Scientific Writing: Manuscript Structure

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1

I've been reading, so you don't have to

2

Citations and recommended reading - 1

Gopen & Swan. The science of scientific writing. American Scientist. 1990; 78:550-8.

Grant. Right your writing. The Scientist. 23:65. (interview with Swan.)

Schimel, Joshua. Writing Science: How to write papers that get cited and proposals that get funded. Oxford University Press, New York, NY. 2012.

Dent, Christopher. Writing in Science & Medicine: The Investigator's Guide to Writing for Clarity and Style. Principal Investigator's Association. Bonita Springs, FL. 2014.

Matthews, Bowen & Matthews. Successful Scientific Writing. A step-by-step guide for the biological and medical sciences. Cambridge University Press, 1996.

Miller. Paper-writing guide. Version 2,002,213.

3

Citations and recommended reading - 2

Zinsser, William. On Writing Well. HarperCollins, New York, NY. 2006.

Douglas, Yellowlees. The Reader's Brain: How Neuroscience Can Make You a Better Writer. Cambridge University Press, Cambridge, UK. 2015.

Pinker, Steven. The Sense of Style: The Thinking Person's Guide to Writing in the 21st Century. Penguin Books, New York, NY. 2014

Garner, Bryan. Garner's Modern American Usage. Oxford University Press, New York, NY. 2009.

Strunk and White. The Elements of Style, 4th edition. Pearson, Boston, MA. 2000.

Thurman, Susan. The Only Grammar Book You'll Ever Need. Adams Media, Avon, MA. 2003.

Straus, Jane. The Blue Book of Grammar and Punctuation. Jossey-Bass, San Francisco, CA. 2008.

4

You are a writer

As a scientist*, you are a professional writer.

- Schimel

*or epidemiologist, clinical investigator, health behavior researcher, or any other researcher…

5

What is the purpose of scientific writing?

6

What is the purpose of writing*?

Communication

*Several points are adapted from Gopen & Swan

7

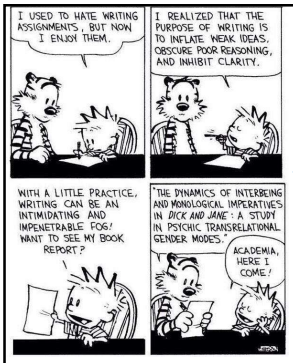
What is the purpose of writing*?

Communication

Write for the READER

*Several points are adapted from Gopen & Swan

8



Calvin & Hobbes, ©Watterson 1993

"There is no form of prose more difficult to understand and more tedious to read than the average scientific paper."

- Francis Crick, *The Astonishing Hypothesis*, 1994*

How do you know a paper is well written?

When you can read it once and understand it!!!

Our goal is to prove both Calvin and Crick wrong!

*cited in Dent, Writing in Science and Medicine

9

Understanding scientific writing

The best science writers learn that science is not a procession of facts and breakthroughs, but an erratic stumble toward gradually diminished uncertainty; that peer-reviewed publications are not gospel and even prestigious journals are polluted by nonsense; and that the scientific endeavor is plagued by all-too-human failings such as hubris.

Ed Yong. What Even Counts as Science Writing Anymore? https://www.theatlantic.com/science/archive/2021/10/how-pandemic-changed-science-writing/620271/

Our goal?
Be as forthright as we can be; limit the nonsense (keep the dumpster empty); be humble.

Photo: https://www.tahoedailytribune.com/news/trash-in-tahoe/

10

Common types of scientific writing

Manuscripts

Proposals

Protocols

These types of writing differ, but practice in one area will benefit writing in another

11

Writing is a skill

Like all skills, it will become easier with practice…so practice!!!

Identify opportunities to write and take them

Write and edit. Editing is the essence of writing.

12

How can I learn to write better?

Read – as many proposals and papers as you can

Write – whenever you have the chance. Volunteer to write (protocols, papers), but follow through

Read – keep reading. Look for clear, concise, compelling papers. When you find papers that you like, figure out why. Identify good writing guides → and use them!

Write – keep writing

13

Learning to write

Do not expect perfection

Learn to edit your OWN writing.

It's challenging to edit your own writing, especially for clarity. You know what you're trying to say, so it is clear to you!

14

Learning to write

Do not expect perfection

Learn to edit your OWN writing.

Look for red ink menters

Great start.
Here are a "few" comments:
…

15

What this course is about…

Structure of a manuscript: how to use manuscript structure to enhance communication

Improving your writing to communicate clearly: developing your writing skills

Getting the writing done: how to make writing a priority

Editorial & review process: how journals work, what to expect, how to respond to reviewers (and be a good reviewer yourself), and journal metrics

16

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17

The STORY

Tell a story!

Tell a story!!

Tell a story!!!

Whether a manuscript or a grant, tell a compelling story

What are the MAIN things you want the reader to know and remember?

1 or 2!!!

REMEMBER: Most of us will remember only one or two key points from a paper

18

How do you read papers?

Write for the reader

We have expectations about paper structure. When things are out of place, we have difficulty understanding and it may reduce our confidence in the authors

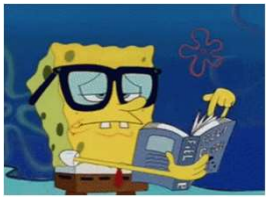
Our expectations carry all the way down from paper sections to paragraphs to sentences.

We've learned to expect certain things; when those expectations are not met, our writing is unclear.

19

How do you read papers?

When rushed – how do you read papers?



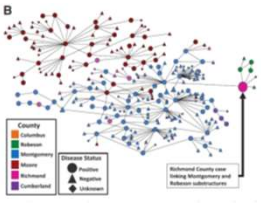
20

How do you read papers?

When rushed – how do you read papers?

- Abstract
- 3rd paragraph of introduction
- Tables/results/figures
- Discussion

Topic sentences



21

What do you need to know before you start?

22

Where to publish – target audience?

May have to weigh:

Target audience for the science

Best journal for your career

23

Find the target audience → find the target journal

Who is the target audience?

With audience in mind, select journal

Format according to journal requirements
- names of some sections may vary:
introduction = background, unnamed

Generalists or specialists?

Public health vs clinical?

Consider both the science
and
your personal career needs

24

Where to publish? Which journals?

Different journals have different personalities, expectations

Do your homework – know what the journal has been publishing

Use your literature review to guide you. Do some additional checks in Pubmed

Get additional advice from your mentors, advisors, colleagues, and co-authors

Check out jane.biosemantics.org

Does your paper fit?

Match the paper to the journal's personality as best you can

Will they write a commentary/editorial?

A specialty journal may give more attention to your paper than a more general journal

25

Aim high, but be realistic

Aim high, at least for the first submission

If you don't try for a good journal, you won't get it published in a good journal

but be realistic → aim for the best journal that you have a believable chance

If you get a review from a good journal, it will be a useful review
→ your paper will be improved, even if you are rejected

26

With journal in mind, write the paper!

27

Manuscript structure – a formula

All papers are different BUT the structure is similar

Research manuscripts typically follow a general formula

If you follow this general formula, you'll find it much easier to write

AND your readers will be more likely to understand your paper & take away the points you want them to take away

28

Advantages of this basic structure

Meets readers' expectations

Facilitates communication

Writer knows what to put where

Expedites writing

29

Basic Structure (Quantitative): Part 1

Introduction:
2-4 paragraphs
- big picture
- gap
- aims

Methods:
- design
- population
- (intervention)
- outcome, exposure, other variables
- statistical analyses

30

Basic Structure (Quantitative): Part 2

Results:

- Response rates (eligibility, etc)
- Population description (Table 1)
- Bivariable relationships (Table 2)
- Multivariable analyses (Table 2 or 3)
- Additional specific analyses or sensitivity analyses

31

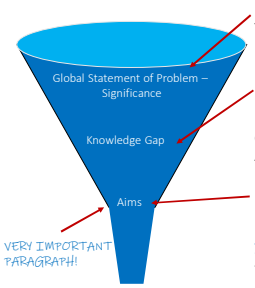
Basic Structure: Part 3

Discussion:

- Overview of findings in context
- Interpretation of findings in relation to other literature
- Full discussion of other limitations not incorporated into interpretation
- Implications
- Conclusion

32

Introduction: a funnel (3 paragraphs)



Paragraph 1 – A "global" introduction.
The medical or public health context Why is it important?
Don't dwell on obvious or begin too broadly

Paragraph 2 – A specific introduction (with gaps in knowledge.)
Brief summary of existing knowledge
Focus on the science, not the literature
Often the longest paragraph of intro; may be split into two
Avoid most specifics here – those will go in discussion

Paragraph 3 – Overview of your aims or hypothesis
How does your study address knowledge gaps?

Introduce the story:
set the stage for the rest of the paper.

33

Introduction

How might the introduction differ for a general journal versus sub-specialty journal?

34

Introduction: first paragraph

Content will vary with target journal:

General journal → broader importance statement
"Chlamydial infection is the most common bacterial sexually transmitted infection."

Specialty journal → more focused (they already know the general stuff)
"Screening for *Chlamydial trachomatis* is challenging in the emergency department."

35

Methods

Study design: statement of basic design
- cross-sectional, cohort, case control, RCT

Study setting: Where study was conducted
- country, city, clinic/population

Study population:
- Who
- How recruited, including sampling process if appropriate
- Eligibility
- IRB approval (here or at end)

36

Methods

Describe intervention, if appropriate

Data collection procedures

Variable definitions/decision making
- outcome, exposure, other variables

Statistical analyses
- power/sample size calculations
- focus on bivariable & multivariable analyses
- data management issues as appropriate
- always address missing data
- sensitivity analyses

37

Methods

Structure is similar to a proposal or protocol, but with less detail.

Past tense

Subheadings

Do not skimp on describing the population or on the statistical analyses

Ideally, sufficient detail to recreate the study.

- Reality = rarely enough space

Sometimes, you may choose to include more detail in the original submission, then reduce it if you need space to respond to the reviewers' comments.

This approach gives the reviewers what they need to decide but more information than may be needed in the final paper. Be sure to tell the editor though!

38

Results

Tell the story!!!

Identify the 1 or 2 key things you want the reader to remember

Use past tense

You rarely can report all of your data or analyses

Doctoral students often struggle with this issue.
They've done all this work for their dissertation (or other project) & they want to show the world.

It's ok! For your dissertation, just move all that "extra work" to the appendix.

39

Results: Topic sentences

Tell the story!!!

Use topic sentences and other qualitative statements to make the points that you want to emphasize to the reader.

- People will remember these statements, not the specific numbers.

As an alternative measure of unprotected sex, we examined the cumulative incidence of a composite STI measure at 12 weeks. The incidence was highest in the control arm (25% at 12 weeks) as compared to the intervention (13% at 12 weeks).

40

Results

Avoid pseudo-precision. Do not report too many digits past the decimal.

Percents: rounded to nn%, n.n%, 0.nn%, or 0.0n%

Risk ratios/odds ratios: rounded to nn, n.n, 0.nn, or 0.0n

Unless the sample size (or context) justifies more significant digits

	25%	2.5%	0.25%	0.03%
RR = 15		1.5	0.15	0.02

41

Results: structure

First paragraph – eligibility, participation

Second & third paragraphs - population characteristics (Table 1)
- demographics
- key exposure, outcome variables
- do not bury outcome frequency at end of a paragraph→ highlight it!

Latter paragraphs – bivariable, multivariable analyses

*REMEMBER: Hypothesis driven questions are typically stronger than exploratory questions (i.e. dumping a bunch of variables in a model)

42

Reporting absolute information

Include the outcome frequencies, proportions, cumulative incidence, or incidence rates.

The frequencies are critical for interpretation:

Provide these data for each stratum of any factor of interest

RR = 0.4/0.2 = 2 over 10 yrs
≠
RR = 0.0004/0.0002 = 2 over 10 yrs

In a case control study, include the exposure proportions by disease status

43

Unadjusted and adjusted results

Include both unadjusted and adjusted analyses

- unadjusted analyses reflect the data as they are
- comparing unadjusted and adjusted analyses give insight into the impact of adjustment

In descriptive studies, carefully consider whether adjustment is necessary

Be clear what type of analysis you're doing:
Descriptive
Predictive
Causal

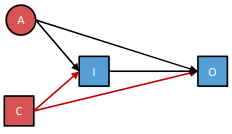
44

Beware the Table 2 fallacy

Be clear what type of analysis you're doing:

Description, prediction, causal explanation

The model interpretation varies.



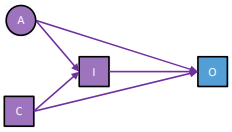
Westreich D & Greenland S. The table 2 fallacy: presenting and interpreting confounder and modifier coefficients. *Am J Epidemiol* 2013; 177:292-8.

45

Beware the Table 2 fallacy

Be clear what type of analysis you're doing:

Description, prediction, causal explanation



Description:

Report bivariable (aka univariate) RR/OR for A, C, I

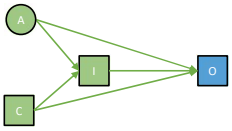
Do not do multivariable analysis

46

Beware the Table 2 fallacy

Be clear what type of analysis you're doing:

Description, prediction, causal explanation



Prediction: A, C, I may predict O

Report multivariable RR/OR for A, C, I

47

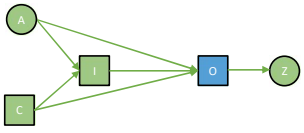
Beware the Table 2 fallacy

Be clear what type of analysis you're doing:

Description, prediction, causal explanation

Prediction: A, C, I and Z may predict O

Report multivariable RR/OR for A, C, I, Z



REMEMBER: Prediction requires additional analyses to assess model fit and performance!!!

48

Beware the Table 2 fallacy

Be clear what type of analysis you're doing:

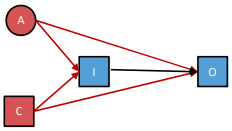
Description, prediction, causal explanation

Causality (I→O):

Adjust for A & C

Report RR/OR for I only

Do not report RR/OR for A & C



Avoiding the Table 2 Fallacy

49

Beware the Table 2 fallacy

Be clear what type of analysis you're doing:

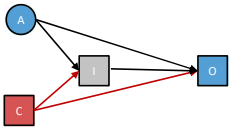
Description, prediction, causal explanation

Causality (A→O):

Report RR/OR for A

Do not adjust for I & C

Do not report RR/OR for I & C



Avoiding the Table 2 Fallacy

50

Results: supplemental & sensitivity analyses

Address the "what about" and "what if" questions with supplemental & sensitivity analyses

Incorporate after main results

May include alternative ways of handling missing data, address selection bias or measurement error, and other issues.

51

Results: tables

Make the tables pretty (sloppiness suggests the work was sloppy)

Try to keep data in column consistent (e.g. all N (%))
- consider mean +/- SD in text, categories in table

Be sure numbers in tables add to total or have footnote explaining why not

No vertical or horizontal gridlines, except to separate headings

Don't make people do math
- include all groups (e.g. Yes & No)
- the table may be bigger, but it will be clearer

52

Sample Table 1

Characteristic	Index Participants		
	Overall n=502 n (%)	Intervention n=126 n (%)	SOC n=376 n (%)
Self-identified gender			
Female	75 (15%)	16 (13%)	59 (16%)
Male	427 (85%)	110 (87%)	317 (84%)
Age at enrollment (years)			
18-19	1 (0.2%)	0 (0.0%)	1 (0.3%)
20-29	81 (16%)	21 (17%)	60 (16%)
30-39	328 (65%)	85 (68%)	243 (65%)
40+	92 (18%)	20 (16%)	72 (19%)
Unemployed (last 3 months)			
Yes	305 (61%)	78 (62%)	227 (60%)
No	197 (39%)	48 (38%)	149 (40%)
	Median (IQR)	Median (IQR)	Median (IQR)
Years since HIV diagnosis	1.4 (0.07, 6.4)	2.1 (0.08, 8.4)	0.8 (0.07, 5.9)
HIV-1 RNA (log_{10} copies/mL)	4.6 (4.0, 5.0)	4.6 (4.0, 5.0)	4.6 (4.0, 5.0)

Things to note:

Gridlines only for headings

Age given in categories; Other continuous variables at the bottom

53

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Things to note:

The n is right justified; the % is left justified in separate (hidden) columns

% and continuous variables given with correct # of digits

54

Sample Table 2

	Status[1] at 26 weeks			Time to Event[2]
	Intervention Percentage	SOC Percentage	PR (95% CI)	HR (95% CI)
Indexes				
ART	73%	36%	1.9 (1.6, 2.3)	3.6 (2.7, 4.8)
Viral suppression (<40 copies/mL)	36%	16%	2.2 (1.6, 3.0)	1.8 (1.3, 2.4)
MAT	38%	24%	1.7 (1.2, 2.2)	2.4 (1.6, 3.7)
Partners				
MAT	30%	25%	1.2 (0.84, 1.6)	1.3 (0.87, 2.0)

Abbreviations: SOC: standard of care, PR: probability ratio, HR: hazard ratio, CI: confidence intervals, ART: antiretroviral therapy, mL: milliliter, MAT: medication-assisted treatment; [1]Status reflects self-report of current ART or MAT at time interval noted; [2]Time to event reflects time to ART or MAT uptake

Things to note:

This table represents multiple outcomes and alternative analyses

Clear gap between status & time to event sections

Footnotes clearly describe content & abbreviations

55

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Abbreviations: SOC: standard of care, PR: probability ratio, HR: hazard ratio, CI: confidence intervals, ART: antiretroviral therapy, mL: milliliter, MAT: medication-assisted treatment; [1]Status reflects self-report of current ART or MAT at time interval noted; [2]Time to event reflects time to ART or MAT uptake

Things to note:

The PR is right justified; the CI is left justified in separate columns

PR,HR, and % given with correct # of digits

56

Results/Tables: a little "peeve"

Do not write: "Table 1 shows the characteristics of the study population"

Instead write: The study groups were similar after randomization (Table 1).

Do not waste words!

57

Results: a few key points

All numbers in abstract must be in results

Highlight key results from table in text

- tables provide details, text allows you to direct reader to the main findings → what you want the reader to remember
- use prose rather than numbers to help with this

Use figures when possible

58

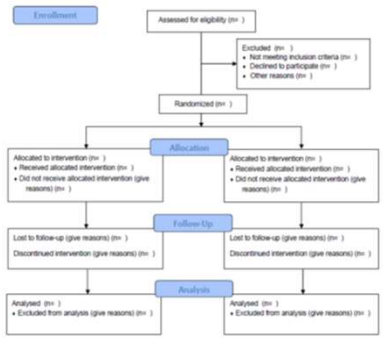
Figure 1

Most studies should have a CONSORT-type Figure 1 (even if your study is not a trial)

The CONSORT Flow Diagram includes:

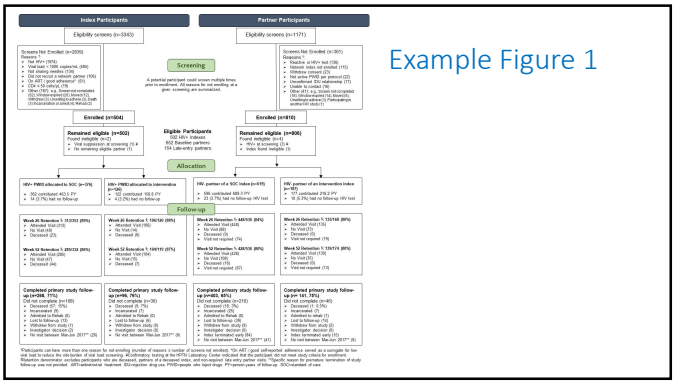
- Enrollment (assessed for eligibility, excluded, randomized)
- Allocation (intervention/control)
- Follow-up (lost to follow-up; discontinued intervention)
- Analysis (analyzed; excluded from analysis)

59



CONSORT Flow Diagram

60



Example Figure 1

61

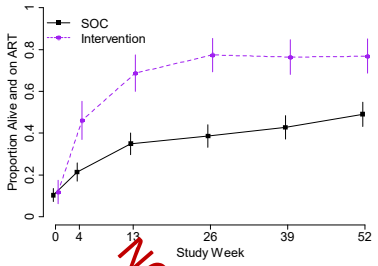


Figure 2: Proportion Alive and on ART – Index Participants.

Figure & Legend

Provide clear & complete figure descriptions—a legend is not just a title

- figure stands alone without reading main text

62

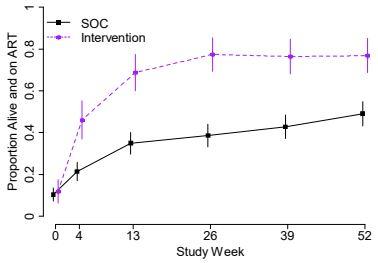


Figure & Legend

YES!!!

Figure 2: Proportion Alive and on ART – Index Participants. The figure shows the proportion of indexes who were alive at each study week and reported that they were on ART. 95% confidence intervals are calculated with the Wald method. Purple dashed line: intervention; black solid line: standard of care.

63

Unique aspects of qualitative papers

As compared to most quantitative studies, qualitative studies have a smaller sample size

Study population is often purposively sampled

Data are usually derived from in-depth interviews or focus groups

Data are transcribed, coded, themes identified

Results represent a synthesis of the identified themes

Quotes are used to exemplify the identified themes

64

Qualitative paper results

Describe the study population

Consider a table showing the demographics of the respondents
- the purpose is to allow the reader to know who was in the study

65

Qualitative paper results

Synthesize the emergent themes for the reader

Consider a visual representation of the themes, showing how the themes are interconnected

Use exemplary quotes to highlight the themes. Provide an indication of who the quote was from (e.g., gender, age, occupation)

66

Qualitative paper results

Quotes are not needed for every theme or every result.

Use quotes to provide a more powerful demonstration of a result.

Example Theme: The person who uses drugs as a victim of circumstance

"Uh, forever, I said the reason I used drugs was 'cause my dad used to beat me up all the time until I was 13 years old and like that was how I would escape it."

67

Qualitative papers and quantitative results

Avoid presenting quantitative results from a qualitative study

The purpose of the study was not quantitative

The study population is typically not representative

Do not present quantitative tables with numerical results from the study population (nearly always!)

68

Qualitative papers and word limits

Many journals have word limits (e.g., 3500 words). Qualitative papers often require more words given the nature of the results.

To stay within the word limit, consider focusing the results text on the synthesis and putting the quotes in tables .

69

Discussion: primary purpose

Convey the importance of your work

Relate your findings to previous work

Identify the limitations of your work

Identify the effect of the limitations on your work

Put your work into the larger context of the research

Remember: Readers will only retain one or two key points, not the details
- emphasize these points

70

Discussion: first paragraph

Describe your results qualitatively and put them into the context of the story

No numbers—do not restate your numerical results (or add new results!)

Drive home the take home message of the results

What do you want people to remember?

71

Discussion – paragraphs 2-3 (or more)

Link the results to existing knowledge of the science (more detail than in introduction).

If major differences with previous studies, seek to identify the potential sources for the differences (strengths! limitations!).

If similar, justify what you're adding to the literature.

Avoid speculation beyond your own results – keep the discussion to the contributions of your study.

A strong discussion is based on a full grasp of the relevant literature.

72

Discussion – quantitative vs qualitative papers

Quantitative: Results are reported with minimal interpretation in the results section. "This is what we found."

The discussion puts these results in context and interprets what the numbers mean.

Qualitative: Interpretation is a part of qualitative results—the authors must interpret and synthesize the interviews or focus groups to identify the themes

This interpretation becomes a part of the results section.

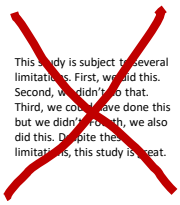
The discussion focuses on putting these results in context with what is already known and what is less clear. The contextualization may lead to deeper interpretation.

73

A special note on limitations

Avoid the "litany of limitations"

Weave the limitations into the main discussion
- the strengths/weaknesses of your work are key considerations when comparing to previous studies.



If you can't work into the discussion elsewhere:

State a specific limitation, address the effect it might have, and finally address why or why not we should be worried about it
- this will take a paragraph for each, not a sentence

74

More on limitations

Consider sensitivity analyses

Be upfront and honest about the limitations
- If a reader is likely to think it is a limitation, address it.
- Do not address trivial issues

Consider addressing critical limitations, or a perceived limitation, early in the discussion.

The more clearly you acknowledge the limitation, the better chance you have that the reviewer will accept your forthrightness.

If you feel a limitation is so significant that you don't really believe your results, don't publish the paper!

75

More on limitations

You will get push back for not having a limitations section.

Resist that pushback.

Reflect on well-written discussion sections that incorporate the limitations of the study and previous studies. You will find that it truly strengthens the discussion.

76

Implications/Conclusion

Finish the story!

Remind people of the key things you want them to remember

Consider real policy implications, but don't overstate

Avoid simple statements like "more research is needed"

Tell readers what is needed!

77

Discussion/Conclusions

How might the discussion & conclusions differ for a general versus subspecialty journal?

78

Discussion/Conclusions

For general journal, you must justify the importance of the work to the broader medical community

For specialty journal, you must simply justify how the work advances your field

79

Abstract

The abstract is read more than any other part of the paper

Must accurately reflect content of paper
- No data in abstract that are not in the paper!

Structured abstracts are better (use a structured outline, even when not required)

Write a real, justified conclusion – not "more research needed"

80

Title

Simple, concise, specific (not cutesy)
Easy to understand (reflects study content)
Study focus, not study results
A headline – and accurate promise
Interesting – grab the reader
Non-declarative (question may be used after a colon)
No abbreviations (unless standard in the journal)

Quinn CT & Rush AJ. J. Invest. Med 2009; 57:634-9

81

Reporting Guidelines

CONSORT (https://www.consort-statement.org/)
- guidance for publication of clinical trials (and other interventions)

STROBE (https://www.strobe-statement.org/)
- guidance for publication of observational studies in epidemiology
- checklists for specific types of designs (cohort, case control, case cohort, cross-sectional, RDS samples)

PRISMA (https://www.prisma-statement.org/)
- guidance for systematic reviews and meta-analyses

82

Reporting Guidelines: CONSORT Extensions

- Cluster trials
- Non-inferiority & equivalence
- Pragmatic trials
- Pilot & feasibility trials
- Multi-arm parallel group trials
- Adaptive designs
- Non-pharmacological treatments
- Social and psychologic interventions
- CONSORT-PRO (patient-reported outcomes)
- Reporting of harms
- Others…

83

Reporting Guidelines

Each guideline has a statement, a corresponding manuscript, and checklists

Some journals require the use of the specific guidelines

The guidelines help you to organize the structure of your manuscript

Review the guidelines:
a) before you start your study;
b) before you start writing your paper;
c) when you've finished the draft (did you forget anything?)

Use the checklists to help you outline your paper.
That way you won't forget any key elements.

84

STROBE Checklist: Cohort Studies (1)

	Item No	Recommendation
Title & abstract	1	Indicate the study's design with a commonly used term in the title or the abstract
		Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up
		For matched studies, give matching criteria and number of exposed and unexposed

85

STROBE Checklist: Cohort Studies (2)

	Item No	Recommendation
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ Measurement	8	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	Describe all statistical methods, including those used to control for confounding
		Describe any methods used to examine subgroups and interactions
		Explain how missing data were addressed
		If applicable, explain how loss to follow-up was addressed
		Describe any sensitivity analyses

86

STROBE Checklist: Cohort Studies (3)

	Item No	Recommendation
Results		
Participants	13	Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		Give reasons for non-participation at each stage
		Consider use of a flow diagram
Descriptive data	14	Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		Indicate number of participants with missing data for each variable of interest
		Summarise follow-up time (eg, average and total amount)
Outcome data	15	Report numbers of outcome events or summary measures over time

87

STROBE Checklist: Cohort Studies (4)

	Item No	Recommendation
Main results	16	Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		Report category boundaries when continuous variables were categorized
		If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses

88

STROBE Checklist: Cohort Studies (5)

	Item No	Recommendation
Discussion		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

89

Special paper types: Methods papers

Developing a new approach to a problem is a form of a research paper

The sections are the same:

- The methods are a description of the approach
- The results are the assessments of how the new approach works
- The discussion addresses the use of the approach *and* when the approach should not be used (or may not work as well)

90

Special paper types: New application of existing method

Sometimes, we have a problem in our substantive area that would benefit from an established approach in a different field

These papers are beneficial. They move your field forward.

But they are hard to write: Are you just applying the new method and answering a question? Or are you demonstrating the method for others in your field?

These are two very different types of papers. It is nearly impossible to combine both objectives in one paper. Choose one. Or consider writing two papers.

91

Special paper types: Commentaries/editorials

Editorials are typically requested by an editor. Commentaries may be author initiated or may be requested.

Focus is a hot topic or written in response to a particular paper.

Great way to focus your thoughts.

92

Special paper types: Commentaries/editorials

Identify the key points you want to make before writing

Begin with a short introduction to the issue

Describe what the problem/issue is

Provide your thoughts about the problem/issue

Aim for balance and accuracy

Conclude with what needs to be done next

93

Special paper types: Systematic reviews

Follow standard paper format—a systematic review is a protocol driven study

Introduction: provide rationale for the need of the paper

Methods: fully disclose the search strategy and review process

Results: describe findings, include estimates of heterogeneity, publication bias

Follow the PRISMA guidelines

94

Write for the reviewer…

"When writing your essays, I encourage you to think for yourselves while you express what I'd most agree with."

95

Writing for the reviewer

Know who are the key people in the research area

- the references you cite are a likely source of reviewers

If you know their potential "biases", address those

96

Rejection: a fact of academic life

97

Common reasons for major revision or rejection (1)

Introduction too long
Introduction has too much detail
Methods lack detail
Inadequate methods
Results jumbled or don't flow logically
Too many unrelated results (i.e. multiple research questions)
Figures unclear, ugly, or not useful

98

Common reasons for major revision or rejection (2)

Discussion too long or not informative
Inadequate discussion of major limitation
Confusing or inconsistent terminology
Lack of clarity
Poor flow
Too many stories
Does not tell the main story
Main findings remain unclear after reading paper

99

Final thoughts

Tell one story → Communicate!!!

Use manuscript structure to meet readers' expectations
- Funnel the introduction in 3-4 paragraphs
- Make tables/figures easy to read & effective
- Focused **discussions**

Write for the reader (reviewer!)

THANK YOU!!!

Bill Miller
bill_miller@unc.edu

100