Use of IMRaD format ≠ well-written article

“Scientific papers are not just baskets carrying unconnected facts like the telephone directory; they are instruments of persuasion.

Scientific papers, even if they are based on sound research, must argue you into believing what they conclude; they must be built on the principles of critical argument” (p. 60).
The Writer’s Task: Communicating Importance

Present a clear, compelling, concise, and well-supported argument for:

1. The importance of your research idea (the need for, or value of, whatever you investigated, studied, tested)

2. The importance of your specific findings (the value of the new knowledge that you generated).
Readers (and reviewers) expect that you have investigated an important (significant) question.

1. Don’t assume readers will “get it.” Instead, directly address need, value, importance of your work by answering questions such as these in the text:

**Research article:**
- What gap in knowledge does this project fill?
- How will filling this gap move the field forward?

**Review article:**
- Why is a review needed on this topic? Why now?

**Education innovation:**
- What is novel about your approach? What educational need does it fill, what challenge does it overcome, or what opportunity does it leverage?
Introduction

2. Be **specific** in arguing for your project’s significance. LIKA (“little is known about”) is **not** a sufficient justification!

**Example:**

To our knowledge, projects studying the use of rapid HIV testing in community outreach settings **have not been reported**.

This is an important area for research, because many outreach clients:

- Are at high risk for HIV
- Do not access HIV testing through standard venues (clinical settings)
- Are highly mobile, unlikely to return for test results after standard (non-rapid) testing.
3. Use “funnel” format to organize your significance argument.

Introduction

Purpose Statement
(research question, hypothesis)

Gaps

What we know

Scope of problem, significance
Sepsis is a major cause of morbidity and mortality in patients who have chronic kidney disease and are receiving dialysis. No preventive treatment has been identified.

Can statins help? Animal trials suggest “yes.”

Limited study in humans. Previous trials were small, observational; one larger, population-based cohort study.

“Therefore, our aim was to assess the effect of treatment with statin medications on the rates of sepsis in a prospective cohort study of patients who had chronic kidney disease and were receiving dialysis.”

JAMA. 2007;297(13):1455-1464
Fungal infections are serious health hazard. *C. albicans* is one of the most clinically relevant fungal pathogens.

A crucial host defense mechanism against fungal infections is **IL-17–mediated immunity** [~3 supporting sentences]

**Th** cells are seen as principal source of IL-17 during fungal infections.

**But:** Mouse model results (failure of IL-17RA–deficient mice to control *C. albicans*) are inconsistent with involvement of Th17 cells.

This raises question: Are there alternative cellular sources of **IL-17**? What are these?

One possibility is subset of innate lymphoid cells (ILCs) – shown to mediate protective immunity against infectious agents, but have not been linked to immunity against fungal pathogens.
4. Finish the introduction with a clear, strong purpose statement

• **Explicitly signal** the purpose, question, hypothesis:
  - The purpose of this study was…
  - This report describes…
  - We tested the hypotheses that…
  - Therefore, our first objective in these studies was…
  - In this study, we sought to extend our initial observations and to specifically test…
Introduction

4. Finish the introduction with a clear, strong purpose statement

• **Be detailed and precise:**

  **General (weak):**
  We compared the efficacy of two treatments for metastatic breast cancer.

  **Specific (strong):**
  We conducted a *randomized controlled trial* to compare the effect of two treatments – *standard therapy X or new therapy Y* – on *one-year survival rates* in *women with metastatic breast cancer and under the age of 50.*
In this study we show that ILCs are the major source of IL-17 in response to *C. albicans* and that, unlike T cells, they are essential and sufficient for IL-17–mediated protective immunity against the fungus in the oral mucosa.

Signaling purpose statement

Good detail

Missing: This is animal work (mouse models)
Introduction

Additional Writing Strategies

1. Use “funnel” format to organize.

2. Conclude with strong purpose statement.

3. When describing previous literature,
   - Be selective (brief)
   - Focus on the findings
   - Identify flaws if your work is an improvement

The initial studies of the effects of ART on gene expression in HIV-infected persons have been limited in size and duration, and none included longitudinal analyses in persons with AIDS.

4. Draft, then revise after discussion is written.

5. Check for new literature before you submit.
1. Investigated an important (significant) question.

2. Approached the question or problem with an appropriate study design and methods.

3. Reported methods and findings in sufficient detail to allow the research to be evaluated (for quality) and replicated.

“Devil is in the details” – but which details are needed?

Take advantage of:
- Reporting guidelines
- Model articles from excellent journals
- Instructions for authors
http://www.equator-network.org/

Reporting guidelines: what reviewers expect to see for certain article types or research designs

- CONSORT – randomized controlled trials
- STROBE – observational studies
- PRISMA – systematic reviews, meta-analyses
- SQUIRE – quality improvement in healthcare
- CARE – case reports, data from point of care
- ARRIVE – animal research, reporting in vivo experiments

Review these before you start a study, and as you develop manuscript
Example: Systematic Review (PRISMA)

- **Eligibility criteria for studies**: Study characteristics (e.g., length of follow-up) and report characteristics (e.g., language, years considered)

- **Information sources**: Databases with dates of coverage, date last searched.

- **Search protocol**: Full electronic search strategy for at least one database, including any limits used, such that it could be repeated

http://www.equator-network.org/reporting-guidelines/prisma/
The ARRIVE Guidelines Checklist
Animal Research: Reporting In Vivo Experiments

<table>
<thead>
<tr>
<th>Housing and husbandry</th>
<th>9</th>
<th>Provide details of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>a. Housing (type of facility e.g. specific pathogen free [SPF]; type of cage or housing; bedding material; number of cage companions; tank shape and material etc. for fish).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Husbandry conditions (e.g. breeding programme, light/dark cycle, temperature, quality of water etc for fish, type of food, access to food and water, environmental enrichment).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. Welfare-related assessments and interventions that were carried out prior to, during, or after the experiment.</td>
</tr>
<tr>
<td>Sample size</td>
<td>10</td>
<td>a. Specify the total number of animals used in each experiment, and the number of animals in each experimental group.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Explain how the number of animals was arrived at. Provide details of any sample size calculation used.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. Indicate the number of independent replications of each experiment, if relevant.</td>
</tr>
<tr>
<td>Allocating animals to experimental groups</td>
<td>11</td>
<td>a. Give full details of how animals were allocated to experimental groups, including randomisation or matching if done.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Describe the order in which the animals in the different experimental groups were treated and assessed.</td>
</tr>
<tr>
<td>Experimental outcomes</td>
<td>12</td>
<td>Clearly define the primary and secondary experimental outcomes assessed (e.g. cell death, molecular markers, behavioural changes).</td>
</tr>
<tr>
<td>Statistical methods</td>
<td>13</td>
<td>a. Provide details of the statistical methods used for each analysis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. Specify the unit of analysis for each dataset (e.g. single animal, group of animals, single neuron).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. Describe any methods used to assess whether the data met the</td>
</tr>
</tbody>
</table>
Additional Writing Strategies

1. When needed, give rationale for study design, methods

Example, exclusion criterion:

Because this test may give false positive results in the presence of active infection, we excluded patients who were febrile (>37.5 degrees C) or who had been treated with antibiotics during the previous 2 weeks.

Additional Writing Strategies

2. Include definitions when appropriate

Examples:

- “From May 1 to October 31, 2006, all consecutive patients with a suspected TIA [transient ischemic attack] were prospectively evaluated.... TIA was defined on the basis of the World Health Organization standards.”

- “Relapse was defined as a relapse from continuous abstinence (i.e., a single puff from a cigarette; Hughes et al., 2003).”
3. Always provide details that emphasize data quality, (e.g., validated scales, controls)

Example, Rater agreement

“The study neurologist and radiology report had to agree on each finding. If disagreement, consensus had to be reached by discussing discrepancies.”
1. When needed, give rationale for study design, methods
2. Include definitions when appropriate
3. Always provide details that emphasize data quality
4. Be consistent, logical with terms, label
   - **Study Groups:**
     - low-fat diet group, high-fat diet group
     - Control (usual care), Treatment (intervention)
   - **Variables:** Aggression or aggressive behavior?
5. Provide a method for every result (and vice versa)
6. Use a logical organization (subheads) – not necessarily chronological
7. Consider using tables, figures for clarity and brevity
**FIG. 1. Outline of visit 3.** Bedside glucose was measured every 10 min for adjustment of the GIR. Blood was collected every 30 min for measurement of glucose, insulin, and FFA. Three muscle biopsies were obtained from the vastus lateralis (biopsy 1, time 0 min; biopsy 2, time 120 min; biopsy 3, time 360 min) over the course of the lipid/glycerol infusion.
<table>
<thead>
<tr>
<th>Fatigue Countermeasures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Taking a 30-min nap at 3:00 AM.</td>
</tr>
<tr>
<td>2. Changing 24-h shift to two 12-h shifts.</td>
</tr>
<tr>
<td>3. Sleeping in on day off.</td>
</tr>
<tr>
<td>4. Prioritizing sleeping during darkness rather than day when post call.</td>
</tr>
<tr>
<td>5. Improving sleep hygiene when sleeping during day (ie, dark environment, no caffeine/alcohol, minimize interruptions).</td>
</tr>
<tr>
<td>6. Encouraging 1 h or more of sleep daily, from 6 to 7 h during the week.</td>
</tr>
<tr>
<td>7. Taking a nap before first night shift.</td>
</tr>
</tbody>
</table>

Readers (and reviewers) expect that you have…

Presented all relevant data, in accordance with best reporting practices for this type of study (or analysis), and in a transparent, unbiased manner.

### Results for Observational Studies [partial STROBE checklist]

<table>
<thead>
<tr>
<th>Participants</th>
<th>(a) Report <strong>numbers of individuals at each stage of study</strong>—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, &amp; analysed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(b) Give <strong>reasons for non-participation at each stage</strong></td>
</tr>
<tr>
<td>Descriptive</td>
<td>(a) Give characteristics of study participants (eg demographic, clinical, social) and <strong>information on exposures and potential confounders</strong></td>
</tr>
<tr>
<td>data</td>
<td>(b) Indicate <strong>number of participants with missing data</strong> for each variable of interest</td>
</tr>
<tr>
<td>Outcome data</td>
<td><strong>Cohort study</strong> —Report numbers of outcome events or summary measures over time</td>
</tr>
<tr>
<td></td>
<td><strong>Case-control study</strong> —Report numbers in each exposure category, or summary measures of exposure</td>
</tr>
<tr>
<td></td>
<td><strong>Cross-sectional study</strong> —Report numbers of outcome events or summary measures</td>
</tr>
</tbody>
</table>

• Reporting by type of analysis
  – Measures of risk
  – Estimates, confidence intervals
  – Association and correlation analyses
  – Regression analyses
  – Survival analyses

• Presenting data and statistics in tables
1. Section organization

- Typically most important to least important
  - Main question or outcome
  - Secondary aims or outcomes
- Sometimes chronological
- Follow order of methods
- Use descriptive subheads to guide reader (if allowed by journal)
Result subheadings - Examples

- Patient characteristics
- Effects on blood pressure
- Effects on LDL cholesterol
- Effects on Framingham risk score and estimated 10-year risk of coronary heart disease
- Safety evaluation
- Clinical laboratory test abnormalities

- ASC specks remain active in the extracellular space
- Extracellular specks are a danger signal
- ASC specks have 'prionoid' activities
- Anti-ASC opsonizes ASC specks and increases inflammation

Franklin et al. *Nature Immunology* 2014;15:727–737
2. Paragraph Organization

- Present general result in first sentence. Focus on the overall finding.
- Then provide explanatory details. Subordinate the specific data that support the finding.
- If necessary, add conclusion sentence to reinforce overall finding.
The 2 weight loss diets differed ...in their effect on postprandial glycemia and insulinemia. Incremental area under the curves for glucose (mean [SE], 2706 [394] vs 1070 [336] mg/dL per minute, \( P = .003 \)) and insulin (5581 [859] vs 2044 [733] \( \mu \text{IU/mL} \) per minute, \( P = .003 \)) were more than 2-fold greater for test meals from the low-fat vs low-glycemic load diet groups, respectively.
Additional Writing Strategies

3. Redundancy in sentence structure and word choice is desirable

Example  American Journal of Medicine 2013; 126(4): 362-365

• When evaluating the 16-hour violations for interns, a statistically significant difference was detected with violations occurring in 1% of self-report data compared with 4% in parking card data \((P \leq 0.001)\). This difference amounts to 32 additional 16-hour violations detected over the 28-week period.

• When evaluating the 8-hour violations for all postgraduate year levels, a statistically significant difference of 1.0% violations in the self-report data compared with 3.0% in the parking card data was observed \((P \leq 0.001)\). This difference amounts to 49 additional 8-hour violations detected over the 28-week period.
Readers (and reviewers) expect that you have...

Provided a thoughtful and balanced interpretation of your findings – what they mean, how they might be applied.

Complicating factors:

Answer is unexpected

Multiple interpretations are possible

Study limitations: What can you really conclude?
“Before you write” Strategies

1. Read (re-read) the literature as you analyze and interpret your results.

- Identify relevance to your work
- Note support for/disagreement with your results
- Note similarities/differences in design, endpoints, sampling, etc.
- Get ideas for points covered in discussion sections
2. Identify your main message(s).

- What’s the headline?
- Is your “story” verified by your sources” (quality of your data, existing literature)

- What are the key messages to be conveyed?
  1. ____
  2. ____
  3. ____

- What is the significance/potential impact on practice or research?
  - Potential clinical benefits: ________________
  - Significant additions to the knowledge base of a particular animal model or mechanistic concept: ________________

http://www.texasheart.org/AboutUs/Depart/scipubdocuments.cfm
3. Take your ideas for a test drive.

- Present your results and discussion ideas at suitable seminars, conferences.
- Circulate your main message(s) in writing to coauthors, other trusted colleagues for feedback.
Additional writing strategies

1. Use “inverted funnel” or pyramid structure

   Beginning: Answer to research question

   - Generalization from your results, not a repetition of your results

“This large placebo-controlled study establishes the safety, efficacy, and lack of pharmacodynamic or adverse interaction between coadministered amlodipine and atorvastatin in a clinically relevant population, consisting of patients with multiple cardiovascular risk factors.”
Structuring Your Discussion

Middle:
- Interpret your results
- Discuss key studies relevant to your work
- Compare your work to that of others – if discordant, discuss objectively
- Offer explanation(s) for unexpected findings
- Briefly describe limitations (and strengths!)
Structuring Your Discussion

End:
• Strong conclusion
• Signal the end
• Discuss implications
• Suggest future work

Your research will “shine a spotlight on one area of the truth.”
Additional writing strategies

2. If you recommend more research, don’t be vague:

Additional research is needed.

Further studies to confirm these findings would be helpful.

Instead, make (a few) specific suggestions

Examples

“Future research might test long-acting stimulant formulations for other substance-abusing ADHD adult populations, such as those with alcohol or cannabis use disorders.”

“Further examination of the associations observed in this study might be improved by using a more comprehensive set of smoking intensity outcome measures.”
Example: JGIM article review form

• **ORIGINALITY, NEW INFORMATION:** High 1 2 3 4 5 Low

• **STUDY DESIGN:** __adequate __contains minor flaws __seriously flawed

• **STATISTICAL ANALYSES:** Appropriate 1 2 3 4 5 Inappropriate or absent
  --or--

• **Recommend review by Statistical Consultant:** _* Yes __No

• **VALIDITY OF CONCLUSIONS:** Valid 1 2 3 4 5 Invalid

• **CLARITY OF WRITING:** High 1 2 3 4 5 Low

• **RECOMMENDATIONS:**
  ___ACCEPT: ___REJECT ___ RECONSIDER
  ( ) as is ( ) with major revisions
  ( ) conditional ( ) with minor revisions
Editors Choice On Pre review

Rejection-- Academic Medicine

• In the first, internal review, editor-in-chief and associate editors consider the following:
  – Is topic addressed important and of interest to faculty and administrators of medical institutions?
  – Recent publication related articles? If so, does manuscript add something new?
  – Is the paper written clearly? \textit{Is it logically consistent?}
  – For research papers: Sample size, Design, Analysis, Discussion adequate and appropriate?

• Submission to external reviewers follows
Reasons for Non Acceptance

Bordage. Academic Medicine, 76: 889-896. 2001
Pierson. Respiratory Care, 49: 1246-1252. 2004

• Poor design/inappropriate methods
• Sample too small or biased
• Insufficient data presented
• Wrong journal/wrong format
• Text difficult to follow/poor writing
• Inappropriate/incomplete statistics
• Insufficient statement of problem
• Over interpretation of results or discussion “excesses”
• Inaccurate/inconsistent data reported
• Incomplete/inaccurate/outdated literature review
• Defective tables or figures
Review Content

• Recommendation to the editor
• Comments to the editor (his/her eyes only)
• Comments to the author
  – General comments
    • Conceptual issues or comments on adequacy of methods, design etc.
  – Specific comments
    • Points of clarification
    • Detail items, e.g. numbering, typo’s, spelling, references
“General/major comments”

**Generalizability**

- Dependence severity is not discussed. It may be that these patients were less dependent, with higher functioning, thus more able to make each session. This should be addressed and may affect generalizability.

**Analysis**

- The data has to be reanalyzed using the number of BE positive urines over the total time period, imputing missing urines as positive and controlling for baseline differences in cocaine use severity.
Understanding the Critiques

“Specific/minor comments”

• Not all tables, figures and supplements are cited in the text.

• Table 1: Please include study site.

• When presenting results, it is not always clear if they are crude or adjusted.

• Introduction, line 91: "outcomes." and suggest "several medications available for..."

• The authors should consider referencing use of prescription drug management programs, etc. when treating such patients to help in monitoring potential drug abuse

• Decide upon amphetamine salt or salts and maintain throughout.
Understanding the Verdict

• Rejection, no invitation to resubmit
  – *No peer review (triaged)*
  – *Negative peer review*

• Rejection “in its present form”
  – *Revise, resubmit, re-review, reconsider*
  – *Major revisions, minor revisions*

• Final acceptance (in press)
Response to reviews

• Reviewers’ comments are meant to enhance the quality and impact of your work.
• Your work is almost always better following revision in response to critiques.
• There many, many, many journals.
• Persistence pays off.
• Unsubmitted papers are never published.
When the verdict is an invitation to revise and resubmit:

1. Carefully read, then re-read the comments.
2. Compare your understanding of them with others.
3. Informally rank them by priority (severity). Cluster like comments together.
4. Make a revision plan!
5. Revise the manuscript.
7. Finalize the response letter.
8. Cross-check response letter with manuscript.
9. Do all of this within the stipulated time frame.
The Response Letter

Dear Dr. Tenure, [The editor who sent you the reviews]

We are pleased to resubmit to you our manuscript entitled, “____________,” MS #____________. We found the reviewers’ critique of our initial submission to be very helpful. In responding to their comments, we believe our manuscript is greatly strengthened. Our point-by-point responses to their concerns and revision suggestions are outlined below:

Reviewer 1

1. [“Quote the specific critique point.”]

   **Response:** [Clear, concise, explanation of how you’ve revised the manuscript. Indicate sections and page numbers]
Use Responsive Language

1. “We revised paragraph 2 of the introduction (page 1) to include additional literature on...”

2. “As suggested, we deleted Figure 1 and combined Tables 3 and 4.”

3. “As recommended, we reanalyzed our validity data using t-tests rather than ANOVA procedures.”

4. “We appreciated/understood reviewer 3’s perspective but have retained the point because---”
Use Explanatory Language

1. “Unfortunately, we did not collect data on variable X, so we are unable to assess its interaction effect. We acknowledge this as a limitation on page 22.”

2. “Our decision to use the EPDS rather than the CES-D as our depression screening tool was informed by several factors....We have added this rationale to our methods section on page 4.”
When necessary, defend your original text (without being defensive), respectfully disagree.

1. “We have added citations to support our position. We have also rewritten several sentences in the discussion to avoid overstatement.”

2. “Were we to build in many of the extra process measures suggested by the reviewer, ...our clinics’ processes for initiating the [XXXX] system would have been very different. Our study was designed to evaluate PPIP in a real-world setting.”
Thank You!

KEEP CALM AND START WRITING

CONTINUE and FINISH