Scientific Writing Course
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Discussion

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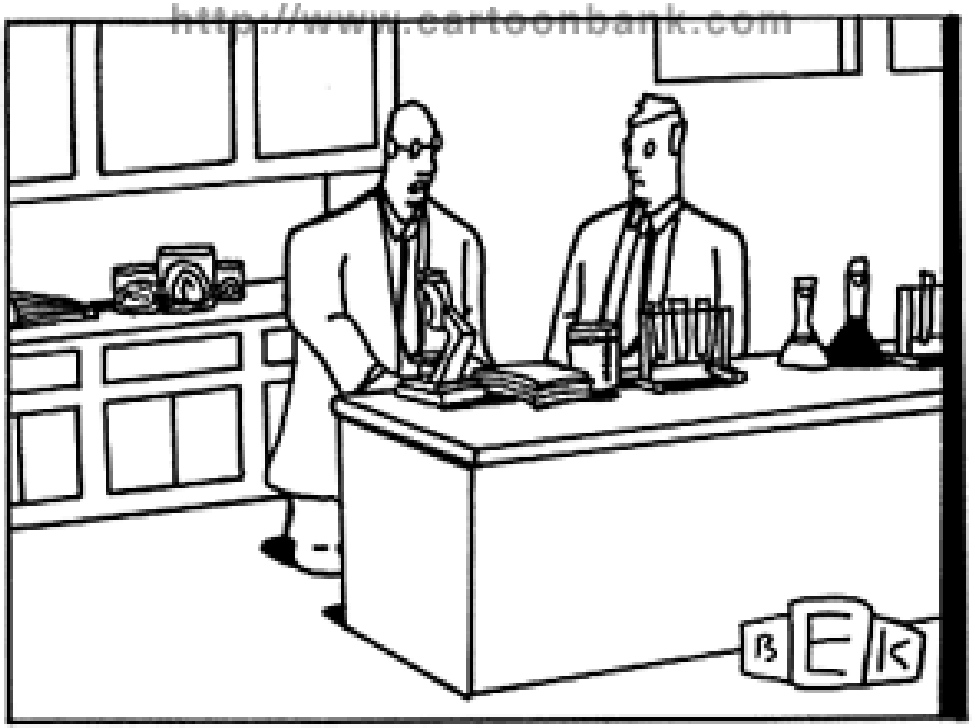
Discussion



"Sometimes I wonder if there's more to life than unlocking the mysteries of the universe."

Answers questions or hypothesis posed in introduction.

Relates findings/conclusion to existing knowledge.

Discussion

- What exactly did the study show?
- What might that mean?
- How else could the results be interpreted?
- Have other studies had similar results, or is there disagreement in the field?
- What are the study's strengths and weaknesses?
- What, exactly, should happen next?

Template for discussion

A “story” that consists of the following:

- Beginning:
  - Mission accomplished! The single most important finding
- Middle:
  - Not only that… (Secondary findings; context - other important points, comparisons with other studies)
  - Mea culpa (Limitations, redemption)
- End:
  - Conclusion & [Public health] implications

Discussion: Beginning

Paragraph 1:

1. Answer the question posed at the end of the Introduction.
2. List the key findings that support the answer.
3. End with general conclusion.

Discussion: Beginning

Signal the Answer

This study indicates that

The results of this study show that

Link Results to the Answer They Support:

In our experiments,

In our patients,

The evidence is that

Discussion: Beginning

First sentence can give the answer (This example states 2 answers, to 2 study questions, in 2 sentences):

Our study shows that although lay people witness many emergencies and deaths in Kampala and provide much-needed pre-hospital emergency care, they are grossly ill-equipped, both in terms of medical training and supplies, to provide such care. **However, we found** that lay people can be effectively trained through a context-appropriate first responder course for trauma, and can be equipped with locally available supplies to provide these informal emergency medical services.

Discussion: Beginning

The first sentence can restate the question and second sentence can give the answer:

This study aimed to explore the potential of telehealth to support medical practice in rural and remote regions, as well as the conditions to ensure successful implementation of this technology into health care organisations. **We found that Telehealth** shows several potential benefits for rural and remote populations and could definitely improve patient care as a result of increased accessibility to specialised services, better continuity of care, and avoided transfers.

Discussion: Beginning

"Answer" can start with "We found" and then give evidence that supports the answer:

We found that what makes an initiator tRNA an initiator is not the T-1 mutation, because this mutation had no effect on protein synthesis (Fig. 1). Rather, the sequence conserved in the anticodon stem of both prokaryotic and eukaryotic initiator tRNAs is important for initiation. **In our experiments**, as one, two, and all three of the G•C base pairs were altered to those found in *E. coli* elongator methionine tRNA, the activity of the mutant tRNAs in protein synthesis initiation decreased progressively (Fig. 3).

Discussion: Beginning

Another example

Our study provides evidence that a single counseling session at the time of initial STD evaluation increases the likelihood of partner notification in Harare, Zimbabwe. **The evidence is….**

Discussion: Beginning

Answer & relation to previous studies

Our study shows that from 1992 to 2000, the prevalence of HIV infection declined from 23% to 13% among >200,000 first-time clients who sought VCT at Uganda's largest stand alone VCT provider. **These findings support** surveillance data and population-based cohort data from Uganda…"

Discussion: Beginning

Signal the answer

- **Use "study" or "results" in the signal.**
- **Make the verb tense fit the subject and verb.**

  For "study" and "results," use present tense.

  For "we," use present, present perfect, or past tense, depending on the verb.

Examples	
This study indicates that	*present*
Our results indicate that	*present*
The results of this study show that	*present*
In this study, we provide evidence that	*present*
In this study, we have shown that	*present perfect*
In this study, we have found that	*present perfect*
In this study, we found that	*past*

Discussion: Beginning

- Class Participation

  How would you revise the first sentence of your discussion?

Discussion: Middle

Fit the answer into the "big picture puzzle in the sky" that is science.

- Make one, two, or three good points.
- Each point can run for one or more paragraphs.
- Organize the points either according to the science or from most to least important.
- In addition, explain conflicting results, discrepancies with the literature, unexpected findings, limitations of the methods, limitations of the study design, and assumptions—as needed.

Discussion: Middle

Secondary Findings =“Not Only That”…

Sub-group findings, effect modifiers of single most important finding:

Men vs. women

Young vs. old

Secondary questions, findings

Unexpected findings

Findings that contradict other studies, conventional wisdom

Examples of "Not only that…" Sentences

- We also found that the 80% partner notification rate in our study was higher than that reported in other studies in sub-Saharan Africa.

- We also found that for both men and women, the mostly likely partner to be notified was a spouse.

Discussion: Middle

- Class Participation: "***Not only that***…"

How would you revise the first sentence of a paragraph that states an important secondary finding?

Discussion: Middle

Give credit to yourself and others

If others' results help support your answer, mention them and cite the appropriate references. Give appropriate credit to yourself as well, but avoid claiming priority (in most cases).

Example

By using whole mounts stained histochemically for acetylchoinesterase, we have reconstructed an overall picture of the architecture of the nerves and ganglia of the mouse trachea. This reconstruction, which incorporates and confirms the separate observations of previous investigators (6, 9, 11, 14, 24), **includes several new observations** that provide a more complete understanding of trachea innervations.

Underlined phrase credits the work of others; **bold face terms make it clear what the author's contribution is**.

Discussion: Middle

Explain unexpected findings

Sometimes they are more exciting than the original question and take over the paper.

When describing unexpected findings, state at the beginning of the paragraph that the finding was unexpected (or surprising) and then explain it as best you can.

Example

We were surprised to find that tea drinking was associated with cancer of the pancreatic islets…

Discussion: Middle

Explain agreement/discrepancies with published studies.

Example

Though our results may seem to differ from those of Haley et al., we used a different method of ascertaining compliance with therapy than they did.

Explain unexpected findings.

Example

We were surprised to find that tea drinking was associated with cancer of the pancreatic islets…

Discussion: Middle

Describe patterns, principles, and relationships your results show.

Do the results have:

- Theoretical/practical implications?
- Relation to other situations or species?

Do the findings help us understand a broader topic?

Don't lose sight of the big picture!

Discussion: Middle

Introduce Points with Your Own Findings

Example

Our study did not address the mechanism for the previously reported adverse cardiovascular events after the use of sildenafil, but our results do suggest that this mechanism is not the result of an adverse effect on coronary hemodynamics. Others have speculated that cardiac events may be due to interactions with other drugs.

Discussion: Middle

Use Your Work to Support Previous Studies

Example

The fact that our study was prospective lends support to the evidence of a causal role of sleep-disordered breathing in hypertension. We found that the presence of sleep-disordered breathing was predictive of hypertension four years later.

Discussion: Middle

Use Others' Work to Support Your Study

Example

Previous studies of the hemodynamic effects of intravenous and oral sildenafil in normal men and men with stable ischemic heart disease have demonstrated a small but consistent decrease in systemic and pulmonary blood pressure after administration of the drug (***refs***). The results of the present study confirm these findings in men with anatomically severe coronary disease. In addition, we investigated the effects of sildenafil on coronary hemodynamics.

Discussion: Middle

Explain limitations of your study = “Mea Culpa”

“We recognize limitations of our study…”

- Confess, come clean
- No study is without potential bias
- No study is perfectly executed
- No study is definitive
- Head criticism off at the pass

“Mea culpa”

Example

The study did not have sufficient power to identify infrequent risks, to define fully the need for extended antiplatelet therapy, to explain the observed effect of cilostazol fully, or to assess effectiveness in more complex lesions. The six-month follow-up period leaves unanswered the question of the duration of the benefits seen at six months and the possible long-term adverse effects of drug-eluting stents, whether the drug eluted is paclitaxel or another agent.

"Mea culpa"

Another Example

This study has many limitations that may constrain the interpretation of the results. First, participants were chosen through convenience sampling. Therefore, their experiences may not be truly representative of all members of the three target cohorts. In addition, since these cohorts are predominantly based on the roads, they may not be likely to encounter obstetric emergencies, which may be more likely to occur in or around the home. Second, recall and interviewer bias may have contributed to over-reporting of witnessed emergencies and care that is provided. Trainees may have been prone to exaggerate their reports during the semi-structured interviews that were not anonymous.

"Mea culpa"

- Start with single biggest threat to internal validity
  - Differential loss to follow-up
  - Participation bias

- Explain (if you can):
  - Likely size of this bias
  - Likely direction of this bias

"Mea culpa"

- Address common problems and biases if they are a particular concern in your study:

  - Sample size, power (when no association)
  - Incomplete responses, data quality
  - Self-reported behavior, recall bias
  - Causality in cross-sectional study
  - Unmeasured and unknown confounders
  - External validity, representativeness
  - Alternative interpretations, explanations
  - Not enough money…

“Mea culpa”… and redemption!

There is no perfect study; redeem yours:

- “However, we do not feel this bias is likely to…”
- How you did your best to address the bias in the design and analysis
- Other evidence that bias is not likely to change primary conclusion
- Other studies face worse biases

Example of primary "Mea culpa" sentences

"Our findings are subject to several limitations. First, VCT clientele may not be representative of the general Ugandan population."

"The primary limitation to interpreting our data is that only half of persons enrolled completed follow-up."

Example of "Mea culpa" sentence (with redemption)

"Second, our data were drawn from only 4 major towns in Uganda and do not represent the whole country. However, the fact that our data were comparable with ANC data suggests that our major findings of declining prevalence are not likely to have been affected significantly by such differences."

Discussion: Middle

Class Participation: “Mea Culpa/Redemption”

Write/revise a sentence that expresses a study limitation and redeems your study.

Discussion: Middle

Because the middle can be several paragraphs, organization and continuity are important to keep the story flowing well:

Organize either according to the science or from most to least important.

Use topic sentences at the beginning of each paragraph to tell a story!

- Each topic sentence stating the message or the topic of the paragraph; details in logically organized supporting sentences.
- Each topic sentence linked to the previous paragraph by
    - a repeated key term*
    - a transition word
    - both + the other techniques of continuity as needed*

* *Covered in other lectures*

Discussion: Middle

Keep the story flowing

Use sentences that segue between ideas:

These results are consistent with…

These results suggest that…

This study had several limitations…

The first limitation was…

The second limitation was…

Despite these limitations…

Discussion: Middle

Keep the story flowing

Use transitions:

For example,

First….Second…

In addition…Moreover….Furthermore

In contrast,

However,

Thus,

Therefore,

Discussion: End

Make it strong!

1. Restate the answer to the question.
2. Signal the end by using a phrase such as “In conclusion”, or “In summary”, so readers will know this is the answer.
3. Then indicate the importance of the work by briefly stating applications, recommendations, implications, or speculations.

Discussion: End

- Signal + answer: stated the same way as at the beginning of the Discussion
  - "In conclusion, **this study shows that**" or "In summary, **we have shown that**".

- Big picture, extrapolation
- Public health implications/recommendations
  - HIV prevention
  - HIV care
- Clinical practice implications/recommendations
- Program implications/recommendations
- Setting the future research agenda (be specific)

Discussion: End

"Big Picture" Example

"These important findings underscore the usefulness of VCT data not only as a planning tool to target key interventions for HIV prevention and for HIV/AIDS care but also as a tool to help monitor a dynamic and evolving epidemic…Triangulation of ANC data with VCT, PMTCT, and other programmatic data could allow for enhanced surveillance as HIV prevention and care interventions expand. VCT data should be considered in other settings as a surveillance tool, and international guidelines for VCT data collection, analysis, and interpretation should be developed."

Discussion: End

“Big Picture” Example

“Despite the limitations of our study, we believe that the addition of a single client-centered counseling session increased the delivery of partner notification services overall and improved self-reported success in referring partners to treatment.”

Discussion: End

Importance of the study is indicated by…

- Application (methods papers)
- Recommendation (clinical papers)
- Implication OR
- Speculation

Examples of Endings and how to signal them to the reader

Application: **can, will**

Recommendation: **should**

Implication: **suggest, imply**, (used together with "may" or "probably", e.g., may have, may influence, may reflect…probably reflects, probably influences, etc.)

Speculation: **speculate** ("lead us to speculate that X is clustered with Y"

Additional tips for the Discussion

- Stick to your data and your findings
  - Do not speculate on causes that are not suggested by your data
  - But, OK to offer new hypotheses
- Do not include new study results
  - All findings must be in Results
  - Go back and include them
- Avoid “More research is needed…”
  - Unless you say very specifically what is needed

Additional tips for the Discussion

- **Avoid "More research is needed…"**
  - **Unless you say very specifically what is needed**

Example

A larger multicenter study should be conducted to confirm these results and to address many issues, including the best dose of growth hormone and the length and frequency of therapy that are necessary to produce and maintain clinical remission.

Additional tips for the Discussion

- Do not simply repeat results
- Keep the Discussion as short as possible so reader grasps the “take home message” (the elevator test)
- Use words rather than numbers or statistics
- Avoid promising future papers or studies

Additional tips for the Discussion

- OK to strike uncertain tone if uncertain
- Avoid bragging (well, a little is OK)
  - First ever, first in Southeastern Europe, Kenya,
  - First controlled study
- Avoid clichés
- Do not end on a sour note!

Additional tips for the Discussion

Include only one thought per sentence; one idea per paragraph.

Use the active voice whenever possible.

Use simple words. Scientific words are complicated enough. Don’t subject your readers (even if they are brilliant) to every four- or five-syllable word you know. Long words make a paper very hard to read.