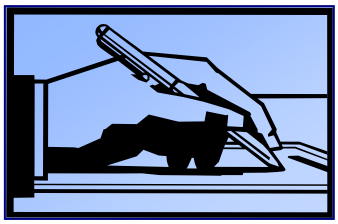


Module 4: Research Articles from Start to Finish

Contents

NOTE: ***This module will be most useful to you if you work through it alongside a paper in preparation, ideally with a mentor!***

Goals of Module 4

This module aims to teach the following strategies and specific methods to get your scholarly papers published:

- Choose a high quality, peer-reviewed journal or other dissemination vehicle
- Preplan with a scholarly approach: a focused, novel question based on best evidence; well tested methods; meticulous analysis of data; careful interpretation of what the data mean
- Discuss the relevant literature in relation to your study question
- Describe methods in an organized fashion
- Report results clearly: use well designed figures and tables, and focused, objective narrative
- Interpret findings and draw conclusions with rigor and understanding of context
- State study conclusions in the context of what needs to be known, or what needs to be done in new ways
- Learn to respond constructively to reviewer critiques
- Study well-written papers that illustrate the methods above

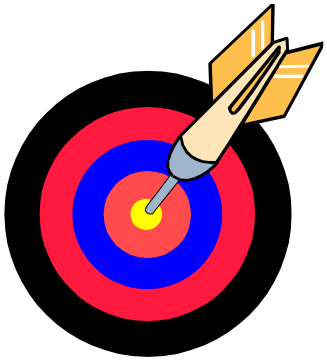
This module applies mainly to articles about biomedical research and educational scholarship. The same fundamental strategies are valid for basic science articles, but they follow somewhat different conventions, because the study designs of laboratory research differ from those of clinical studies. Laboratory research is often progressive, with new experiments evolving from those which preceded it, while clinical research typically follows a unified design planned and approved in advance. I have provided a section specifically about writing qualitative articles, because quantitative and qualitative research are different in some fundamental ways.

1. Efficient Writing of Research Articles

Choosing the right journal

Your articles need to find the right home. First, identify your primary message and what audience you want to receive it. Choosing the optimal audience is important: the paper is much more likely to be accepted by a journal that is read by your targeted readers, and with the right journal, you are more likely to exert the influence you aim for. Second, consider the level of journal (i.e., impact factor) that is likely to accept your paper. If your paper is rejected, and you resubmit it to a new journal, you may be targeting a different audience with your revision and will need to modify the paper accordingly.

Mentors can be indispensable in recommending a good journal choice. I usually advise new authors to ***aim high, but not too high***. This decision requires sound judgment of the quality and publishability of the paper. My co-authors and I usually aim our papers one step above the most likely target on the impact factor ladder. This strategy means that the paper may need to be resubmitted to a lower-level journal, but sometimes we are surprised, and the paper is accepted! If a rapid turn-around speed for publication is a priority (e.g., upcoming grant submission, pending promotion), we aim at a reasonable level on the ladder, in hopes of avoiding a time-consuming resubmission. Be sure to study the potential journal's online *Instructions to Authors* to clarify your article's eligibility for the submission.



Key considerations for journal selection:

- Level of prestige
- Journal's scope of interest
- Reading audience, size and type
- Formats and styles allowed (e.g., availability of brief reports, word counts, color graphics, online vs print publication, open access)
- Turnaround speed, if time is limited. (Ask colleagues who have published recently in the journal.)

It is far more efficient to choose 1-3 potential journals ***early*** in the writing process, to clarify the audience to whom you are talking. To help you decide if the journal is a good fit, look over what it has published in the past couple of years, to get a sense of what the journal is interested in and who its readers are. Also, reviewing the journal's recent articles will help you avoid submitting a paper on a topic they have just covered. This duplication greatly reduces the chances of acceptance.

Before you begin writing, reread the journal's *Instructions to Authors* in detail. Knowing in advance your word limit and allowable number of tables and figures will save you a lot of time. If you are having trouble deciding if a journal is right for you, talk to mentors and colleagues. A ***brief*** email to the editor that identifies your key question is also possible.

Writing the first draft

It is efficient to consider the broad outline of your future paper when you plan the study. Try to ***visualize components of the paper while conducting the study*** to make your work more focused. This is like making the bricks before you build the wall. When you are studying the literature for your study, collect, organize, and prioritize bibliographic materials before you begin to write. A table of potential references, with full citations and notes, can save you a lot of time later, thumbing through piles of papers in your home office and work office (and car?). In addition, it is important to plan ahead who will be your co-authors and in what order they should be listed. This can be a difficult political process, best not left to the last minute! It also helps you identify who should be available to answer questions and review your drafts as the paper develops.

We discuss specific writing strategies in more detail below, but here we are focused on writing efficiency. Begin by ***defining your primary purpose***: What scientific question are you asking and how will you answer it? Put this statement in writing and post it near your desk for continued reference. Update it as you write. Next, I suggest that you generate ***a list of key information and ideas*** that your paper will present. Try to ***sequence the list*** to create a strategic and logical line of argument across the sections of the paper, and use this as a flexible outline. This technique will help you make an efficient start, but expect the outline to evolve as the paper develops. If you choose not to begin writing with a sequenced list of ideas, I recommend that you create such a list around your first draft, to facilitate editing.

Try to shape the first draft quickly. Do not worry about less than perfect sentences. Do not obsess over gaps. Just leave a brief note in places where you do not have the data yet, or are not sure about an interpretation. ***Remember: The first draft only has to get written to succeed!*** No one else needs to see this version. Of course, later drafts will require systematic refinement. What you have learned in Modules 1-3 will help you through the process of taking the first draft forward, with refinement of sentences and paragraphs. Specific strategies for each section are discussed below, in **3. Writing a Research Article.**

Few authors draft a paper from beginning to end. Many begin with the Methods section, which is relatively easy because it is more descriptive than analytical. Others begin with Results, because the content of this section dictates everything else in the paper. Some authors write the Abstract and a one-paragraph Conclusion at the start, so they have a game plan for the writing process, knowing that they will have to revise these parts later. Nearly everyone writes the Discussion last.

Writing and sequential editing of a paper is seldom rapid. You will probably be editing sections as you write the paper, and it will need a new series of careful edits after all the parts are assembled. This process typically takes weeks. My papers usually go through a dozen edits, including those from co-authors. A six-month timeframe from start to finish is common.

Feedback and revisions

Writing a paper should not be a solo effort. Your co-authors should help with pre-planning and provide critiques and new ideas throughout the process. As you are writing, your co-authors can help if you encounter obstacles (discussed in Module 6, Mastering Productivity and Fighting Procrastination). Some co-authors draft specific sections that match their expertise. As authors, they must also approve the final version.

When you have a reasonably refined draft to distribute to co-authors, it is smart to recruit a couple of other in-house reviewers: e.g., a mentor, a topic expert if needed (to review sections directly relevant to their specialty), and maybe a “science-naïve” reader, who can offer new perspectives. Distribute the draft with ***instructions and suggestions*** (e.g., where to focus) and a ***deadline*** for returning it to you. A two-week turnaround is reasonable.

After distributing this draft, I find it helpful to ***let the document lie fallow*** while waiting for comments. After a couple of weeks, I often have new insights and see new areas for improvement. When you get the critiques back, assimilate and evaluate them carefully; gratitude is more useful than anger! If you decide on significant revisions, keep a sequence of dated backups, in case you change your mind about cutting out a section.

Before submitting the paper to the journal, re-review it compulsively. Read it aloud to yourself to catch typos. If you wish, you can use the Read Aloud function in Word (under Review, click *Read Aloud*), but to me the voice makes everything sound boring! All co-authors must review and approve the final draft. At the end, print it out and proof carefully again on paper. As you near submission, ***avoid perfectionist paralysis***: know when enough is enough (see Module 6, 4. Seven Tips for Fighting Procrastination). I always tell myself that I will get another chance to revise when the reviews come back!

A letter to the editor must accompany the submission. Much of the letter is *pro forma* (title, authors, topic, offer to answer questions, plus statements required by the journal about conflicts of interest, no prior publication, etc.). Read the journal’s *Instructions to*

Authors, and ask someone for a model to follow. I always include in the second paragraph of this letter a statement about the importance and novelty of the paper. If you are resubmitting a paper and responding to editorial/reviewer comments, the letter should broadly address the changes you have made, and an attached **Revision Summary Table** will give all the details, with responses to each comment by the editor and reviewers (see example of this table at the end of Appendix 3).

2. Pre-planning: Envision the Big Picture

A writer needs to think like a reader

Journal readers typically use a staged process to choose which articles to read, so think about this as you write. They read the title first, and if it passes the test of interest and relevance, they look over the abstract. The title needs to capture attention, and the abstract needs to clearly articulate your primary question and its novelty and importance, summarize your findings, and state your conclusion. If these components pass the test, readers may undertake a more detailed reading. Many will initially scan the paper, looking perhaps at the first and last paragraphs of Introduction, the Tables and Figures, plus the Conclusion, before they commit to reading the whole paper.

To facilitate the reader's effort, place information in the expected places, following the conventional format outlined below. Make sure ***the primary question and why it matters are clearly stated*** in Title, Abstract, at the end of the Introduction, and in the Conclusion. These statements need to be consistent, but within the paper, phrase them differently when you repeat the idea. For example, at the beginning of the Introduction, state your primary question in ***broad*** terms; at the end of the Introduction, your wording of this question should reflect what the intervening paragraphs say about the ***specific*** problem to be solved or gap to be filled. In the Conclusion, you can restate your question and your answer in the context of your findings.

A useful writing tip for all documents: Use consistent naming of variables, but otherwise, *never say the same thing the same way twice.*

See **Module 1** for more on editing strategies: the reader, to decipher your meaning, has to back-translate from your words and the structure in which you place them. **Modules 2 and 3** discuss word choice and structure in the context of sentences and paragraphs. Learning the lessons of these modules will make your paper more readable and more convincing.

Basic questions to help you focus your writing

1. **How shall I convert my project into a reportable study**? Ask yourself: How much new information is enough? Do I have an intelligible and interpretable data set?

Alternatively, do I have too much data to manage in a single paper? Is there enough for 2 articles?

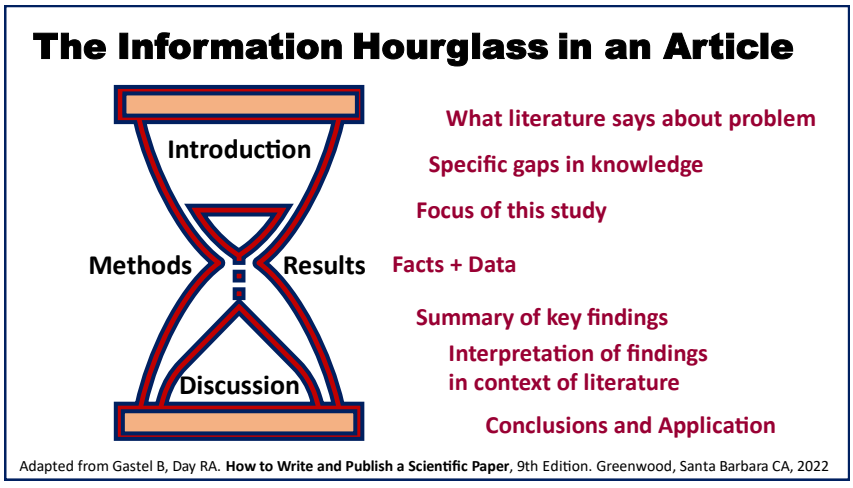
2. **What is this paper trying to prove? Why does it matter?** These two questions need to be crystal clear in your mind, so they come across strongly to the reader. For many authors, especially those new to scientific writing, deciding on a precise question and rationale for an article takes time. All writers benefit from multi-source feedback as they refine their thinking: when they plan the study, interpret the results, and then plan the paper. For many, writing the paper is easier if they first give a talk on the study, and listen carefully to the questions and comments.
3. **What challenges do I face in putting my argument across?** Are there particular strengths and weaknesses in my findings? Sometimes you will need to adroitly address design limitations or methodological difficulties. Another challenge might be that your results do not match those in the literature: conflicts with previous studies may weaken the case for the validity of your study, but these differences may also enhance the case for novelty (see **3. Writing a Research Article, Discussion** for more detail). Plan in advance where and how you will address such challenges.

Your Final and Crucial Planning Step: ***Commit to an action plan and a timeline!*** Unlike grant applications, papers usually have no specific deadline. You have to make your own!

Organizing information in an article

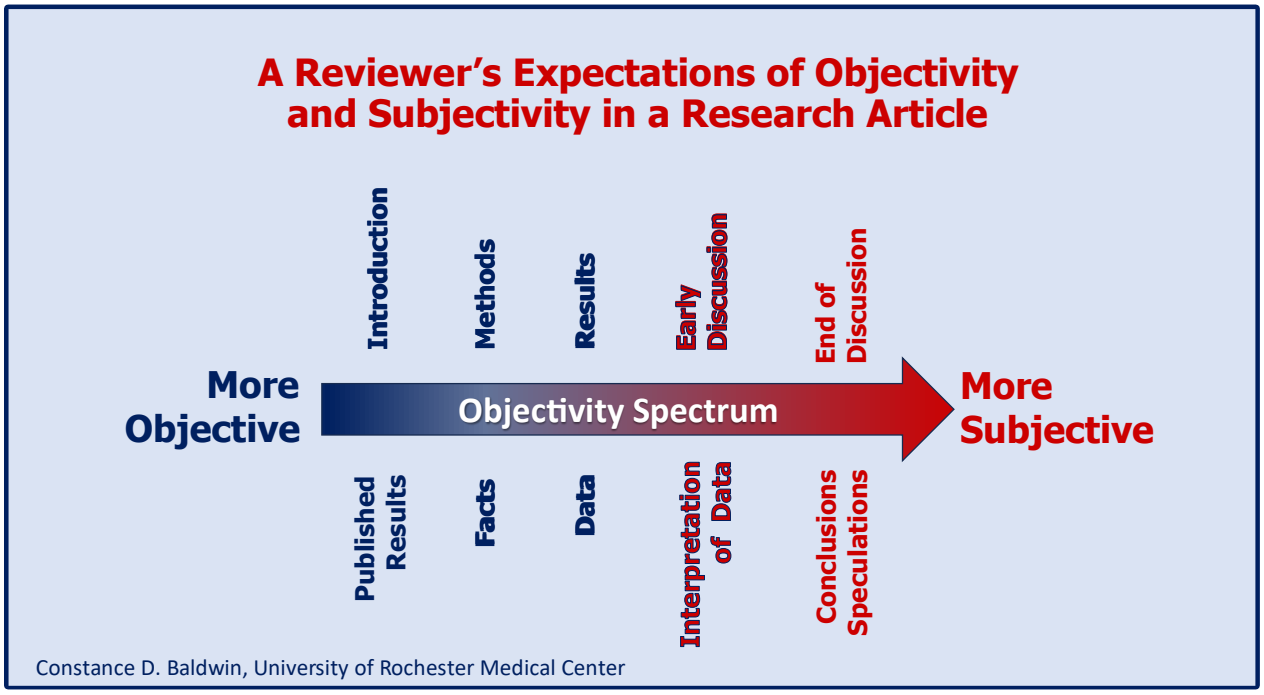
We all know that the standard parts of an academic paper are Title and Abstract, and then Introduction, Methods, Results, and Discussion/Conclusions (aka IMRaD format). Each part contains specific kinds of information dictated by common usage. Understanding the overall shape of the information in an article will help you to convey your message effectively.

The Information Hourglass. The Figure depicts a useful metaphor to help you manage information in your article. A paper begins in the Introduction with a ***broad perspective*** on your targeted problem. In the middle, Methods and Results narrow down to more ***concrete, factual data*** about what you did and what you found. The Discussion and Conclusion ***return to a broader perspective*** to interpret your findings in the context of the literature.



This distribution of information is consistent with how your readers (and reviewers) will comprehend your message. In the Introduction, they need to understand your ***focal question or problem*** in the broad context of what is known in the literature and what ***gaps need to be filled*** (see model of Introduction in App. 2). After getting the big picture, they will be ready for the specifics of how you conducted the study (Methods) and what you found (Results). Towards the end, they want to step back and see what it all signifies. In the Discussion, You put your findings in a broader context: how do they relate to previously published reports, how should specific results be interpreted, and what are the strengths and weaknesses of your findings? Finally, you conclude the paper with an overall statement of how well your results address your initial purpose, and the importance and novelty of these results. (App. 3 provides a good example of such a discussion.)

The Spectrum of Objectivity ➔ Subjectivity. The conventions for organizing information in a research paper sometimes appear to be arbitrary. The spectrum below explains the logic behind some of the unwritten rules. For example: Why don't you describe your study in the first paragraph of the Introduction? Why should the Results section not include interpretations of your findings? The Objectivity Spectrum is my invention to describe the overall rationale of a paper: you need to present your study with objective, peer reviewed facts and concrete data first. Then in Discussion, you share your more subjective interpretations with readers. This order of presentation ***allows readers to make independent judgments about what your study means***, before they hear what you think about your findings.



To apply this rationale:

- In the **Introduction**, you do not refer to your own study until the final paragraph. You present what is known about the field/problem using the literature alone. Peer-reviewed results in the literature are considered more "factual" than your unpublished data.
- In **Methods**, you discuss the facts about how the study was conducted. If needed, include the rationale for why you chose specific methods.
- In **Results**, you let the data speak strictly for themselves, without interpretation and without drawing conclusions. [Note: Basic science research articles may vary from this rule. A stepwise basic science study in which the results of one experiment create a rationale for the next experiment must interpret results along the way.]
- In **Discussion**, you are allowed to interpret the data in Results, but you postpone drawing broader conclusions until the very last paragraph(s). Recommendations, if included at all, are brief and are usually in a separate paragraph, just before the final conclusions.

In brief, you proceed through the paper across a spectrum of objectivity, beginning with objective facts and data, and reserving more subjective analysis until the end. This conventional approach will make your writing more acceptable and convincing to reviewers and readers.

3. Writing a Research Article

Title

The title should be brief; use it to highlight your primary question. To attract readers, I usually put the topic before the population studied. Look up the word/character limit for titles in your targeted journal, and study examples of titles in recent issues to become familiar with the journal's preferred style. Are the titles purely factual or do they ask a question? Do they state the conclusion of the study? In clinical research journals, statements of the conclusion in titles are usually avoided, but basic science journals can be more flexible. Choosing a title before you begin to write may help you to focus your writing, but remain open to renaming the paper as your central message clarifies.

Abstract

The Abstract is a brief summary of the article as a whole, and needs to be clear and informative, addressing importance, validity, and applicability of findings. It creates a first impression of you as the author. Be sure the **primary question** and **conclusions** of the paper come through clearly and accurately. The Abstract helps readers decide whether (or not) to read the entire article and orients them to the big picture of the study. (A good example can be found in App. 5.)

I usually write the Abstract last, borrowing key sentences from the narrative and then cutting it down to size. Others write the abstract at the beginning of the writing process

to provide a game plan for the paper. If you do the latter, expect to revise the Abstract significantly after the article is written.

Follow the strict word limit and format prescribed by the journal. Many journals require a structured Abstract, with subheadings for purpose or background, objective(s), methods, results, and conclusions (names will vary). If subheadings are not required, I always order the information the same way, just without the labels.

Abstract content and organization

The journal always specifies the length of the abstract, usually 300 or 350 words. My suggestions below reflect this length. Do not include references in this section.

1. **Purpose or Background:** Usually 1-2 sentences are enough. Your main task is to address the importance of the problem you are studying. This is key information, but do not be tempted to dwell at length on your rationale.
2. **Objective:** This section should be brief and pithy. Usually in one sentence, you describe specifically what your study aimed to investigate. Sometimes 2-3 aims are included with numbers.
3. **Methods:** The essential elements of Methods are the study design and the methods used to test your key question. Say only as much as is necessary to understand the results that follow, and allow evaluation of the study.
4. **Results:** This is usually the longest section of the abstract. A clear summary of results is a higher priority than a lot of numbers and statistical data. ***Note:*** While the results section in an abstract for a professional meeting is data-intensive, the results in an abstract for a paper need not be dominated by numbers. Do not include tables or figures.
5. **Conclusion:** Aim for 1-3 sentences. State your conclusion clearly, but with carefully considered qualifications. ***Do not let the brevity of an abstract lure you into overstatement!*** When I formally review a paper for a journal, an unqualified, overstated conclusion in the abstract makes me very wary of subjectivity in the rest of the paper.

Introduction

Remember: The first draft only has to get written to succeed!

Basic strategies. The main purpose of the introduction is to ***establish the importance and novelty of the study, leading to a focused definition of your primary question***. Review the literature in a way that focuses on what is known and not known about your topic, with an emphasis on ***gaps that need to be filled*** (these will demonstrate novelty)***.*** Literature that does not relate directly to the significance of your topic or the novelty of your findings can usually be omitted. Note that in the Discussion section, you will also be commenting on the literature, but there you will use past studies primarily to clarify your findings. In the Introduction, the literature sets the stage for your work. Direct reference to your study is usually saved for the final paragraph. (See good models of introductions in Apps. 2, 4 and 5.)

The introduction is short and focused in most clinical and basic science research journals, but longer in social science journals. Review *Instructions for Authors* for your targeted journal to identify the expected length. Often journals state a requirement for total length of a submitted article, but not specifically for the Introduction. Nonetheless, you cannot afford to let this section get too long, or it will steal space needed for Results and Discussion. Looking back at my papers, I see that the Introduction is about 15-20% of the total word count of the narrative.

Content and organization

Paragraph 1: State question and why it matters. The convention is to state your question and its importance without specific reference to your study. Use the literature to establish why the question is important. Describing a controversy in the field can be a good starting point that attracts attention, assuming that your study sheds light on the point of contention.

Paragraph 2-4+: Review literature selectively. The purpose of this review is to defend your choice of question/hypothesis, and your claim to novelty and significance. Do not think of the Introduction as an extended discussion of the general problem you want to address (unless you are writing for a social science journal). For medical and basic science journals, make it short and focused, targeting ***your specific question***. (Note: Avoid comparing your study with previous studies: this is a topic for the Discussion.) Usually, the introduction identifies specific gaps in knowledge that your study will answer or clarify. Immediately prior to the final paragraph, it can be effective to include a sentence that summarizes these gaps: e.g., “a better understanding of x and y is needed for the z field to advance.” This sets the stage for the last paragraph, which can begin with: “Our study will address these gaps in knowledge by….”

Final paragraph: The final paragraph provides a snapshot of your study design and methods (no findings), described in 2-3 sentences. It sets the stage for the Methods section that follows. The typical content of the final paragraph includes: 1) study question or hypothesis, 2) population studied, and 3) brief study design. You can afford to be brief; the details will follow immediately in Methods.

Methods

Basic strategies. This section is usually reasonably compact, but the reader needs to be told enough to evaluate the quality of your study and interpret your results. In the past, the Methods section was expected to enable another researcher to reproduce the study and test its results, but this amount of detail is rarely expected in today’s shortened format for research articles. In some journals, especially those in the basic sciences, an online supplement to an article can include detailed methods.

Think about how much your reader needs to be told about each method. If a tool is widely used (e.g., a Stanford-Binet IQ test), you could simply cite the source. However, if you are using the Stanford-Binet with a multi-ethnic population, discussing its validity for limited-English speakers would be important. Any tool that you have created *de novo* demands more detailed description, particularly evidence for the validity of pilot data collected with the new tool. Be meticulous about using identical names for each variable

throughout the paper, or the reader will get lost. (If you have several authors, nomenclature can easily drift.)

Readers are likely to refer back to Methods when they read Results, so include bold-faced headings in Methods (like those in this module) to help them find what they are looking for.

Content and organization. The organization of the Methods section will vary depending on the kind of study you have conducted. There are some very useful guidelines to help you with different kinds of research. For example, a randomized controlled trial can be described following the CONSORT guidelines. For a systematic review (like App. 3), use the PRISMA checklist. (Use these tools from the beginning of study planning!) It can be helpful to read a couple of well-written articles that describe studies similar to yours, to get ideas about how to organize Methods (and Results).

If you are reporting on a **clinical study**, begin by defining:

- **Study type and design** (e.g., randomized controlled trial, secondary data analysis, qualitative or mixed methods study),
- **Sample** (from what population, inclusion/exclusion criteria, recruitment protocol, sample size required for the study). Your approaches to controlling for bias are particularly important to journal reviewers: by design (e.g., comparison groups), or methods (e.g., recruitment process, eligibility criteria), or statistical controls. A brief sentence about IRB approval can be included after your sample description.
- **Study protocol.** Describe patient recruitment, consent process, timeline, assessment, intervention, primary and secondary outcomes.
- **Procedures or instruments.** Describe diagnostic assessments and experimental interventions. Give more detail where methods are novel, less detail if previously published. Link your description of procedures with your outcome measures.

For a **basic science study using animals**, you will typically include these sections in Methods:

- **Organism(s) studied** (plant, animal, human, etc.), genetic information if relevant, and handling and feeding before and during the study.
- **Experimental design:** hypotheses tested, controls, treatments, variable(s) measured, number of samples collected, replicates, what measured
- **The protocol for collecting data:** how experimental procedures were performed, timing/quantities, specific measures, equipment.

Statistical approach and methods. This section is often drafted by the statistician on your study team. Describe how the data were summarized (means, percents, etc.), how you will report measures of variability (SD,SEM, etc.), data transformation (if used), and statistical tests.

Explain your rationale for using unfamiliar statistical methods. This section may be a rather short paragraph, but if your statistical methods are complex or not well known to

reviewers, a longer discussion will be needed. Your goal is to tell readers enough so they can evaluate the suitability and rigor of your analytic methods. For a large clinical study, a power analysis is important to show that your sample size is adequate to answer the question(s) posed.

Results

Basic strategies. The convention for writing the Results is to ***let the data speak for themselves***. (See the **Spectrum of Objectivity** graphic above.) Avoid or minimize interpretation of data, and strictly avoid stating conclusions; these are the business of the Discussion.

The Results can be organized in a variety of ways, but the important goal is to make the section systematic and easy for readers to follow. (E.g., see App. 2 for a mixed methods Results section. In App. 4, see the section called Assessing the Quality of the Educational Scholars Program, which is the equivalent of the Results section.) Keep like things alike: e.g., variable names, and table/figure formats (where feasible). Answer all research questions. Use of boldfaced headings will help readers find specific data when they look back at Results while reading the Discussion.

It is conventional to ***use past tense to describe your results***. You are describing what you have observed or found, not what is happening now. Just to make things complicated, in the Discussion you ***use past tense for your data, but present tense to describe published results from the literature.*** My guess about the rationale for this convention is that published results are considered "true and present" because they have received the formal blessing of the peer review system, while results in an article are written before peer review has occurred.

Content and organization. In Results, you normally describe the sample first (number, demographics), before getting into the results of interventions or experimental conditions. Authors often follow the order of the Methods section. Data can also be organized around hypotheses, or chronology, or design elements (such as comparison groups). Generally, you present simpler before more complex results, to facilitate understanding: e.g., sample demographics before group comparisons. Order your figures and tables to follow the organization of topics in your Results section. I try to give prominence to my strongest findings, if that does not violate a logical order for my results. I generally describe negative findings briefly, somewhere in the middle, where they are less prominent.

Data presentation. Results are described using a combination of graphs, tables, and narrative. Think carefully about the most effective way to present each set of results. Ideally, graphics are used to present your most important findings, because a picture has strong impact; it often tells a story more clearly than a paragraph. Graphics show relations between data sets, while tables are essential to present and compare specific numbers: e.g., abnormal vs normal clinical values, or Likert scale ratings with frequencies and ranges. In tables, use formatting strategically: organize the data in a

way that highlights your most important results. You may choose to use bold face to emphasize significant differences. If you use a series of graphs or tables, keep the formats within a group similar, if possible, to simplify interpretation. You must mention all tables and graphs in the narrative (in order), but usually you introduce them briefly: highlight key findings and the bottom line, but ***do not reiterate the data***. (See App. 4: Model of a Program Evaluation Article, Assessing the Quality of the Educational Scholars Program).

Narrative is indispensable to tell your story coherently, no matter how well you design your figures and tables. The critical rule in Results is to ***stick to the facts***. Graphs and tables usually do this, but the narrative can sometimes wander into the subjective world. Keep the story as simple and focused as possible without distorting meaning; omit detailed data if a summary is adequate. (Tangential data—i.e., data that is somewhat related to the study, but not critical—is tempting to include, but omitting it will usually strengthen your paper by improving the focus.) Discipline yourself to avoid interpretation and especially conclusions in Results; these belong in Discussion.

It is common for Results (and Discussion) to require condensation in later drafts. I often write a fairly detailed Results section for the first draft, and then cut it back to create a briefer, but coherent summary. I find that my brief summaries are meatier when I write a longer version first, but everyone should find their own best methods.

Discussion

Basic strategies

This critical section of a paper is for many authors the most challenging to write. First, you need to adroitly manage differences (or similarities) between your results and those in previously published papers. In the process, you must deal with the ambiguities in your results, and findings that may be hard to explain. Moreover, it can be thorny to sort out what really must be discussed, and what is not worth the space. This section is where your word count becomes important: it cannot be overly detailed, but to make room for critical discussion topics, you may need to cut back earlier sections of the paper. Despite these complexities, it can be very satisfying to sort out your findings and declare what you have discovered in positive language!

The Discussion always begins with a one paragraph summary of key findings. The next few paragraphs evaluate the strengths and weaknesses of your specific findings in relation to the literature, and interpret their meaning. Save conclusions for the end of Discussion. Interpretations in the earlier parts of Discussion deal with specific results, but conclusions put all those interpretations together into a “bottom line” statement of what the study as a whole is telling us (as in Apps. 2, 3, 4, and 5).

Content and organization

Beginning: Summary of key findings. Always begin the Discussion by succinctly summarizing your most important findings, viewed in the context of your key question or

hypothesis. This is one place where you can sing your own praises, as long as you stay in tune! I rarely bring in the literature here. There is plenty of time for the literature in the paragraphs that follow. The initial summary is usually one paragraph, or no more than two (see Apps. 2, 3, 4 and 5).

Middle: Compare your findings with results of previous studies. This component of the Discussion is usually several paragraphs in length. Be selective: discuss only results that deserve comment. We may choose to order the discussion of findings in roughly the same order as the Results section. However, sometimes we begin and end strategically with the most exciting, convincing, or novel results, and put in the middle what is more debatable and ambiguous, or less interesting.

As you write this section, ***begin each paragraph with your data.*** I have read many early investigators' papers that give priority to others' papers, instead of their own data. The purpose of the Discussion is to interpret what ***you*** have found. Previous studies are used to confirm, question, or clarify your findings. Studies that need special attention in their own right belong in the Introduction, or sometimes later in the Discussion prior to the conclusions.

You can use previous studies in several ways. If your results ***confirm*** previous studies, the similarities support the validity of your study, but could also be interpreted to suggest that your findings are not very novel. If your results ***differ*** from those of previous studies, this may indicate that your results are novel, but the difference might also call into question the validity of your findings. To minimize both of these problems, explain clearly ***what is unique*** in your study (e.g., the population sampled, study design, specific methods). Highlighting this uniqueness is strategic in itself, but also helps to clarify differences between your findings and those of others. Previous studies can also be used to ***clarify ambiguities*** in the interpretation of your findings. If there are two possible interpretations of your data, previous publications may help you decide which is more likely to be valid. You are not obligated to answer every question brought up by your data. Posing these questions can make your findings more interesting, and may suggest promising avenues for future research.

It is essential not to overstate interpretations or conclusions anywhere in the Discussion—practice the strategic use of qualifiers! (E.g., "it ***appears*** that…," "this result ***may*** be reproducible if…," "these data ***suggest*** that...") The skillful use of qualifiers is well illustrated in App. 2, Conclusions and Implications. On the other hand, understatement is also a liability. Your readers deserve to hear what you think you have discovered in relatively objective language (see Spectrum of Objectivity).

Be especially careful in comparing the strength of your work to that of other authors. It takes some practice to do this without ruffling feathers—those authors MIGHT be your reviewers! ***Never disparage or attack previous studies***; you can almost always explain differences in findings in an even-handed fashion. For example, no two samples are identical, so conflicting findings might reflect that fact. Changes in a population over time may influence findings. Development of better investigative methods in your field

may also help to explain differences in results. Get your mentors to help you learn smart ways to respectfully compare your results with those of the "competition."

In the Discussion, referring back to points you made in the Introduction is good, but avoid including detailed information that really belongs in the Introduction. There, you review the literature to establish your study's importance and novelty. Here you use previous reports to confirm, question, or clarify your results (or theirs).

Our model articles in the appendices demonstrate some variations in the writing of Discussion sections. App. 2 offers a very careful treatment of limitations, and an excellent conclusion statement. In App. 4, the extended consideration of Figure 2 in the Discussion may seem to belong in Results, but it is appropriately placed in Discussion to compare the paper's results with a new model in the literature. The article in App. 3 is a systematic review, so the middle paragraphs of the discussion follow a different pattern from that discussed above. The authors do not compare their findings with other reports because these other reports ***are*** the results. Instead, they compare the numerous studies they reviewed with each other (e.g., child abuse terminology or educational methods). Nonetheless, this Discussion begins with a typical summary of findings in paragraph 1, and ends with the usual summary of implications, strengths and limitations, and conclusions. The standard components of a Discussion section are followed quite consistently in medical and scientific research articles. (App. 5 offers a typical example.)

Next to last: Limitations. This topic is usually discussed just before the conclusion(s). ***Addressing limitations of your study is essential!*** You will ***not*** be happy if your reviewers feel obligated to identify all your limitations for you! Discussion of study limitations is an art unto itself. Often limitations are methodologic complications or design weaknesses. Sometimes these problems are addressed earlier in Discussion, in the paragraphs where you discussed specific results where the limitations are evident. Some limitations are unavoidable (e.g., small sample size, or lack of the optimal methodology, see App. 5), but they still need to be mentioned. Get advice from others to help you identify limitations and evaluate their impact. Most important, try to make a case that the limitations have not seriously compromised your findings or their interpretation.

I like to combine strengths and limitations in the same section (e.g., App. 3), usually beginning with strengths. A key study characteristic may fall in both categories. For example, you may say that your study has limited generalizability because you included a predominantly Black and Hispanic sample. However, you can also say that your study is the first to study this problem in these populations, so this feature makes the study unique and valuable.

Most limitations are addressed briefly, with a comment on how much the limitation may have compromised the study results. However, a serious limitation may need its own paragraph, in which you evaluate how much the problem undermines confidence in the validity of your results. For example, we once had 30% attrition in a 7-year study of otitis

media in children recruited at birth. Even though this much attrition was hardly surprising over 7 years, journal reviewers required us to go back and analyze who stayed in the study and who dropped out, compare them demographically and clinically, and make a strong case that the attrition was unlikely to have created false positive results. Getting this argument right (to the satisfaction of the reviewers) took three submissions of the paper (Johnson, DL et al., The Effects of Early Middle Ear Effusion on Child Intelligence at Three, Five and Seven Years of Age. *Journal of Pediatric Psychology*, 2000. 25 (1): 5-13). We were compelled to solve this problem, or none of the following 10 papers from that study would have been publishable.

The Discussion in App. 3 takes a rather different approach to limitations because it is a systematic review. First, it includes two paragraphs (6 and 7) on the limitations of the studies identified in the review. Then, before Conclusions, the authors focus on their own study: ¶10 discusses strengths of the systematic review, and ¶11 and 12 address its limitations.

Ending: Your conclusions and what they mean in the "real world." Conclusions need to be written with great care, so they do not exceed the strength of your findings. Always have a mentor and other colleagues read your conclusions to assure that they are justified by the data from an objective perspective. ***Indicate your degree of confidence in your conclusions, using needed qualifiers.*** You may choose to extend your conclusion with a speculative comment, as long as you identify it as such. For example:

- From our findings, we conclude that…. We might speculate that…
- This conclusion suggests that… might underlie these findings, but further investigations are needed to confirm this interpretation.

App. 2 does a particularly good job of using qualifiers in the Conclusion without diluting meaning.

Sometimes it is appropriate to end a paper with a brief recommendation, particularly in a clinical study. However, more often we propose follow-up studies (never simple confirmatory studies) that will build on the current study and extend its findings. Your proposal for continuing research helps build the case that your results are novel and significant. For example, in App. 2, the final message in the Conclusion is that education that includes self-reflection has the potential to help physicians provide better care for adolescents in the future. App. 3 concludes with the argument that future studies of adverse childhood experiences in children, which extend earlier groundbreaking work in adults, should enable development of better strategies to prevent adverse experiences early in life.

The final 2-3 sentences of your paper should restate why the topic matters and how the findings may make an important difference in the world. A little eloquence here is welcome! Often this final paragraph harkens back to the first paragraph in the Introduction, linking the question you posed with the answer you found.

4. Writing Qualitative Articles

How Qualitative and Quantitative Methods Differ

Most of the approaches to writing research articles that I have shared in this module apply to both quantitative and qualitative scholarship. Most clinical research articles (and virtually all basic science articles) are quantitative, but in clinical and educational research, articles can also use qualitative methods or mixed methods (both methods combined). Quantitative studies employ precisely defined interventions and strive for exact measurement of numerical outcomes. Qualitative methods collect verbal data, usually from open-ended survey responses, interviews, focus groups, or written documents, and seek to understand the thoughts, feelings, perceptions, and reported behaviors of participants. In mixed methods studies, the qualitative data can help to interpret the quantitative data in greater depth. Reviewers have expectations for rigor in both quantitative and qualitative articles, but rigor is defined differently for the two methods.

Whether a research paper is quantitative or qualitative, the essential criteria for success are ***novelty*** and ***importance***. Researchers choose a qualitative approach when numbers alone will not answer an important question. For example, educators may be unable to evaluate everything that learners have gained from a rich educational experience unless they can hear what the learners themselves have to say about it. A quantitative knowledge test is useful, but it may be insufficient to evaluate a learner's depth of understanding of what has been taught. Mixed methods studies are undertaken to look at a question from more than one perspective: e.g., in behavioral science research, a mixed methods study might capture quantitative data on intervention outcomes, combined with qualitative data on a patient's personal responses to treatment. Some qualitative research is used to "assess the landscape" in a novel area of interest, in order to discover questions or generate hypotheses that merit more definitive quantitative studies in the future.

Suggestions for writing qualitative articles

Some kinds of qualitative research are open-ended by design, to ensure that the mindsets of the researchers do not interfere with the process of discovering "truth." Studies using grounded theory, for example, begin with a question, or just a data collection process, and then may analyze the data to develop a theory or hypothesis as a study endpoint. In contrast, directed content analysis may begin with a theoretical framework that is used to structure data collection and interpretation of the findings. The methods section of the article explains this research approach, and why and how particular components of the study were included. This information allows article reviewers to evaluate the methodological rigor of the study.

If you have a qualitative study to report, choose a journal carefully. Some journals allow longer articles for qualitative studies, and have reviewers with qualitative research

expertise. However, many journals do not. Look at the instructions to authors to find if qualitative research is discussed, and look through recent issues to see if the journal has published any qualitative papers. It is usually easier to get mixed methods papers published than pure qualitative papers, because reviewers are more confident evaluating numbers and words, compared to words alone. You will note that in our model articles in the appendices, Apps. 2 and 4 are mixed methods studies.

Introduction. As in any scientific paper, clearly define your primary question and why it matters, and review the relevant literature. In the final paragraph(s), explain why you have chosen a qualitative approach and a particular population and setting to study. For a directed content analysis, a section of the Introduction should present the previously published theoretical framework from which you approached the analysis. This information can also be placed in a separate section following the Introduction, if more than a paragraph or two are needed.

Methods. Qualitative papers focus on words, so it is critical to describe your selection of the participants who are your verbal sources, and the social and/or personal context in which you collected the data. Data analysis methods vary for different kinds of qualitative research; a precise description of your chosen method(s) is essential to establish the rigor of the study. In general, you describe participant selection, data collection ***in context***, and how and by whom the data were analyzed. Details of the data collection process enhance trustworthiness (similar to validity in quantitative research).

Qualitative data analysis includes coding by 2-3 or more researchers, to provide diverse perspectives that will ultimately lead to a group consensus on the findings. Describe whether you used coding software or “hand” coding, and in either case, how the codes were organized into themes. Describe how consensus among coders on codes and themes was achieved. Use of triangulation, which is collection and comparison of parallel data from different sets of respondents, strengthens the validity of the findings. The final step is member checking, a method for respondent validation. Did participants review and agree with your summary of themes and conclusions? Member checking lends credibility to the results.

This description of methods is very brief. To help you navigate this complex landscape, read a good article on the specific type of qualitative methods that you want to use, and study model articles using that approach. Experts can help you to learn details about terminology and process. This kind of research has its own vocabulary. I should also mention that in mixed methods papers, such as Apps. 2 and 4, the qualitative methods discussion is usually much briefer than that in a pure qualitative article.

Results. The Results section of a qualitative paper is fundamentally different from that of a conventional scientific study. Subjectivity is assumed, and is valued. You and your coauthors filter personally meaningful data from respondents through your own minds and interpret it based on your own experiences. Richness is preferred to the parsimony appreciated by quantitative scientists: you are aiming to collect verbal data and interpret it for deeper meanings and fertile ambiguities, not assemble a discrete set of “facts.”

Therefore, after you interpret your data, create codes, and group them into themes, you illustrate the themes with verbatim quotations to show the breadth of meanings embodied in each theme. The results of the study are usually presented either by narrative with embedded quotations (typical of pure qualitative studies), or by narrative with reference to a table of quotations organized by themes (as in Apps. 2 and 4).

Discussion. This section is structurally similar to the Discussion section of a quantitative paper. You will relate qualitative themes to your study questions. Reference to the setting in which you conducted the study is important, because qualitative studies are not expected to generalize broadly. Data depend on setting and context; statements about transferability (if included) should be made with care. Usually, these studies do not aim for what quantitative researchers fervently value: reproducibility and generalizability across contexts.

Qualitative studies use the Discussion to put together a unified picture of how the themes that have emerged fit together. Often this is a narrative discussion. Sometimes, authors begin their study with an existing theoretical construct and return to it in the Discussion; others create a conceptual model in the Discussion from their qualitative results to help interpret their findings. (App. 4 offers a variant of this approach, see **3. Writing a Research Article,** Discussion.) The goal is to create focus, facilitate interpretation of the data, and suggest potential application of the study findings to other settings.

Limitations are important, given that qualitative studies are inherently subjective. This subjectivity is offset by the rigor of the methods you have used. It is important to evaluate the potential impact of limitations on the usefulness of results. Both mixed methods articles in Apps. 2 and 4 provide examples of addressing limitations.

Conclusions from a qualitative study are contextual: e.g., how does a specific group of people feel about or react to particular experiences or circumstances? The point is usually not to demonstrate consistency within a group of subjects, or to project findings from one context to another. While uncontrolled variability in data from a quantitative study might render it meaningless, the richness of individuality in human reactions is what qualitative studies are about. For example, we educators hope that after exposure to a teaching intervention, all learners have benefited; however, because their styles of learning and past experiences are individual, we consider the intervention most effective if it creates a range of diverse effects.

I lacked room in the appendices to include a pure qualitative research article. For an instructive example, look up the following article, first authored by an excellent qualitative research expert: Balmer DF, Courts KA, Dougherty B, Tuton LW, Abbuhl S, Hirshfield LE. 2020. Applying the theory of gendered organizations to the lived experience of women with established careers in academic medicine. *Teach Learn Med*. 32(5):466–475.

A look at two mixed methods studies

It is common for investigators to combine qualitative and quantitative methods in a mixed methods study. Apps. 2 and 4 demonstrate how results from such a combination can be used to reinforce and illuminate each other.

In App. 2 ("Use of a Self-Reflection Tool to Enhance Resident Learning…"), the authors chose to evaluate residents' self-reported survey results through both numerical data (likert scale, 1-5 responses) and verbal data (open-ended comments). Survey results are reported by statistical analysis of the likert-scale responses, and qualitative analysis of the written responses. A study of self-reflection in learners is an ideal opportunity to use qualitative methods. This analysis yielded 4 themes, reported in the narrative with reference to a table of quotations. The article has an extended limitations section that assesses strengths and weaknesses in both the quantitative and qualitative components of the analysis.

App. 4 ("Impact of a National Faculty Development Program…") also mixes methods. Educational scholars' self-reported growth in 4 areas of educational competence was assessed with a quantitative survey tool, based on a previously published developmental rating scale (1=novice to 5=expert). In contrast, the responses of 8 past Academic Pediatric Association (APA) presidents describing the contribution of the Educational Scholars Program to the APA were collected by 30-min transcribed interviews and analyzed using standard qualitative methods. These data are reported in a detailed table that displays 5 primary themes, numerous subthemes, and 21 representative quotations. As noted in the Editorial Comments to App. 4, reporting the responses of 24 scholars by quantitative methods, and 8 presidents by qualitative methods makes good sense: 8 is too small a sample for quantitative analysis, but the interviews produced a very robust set of qualitative data from authoritative respondents. In the Discussion, this paper shows the interesting use of a conceptual model from the literature to both confirm the validity of the mixed methods study, and to build the foundation for an impressive, expanded model in Figure 2. The model combines data from both the quantitative and qualitative components of the study.

In conclusion

What you have read in this section represents my perspective on qualitative research. I do not consider myself an expert in this method, but I have written qualitative and mixed methods papers, and I appreciated the process and results. One lesson I have learned is that when you write a qualitative paper, you are often not only describing a study, but educating the reader about your methods. You cannot assume that all reviewers or readers will understand your approach or share your assumptions about its value. However, a well written qualitative paper may show them how illuminating this method can be. I find the human depth of a good qualitative study fascinating; it provides a welcome alternative to the narrow exactitude preferred for purely quantitative studies.

5. Back to the Big Picture

Plan a paper both forwards and backwards

Planning a paper forwards means that at the beginning of writing, you consider all the sections you will write to build a strong central argument that is consistent and coherent. Planning a paper backwards means that once you have a completed draft, you reflect back on the interrelations between the sections of the paper, to be sure they are mutually supportive. Every part of the paper should reflect where your study was going and what you found there. This process helps to keep the paper focused on your primary question and the answer you reach from interpreting your findings.

When we write papers over multiple iterations, we can take full advantage of the insights that emerge as we create, clarify, and perfect our ideas.

Two Ways to Approach a Research Article

	Looking Forwards	Looking Backwards
Introduction	• What does the literature say about the importance of your study question? • Do you describe documented gaps in knowledge that your study addresses? • How and where in the rest of the paper can you build a case for this central message?	• Can a deeper understanding of your key findings, as described in Results and Discussion, help you to focus, clarify, and possibly shorten the Introduction? • Should you consider a rewording of your key study question? • In the Discussion, what literature was central to your findings? Should any of it be added to the Introduction? • Is your summary of the study precise in the final paragraph of introduction?
Methods	• How did you choose your design and methods to answer your central question? • What is the clearest way to present your methods and in what order?	• Given what is now in Results, are all the included methods needed, and are any missing? • Can any methods descriptions be shortened? • Are the orders of Methods and Results sections well aligned?

Results	• How can you create a focused and dynamic presentation of your central data? Which results should you spotlight? • Where can you make best use of graphics, tables, or narrative for focus and impact?	• Do you use Results effectively to address your central question in Introduction? • Can your choice of key results help you reorder or refocus the Methods section? • Which results require analysis and interpretation in Discussion? • Study your combined results deeply to assess the best focus for the Discussion.
Discussion	• How can you highlight your key findings, interpret nuances of the data, clarify ambiguities, and put the pieces together to create a coherent picture? • What are the key implications of your findings? • How should you address strengths and limitations? • What are the key points to include in Conclusions?	• Consider how your central message and conclusions emerge from previous sections of the paper. Are these connections clearly articulated? • Reassess your strengths and limitations section. Is the language adjusted to the optimal degree of emphasis? • Overall, do you feel that your conclusions are as strongly supported as possible? Alternatively, would they benefit from use of more qualifiers?*
* Examples of qualifiers on page 14		

Three authoring challenges

No one has said that scientific writing is easy! When a task is difficult, it is helpful to identify the problems you will face and plan ways to manage them. What is not helpful is feeling personally defeated by the challenges that every writer faces. We are all in this together—particularly those of us blessed with co-authors who offer multiple perspectives and talents to our research. Even our “competitors” can provide interesting insights that help us to think about our work in new ways. And critical reviewers often help us clarify our thinking and our writing.

NOTE: Module 1: Think Like a Writer, discusses several challenges explored in this section.

Challenge 1: Mastering form and content simultaneously

Mastering the form. This module has discussed in detail the expected form of a research article. Making the standard form work for you requires some finesse: it helps to consider what the reader needs to know, and when. For example, the final paragraph of Introduction gives the reader an overview of what will be discussed in detail in

Methods. The Methods tell the reader how the study was done, so the Results will make sense. Of course, the Results pave the way for the Discussion, which interprets the Results, piece by piece. Try to avoid confusing the reader with new information that springs up out of context. When you ask others to read your drafts and provide feedback, they can help you learn to write your paper from the readers' perspective.

Mastering the content. Research rarely produces simple information, so authors need to focus on what matters most. Ask yourself: What data are novel and important? How much information is sufficient, but not too much? In what detail do you need to explain your findings, to make them interpretable? What conclusions are justified by your results, and why and how do they matter in the "real world"? Planning a paper both forwards and backwards, as described above, will help you gain perspective on the best ways to present the content of your study.

Ultimately, ***form and content need to reflect and support each other*** in a paper. Mastering both simultaneously is a special challenge of scientific writing.

Challenge 2: Balancing the expectations of reviewers with the needs readers

Reviewers vs journal readers. Reviewers are the first readers of your article, and without their approval your broader group of journal readers will never see it. Reviewers are much harder to please, and sometimes ask for more explanatory detail than the ordinary reader wants or needs. Less sophisticated journal readers need more focus and simplicity to avoid confusion. Writing to satisfy both sets of readers is a balancing act, but it can be done. Remember that both reviewers and readers need clarity and focus, so make these a high priority.

Challenge 3: Balancing the need for scientific accuracy with the need to interpret the data in a nuanced way

A scientific writer must adhere to expected standards of objectivity, emphasizing ***accuracy*** in describing the study. The author must also manage the reader's understanding of the results by the use of ***focus*** and ***strategic emphasis.*** Accuracy and focused emphasis are sometimes counterpoised. On the one hand, total accuracy may produce a large, indigestible mass of unfocused data. On the other hand, focus requires choosing to emphasize some information at the expense of other information, and this selection may infringe on accuracy.

As depicted in the **Spectrum of Objectivity** (Section 2), a paper evolves as it progresses. It prioritizes factual accuracy in the Introduction, Methods and Results. In the Discussion, the author shifts to a focus on selected key points, and uses more generalization, interpretation of nuances in findings, and selective application of facts in context, in order to draw conclusions. In the Conclusion, strategic emphasis helps the

reader to understand how the author thinks the study should be applied in the "real world" of science or clinical practice.

Hence, a paper ends in a more subjective mode than it used at the start. This tension between objectivity and subjectivity is not simple, but it is manageable. A paper will not spin out of the orbit of scientific rigor if the author manages the balance between accuracy and nuanced interpretation openly and honestly, particularly in the Discussion and Conclusion. This is a critical place to use ***qualifiers*** strategically. Such phrases allow you to state your interpretation clearly, but without claiming that it is "proven truth."

6. Surviving Rejection and Resubmission: What to expect after you submit an article

Then, in due time (2 months or more), you will receive a letter from the editor stating the journal's decision to:

a) Accept the paper pending minor revisions
b) Reconsider the paper if resubmitted with major revisions
c) Reject the paper
[I did not include: Accept the paper with no revisions. I only recall it happening once in my 5 decades of editing.]

Both a) & b) are good outcomes!! Even for a strong paper, b) is more likely than a).

The decision letter will include the editor's overall summary of the reviewers' comments. Then you will see general and specific comments from 2-5 reviewers. ***Teach yourself to value these comments.*** Most reviewers make a sincere effort to help you improve the paper. If they misunderstand something you have written, it may have happened because of flaws in the way you presented those ideas. Often, the editor will share his/her own views, and suggest which reviewer comments are most important to address. If a resubmission is invited, the editor will provide instructions.

Common reasons for acceptance *** Most relevant to the writing process**

1. Important, timely problem
2. Clear, logical, accessible writing*
3. Well-designed study
4. Thoughtful, focused, current literature review*
5. Sufficient sample size
6. Practical, useful implications*
7. Study limitations accounted for in interpretation*
8. Problem well stated and formulated*
9. Novel, unique approach to data analysis

Common reasons for rejection

1. Inappropriate or incomplete statistical methods
2. Over-interpretation of results*
3. Inappropriate or inadequate instrumentation
4. Sample too small or biased
5. Text difficult to follow*
6. Insufficient problem statement*
7. Inaccurate or inconsistent data reported
8. Literature review incomplete, inaccurate, or outdated*
9. Insufficient data
10. Defective tables or figures*

Responding to the journal's decision. For a resubmission, the editor will give you a deadline (~2 mo). Lick your wounds for a few days, but then get back to work! Remember that ***virtually ALL scientific writers have resubmitted papers many times!*** I think my personal record was 4 submissions for one paper, until we finally found the right journal. (Note, I did not say "until we got the paper in shape"!)

RULE #1: Do not hide the critique in a drawer!

Learn to cope with your emotions. Set the paper aside for no more than a week. Share the critique and talk to others. (Soak up their sympathy). After that week, make an effort to appreciate the work that went into the detailed analysis that you received from your reviewers. This really will help you learn to cope.

RULE #2: Do not let the emotions of rejection stop your progress toward publication!

Rejection may not mean that the article is weak. It may have been ill-matched to the journal's mission or readership, or it may have addressed a recently covered topic. If the paper has faults, you now have a perfect opportunity to learn and improve your writing. Use reviewers' comments to make the paper better, even if you will resubmit to a different journal; most critiques will be relevant and useful. If a reviewer misunderstood or missed a point, then you need to make the point clearer and perhaps repeat it (with new phrasing) in a second strategic location. Study the **Revision**

Summary Table at the end of App. 3 for examples of reviewer comments and author responses.

The path toward resubmission

First questions to ask yourself. Was the review mainly positive or negative? Was it sound and fair? Another important question is often: How did ***the reviewer*** answer the "so what?" question? That is, did he/she understand your interpretation of why the study matters, and accept this view? Answering these questions help you decide how to approach your revision, or whether to undertake a more complete rewrite.

The key issue is the "bottom line" the critique, and sometimes this is subtle. This may be evident from the editor's summary, but it may not. You may need to read between the lines, and get others to lend their insights. Often reviewers have specific, potentially valid and useful objections, but other times they may just feel that the topic is uninteresting (without saying so). If lack of interest seems to be the problem, choosing a different journal may well be indicated.

If there is controversy among the reviewers, what is that telling you? You can probably learn from both perspectives. The key point here is that you need to thoroughly digest the critique. The Editor's summary should be useful. Get advice from your mentor and co-authors about responses to the critique, especially if you are going to resubmit this paper to the same journal. You might try inserting boxes with the important reviewer comments into the file for the paper, to get the revision process started. [You will enjoy deleting them later, when you have addressed them!]

What you need to decide next. A key issue is to decide if you targeted the right journal and audience. If you think it was a good journal choice, and they have not published on the topic recently, then decide if the importance of the study came across clearly. Was the main reason for the rejection (or request for major revision) primarily a problem with the science (e.g., validity or interpretation of findings) or faults in the writing? Get advice from others.

The main issue here is: Can your respond to the critique effectively? Perhaps you now have additional data that might strengthen a resubmission. Or maybe the reviews have shown you how to present your study more effectively. Before resubmitting, decide if you should: ***1) revise paper, retaining the primary question/answer, or 2) recast/rewrite the paper.*** If you receive a rejection, you must choose a new journal for resubmission, but the same two questions are relevant.

If you will resubmit to the same journal

Making the revision. This part is easy to describe! Go back to the beginning of this module and review it in parallel with your article. The lessons sound different when you are looking at a real draft of an article you wrote. Of course, you need to ponder the comments of the editor and reviewers as you work through this job.

Writing your response to the editor, if you are asked to resubmit. Your letter to the editor will be accompanied by a **Revision Summary Table** (see abbreviated example at end of App. 3). The letter itself need not be over a page (unless you have an important and complex argument to make), because all the details will be in the revision table. My example lacks an important third column which includes line numbers where relevant revisions can be found in the text of the article. You need to insert line numbers in the document, continuously from page 1 to the end. (In MS Word, go to "Layout" then "Line Numbers" and choose "Continuous.")

Your responses to reviewers' critiques must be diplomatic! Often you will agree with a criticism, at least in part, and can politely thank them for their suggestion. The revision you make in the paper may be fully or partly responsive to their suggestions. If the reviewer misunderstood something, you might include a brief apology, and cite a wording change you have made to clarify your point. If two reviewers said the same thing, just cross-reference to your previous response. If you decide to reject a reviewer's suggestion, ***respond politely, but defend your decision.*** (E.g., see final line on the Reviewer Summary Table, App 3.) In all circumstances, it is important to ***refrain from angry innuendo.*** (Ask others to review your letter and table to search for this!) Being angry about a rejection is totally normal, but expressing that anger in your response is counterproductive! Notice in the example of Reviewer Summary Table, the authors thank the reviewer for negative as well as positive comments.

The letter to the editor, which accompanies the Revision Summary Table, should begin with a brief overview of the critique and response, first emphasizing positive features:

- Express appreciation for critique.
- Use positive reviewer comments to emphasize strengths of the paper.
- Briefly restate your argument for why the paper is novel and important.
- Conclude on a strong, positive note, with gratitude for the efforts of the reviewers and editor to help you improve the article.

Give yourself time to compose this letter strategically, and get input from others!

If the paper was rejected

The key decisions here are: Should you aim for a less competitive journal? Should you submit a different version of the paper, maybe for a different audience? When you choose a new journal, consider its special mission and readership. Ask yourself who needs and wants to read what you have to say? To address a different audience, the paper needs to be recast. Ask yourself what they are likely to find interesting, e.g., what is relevant to their medical practice or their field of science?

If reviewers have said or implied that the content of the paper is thin, you might a) aim for a shorter format (e.g., brief report), b) strengthen the literature review, and/or c) add more data. As you navigate this decision-making process, get input from your mentors and colleagues. Do not be afraid to ask for help: ***everyone*** gets papers rejected.

REMIND YOURSELF:

- Rejection may not mean the paper is poor: good papers are often rejected! Successful scientific writers expect to resubmit most papers at least once.
- Even a misguided critique is likely to reveal something you can improve in the paper, e.g., clarification of purpose, or why a particular approach was not used. If you said it and they missed it, then state the point more clearly in the revision, and perhaps in more than one place (using different language).
- Learn from the critique! Discuss it ***in detail*** with experienced writers to capture the full meaning. In spite of your frustration, this can be the positive part of your rejection experience. You can learn a lot, if you let yourself. And your future papers will be more successful.

KEEP ON MOVING!
The good news: It gets easier over time!

An evaluation form specific to this module in MS Word format is included as Module 4, App. 6. Please complete it on your computer and email to: constance_baldwin@urmc.rochester.edu. Your input will help me to improve this writing course! C. Baldwin