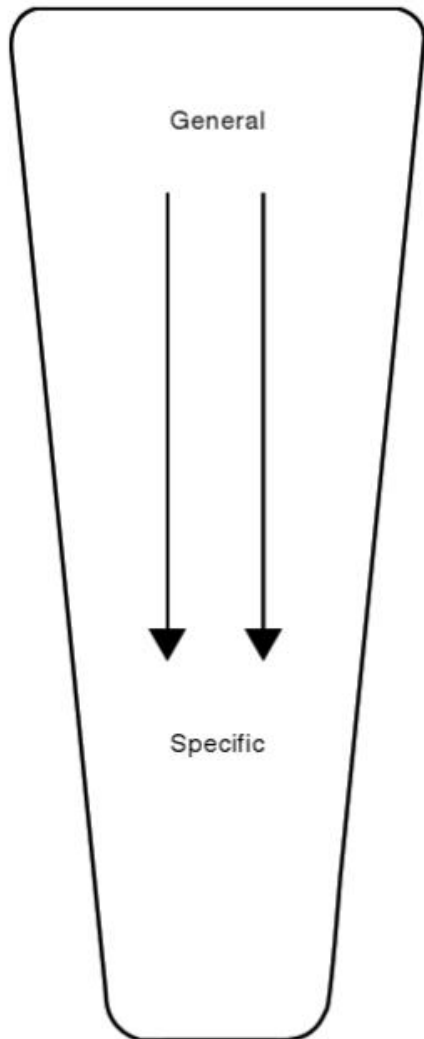
2. MATERIALS AND METHODS

The main purpose of the materials and methods section is to provide sufficient information to the reader on how the study was done, and, ideally, with enough detail such that the study can be replicated. However, this level of detail (to allow for replication) is often not provided in published articles, and the materials and methods section generally provides broad guidance on how that study was conducted and how the findings were obtained. This provides crucial context for the reader should they need it.

The materials and methods section are often field specific, and looking at the structure of the materials and methods sections of field-relevant articles may be useful for determining what structure to use. It is important to cover key aspects of studies such as the study population, intervention, comparator, outcome and data analysis in the methods section.

3. INTRODUCTION

The introduction is a critically important part of a manuscript as it provides the context and the setting for the rest of the paper. *Cargill and O'Connor (2013)* propose 6 argument stages for the introduction consisting of a series of statements that progress from being “general” in nature towards being more and more “specific”.



- (1) Statements about the field of research to provide the reader with a setting or context for the problem to be investigated and to claim its centrality or importance.
- (2) More specific statements about the aspects of the problem already studied by other researchers, laying a foundation of information already known.
- (3) Statements that indicate the need for more investigation, creating a gap, a need for extension, or a research niche for the present study to fill.
- (4) Very specific statements giving the purpose/objectives of the writer's study or outlining its main activity or findings.
- (5) Statement(s) that give a positive value or benefit for carrying out the study (optional).
- (6) A "map": statements telling how the rest of the article is presented (only in some research fields).

From Cargill and O'Connor, Writing Scientific Research Articles: Strategies and Steps, Second Edition, 2013.

Stage 1: General statements – *Cargill and O'Connor (2013)* describe stage 1 as “locating your project within an existing field of scientific research”. Essentially here, there will be a series of general statements specific to the field of research or project to provide context.

Stages 2 & 3: Specific statements and identification of the gap – In stage 2, statements become more specific to the research problem, and should include reference to current literature of closely related or similar studies. In stage 3, the gap in the literature is identified, and is used to substantiate the need for the current study.

Stage 4: Statement of purpose or main activity – In this stage, statements describe the main purpose of the study and broadly how the study will achieve this. E.g. In this study, we investigated ...

Stages 5 & 6: Highlighting benefit and mapping the article – These stages are not necessarily found in all articles, and are considered optional. It's probably more common to include stage 5, to highlight the likely impact of the study.

Example of stages 1-3 (very simplified!)

(Stage 1) Perinatal loss of an infant is a highly traumatic life event, and can lead to complicated grief and long term psychological distress if inadequate bereavement support is provided. The ultimate aim remains to prevent all perinatal foetal loss where possible.

(Stage 2) Perinatal mortality rates have declined sharply over the last 30 years, with recent data showing rates of x-y per 1,000 births in many Western nations. Numerous interventions and changes in management of pregnancy and clinical practice have contributed to these declines. Among these has been the focus on optimising maternal health with interventions and initiatives such as x, y and z generally accepted as having had the greatest impact.

(Stage 3) However, perinatal mortality rates still remain at x in Australia, with rates having stabilised over recent time, and it remains largely unknown, at a population-based level, how infant health outcomes vary by maternal health, and specifically by prior maternal medical conditions. Gaining an understanding of the impact of prior maternal medical conditions on infant outcomes may help with the development of tailored risk profiles for use in the management of pregnancy.

4. DISCUSSION

The main purpose of the discussion is to highlight the **main, novel findings** of the study and **contextualise** them with reference to and discussion of existing literature.

Cargill and O'Connor (2013) propose a general structure for the discussion composed of a number of predetermined sections (as follows directly from the text):

9.2 Information elements to highlight the key messages

The types of information commonly included in Discussion sections are given below: this list can form a checklist for you as you write. You may not have - something to say under every point in the list for every result you discuss, but it is worthwhile thinking about each element in turn as you draft the section.

1. A reference to the main purpose or hypothesis of the study, or a summary of the main activity of the study.
2. A restatement or review of the most important findings, generally in order of their significance, including
 - a. whether they support the original hypothesis, or how they contribute to the main activity of the study, to answering the research questions, or to meeting the research objectives; and
 - b. whether they agree with the findings of other researchers.
3. Explanations for the findings, supported by references to relevant literature, and/or speculations about the findings, also supported by literature citation.

4. Limitations of the study that restrict the extent to which the findings can be generalized beyond the study conditions.
 5. Implications of the study (generalizations from the results: what the results mean in the context of the broader field).
 6. Recommendations for future research and/or practical applications (after Weissberg & Buker 1990).
-

From Cargill, Margaret, and Patrick O'Connor. Writing Scientific Research Articles: Strategy and Steps, John Wiley & Sons, Incorporated, 2013.

- Guidelines (with checklists) – *STROBE (observational studies), PRISMA (systematic reviews and meta-analysis), CONSORT (randomised controlled trials)*
- Other resources

Elements of Style by Strunk

<http://www.bartleby.com/141/index.html>

How to publish a scientific paper, by Sharon Downes, CSIRO

http://biology-assets.anu.edu.au/hosted_sites/Scott/how-to-publish-a-paper.html

- Elsevier

How to give a dynamic scientific presentation

Convey your ideas and enthusiasm – and avoid the pitfalls that put audiences to sleep

By Marilyn Larkin Posted on 4 August 2015

 Print  PDF

SHARE STORY:

Giving presentations is an important part of sharing your work and achieving recognition in the larger medical and scientific communities. The ability to do so effectively can contribute to career success.

However, instead of engaging audiences and conveying enthusiasm, many presentations fall flat. Pitfalls include overly complicated content, monotone delivery and focusing on what *you* want to say rather than what the audience is interested in hearing.

Effective presentations appeal to a wide range of audiences – those who work in your area of interest or in related fields, as well as potential funders, the media and others who may find your work interesting or useful.



This article by Marilyn Larkin (an award winning science writer and editor) and published by Elsevier provides advice on how to approach and construct an effective scientific presentation. The article is split into three sections covering: 1) content; 2) You; and 3) dos and don'ts.

Content

1. Know your audience

You must develop and pitch your presentation to match your target audience, and make sure that you communicate in a way that is understandable (e.g. will you present to colleagues, researchers in your field, or consumers?)

2. Tell audience members up front why they should care and what's in it for them

Is this new information that will impact their work? Is it a new technique or treatment in their field? Does it confirm or refute a hypothesis?

3. Convey your excitement

This likely relates to the pitch and tone with which you should try to deliver your presentation. It's not always possible to be excited about your presentation (overly nervous, you were asked to fill in...), but it's probably worth making an effort to convey some enthusiasm for the content (or act it).

4. Tell your story

Marilynn indicates that a presentation is *your story*, which has a beginning, a middle and an end. A convenient way to fill the beginning, middle and end is to follow the structure of a journal article and include:

- Some background and the purpose of the study (introduction)
- How you did your study (methods)
- The main study findings (results)
- What the results mean (discussion)

5. Keep it simple

Try not to overly complicate things. Focus on the main study findings and their interpretation within the context of current knowledge. Focus on the impact of the study and what the implications are (Further research? Translation? ...). Avoid the excessive use of jargon and acronyms.

You (the presenter)

1. Set the stage

Practice your presentation (many times); become familiar with the venue by getting there earlier and walking the room; make sure you are familiar with the equipment

2. Get ready to perform

A presentation is a performance, and it's critical that you know your lines and the subject. It's not necessary to memorise your talk, although some do. The key is to revise your talk in such a way that you are able to pick up cues from the presentation slides such that you can communicate the main points (a number of different ways).

Tips on addressing fear and being nervous (it's pretty normal to be nervous before a talk):

Focus on ***breathing*** deeply and slowly a few minutes before your talk

Visualise yourself giving the talk

Do affirmations (you are relaxed, confident, the best ...)

Assume one or more "power poses"

3. Stride up to the podium

4. Stand tall and keep your chest lifted

I.e. Be conscious of your presentation and try to look confident

5. **Smile**

6. **Speak up**

7. **Take your time (don't rush)**

8. **Try to talk to the audience**

9. **Keep to time (very important!)**

10. **Finish strong**

For example – “That concludes my presentation. Thank you for your attention.”

Dos and don'ts

Less is more: Marilyn suggests using 20-25 slides per 1 hour of presentation. However, I don't think there are any hard and fast rules about how many slides you should have. The key here is to have slides that **support** what you are saying in a clear and concise way. Therefore, slides are really a **visual medium** that supports your talk.

Create sections: Use a title slide to start a new section or change the subject. This will also help you organize your presentation and make sure it flows logically.

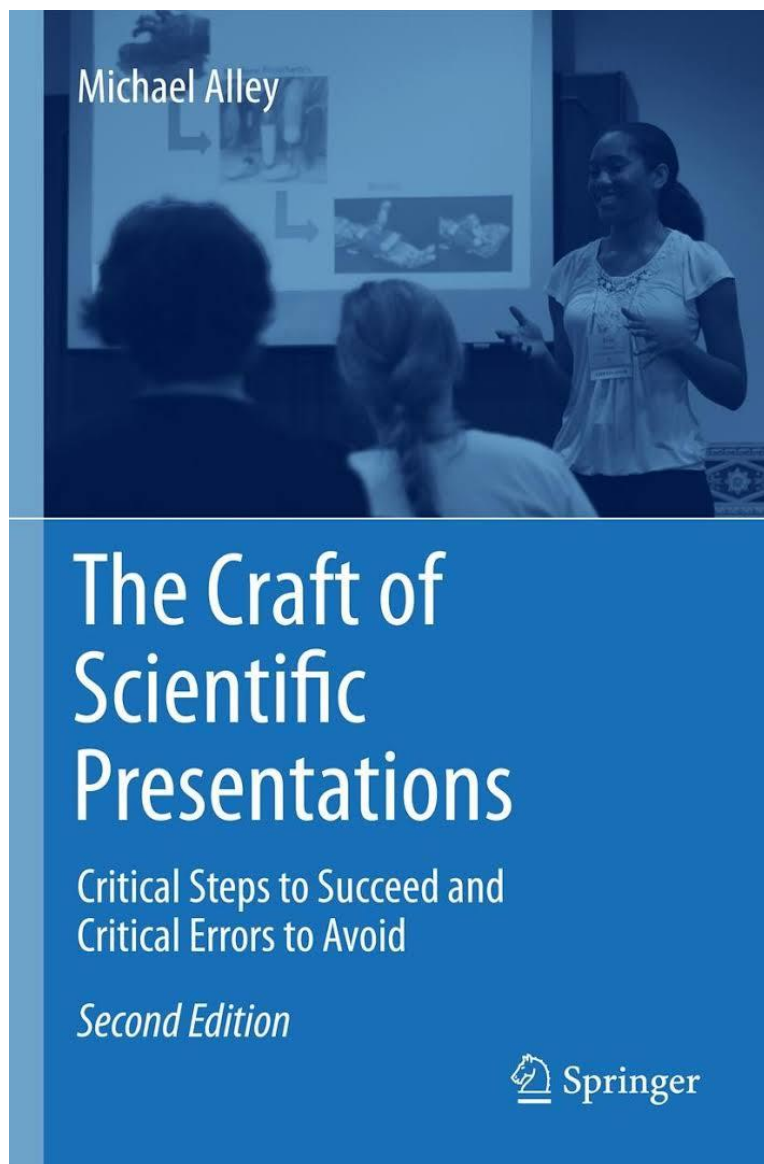
Avoid clutter: Ensure slides are **not too busy**. Excessive content makes reading slides difficult (for the audience and you), and the audience will not be as engaged. Limit the use of text, and, if you do use text, try to limit them to keywords and not full sentences.

Make it readable: In other words, make sure text font and images/figures are big enough. This is a bit like creating Figures for a publication, make sure all font is big enough to read at 100% zoom.

Use visuals: Figures, images, cartoons and pictures are all really great to support your talk. However, the same rules apply as those for text and do not overly complicate slides (nothing is stopping you using one figure per slide).

Check your spelling and grammar (as best as you can...)

- Text books



- Other resources

Oral Presentation Structure, by scitable

<http://www.nature.com/scitable/topicpage/oral-presentation-structure-13900387>