How to improve the impact and readability of your scientific manuscripts

Rosie Perkins, PhD
Who is your audience?

• Co-authors
• Journal editor
• Reviewers
• Scientists in your field
• Scientists in other fields
A readable manuscript

- Good structure
- Clear message
- Simple and concise
- Attention to audience
How to begin

• Make figures and tables
• Work out which data to use, sufficient data
• Outline results section using subheadings
• Summarize your central message in two or three sentences
• Literature search
• Don’t focus too much on details
When to use your central message

- Hypothesis
- Final paragraph of introduction
- First and last paragraphs of discussion
- Title
- Abstract
- Refer to it when writing results
Choose a journal

- Decide early on
- Audience – editor, reviewers, readers
- Be realistic
- Instructions for Authors and recent issue of journal
  - word count
  - number of figures and tables
  - overall style
Order to write

1. Figures and tables
2. Results and methods
3. Introduction and discussion
4. Abstract
5. Title
Make clear figures

- Decimal points, not commas
- Dependent variable on y axis
- Label axes and don't forget units
- Independent variable on x axis
- Clear key
- Line width >1 pt
- Axes don't extend beyond range of data

Graph showing the height of sunflowers over time with water and no water conditions.

- Height of sunflowers (cm) on the y-axis.
- Time (days) on the x-axis.
- Water represented by circles.
- No water represented by squares.
This is a boring figure

Plasma insulin (mmol/l)

Controls  Patients

ns
Do’s and don’t’s

• Do use a figure if it will increase the impact of your data
• Do use the same format for all figures
• Do start with control (on left, first in key)
• Don’t repeat same data in separate panels
• Don’t repeat data already published
Do spend a lot of time on figures

- Create a good impression
- Increase the impact
- Improve the readability
Figure legends

• Brief title
  – Figure 1. Lack of water reduces growth of sunflowers.

• Describe all panels, clearly

• Minimize experimental detail and discussion

• Include statistical information
  – Data are mean±sd; n = 5; *p<0.05
Tables

- Don’t include too much data
- What is required to tell your story
- Use to avoid lots of data written out in main text
Don’t compare data by rows

<table>
<thead>
<tr>
<th></th>
<th>No.</th>
<th>Age, years</th>
<th>Body weight, kg</th>
<th>Height, m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>98</td>
<td>54.1±10.7</td>
<td>72.8±7.8</td>
<td>1.6±0.1</td>
</tr>
<tr>
<td>Patients</td>
<td>101</td>
<td>63.9±15.0</td>
<td>85.6±10.4</td>
<td>1.8±0.1</td>
</tr>
</tbody>
</table>
Table 1. Characteristics of the control and patient groups

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Control</th>
<th>Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of subjects</td>
<td>98</td>
<td>101</td>
</tr>
<tr>
<td>Age, years</td>
<td>54.1±10.7</td>
<td>63.9±15.0</td>
</tr>
<tr>
<td>Body weight, kg</td>
<td>72.8±7.8</td>
<td>85.6±10.4</td>
</tr>
<tr>
<td>Height, m</td>
<td>1.60±0.08</td>
<td>1.83±0.12*</td>
</tr>
</tbody>
</table>

* p<0.01 versus control

Consistent no. of digits

Define any symbols
Citing figures and tables

• Refer to ALL the figure panels and tables in sequential order
• Aim for one figure per subsection
• Mainly cited in results, sometimes methods, avoid in discussion
• Don’t repeat data from figures and tables in the main text
Results

• Limit interpretation – save this for the discussion
• Use subheadings to summarize results
  – state key finding
  – orientate the reader
• Present most important changes first in each section
Don’t overinterpret your results

- Correlations
- Non-significant changes
- Appropriate statistical tests
- Compare with control
- Reviewers will jump on overinterpretation
Methods

• Write in parallel with results
• Sufficient information to allow another scientist to repeat your experiment
• Don’t need to reproduce details of a published protocol
  – as previously described (Ref. 37)
A diagram can help explain a complicated protocol

Variable rate of 20% glucose infusion
Insulin 1 mU/kg/min

Tracers

0 30 150 270 390 510

Adiels et al. Diabetologia 2007
Methods

• Order logically to match order in results section
• Use subheadings
• Don’t put results here - exceptions
• Include ethical considerations and statistical methods
Limit your introduction to three paragraphs

1. Background
   not too general

2. Gaps in the knowledge
   opens up questions

3. Aim of your study
   hypothesis, objectives,
   central message
Discussion

• Don’t repeat introduction
• First paragraph
  – summary of key findings, central message
• One results subsection per paragraph
• Discuss ALL your results
• Final paragraph
  – implications of your results in general context
Discussion to mirror introduction

**Introduction**

1. Background
2. Gaps in the knowledge
3. Aim of your study

**Methods and results**

**Discussion**

1. Summarize key findings
2. Compare and contrast
3. Limitations
4. Suggestions for further work
5. Conclusion and implications
References

• A reference for every result, idea or quotation taken from another source
• Original primary study not review articles
• Avoid plagiarism: restate author’s findings in your own words
• Literature search
Abstract

• A shortened version of the paper
• Write (or rewrite) when you have finished full paper
• Check word count and journal style
• Very important as it will encourage scientists to read the full text
A title should summarize the key message

- Not too technical
- Check word count
- No abbreviations
- Very important as it will encourage scientists to read the abstract
- State what you have shown
Good titles?

Investigation of the effects of low dose aspirin therapy on primary and secondary prevention of cardiovascular disease

Cyclooxygenase-2 controls energy homeostasis in mice by de novo recruitment of brown adipocytes

Metabolic syndrome
Good titles?

The Wnt/beta-catenin pathway is required for the development of leukemia stem cells in acute myelogenous leukemia

Interleukin-6 and interleukin-10 gene polymorphism, endothelial dysfunction, and postoperative prognosis in patients with peripheral arterial disease
Good titles?

The effect of dimerumatic acid on LPS-induced downregulation of Mrp2 in the rat

Creation of a bacterial cell controlled by a chemically synthesized genome
First draft

- Plan first
- Write without worrying about grammar
- Remember the central message
- Write the paper in parts
- Leave the first draft for a few days
- Read it through
A readable manuscript

- Good structure
- Clear message
- Simple and concise
- Attention to audience
Writing good English

- Clarity
  - essential to get your message across

- Simplicity
  - avoid complicated words

- Brevity
  - female individuals = women
  - in order to =
Use simple terms

Instead of
• Utilize
• Prior to
• Demonstrate
• Due to the fact that
• Sacrifice
• It has long been known that

Write
• Use
• Before
• Show
• Because
• Kill
• I’m too lazy to find the correct reference
Use simple terms

• Prior to sacrifice, the mice were starved overnight
• The mice were killed after an overnight fast
How to keep it short

- Ten patients, six male and four female individuals, with [the disease] were included in the study during acute relapse, and repeated blood sampling was performed after a further 3 months.
- Blood samples were taken from six men and four women with [the disease] at acute relapse and 3 months later.
Don’t ramble

• One thought per sentence
• Avoid sentences with >2 subclauses
• Logical order
  – sentence B follows sentence A…
  – don’t assume that the reader knows the missing parts
- Collect related thoughts into a paragraph
  - not too long
- Don’t end a paragraph with first sentence of next paragraph
- Logical order
  - paragraph B follows paragraph A…
Use active verbs

• Active is easier to read
  – he cut the grass
• Passive is very formal
  – the grass was cut by him
Use active verbs

• Food was consumed by the obese mice at a higher rate than their wild-type littermates
• The obese mice ate more than their wild-type littermates
Human studies

• Don’t use man (unless you mean man), use human
• Be sensitive
  – avoid use of diabetics, asthmatics
• Use who/whom not that/which when referring to people
  – …in ten subjects from which we had sufficient amounts of RNA…
Before you submit

- Check Instructions to Authors
- Check figures and tables cited
- Optimal use of subheadings
- Check facts
- Check references, no., accuracy, style
- Check language and spelling (US or UK?)
- Ask someone else to read through
Summary

• Tell a story
• Good structure
• Central message
• Clear, concise and consistent
• Think about your audience
• Revision is essential
• It takes a lot more time than you think
It gets easier with practice

’Experience is that marvelous thing that enables you to recognize a mistake when you make it again’

Franklin P Jones
Tense

• Use past tense for results described in your paper
• Use present tense for results from published papers
US vs UK spelling

US spelling
- Color
- Organize
- Characterize
- Analyze
- Advertise

UK spelling
- Colour
- Organise, -ize
- Characterise, -ize
- Analyse
- Advertise
### US vs UK spelling

<table>
<thead>
<tr>
<th>US spelling</th>
<th>UK spelling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modeling</td>
<td>Modelling</td>
</tr>
<tr>
<td>Labeling</td>
<td>Labelling</td>
</tr>
<tr>
<td>Enrollment</td>
<td>Enrolment</td>
</tr>
<tr>
<td>Anemia</td>
<td>Anaemia</td>
</tr>
<tr>
<td>Fetus</td>
<td>Foetus</td>
</tr>
<tr>
<td>Feces</td>
<td>Faeces</td>
</tr>
<tr>
<td>Program</td>
<td>Program(me)</td>
</tr>
</tbody>
</table>
Abbreviations

- Limit abbreviations
- Don’t define standard abbreviations
  - DNA, h, min
- Define all others at first mention
- Check abbreviation is used again
- Space between number and unit
  - 36 h, 35 nmol/l
  - exceptions: 53%, 34°C
Common word errors

• Data are plural
• Compare with: to examine differences and similarities
  – almost always what you should use in scientific writing
• Compare to: to liken to without analysis
  – ’shall I compare thee to a summer’s day’
Spelling

• Misspellings reflect careless attitude
• Spellcheckers will not spot all your mistakes
  – treating the mouse as a hole
  – were or where
  – pier review
  – witch or which
  – personal or personnel
Style for references

- Follow journal style
- Use Endnote, but check in journal


- Is volume no. bold?
- En dash or hyphen for page range?
- How many authors before *et al.* is used?
- Use correct abbreviation