The Association of Public Health Laboratories,
in collaboration with the United States Centers for Disease Control and Prevention's National Center for Immunization and Respiratory Diseases, presents

SCIENTIFIC WRITING

The Basics

PARTICIPANT'S WORKBOOK

APHL ASSOCIATION OF PUBLIC HEALTH LABORATORIES™

This workbook belongs to: _____

Scientific Writing: The Basics

This workbook is a comprehensive in-person companion to the online *Scientific Writing: The Basics* training developed by the Association of Public Health Laboratories (APHL), in collaboration with the United States Centers for Disease Control and Prevention's (CDC) National Center for Immunization and Respiratory Diseases (NCIRD). This training utilizes digital content, in-person instruction and various learning activities.

About APHL

APHL protects the public's health by strengthening governmental health laboratory systems in the United States and globally. Its member institutions, known as "public health laboratories," detect health hazards and generate scientific data to inform public health action.

A global leader in laboratory science, practice and policy, APHL supports member laboratories and public health partners with laboratory guidance, high-quality training, national policymaking, leadership development, crisis response and development of laboratory information management systems, among other services. Its expert staff represent diverse disciplines, from infectious disease, environmental health and food safety to newborn screening and public health preparedness. APHL membership now exceeds 800 institutions and individuals, including core laboratory members as well as federal officials, corporate partners, students and other interested parties.

More information about APHL can be found at www.aphl.org, or by contacting APHL at:

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Silver Spring, MD 20910 USA
Telephone: 240.485.2745
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Email: info@aphl.org

Table of Contents

Training Overview

Welcome to *Scientific Writing: The Basics*! This course was developed by the Association of Public Health Laboratories (APHL), in collaboration with the United States Centers for Disease Control and Prevention's (CDC) National Center for Immunization and Respiratory Diseases (NCIRD). The course is designed to introduce participants to the field of scientific writing for publication. It will provide an overview of the scientific writing process, manuscript preparation and revision.

Goal

The overall goal of this training is to introduce you to the realm of scientific writing and encourage you to write for publication. Now more than ever, the scientific world needs diverse voices publishing on diverse topics. This training will provide you with the tools you need to write, revise and publish scientific papers to advance your career, your field and the scientific community as a whole.

Course Learning Objectives

By the end of this training, you will be able to:

- Describe the scientific writing process and its key stages.
- Describe the purpose and structure of each of the sections of a typical scientific manuscript.
- Demonstrate an ability to present data.
- Analyze and review scientific manuscripts for key messages, consistency and justification.
- Understand the importance of informal peer review and feedback.

Agenda

This course is split up into four modules. Modules 1-3 cover an overview of the scientific writing process, manuscript preparation and manuscript revision. The last module, titled "Wrapping Up," reviews the content of previous chapters.

Module	Description
1	Overview of the Scientific Writing Process
2	Manuscript Preparation
3	Manuscript Revision
4	Wrapping Up

Participants

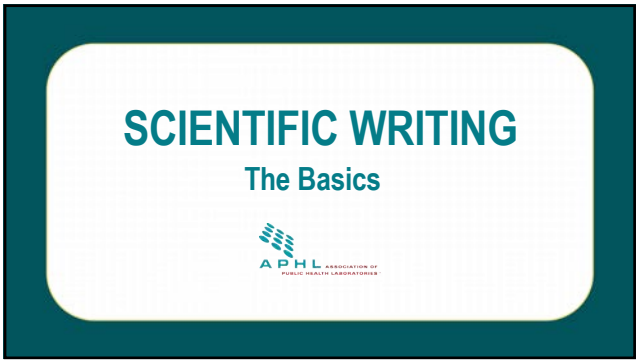
This training is intended primarily for scientists who have either never published their research before, or who are intending to become a first author on upcoming publications. Participants are expected to have a working knowledge of conversational and professional English, though this may not be their first language. Publishing their work will significantly impact their professional lives and is thus of utmost importance.

Using this Workbook

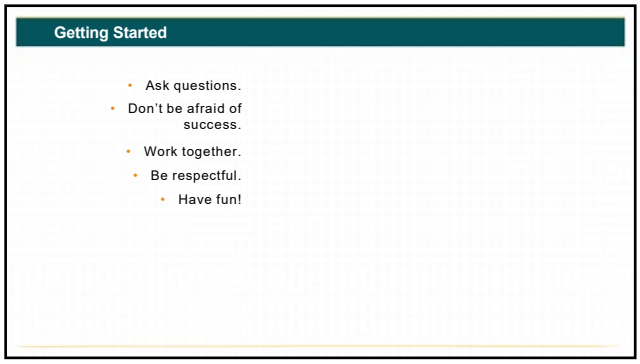
This workbook has five parts:

1. Training Overview (**this part!**)
2. Course Content
    - This part includes all presentation slides, activities and space for notes.
3. Case Study Content
    - Case studies are written descriptions of hypothetical situations that are used to illustrate and analyze specific information or topics.
4. Knowledge Checks
    - These knowledge checks help support and reinforce information throughout the course. These questions are not graded, but they will be collected by your facilitator. All of the knowledge checks also appear as slides in the course content section so that you can continue to take notes and reflect upon them later.
5. Surveys
    - This includes both pre-training and post-training surveys that will help APHL improve future trainings.

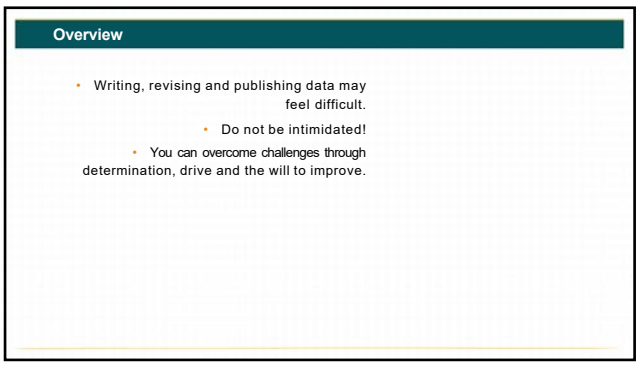
Introduction to Scientific Writing: The Basics


SCIENTIFIC WRITING
The Basics
APHL

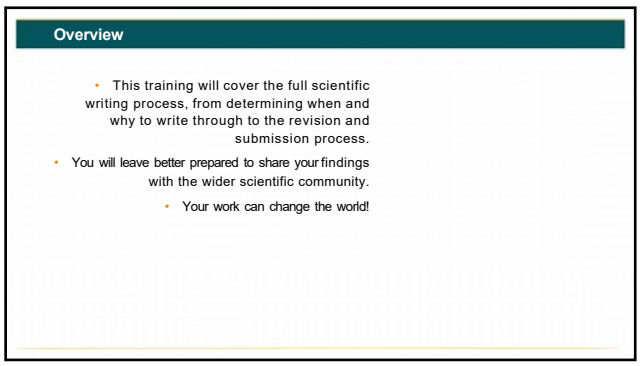
1


Getting Started
Ask questions.
Don't be afraid of success.
Work together.
Be respectful.
Have fun!

2


Overview
Writing, revising and publishing data may feel difficult.
Do not be intimidated!
You can overcome challenges through determination, drive and the will to improve.

3


Overview
This training will cover the full scientific writing process, from determining when and why to write through to the revision and submission process.
You will leave better prepared to share your findings with the wider scientific community.
Your work can change the world!

4

Getting to Know You

Introduce yourself to the person sitting next to you. Spend the next 10 minutes getting to know this person. You will then introduce your partner to the rest of the participants. You are encouraged to take notes.

Remember, you both need to know each other, so use your time and questions wisely!

Some example questions you might ask:

- Where are you from?
- What field do you work in?
- Do you have any experience with scientific writing? If so, what sort of experience?
- What do you hope to learn in this training?

5

Course Agenda

This training has four modules:

- Module 1: Overview of the Scientific Writing Process 

- Module 2: Manuscript Preparation
- Module 3: Manuscript Revision
- Module 4: Wrapping Up

6

Learning Objectives

By the end of this training, you will be able to:

- Describe the scientific writing process and its key stages.
- Demonstrate an understanding of and ability to analyze and present data.
- Analyze and review scientific manuscripts for key messages, consistency and justification.
- Understand the importance of informal peer review and feedback.

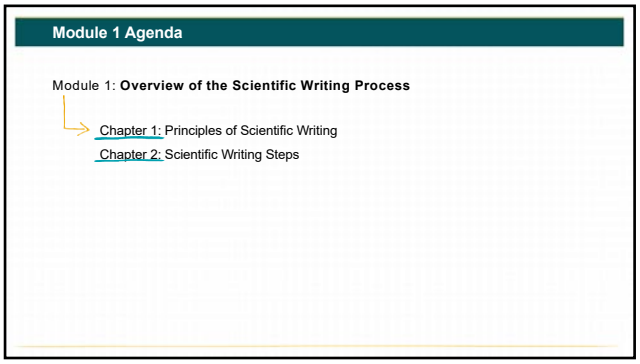
7

Module 1

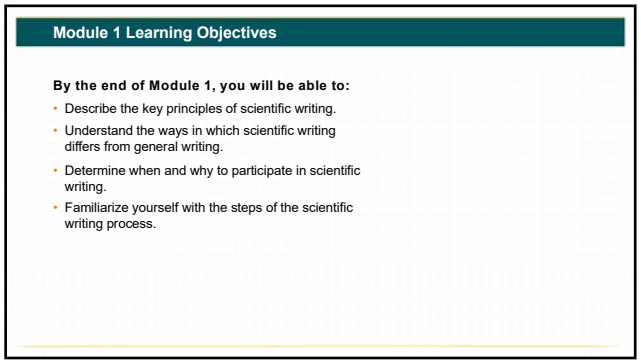
Overview of the Scientific Writing Process

8

Module 1: Overview of the Scientific Writing Process


Module 1 Agenda
Module 1: Overview of the Scientific Writing Process
Chapter 1: Principles of Scientific Writing
Chapter 2: Scientific Writing Steps

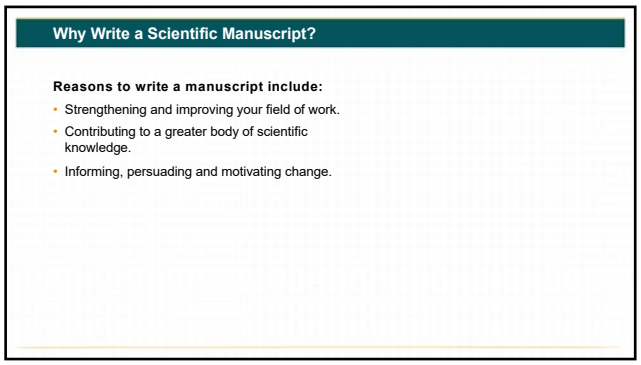
9


Module 1 Learning Objectives
By the end of Module 1, you will be able to:
Describe the key principles of scientific writing.
Understand the ways in which scientific writing differs from general writing.
Determine when and why to participate in scientific writing.
Familiarize yourself with the steps of the scientific writing process.

10


Chapter 1:
Principles of Scientific Writing

11


Why Write a Scientific Manuscript?
Reasons to write a manuscript include:
Strengthening and improving your field of work.
Contributing to a greater body of scientific knowledge.
Informing, persuading and motivating change.

12

What is Scientific Writing?

Scientific Writing is not like general writing.

Scientific Writing is:

- Strengthening and improving your field of work.
- Contributing to a greater body of scientific knowledge.
- Informing, persuading and motivating change.

13

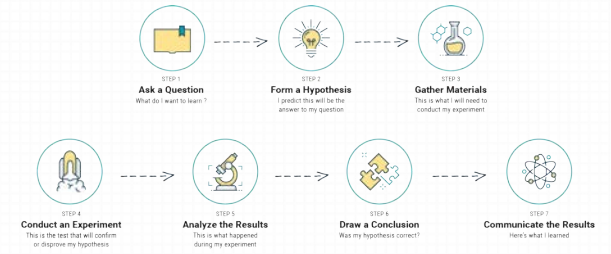
The Scientific Method

Scientific writing is part of the Scientific Method

- Begins with a question.
- Concludes when a researcher shares their results (often in a journal or other publication).

14

The Scientific Method



15

What is the purpose of scientific manuscripts?

Scientific manuscripts:

- Aim to inform, not impress
- Should be easy to read and understand.
- Are published in peer-reviewed publications after a rigorous review process.

16

What is the Purpose of Scientific Manuscripts?

Scientific manuscripts:

- Should appeal to two audiences:
  - Reviewers
  - Readers
- Convince audiences that the research is important, valid and relevant.

17

When to Write a Scientific Manuscript

Are you ready to write a scientific manuscript?

Think about your research and answer the following questions in your workbook.

	YES	NO
Will my manuscript contribute something new and original?		
Will my manuscript advance knowledge in my field?		
Will my manuscript create an impact in my field?		
Will my manuscript fill a gap in knowledge?		
Will my manuscript demonstrate something new or improved		
Is my data correct and accurate?		
Is my data recent and relevant?		
Will my study be interesting or useful to the audience?		

18

Types of Scientific Papers

- **Original Articles**
  Original articles provide new information based on original scientific research, including methods used and supporting data.
- **Case Reports**
  Case Reports are unique events or novel interpretations of individual cases along with a review of other previously-published cases to put the new event in context.

19

Types of Scientific Papers

- **Technical Notes**
  Technical notes describe a technique or piece of equipment that has been modified from its original form to be new or more effective.
- **Pictorial Essays**
  Pictorial essays teach or demonstrate a topic through a series of high-quality images accompanied by brief text.

20

Types of Scientific Papers

- **Reviews**
  Reviews are detailed analyses of recent developments on a topic
- **Commentaries**
  Commentaries summarize an author's personal experience, expertise or opinion on a certain topic.
- **Reviews**
  Reviews are detailed analyses of recent developments on a topic
- **Letters to the Editor**
  Letters to the editor address the editor of a publication or author of an article to ask questions or provide constructive criticism of published work.

21

You've reached the end of Chapter 1!

22

Knowledge Check

Which of the following are *true* about scientific manuscripts?

Select all that apply

- ☐ Scientific manuscripts aim to inform, not impress.
- ☐ Scientific manuscripts are essential to the evolution of modern science. Scientific manuscripts feature technical, clear and concise writing.
- ☐ Scientific manuscripts follow the scientific method.

23

Knowledge Check

Which of the following are good reasons to write a scientific manuscript?

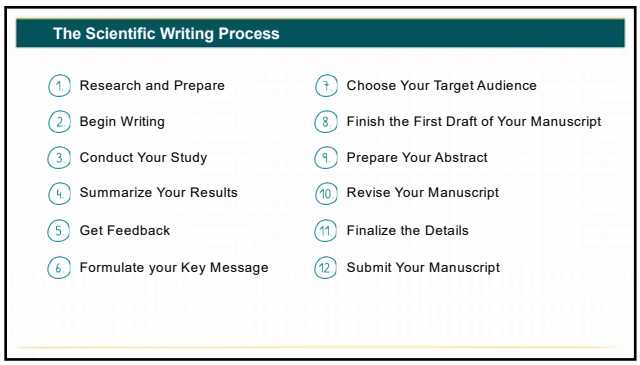
Select all that apply

- ☐ When your work advances the knowledge of the field.
- ☐ When your work would add new and original results or methods to the scientific conversation.
- ☐ When your work has already been published.
- ☐ When your work would fill a gap in existing knowledge.

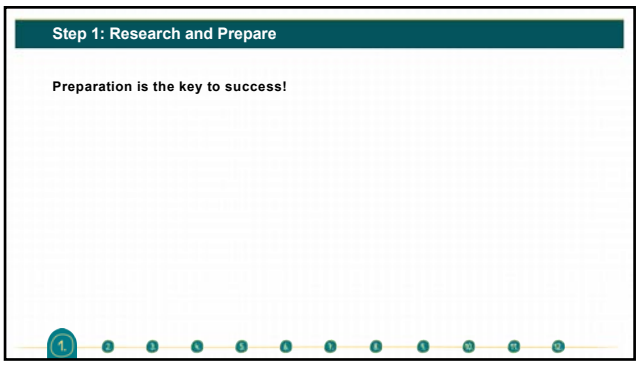
24


Chapter 2:
The Scientific Writing Process

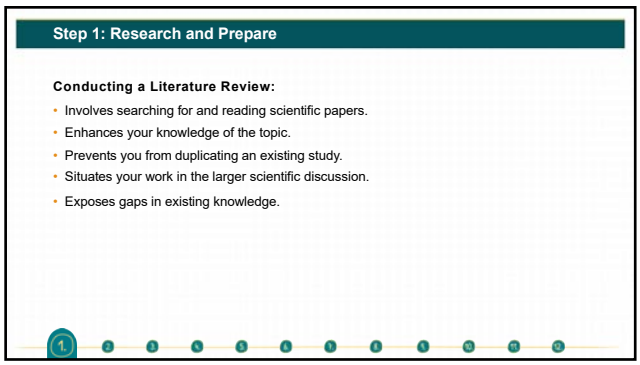
25


The Scientific Writing Process
1 Research and Prepare
2 Begin Writing
3 Conduct Your Study
4 Summarize Your Results
5 Get Feedback
6 Formulate your Key Message
7 Choose Your Target Audience
8 Finish the First Draft of Your Manuscript
9 Prepare Your Abstract
10 Revise Your Manuscript
11 Finalize the Details
12 Submit Your Manuscript

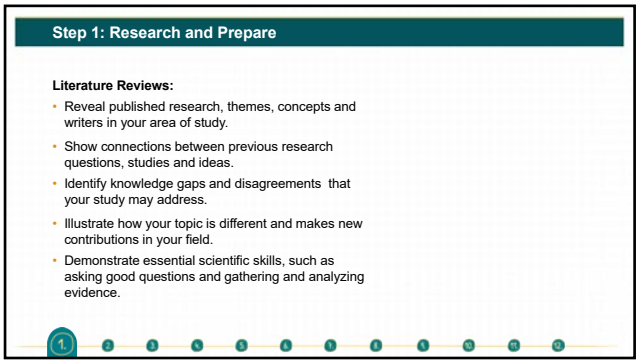
26


Step 1: Research and Prepare
Preparation is the key to success!

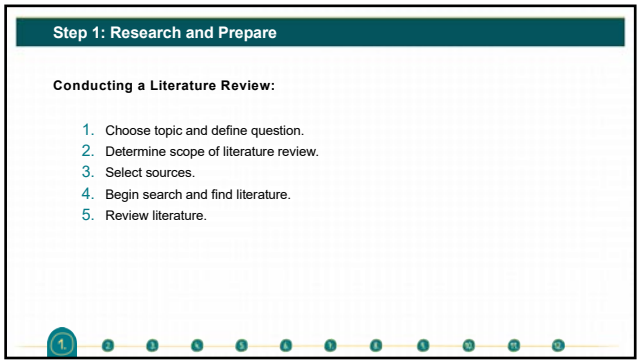
27


Step 1: Research and Prepare
Conducting a Literature Review:
Involves searching for and reading scientific papers.
Enhances your knowledge of the topic.
Prevents you from duplicating an existing study.
Situates your work in the larger scientific discussion.
Exposes gaps in existing knowledge.

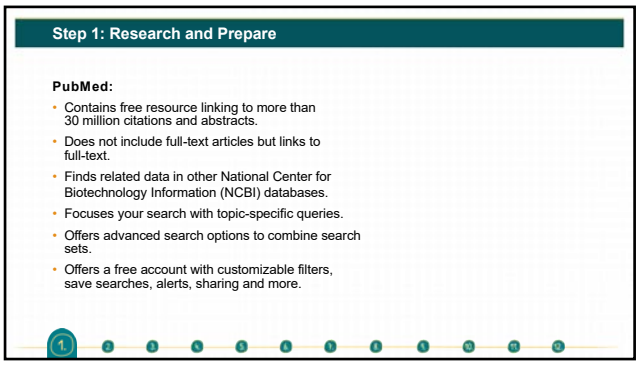
28


Step 1: Research and Prepare
Literature Reviews:
• Reveal published research, themes, concepts and writers in your area of study.
• Show connections between previous research questions, studies and ideas.
• Identify knowledge gaps and disagreements that your study may address.
• Illustrate how your topic is different and makes new contributions in your field.
• Demonstrate essential scientific skills, such as asking good questions and gathering and analyzing evidence.

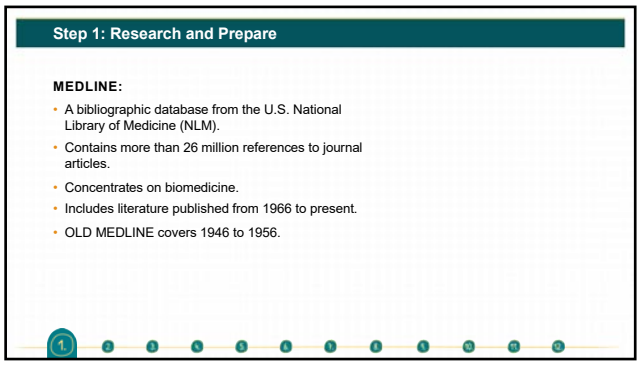
29


Step 1: Research and Prepare
Conducting a Literature Review:
1. Choose topic and define question.
2. Determine scope of literature review.
3. Select sources.
4. Begin search and find literature.
5. Review literature.

30


Step 1: Research and Prepare
PubMed:
• Contains free resource linking to more than 30 million citations and abstracts.
• Does not include full-text articles but links to full-text.
• Finds related data in other National Center for Biotechnology Information (NCBI) databases.
• Focuses your search with topic-specific queries.
• Offers advanced search options to combine search sets.
• Offers a free account with customizable filters, save searches, alerts, sharing and more.

31


Step 1: Research and Prepare
MEDLINE:
• A bibliographic database from the U.S. National Library of Medicine (NLM).
• Contains more than 26 million references to journal articles.
• Concentrates on biomedicine.
• Includes literature published from 1966 to present.
• OLD MEDLINE covers 1946 to 1956.

32

Step 1: Research and Prepare

Other resources:

- Use Google Scholar's "Cited By" feature to find related articles and manuscripts.
- Use the CDC Library for resources and training if access permitted.
- Contact leading researchers to learn about in-press or unpublished work.

33

Step 1: Research and Prepare

Tips & Tricks for an effective search for literature

- Identify key search terms.
- Decide on filters/limits.
- Use Boolean operators like AND, OR, NOT.
- Find associated search terms for proximity searching.

E.g.: searching for "curriculum" and "theories" retrieves many phrases formed with those two words.

- Use truncation or wildcard searching for a word with multiple endings.

E.g.: vaccin will retrieve vaccine, vaccines, vaccinate, vaccination, etc.*

34

Step 1: Research and Prepare

AND

Retrieves records containing BOTH terms

For example:
- Bacteria AND Meningitis
- Viral AND influenza

OR

Retrieves records containing either ONE OR BOTH terms

For example:
- Bacteria OR Meningitis
- Viral OR influenza

NOT

Exclude records containing ONLY the second term

For example:
- Bacteria NOT Meningitis
- Viral NOT influenza

35

Step 1: Research and Prepare

Evaluating the literature: CRAAP test

Currency	How *current* is the piece?
Relevance	How *relevant* is the piece?
Authority	Does the author have *authority*?
Accuracy	How *accurate* is the piece?
Purpose	What was the author's *purpose*?

36

Step 1: Research and Prepare

Evaluating the literature: CRAAP test

Currency	• Consider the timeliness of this piece. When was it written? Is it out of date, or is it still current?
Relevance	• Is this piece relevant to your study or your research question? • Is the information presented at an appropriate level for your needs?
Authority	• Who wrote this piece? Are they an authority on the topic? • Are they a reputable source of information? • Has this piece been cited by other reputable sources?
Accuracy	• How accurate is the information in this piece? • How detailed is the methodology? • Does the research seem to be complete? • What further questions does the study raise? Are those questions addressed?
Purpose	• What was the author's purpose in writing this piece? Is it to inform, teach, sell, entertain, or persuade? Do they have other motivations? • Who funded their studies?

37

Knowledge Check

Literature reviews are important because they...

Select all that apply

- ☐ Explain the background of research on your study topic.
- ☐ Exhaustively detail every work written on your topic.
- ☐ Discover relationships between previously performed research studies and ideas.
- ☐ Identify important research themes, concepts, and writers who have focused on your topic.
- ☐ Identify gaps and disagreements that your study may address.

38

Step 2: Begin Writing

Begin writing about your topic *before* you conduct your study.

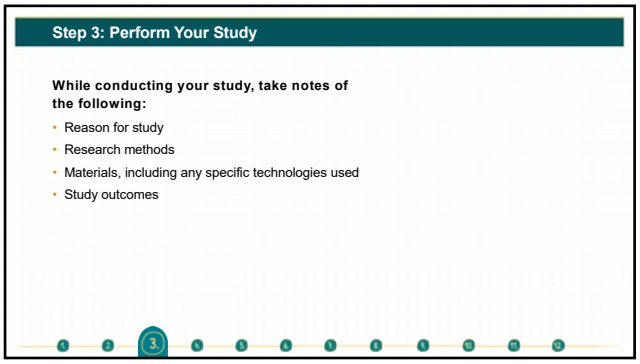
39

Step 2: Begin Writing

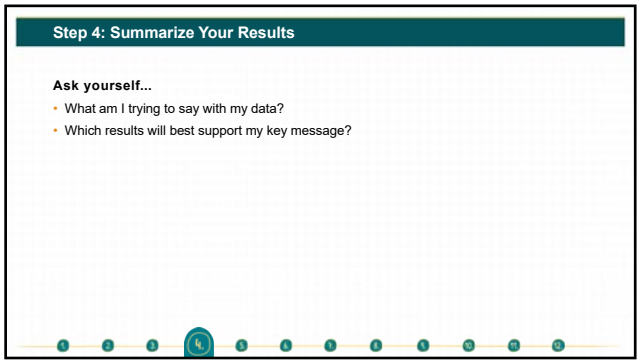
How to start:

- Draft the introduction of your future manuscript.
- Work on your study protocol.
- Write a grant proposal.
- Build dummy tables and figure axes for the results section.

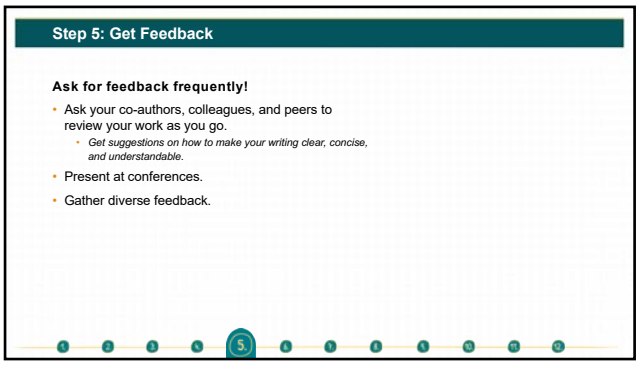
40


Step 3: Perform Your Study
While conducting your study, take notes of the following:
• Reason for study
• Research methods
• Materials, including any specific technologies used
• Study outcomes

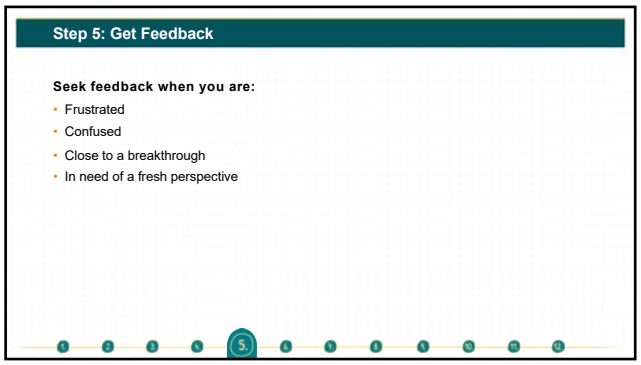
41


Step 4: Summarize Your Results
Ask yourself...
• What am I trying to say with my data?
• Which results will best support my key message?

42


Step 5: Get Feedback
Ask for feedback frequently!
• Ask your co-authors, colleagues, and peers to review your work as you go.
• Get suggestions on how to make your writing clear, concise, and understandable.
• Present at conferences.
• Gather diverse feedback.

43


Step 5: Get Feedback
Seek feedback when you are:
• Frustrated
• Confused
• Close to a breakthrough
• In need of a fresh perspective

44

Step 6: Formulate Your Key Message

Your key message:

- Conveys the most important point for readers to remember.
- Distills your paper down to one sentence.
- May change as you write your paper.

45

Step 6: Formulate Your Key Message

Sample key messages:

- In Ethiopia, diarrheal disease kills more children aged <5 years than malaria. *(12 words)*
- Vitamin A deficiency is common despite widespread distribution of free capsules. *(11 words)*
- Intermittent availability of tuberculosis drugs leads to an increase in multidrug-resistant tuberculosis (MDR-TB). *(13 words)*

46

Step 6: Formulate Your Key Message

What's your key message? Questions to consider:

- If you only had a minute to describe your work to someone else in passing, what would you say?
- If your readers could only remember one thing from your manuscript, what would you want that one thing to be?
- If someone outside your field read your key message, would they understand it?
- Remember, your key message must be clear, concise and direct.

47

Step 7: Choose Your Target Audience

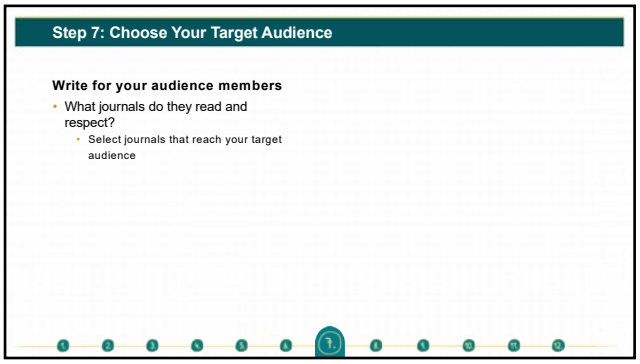
To determine your target audience, ask yourself...

- Who is interested in my message? What are their job titles?
- What conferences do they attend?

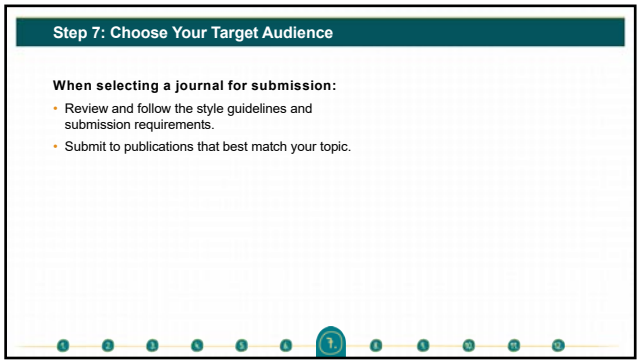
⇨ Potential Audiences:

Laboratorians, Public Health Practitioners, Clinicians, Scientists, Policymakers

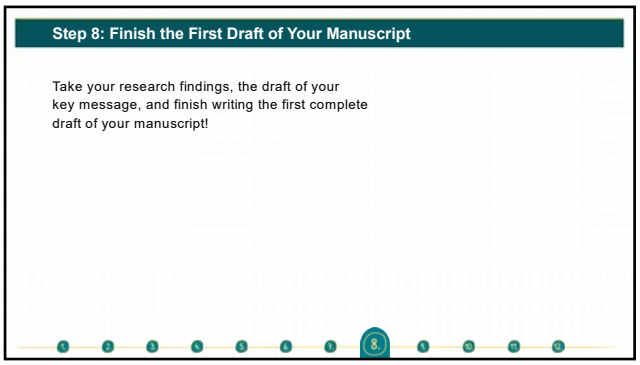
48


Step 7: Choose Your Target Audience
Write for your audience members
What journals do they read and respect?
Select journals that reach your target audience

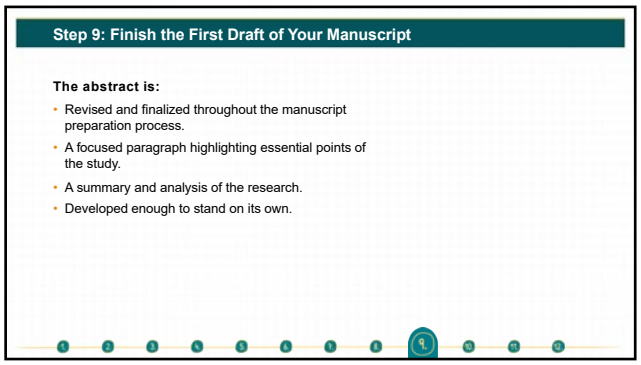
49


Step 7: Choose Your Target Audience
When selecting a journal for submission:
Review and follow the style guidelines and submission requirements.
Submit to publications that best match your topic.

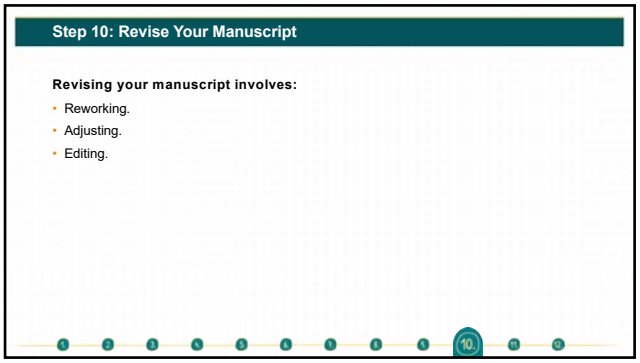
50


Step 8: Finish the First Draft of Your Manuscript
Take your research findings, the draft of your key message, and finish writing the first complete draft of your manuscript!

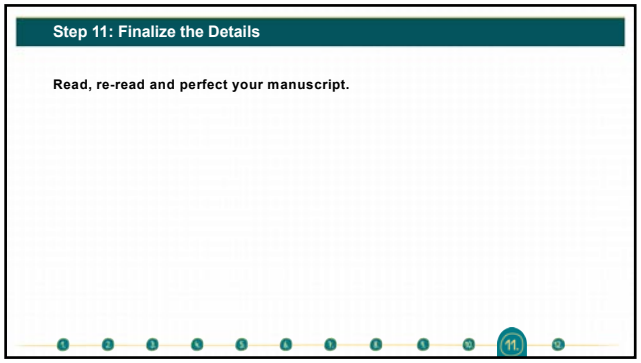
51


Step 9: Finish the First Draft of Your Manuscript
The abstract is:
Revised and finalized throughout the manuscript preparation process.
A focused paragraph highlighting essential points of the study.
A summary and analysis of the research.
Developed enough to stand on its own.

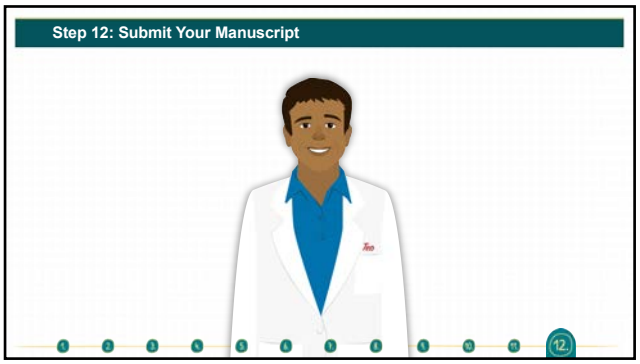
52


Step 10: Revise Your Manuscript
Revising your manuscript involves:
• Reworking.
• Adjusting.
• Editing.
10.

53


Step 11: Finalize the Details
Read, re-read and perfect your manuscript.
11.

54


Step 12: Submit Your Manuscript
12.

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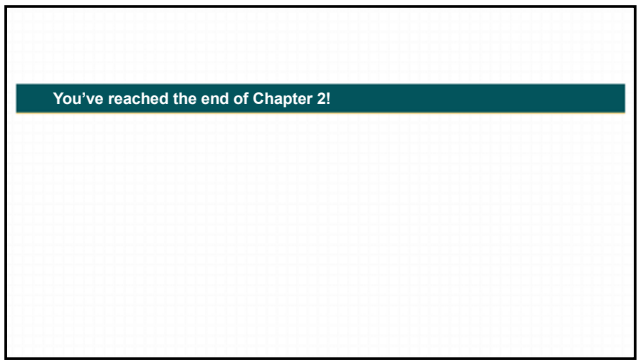
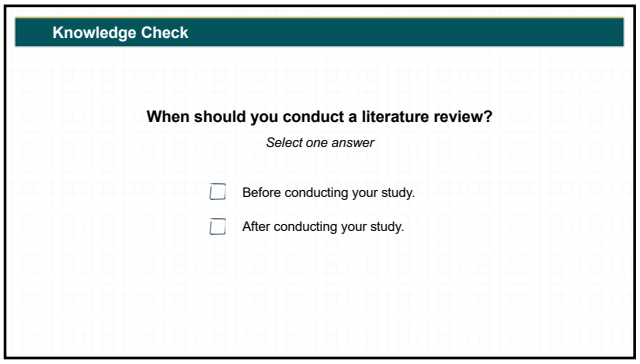
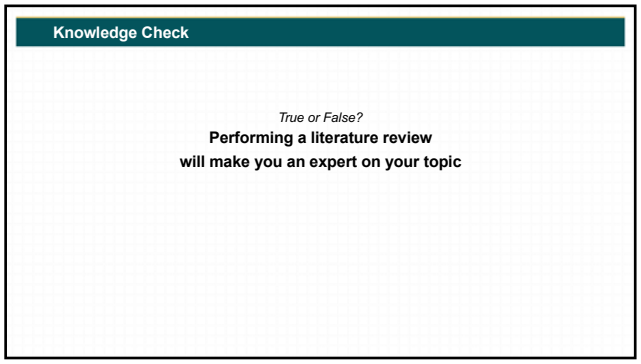

You've reached the end of Chapter 2!

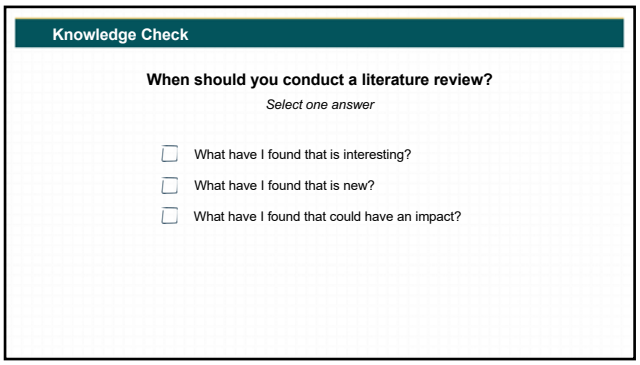
56


Knowledge Check
When should you conduct a literature review?
Select one answer
Before conducting your study.
After conducting your study.

57


Knowledge Check
True or False?
Performing a literature review
will make you an expert on your topic

58


Knowledge Check
When should you conduct a literature review?
Select one answer
What have I found that is interesting?
What have I found that is new?
What have I found that could have an impact?

59


Congratulations!
You've now completed
Module 1: Overview of the Scientific Writing Process!

60

Module 2: Manuscript Preparation

SCIENTIFIC WRITING

The Basics

APHL ASSOCIATION OF PUBLIC HEALTH LABORATORIES

1

Module 2

Manuscript Preparation

2

Module 2 Agenda

Slide 3 of 108

Module 1: **Manuscript Preparation**

- **Chapter 1:** Principles of Scientific Writing
- **Chapter 2:** Scientific Writing Steps
- **Chapter 3:** The Introduction and Methods Sections
- **Chapter 4:** The Results Section
- **Chapter 5:** The Discussion, Acknowledgements and Citations

3

Module 2 Learning Objectives

Slide 4 of 108

By the end of Module 2, you will be able to:

- Describe the scientific writing process and each of its key stages.
- Describe and understand the importance of each section of scientific manuscript
- Demonstrate an understanding of and ability to analyze and present data.

4

Chapter 1:

The Manuscript Outline

5

The Scientific Writing Roadmap

Slide 6 of 108

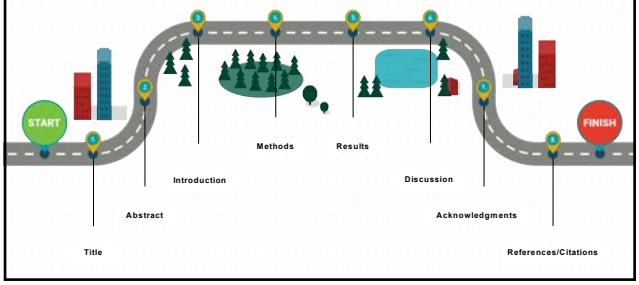
The structure of a manuscript is like a roadmap.

- The sections of the manuscript are signposts!

6

The Scientific Writing Roadmap

Slide 7 of 108



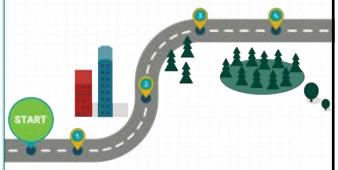
7

The Scientific Writing Roadmap

Slide 8 of 108

TITLE
Key Questions to Answer:

What was the subject, and what particular aspect of that subject was studied?



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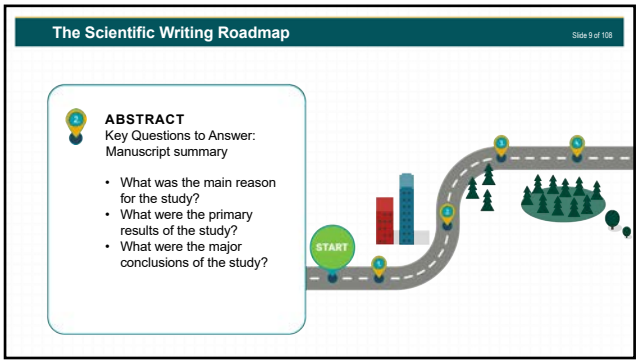
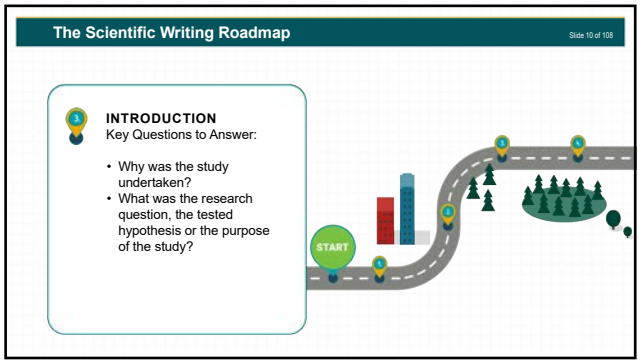
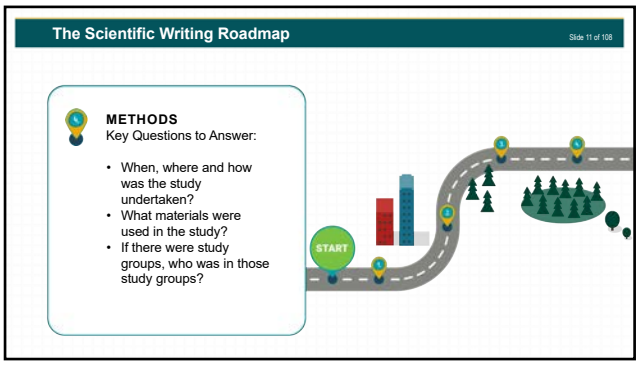

The Scientific Writing Roadmap
Slide 9 of 108
ABSTRACT
Key Questions to Answer:
Manuscript summary
• What was the main reason for the study?
• What were the primary results of the study?
• What were the major conclusions of the study?
START

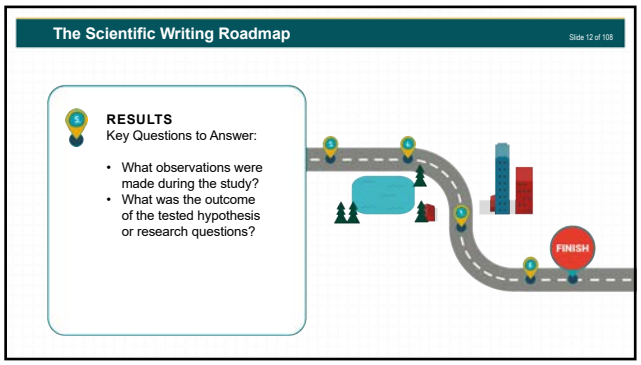
9


The Scientific Writing Roadmap
Slide 10 of 108
INTRODUCTION
Key Questions to Answer:
• Why was the study undertaken?
• What was the research question, the tested hypothesis or the purpose of the study?
START

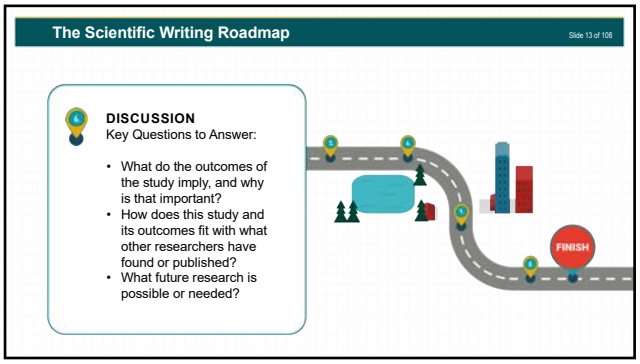
10


The Scientific Writing Roadmap
Slide 11 of 108
METHODS
Key Questions to Answer:
• When, where and how was the study undertaken?
• What materials were used in the study?
• If there were study groups, who was in those study groups?
START

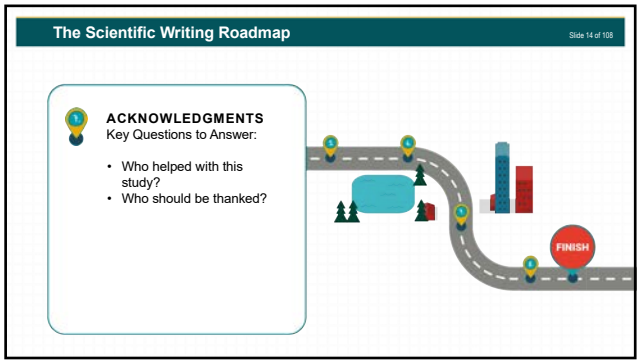
11


The Scientific Writing Roadmap
Slide 12 of 108
RESULTS
Key Questions to Answer:
• What observations were made during the study?
• What was the outcome of the tested hypothesis or research questions?
FINISH

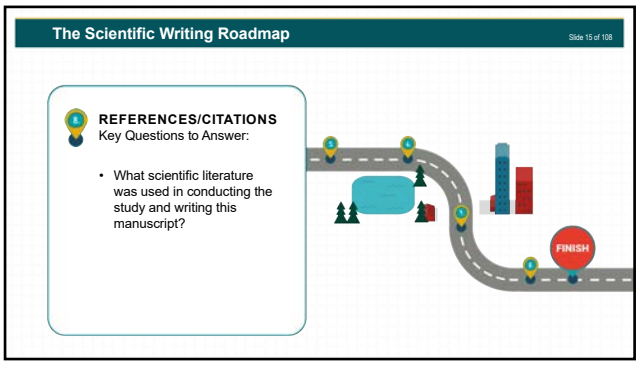
12


The Scientific Writing Roadmap
Slide 13 of 108
DISCUSSION
Key Questions to Answer:
• What do the outcomes of the study imply, and why is that important?
• How does this study and its outcomes fit with what other researchers have found or published?
• What future research is possible or needed?
FINISH

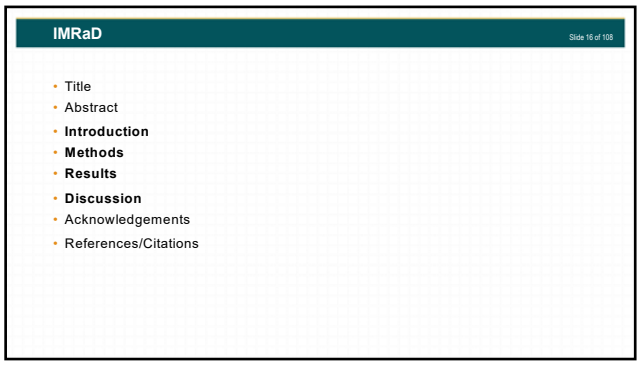
13


The Scientific Writing Roadmap
Slide 14 of 108
ACKNOWLEDGMENTS
Key Questions to Answer:
• Who helped with this study?
• Who should be thanked?
FINISH

14


The Scientific Writing Roadmap
Slide 15 of 108
REFERENCES/CITATIONS
Key Questions to Answer:
• What scientific literature was used in conducting the study and writing this manuscript?
FINISH

15


IMRaD
Slide 16 of 108
• Title
• Abstract
• Introduction
• Methods
• Results
• Discussion
• Acknowledgements
• References/Citations

16

You have reached the end of Chapter 1!

17

Chapter 2:

Developing a Title and Abstract

18

Title

A good title:

- Attracts attention
- Shows up when searching for indexes and citations
- Summarizes paper accurately
- Identifies manuscript's main topic

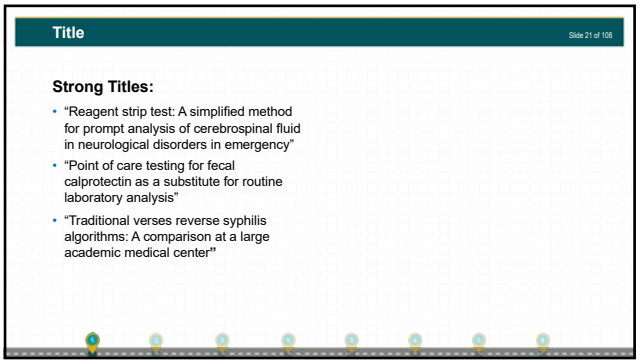
19

Title

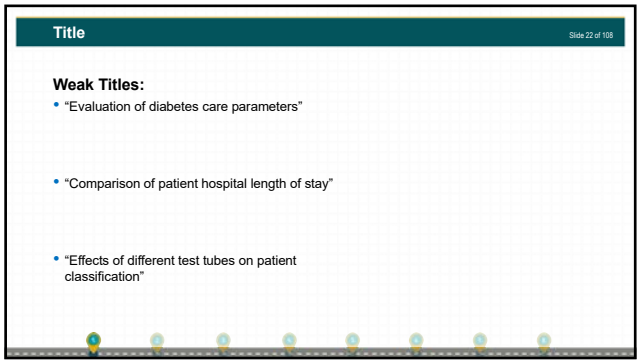
Example Titles:

- "Evaluation of diabetes care parameters"
- "Reagent strip test: A simplified method for prompt analysis of cerebrospinal fluid in neurological disorders in emergency"
- "Comparison of patient hospital length of stay"
- "Point of care testing for fecal calprotectin as a substitute for routine laboratory analysis"
- "Effects of different test tubes on patient classification"
- "Traditional verses reverse syphilis algorithms: A comparison at a large academic medical center"

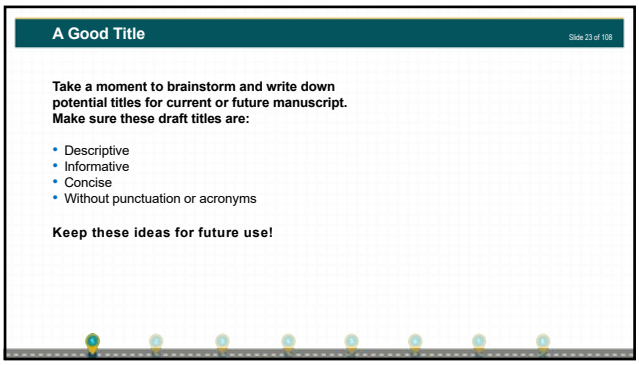
20


Title
Slide 21 of 108
Strong Titles:
• "Reagent strip test: A simplified method for prompt analysis of cerebrospinal fluid in neurological disorders in emergency"
• "Point of care testing for fecal calprotectin as a substitute for routine laboratory analysis"
• "Traditional verses reverse syphilis algorithms: A comparison at a large academic medical center"

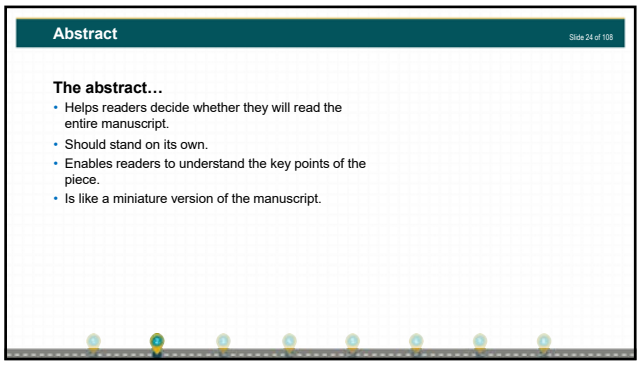
21


Title
Slide 22 of 108
Weak Titles:
• "Evaluation of diabetes care parameters"
• "Comparison of patient hospital length of stay"
• "Effects of different test tubes on patient classification"

22


A Good Title
Slide 23 of 108
Take a moment to brainstorm and write down potential titles for current or future manuscript. Make sure these draft titles are:
• Descriptive
• Informative
• Concise
• Without punctuation or acronyms
Keep these ideas for future use!

23


Abstract
Slide 24 of 108
The abstract…
• Helps readers decide whether they will read the entire manuscript.
• Should stand on its own.
• Enables readers to understand the key points of the piece.
• Is like a miniature version of the manuscript.

24

Abstract

Slide 25 of 108

A good abstract has...

- A clear exciting message.
- Logical flow, appropriate methodology and clear conclusions.
- An appropriate topic for the audience.
- Followed the submission guidelines.

25

Abstract

Slide 26 of 108

Developing the abstract

- Make it informative.
- Revise continuously before submission.
- Finalize your abstract when your manuscripts is complete.

26

Abstract

Slide 27 of 108

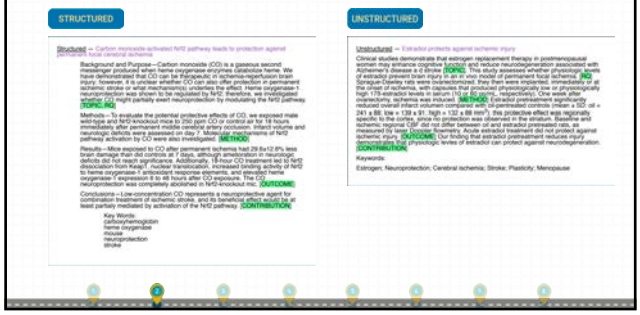
Sample Abstract Guidelines:

- Background and purpose
- Methods
- Results
- Conclusions
- Keywords
- 250-300 word limit

27

Abstract

Slide 28 of 108



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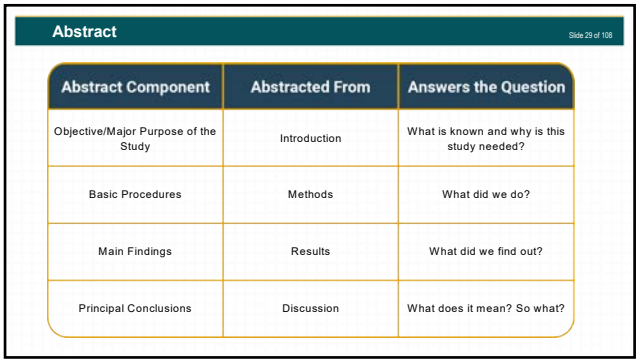
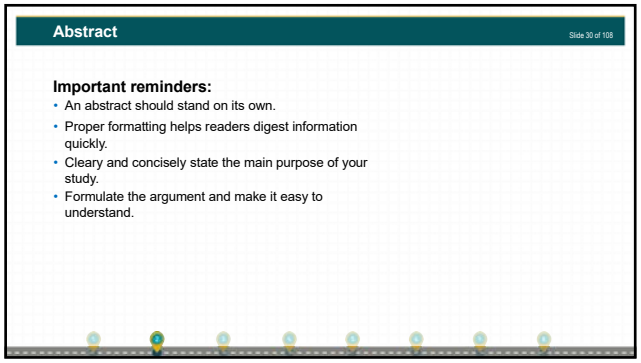
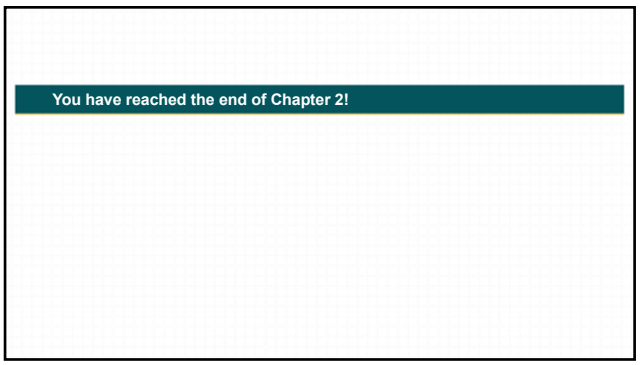

Abstract
Slide 29 of 108
Abstract Component
Abstracted From
Answers the Question
Objective/Major Purpose of the Study
Introduction
What is known and why is this study needed?
Basic Procedures
Methods
What did we do?
Main Findings
Results
What did we find out?
Principal Conclusions
Discussion
What does it mean? So what?

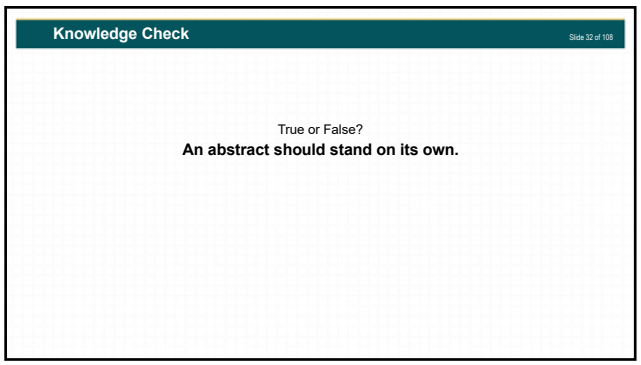
29


Abstract
Slide 30 of 108
Important reminders:
An abstract should stand on its own.
Proper formatting helps readers digest information quickly.
Cleary and concisely state the main purpose of your study.
Formulate the argument and make it easy to understand.

30


You have reached the end of Chapter 2!

31

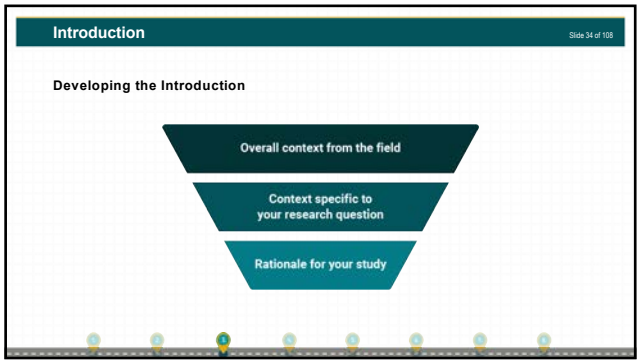

Knowledge Check
Slide 32 of 108
True or False?
An abstract should stand on its own.

32

Chapter 3:

The Introduction and Methods Sections

33



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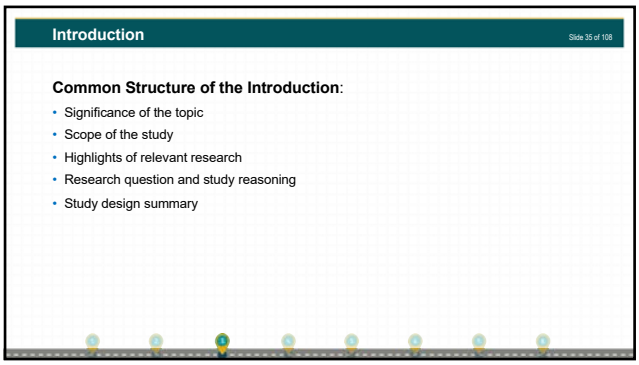

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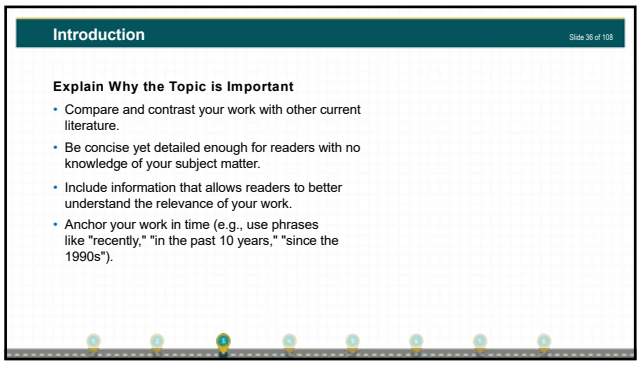


36

Introduction

Slide 37 of 108

Identify and Narrow Down Your Problem Statement:

- Note any knowledge gaps
- Include the scope and nature of knowledge gaps
- Explain how filling knowledge gaps will be useful
- Prompt the right questions in your reader's mind

37

Introduction

Slide 38 of 108

Writing the Problem Statement:

- Focus on only one problem.
- Too many problems and too many solutions lead to reader confusion.
- Save additional problems for future manuscripts.

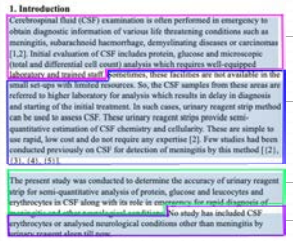
Writing the Purpose Statement:

- Present your approach to filling knowledge gaps through your study.
- Specify how your study will answer the stated problem.
- Clarify your approach as new.
- Include your solution with related data in final paragraph.

38

Introduction

Slide 39 of 108



1. Introduction

Cerebrospinal fluid (CSF) examination is often performed in emergency to obtain diagnostic information of various life threatening conditions such as meningitis, subarachnoid haemorrhage, demyelinating diseases or carcinomas [1,2]. Initial evaluation of CSF includes protein, glucose and microscopic (total and differential cell count) analysis which requires well-equipped laboratory and trained staff. Nonetheless, these facilities are not available in the small set-ups with limited resources. So, the CSF samples from these areas are referred to higher laboratory for analysis which results in delay in diagnosis and starting of the initial treatment. In such cases, urinary reagent strip method can be used to assess CSF. These urinary reagent strips provide semi-quantitative estimation of CSF chemistry and cellularity. These are simple to use rapid, low cost and do not require any expertise [2]. Few studies had been conducted previously on CSF for detection of meningitis by this method [2], [3], [4], [5].

The present study was conducted to determine the accuracy of urinary reagent strip for semi-quantitative analysis of protein, glucose and leucocytes and erythrocytes in CSF along with its role in emergency for rapid diagnosis of meningitis and other neurological conditions. No study has included CSF erythrocytes or analysed neurological conditions other than meningitis by urinary reagent strips till now.

Open with a few sentences placing your study in context.

Follow with a description of the problem and its history, including previous research.

Describe how your work addresses a gap in existing knowledge or ability, or why you've taken this study.

State what information your manuscript will address.

39

Introduction

Slide 40 of 108

- Tailor writing to your audience.
- Formulate your argument and get to the point quickly.
- Clearly state your hypothesis.
- Don't present the entire literature review.
- Keep it brief.

40

Your Introduction

Slide 41 of 108

Ask yourself the following questions and write down your answers to share with your partner.

- What is the issue your paper seeks to address?
- Do you state it clearly and with support?
- What questions does the Introduction provoke in the reader's mind?
- Is there literature you can cite to support your claim that this is a problem worth addressing?

41

Methods

Slide 42 of 108

The Purpose of Methods Section

- Address how the study was conducted.
- Describe the materials used.
- Allow readers to reproduce work and evaluate the study.
- Allow readers to test validity of claims.

42

Methods

Slide 43 of 108

Objectives of the Methods Section

- Describe study design
- List and describe procedures and techniques
- Note any procedure or technique modifications
- List specialized equipment and software, including brand names and model numbers
- Note underlying assumptions
- List and describe statistical methods used

43

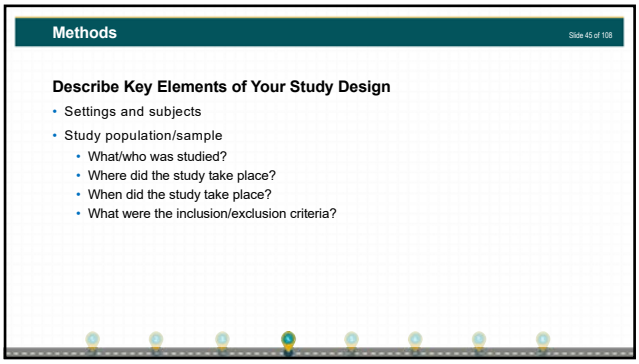
Methods

Slide 44 of 108

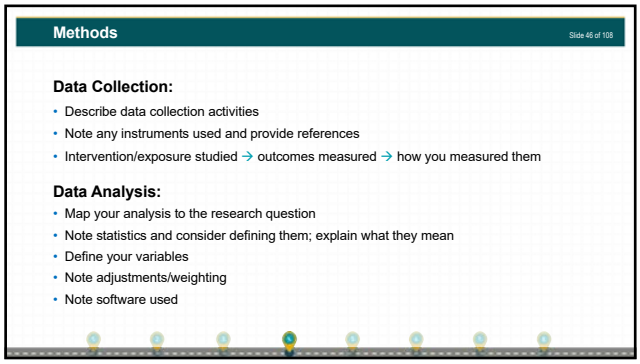
Below is an example showing the sequence of steps for a polymerase chain reaction (PCR) procedure. A Methods section will reflect this sequence:

- Sample preparation
- DNA/RNA extraction
- PCR
- Detection
- Analysis

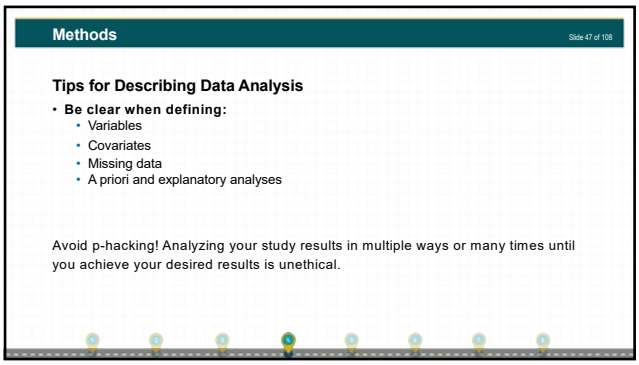
44


Methods
Slide 45 of 108
Describe Key Elements of Your Study Design
• Settings and subjects
• Study population/sample
• What/who was studied?
• Where did the study take place?
• When did the study take place?
• What were the inclusion/exclusion criteria?

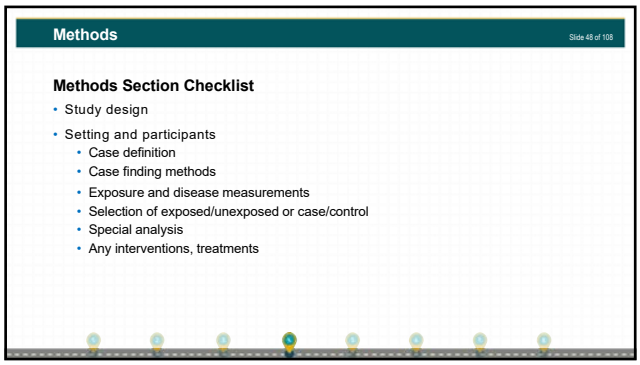
45


Methods
Slide 46 of 108
Data Collection:
• Describe data collection activities
• Note any instruments used and provide references
• Intervention/exposure studied → outcomes measured → how you measured them
Data Analysis:
• Map your analysis to the research question
• Note statistics and consider defining them; explain what they mean
• Define your variables
• Note adjustments/weighting
• Note software used

46


Methods
Slide 47 of 108
Tips for Describing Data Analysis
• Be clear when defining:
• Variables
• Covariates
• Missing data
• A priori and explanatory analyses
Avoid p-hacking! Analyzing your study results in multiple ways or many times until you achieve your desired results is unethical.

47


Methods
Slide 48 of 108
Methods Section Checklist
• Study design
• Setting and participants
• Case definition
• Case finding methods
• Exposure and disease measurements
• Selection of exposed/unexposed or case/control
• Special analysis
• Any interventions, treatments

48

Methods

Slide 49 of 108

Do Include:

- ✓ Laboratory methods
- ✓ Epidemiological investigations
- ✓ Flow diagrams
- ✓ Statistical analysis methods
- ✓ Detailed descriptions of original methods OR references to previously described methods
- ✓ Information on study design, setting and subjects, data collection, data analysis and ethical approval
- ✓ References to previous publications from the same large research project, such as a study protocol, for additional information (if applicable)

Do Not Include:

- x Results
- x Discussion of your results
- x Information about other papers you plan to publish

49

You have reached the end of Chapter 3!

50

Knowledge Check

Slide 51 of 108

How should the Methods section be organized?

- ☐ Alphabetically
- ☐ Chronologically
- ☐ Thematically
- ☐ Whatever seems easiest

51

Knowledge Check

Slide 52 of 108

What is p-hacking? Choose the correct definition.

- ☐ Methods of breaching defenses and exploiting the weaknesses of a computer system or network.
- ☐ When researchers misuse their results by analyzing data in multiple ways or multiple times until they get their desired result.

52

Chapter 4:

The Results Section

53

Results

Goals of the Results Section Include:

- Providing factual statements supported by evidence
- Writing concisely
- Using representative, not repetitive data
- Discussing variables that had an effect (positive or negative)
- Using meaningful statistics
- Avoiding redundancy

54

Results

- Logical presentation of findings from your study
- Present data using figures, tables, graphs and other visualizations
- Explain how results of your study help to answer research questions
- Save evaluation of your results for the Discussion section
- Cite figures, tables and other visualizations within the text

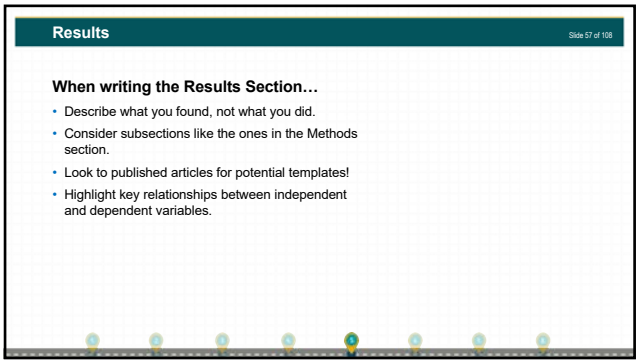
55

Results

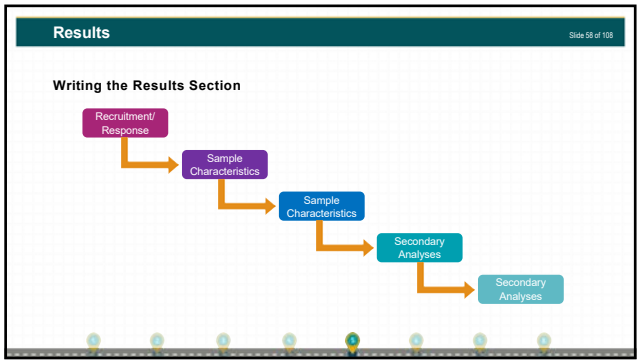
Data Analysis Best Practices:

- Involve a statistician early in the process.
- Analyze and track data throughout study and manuscript writing.
- Develop multiple tables or figures and solicit feedback on the most effective ones.

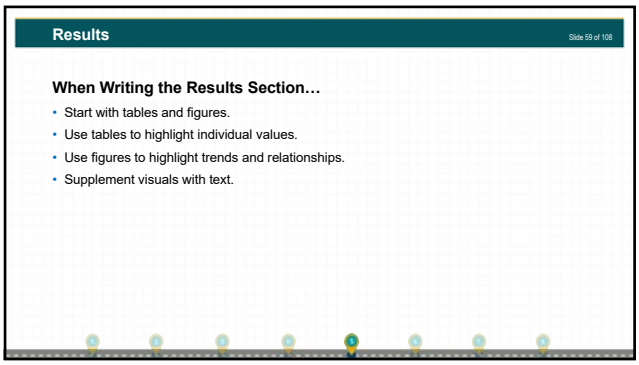
56


Results
Slide 57 of 108
When writing the Results Section…
• Describe what you found, not what you did.
• Consider subsections like the ones in the Methods section.
• Look to published articles for potential templates!
• Highlight key relationships between independent and dependent variables.

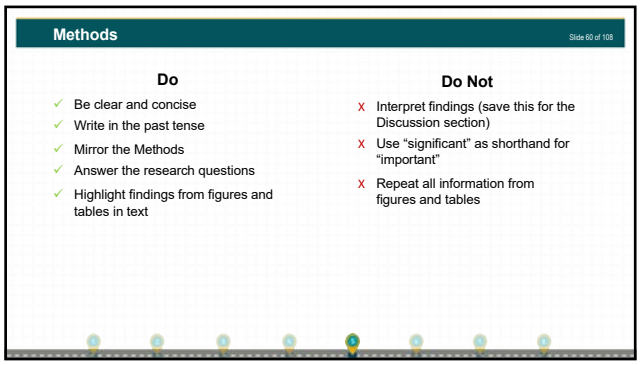
57


Results
Slide 58 of 108
Writing the Results Section
Recruitment/ Response
Sample Characteristics
Sample Characteristics
Secondary Analyses
Secondary Analyses

58


Results
Slide 59 of 108
When Writing the Results Section…
• Start with tables and figures.
• Use tables to highlight individual values.
• Use figures to highlight trends and relationships.
• Supplement visuals with text.

59


Methods
Slide 60 of 108
Do
✓ Be clear and concise
✓ Write in the past tense
✓ Mirror the Methods
✓ Answer the research questions
✓ Highlight findings from figures and tables in text
Do Not
x Interpret findings (save this for the Discussion section)
x Use "significant" as shorthand for "important"
x Repeat all information from figures and tables

60

Results

Slide 61 of 108

- ✓ Present findings without interpretation.
- ✓ Highlight findings from tables and figures in the text.
- ✓ Present estimates with 95% confidence intervals.
- ✓ Consider providing additional results in tables and figures as web-only supplementary material.
- ✓ Write the Results section in the past tense.
- ✓ Structure roughly into: recruitment/response, sample characteristics, primary analyses, secondary analyses and ancillary analyses.
- ✓ Match the Results section with the Methods section.

61

Results

Slide 62 of 108

Considerations for Visualizing Data

- What am I trying to say with my data?
- What information is necessary to support my message?
- Do I need a table, graph or figure?
- Have I been consistent, concise and clear with all supplemental data?

62

Results

Slide 63 of 108

Use Tables to	Use Text to	Use Figures to
Present detailed or important data	Present simple or important data	Show relationships or patterns in data
Highlight individual values		
(Treat tables like expensive real estate!)		

63

Results

Slide 64 of 108

Do	Do Not
✓ Include some measure of statistical precision. ◦ p-values or confidence intervals if appropriate	x Use grid lines.
✓ Use appropriate and consistent number of decimal places (usually to the 10ths).	x Present unnecessary data or graphs.
✓ Double-check all numbers. Then check them again. Then check them again.	x Overuse visualizations.
✓ Present all relevant results - even the ones you don't like.	x Forget to label and explain all visualizations.

64

Results

Slide 65 of 108

Writing Data Visualization Captions

- Summarize and contextualize
- Are brief, but comprehensive
- Are placed above tables and below figures
- Include the title, techniques used, definitions and results
- Use the appropriate verb tense:
  - **Past tense** for completed experiments
  - **Present tense** for facts based on results

65

Results

Slide 66 of 108

Best Practices for Designing Figures

- ✓ Label all parts clearly
- ✓ Define any symbols used
- ✓ Use complete titles and footnotes
- ✓ Write out acronyms
- ✓ Choose colors that will print in black and white
- ✓ Use the right graphs and dimensions (e.g., 3D figures for 3D data)
- ✓ Define and include the scale
- ✓ Ensure graphs show full picture of data

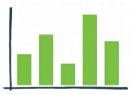
66

Results

Slide 67 of 108

Column/Bar Graph

- Similar graphs
- Differ in orientation
- Column – vertical
- Bar – horizontal
- X and Y axis labeled with categorical or numerical variable
- Heights are scaled according to values
- Length of bars can be compared
- Bar graphs can be 3 dimensional and compiled for data comparison
- Bars or columns arranged in order of frequency



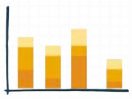
67

Results

Slide 68 of 108

Stacked Bar/ Stacked Column

- Work best to display the differences in values, production, numerical values
- Can be used for dual-axis comparisons to show why results changed
- Can also be used to show:
  - Part-to-whole comparisons
  - Subsections that clarify specific differences

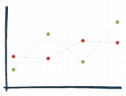


68

Results Slide 69 of 108

Line Graph

- Involve an x-axis (horizontal) and y-axis (vertical) to show comparisons between 2 variables
- Graphs are dot-connected and grid-connected lines
- Display and compare various data sets
- X-axis represents time
- Y-axis represents measures or percentages of quantity
- Often used for tracking variables across times

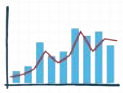


69

Results Slide 70 of 108

Dual Axis Line Graph

- Illustrate the relationships between variables
- Good for limited space
- Clearly show trends
- Can be hard to use!



70

Results Slide 71 of 108

Histogram

- Used to show quantitative data that has been statistically analyzed
- Ranges of values displayed as bars, listed as "classes"
- Taller bars represent classes with greater frequencies

71

Results Slide 72 of 108

Pie Graph or Chart

- Also called a circle graph
- Represent parts of a whole
- Each "slice" is a data percentage
- Segments arranged clockwise from biggest to smallest
- Easy to compare, easy to understand!

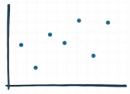
72

Results

Slide 73 of 108

Scatter Plot

- Show values of two variables plotted along two axes
- Pattern of points displays any present correlation



73

Results

Slide 74 of 108

Remember to pay attention to the details!

- Check your math.
- Use consistent row or column summation.
- Keep lines to a minimum and avoid vertical lines.
- Use footnotes to clarify points.
- Check headings, labels and axes for consistency.
- Follow submission guidelines for your target publication.

74

Results

Slide 75 of 108

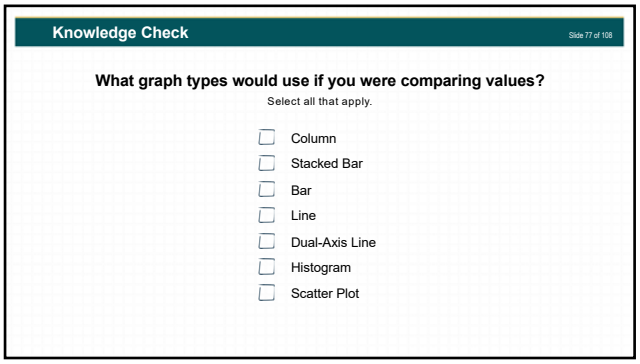
Carefully read the Instructions for Authors provided by your target journal.

- Check for:
  - Limits on file and figure size or table numbers
    - If the limit is low, check and see if supplemental online-only materials are an option
  - Specific file format requirements for figures
  - Guidance for table formatting
  - Footnotes and abbreviations
  - Instructions for submission
    - Order/arrangement
    - One file or multiple files

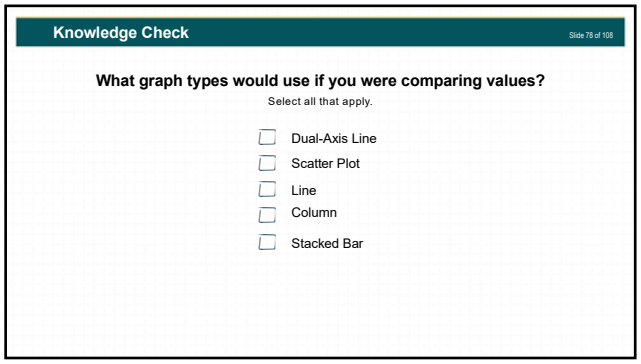
75

You have reached the end of Chapter 4!

76


Knowledge Check
Slide 77 of 108
What graph types would use if you were comparing values?
Select all that apply.
Column
Stacked Bar
Bar
Line
Dual-Axis Line
Histogram
Scatter Plot

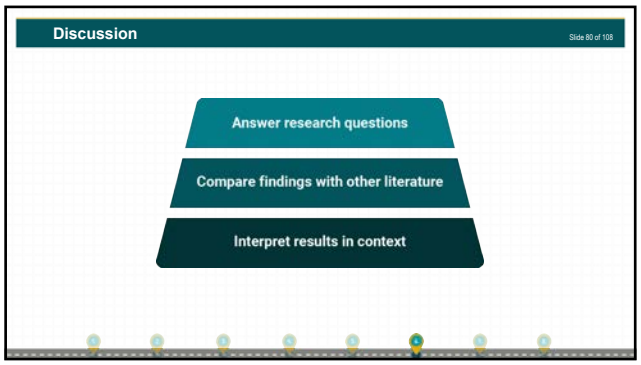
77


Knowledge Check
Slide 78 of 108
What graph types would use if you were comparing values?
Select all that apply.
Dual-Axis Line
Scatter Plot
Line
Column
Stacked Bar

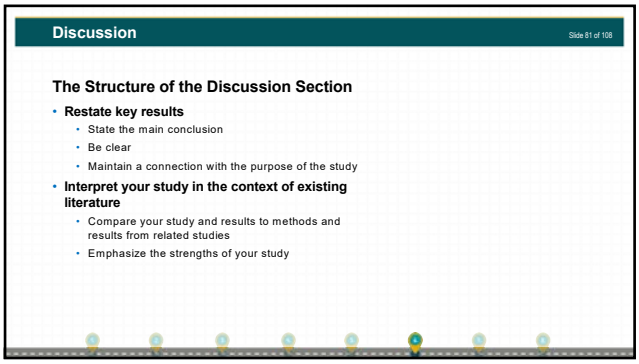
78


Chapter 5:
The Discussion, Acknowledgements and Citations

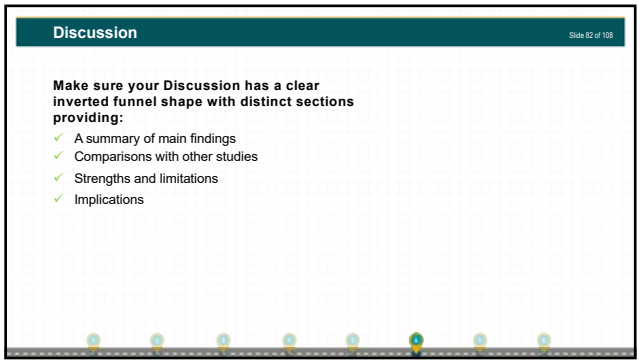
79


Discussion
Slide 80 of 108
Answer research questions
Compare findings with other literature
Interpret results in context

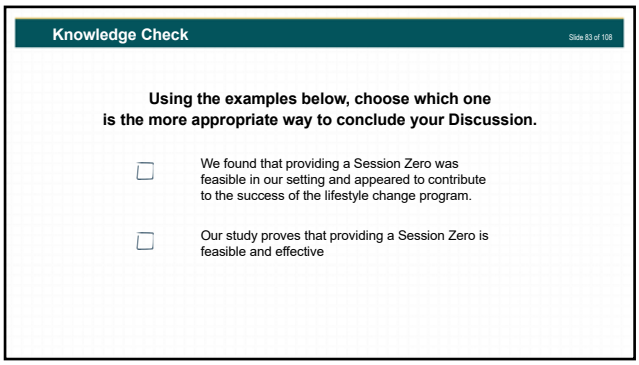
80


Discussion
Slide 81 of 108
The Structure of the Discussion Section
Restate key results
State the main conclusion
Be clear
Maintain a connection with the purpose of the study
Interpret your study in the context of existing literature
Compare your study and results to methods and results from related studies
Emphasize the strengths of your study

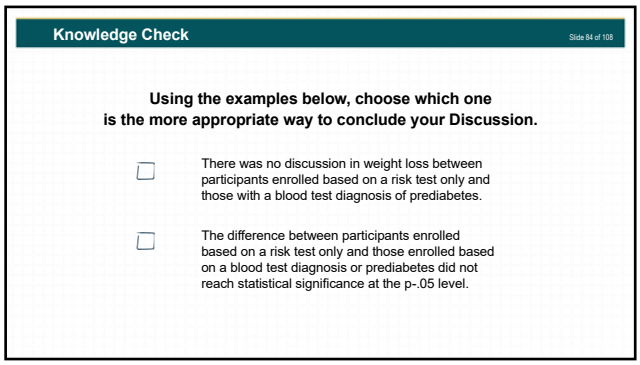
81


Discussion
Slide 82 of 108
Make sure your Discussion has a clear inverted funnel shape with distinct sections providing:
A summary of main findings
Comparisons with other studies
Strengths and limitations
Implications

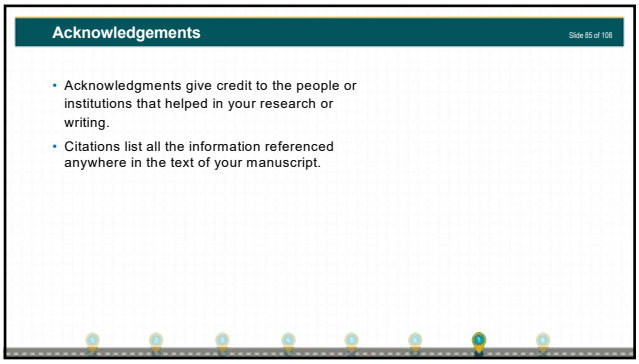
82


Knowledge Check
Slide 83 of 108
Using the examples below, choose which one is the more appropriate way to conclude your Discussion.
We found that providing a Session Zero was feasible in our setting and appeared to contribute to the success of the lifestyle change program.
Our study proves that providing a Session Zero is feasible and effective

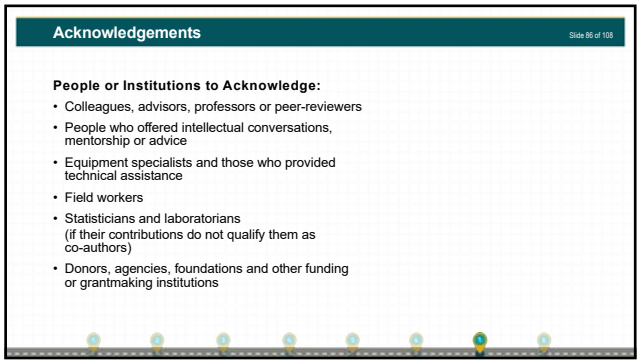
83


Knowledge Check
Slide 84 of 108
Using the examples below, choose which one is the more appropriate way to conclude your Discussion.
There was no discussion in weight loss between participants enrolled based on a risk test only and those with a blood test diagnosis of prediabetes.
The difference between participants enrolled based on a risk test only and those enrolled based on a blood test diagnosis or prediabetes did not reach statistical significance at the p-.05 level.

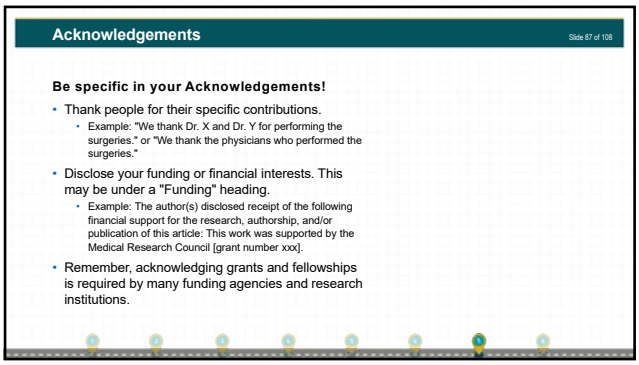
84


Acknowledgements
Slide 85 of 108
• Acknowledgments give credit to the people or institutions that helped in your research or writing.
• Citations list all the information referenced anywhere in the text of your manuscript.

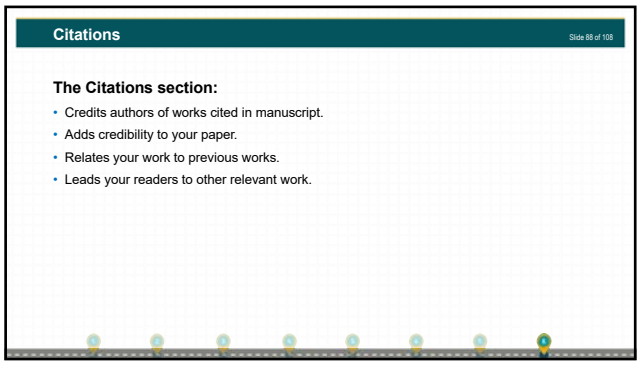
85


Acknowledgements
Slide 86 of 108
People or Institutions to Acknowledge:
• Colleagues, advisors, professors or peer-reviewers
• People who offered intellectual conversations, mentorship or advice
• Equipment specialists and those who provided technical assistance
• Field workers
• Statisticians and laboratorians (if their contributions do not qualify them as co-authors)
• Donors, agencies, foundations and other funding or grantmaking institutions

86


Acknowledgements
Slide 87 of 108
Be specific in your Acknowledgements!
• Thank people for their specific contributions.
• Example: "We thank Dr. X and Dr. Y for performing the surgeries." or "We thank the physicians who performed the surgeries."
• Disclose your funding or financial interests. This may be under a "Funding" heading.
• Example: The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the Medical Research Council [grant number xxx].
• Remember, acknowledging grants and fellowships is required by many funding agencies and research institutions.

87


Citations
Slide 88 of 108
The Citations section:
• Credits authors of works cited in manuscript.
• Adds credibility to your paper.
• Relates your work to previous works.
• Leads your readers to other relevant work.

88

Citations

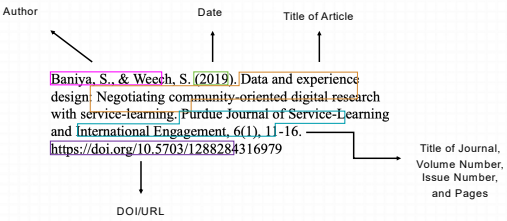
Slide 89 of 108

- Cite original sources
- Cite only references for which you have read the entire paper.
  - List everything you reference in your manuscript and nothing else.

89

Citations

Slide 90 of 108



90

Citations

Slide 91 of 108

Double check all references for correct:

- ✓ Order
- ✓ Format
- ✓ Authors
- ✓ Page numbers
- ✓ Spelling
- ✓ Punctuation

Double check all references for correct:

- ✓ New, relevant work has been published.
- ✓ Your late reviewers connect you to new information or experts that you use in your paper.

91

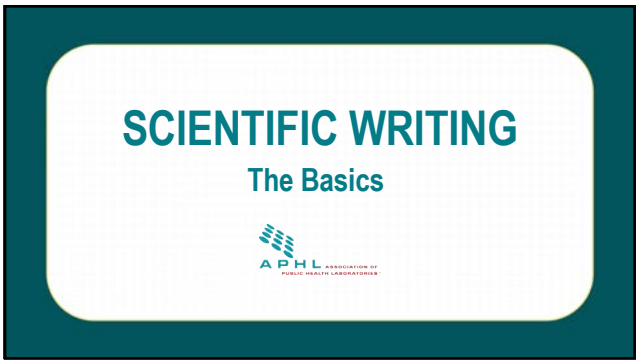
Congratulations!

You've now completed

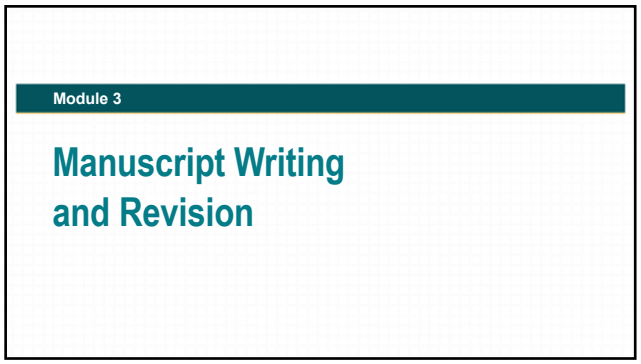
Module 2: Manuscript Preparation!

92

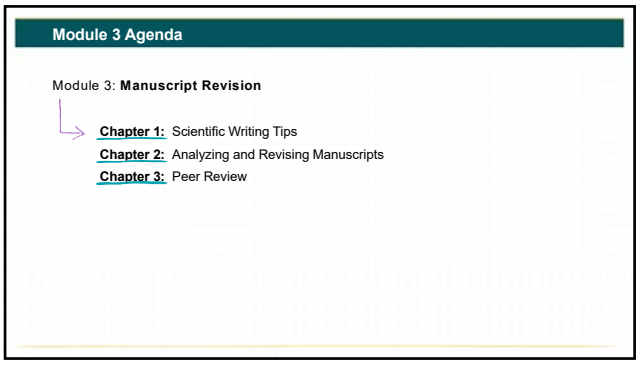
Module 3: Manuscript Revision


SCIENTIFIC WRITING
The Basics
APHL

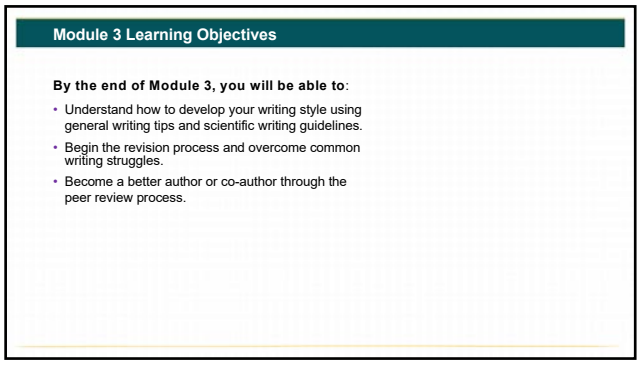
1


Module 3
Manuscript Writing and Revision

2


Module 3 Agenda
Module 3: Manuscript Revision
Chapter 1: Scientific Writing Tips
Chapter 2: Analyzing and Revising Manuscripts
Chapter 3: Peer Review

3


Module 3 Learning Objectives
By the end of Module 3, you will be able to:
Understand how to develop your writing style using general writing tips and scientific writing guidelines.
Begin the revision process and overcome common writing struggles.
Become a better author or co-author through the peer review process.

4

Chapter 1:

Scientific Writing Tips

5

Developing Your Writing Style

Make informed decisions about your manuscript!

- Review general writing tips.
- Learn scientific writing guidelines.
- Consult the submission or author guidelines provided by your target publication.

Keep things simple!

- Use easy-to-understand words and phrases.
- Write simple, short sentences.
- Run a spellcheck and proofread carefully.
- Ask a friend or colleague to read your paper.
- Read your paper out loud.

6

Basic Rules of Scientific Writing

Follow these basics of scientific writing:

- Keep things simple.
- Choose a clear title.
- Break up complex ideas into smaller parts.
- Do no use jargon to explain scientific terms.
- Avoid abbreviations or define and use them consistently.
  - Example: Association of Public Health Laboratories (APHL)

7

Basic Rules of Scientific Writing

Keep it simple by eliminating unnecessary words!

Researchers sterilized each and every plate to eliminate any and all contamination in the final outcome.

Researchers sterilized ~~each and every~~ all plates to eliminate any and all contamination in the final outcome.

⇩

Researchers sterilized all plates to eliminate contamination.

8

Basic Rules of Scientific Writing

Keep it simple by eliminating unnecessary words!

Researchers collected fifteen samples. They collected samples from every study participant.

Researchers collected ~~fifteen~~ samples. ~~They collected samples~~ from ~~every study~~ **each of the fifteen** participant**s**.

⇩

Researchers collected samples from each of the fifteen participants.

9

Basic Rules of Scientific Writing

Keep it simple by eliminating unnecessary words!

Each of the following sentence fragments can be simplified by removing unnecessary words.

1. The results from this study suggest…
2. There were 215 persons in the village.
3. It is clear that unsanitary conditions caused the outbreak.
4. We identified a total of 15 cases.
5. Quality and integrity of the program relies heavily on local trainers. Because of this, it is critical that they are competent and well-qualified.

10

Basic Rules of Scientific Writing

Developing your writing style means making choices about numbering and grammar.

Numerical Style	⇨	One, two, three… vs. 1,2,3… (Letters or numerals?)
Punctuation Style	⇨	X, Y, and Z vs. X, Y and Z (Using the Oxford comma or not?)
Language Preference	⇨	British vs. American English? ("Programme" or "program")

Always follow the journal's style guide!

11

Style Tips: Tense

Past Tense Examples

- Work done
  - "We collected blood samples…"
  - "Astronomers decided to rename…"
- Work reported
  - "Alvarez reported a similar rate…"
  - "In 2009, Tsui published an alternative method…"
- Observations
  - "The number of defects increased…"
  - "The conversion rate was 96%..."

Present Tense Examples

- General Truths
  - "Microbes in the human gut have a found influence on…"
  - "Astronomers decided to rename…"
- Atemporal facts
  - "This paper presents the results of…"
  - "Figure 3.1 shows the difference between …"

Future Tense Examples

- Perspectives and Ideas
  - "In follow-up experiments, we will study the role of…"
  - "The role of temperature will be the objective of future research…"

12

Style Tips: Tense

- **Present Tense**
  - Introduction Text:
    - "Human African Trypanosomiasis (HAT), also known as sleeping sickness, is caused by the protozoan parasites T.b. gambiense (West and Central Africa) and T.b. rhodesiense (East and South Africa)."
- **Past Tense**
  - Discussion Text:
    - "Co-infections with malaria and HIV were studied in detail in the patient population from Tanzania as the majority of the patients were malaria-positive on admission (80%) and agreed to voluntary testing of their HIV status (94.2%)."
  - Methods Text:
    - "Patients with first stage infections, pregnant women and moribund or unconscious patients were excluded."
    - "By molecular analysis of blood samples, the presence of the SRA gene was demonstrated and confirmed T.b. rhodesiense infection in all trial subjects.""

Future Tense Examples

- Discussion Text:
  - "A detailed understanding of the clinical presentation and regional characteristics of T.b. rhodesiense HAT will remain important, and will support decision making and differential diagnosis at the health facility level."

13

Style Tips: "Sell" Your Work

Write with confidence!

- You are the best person to write about your work.
- Be bold and focus on what matters.
- Reiterate the key message
- Avoid weak language (e.g., "somewhat," "speculative," "appear," "almost," "largely")

14

Knowledge Check

Use verbs, not nouns, to express crucial actions.

Select the correct way to express crucial actions below.

- ☐ Demonstration of progress made by laboratories is done through improvement project data.
- ☐ Laboratories demonstrate their progress through improvement project data.

15

Knowledge Check

Use verbs, not nouns, to express crucial actions.

Select the correct way to express crucial actions below.

- ☐ Researchers investigated the epidemic.
- ☐ Researchers conducted an investigation into the epidemic.

16

Achieving a Scientific Voice

To use a scientific voice:

- Develop a precise vocabulary.
- Read the literature and adopt the standard language.
- Label items consistently.
- Define terms and assumptions.

17

Achieving a Scientific Voice

Describe your activities in detail.

- Break activities down, label them and present them in the order they occurred.
- Only include observable details and methods used.
- Omit personal feelings, attitudes, impressions or opinions.
- Follow target journal's style guide and submission guidelines.

18

Achieving a Scientific Voice

Scientific discourse should be reproducible.

- State the limitations of your research.
- Give the reader enough information to arrive at the same conclusions you did.
- Have you presented all the data clearly for correct interpretation?
- Could a reader reproduce your experiment, research or investigation?

19

Knowledge Check

Which of the following examples uses the most effective scientific voice?

- ☐ It is well known that inadequate maternal nutrition can lead to compromised pregnancies.
- ☐ The aim of this study was to assess the causes of severe lipemia and to better define the relationship between lipemia and hemolysis.
- ☐ We thought it could be important to promote quality practices in the mycobacteriology laboratory.
- ☐ This study deals with diagnostic principles and procedures for Mycobacterium tuberculosis.

20

Knowledge Check

Which of the following examples uses the most effective scientific voice?

1. It is well known that inadequate maternal nutrition can lead to compromised pregnancies.
3. We thought it could be important to promote quality practices in the mycobacteriology laboratory.
4. This study deals with diagnostic principles and procedures for Mycobacterium tuberculosis.

21

Addressing Common Stumbling Blocks

Overcoming Writer's Block

- Return to the outline
  - Forget full sentences - just jot down ideas
  - Use bullet points or key words
- Create a rough draft
- Allow yourself to write the "worst possible draft"
  - No one else will see it!
  - Just the act of writing may unleash a flow of creativity
- Work straight from the study protocol
  - Return to what you created for your study protocol and see what it sparks

22

Addressing Common Stumbling Blocks

Too Much Data

- What *specific and clear message* are you trying to get to your reader?
- Which results are necessary to your key message?
- Keep those and nothing else
  - Lay out all results, then cut back
  - Analyze your results again
  - Keep only what is relevant and necessary
- Consider a second paper!

23

Addressing Common Stumbling Blocks

Time

- Set aside dedicated time for writing
- Slow and steady wins the race
- Make deadlines and stick to them!

24

Knowledge Check

Some helpful ways to address writing issues are:
Select all that apply.

- Setting aside dedicated time for writing
- Making deadlines and sticking to them
- Adding unnecessary data to the paper
- Returning to the outline and using bullet points, sentence fragments, or notes to push ahead.
- Refusing to ask for help.
- Allowing yourself to create a "worst possible draft" rather than trying to achieve perfection the first time around.
- Working straight from a study protocol.
- Waiting until the last moment to write.

25

Authorship

Authorship:

- Has important academic, social and financial implications.
- Shows that you are responsible and accountable for the published work.
- Is important for career development, recognition and prestige.

26

Authorship

Authorship Criteria

- Criteria generally require that you made substantial contributions to EACH of the following areas:
  - Concept/design **or** analysis/interpretation of data **or** acquisition of data
  - Drafting the manuscript **or** performing critical revisions
  - Approving manuscript for publication

NOT Authorship Criteria

- The following do NOT quality as criteria for authorship:
  - Funder or approver of funding
  - Departmental supervisor
  - Reviewer
  - Director of institution

27

Authorship

When determining authorship with co-authors:

- Discuss workload and credit before the study begins.
- Evaluate everyone's stake, role, participation and expertise.
- Communicate with co-authors often and support each other.
- Decide early to relieve stress later in the writing process.

28

Authorship

Consider what strengths you need from potential co-authors:

- Mentorship/guidance
- Data analysis
- Laboratory testing
- Writing support
- Help with time-consuming tasks

Young Professionals

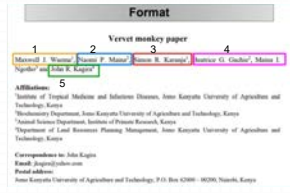
Talk to a supervisor or other publishing professional about helping with their studies in exchange for mentorship or authorship!

Tenured Professionals

Consider mentoring young professionals to help build their careers and to delegate your own tasks.

29

Authorship Order



1 **First Author:**
- Most important position
- Did most of the work; usually the person who writes the first draft
- Usually partners with last author for subsequent drafts

2 **Second Author:**
- Did second most amount of work
- Often performed data analysis or served as the co-principal investigator on study

3 **Third Author:**
- Provided major contributions

4 **Middle Authors:**
- Everyone else who qualifies for authorship, in order of contributions
- May need to be political about who goes where!

5 **Last Authors:**
- Senior-level position
- Often expert in field - your primary mentor
- Usually experienced investigator who partners with first author in interpretation, analysis, and writing
- Especially important in international journals

30

Authorship Affiliations

Affiliations

- Refers to the institute or organization that each author belongs to.
- Usually listed below the author names.
  - Formatted as "department, organization" for each author.
  - Where the author worked/studied while the study was conducted.
  - All funding sources supporting the work and all institutional or corporate affiliations of the authors must be acknowledged.
  - The authors must certify that they have no commercial association that might pose a conflict of interest in connection with the submitted paper.

31

Corresponding Author

Corresponding Author

- Usually first or senior author
- Submits manuscript
- Corresponds with publisher/editor
  - Revision
  - Proofreading
- Timing is important. Deadlines are tight and need to be met, so this person must be diligent!
- Contact information published with the article. Corresponding author often receives subsequent correspondence from outside investigators.

32

Author vs. Contributor

Authors are responsible for ALL of the following:

- Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work.
- Drafting the work or revising it critically for important intellectual content.
- Final approval of the version to be published.
- Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Contributors meet fewer than all four of the criteria for authorship. These contributors should still be acknowledged!

- Individuals and groups that assisted in acquisition of funding.
- General supervision of a research group or general administrative support.
- Writing assistance, technical editing, language editing, and proofreading.

33

Knowledge Check

What qualifies someone as an author or co-author on a scientific manuscript?
Select all that apply.

- They are the director of your institution.
- They have significantly contributed to the concept/design **or** analysis/interpretation of data **or** acquisition of data.
- They financially contributed to the study.
- They have significantly contributed to drafting the manuscript **or** they performed critical revisions.
- They are your boss.
- They have approved the manuscript for publication.
- They are a departmental supervisor.

34

Knowledge Check

True or False?

You *must* write your Introduction first, then the Methods section, then the Results section, and finally the Discussion. This is the *only* approach you may take to writing.

35

Chapter 2:

Analyzing and Revising Manuscripts

36

The Purpose of Editing

Editing enhances your work with:

- Confidence
- Professionalism
- Credibility

37

Becoming a Good Editor

Read and Learn!

- Read many papers.
  - Learn from the good *and* bad work of others.
- Join a journal club to critique a paper as a group
- Read several papers a week think about their quality.
  - What did you like? Why?
  - What did you dislike? Why?
- Being well read facilitates a more objective view of one's own work!

38

General Review Tips

Be Objective!

- The more objective you are with your work, the better your work will be.
- The best scientists are objective about their own work.
- Be proud of your work, but know it can always be improved.
  - Everything requires revision, reworking and rebuilding.

39

General Review Tips

Choose Good Editors and Good Reviewers

- Good editors and reviewers will be objective about your work.
- Reviews won't fix it if there are fundamental flaws in your work!
- Edits and revisions are not personal attacks!

40

General Review Tips

Practice Writing in English

- Take lessons or find free apps/programs.
- The best papers express complex ideas in ways that are understandable to non-experts.
- Manuscripts that are not written in good English take longer to get published.

41

General Review Tips

Feedback

- Learn to accept and use feedback effectively.
- Listen to your reviewers and respond in an objective, appreciative manner.
- If many editors are critical about specific points in your work, these points need to be readdressed.
- If journals or publications request a major revision, follow their advice and address every point raised!

42

General Review Tips

Become a Reviewer

- Work with your mentors
  - Have a mentor give you manuscripts they are reviewing
  - They can appraise *your* reviews.
  - Study the final review done by your mentor.
- You will understand the review process and the quality of reviews.
- Many editors ask authors who have published in their journals to serve as peer reviewers later.
  - This can be an exciting opportunity!

43

General Review Tips

Quality

- It is better to publish one manuscript in a quality journal than multiple papers in lesser journals.
- Quality papers get published in quality journals.
  - Write the best paper you can, but don't be discouraged!
- Try to publish in journals that have high-impact factors

44

Becoming a Good Editor

A writing critique group or journal club will help you:

- Read and analyze others' manuscripts or published articles.
- Practice editing others' writing.
- Give and receive constructive feedback.
- Practice writing, revising and rewriting.

45

Becoming a Good Editor

Remember these tips during the revision process:

- Simplify your writing.
- Stay organized with consistent folders and filenames.
- Track changes.
- Back up your files regularly.

46

Knowledge Check

Keep your writing simple! Which sentences are appropriately concise?
Select all that apply.

- While it is no secret that pathogenic bacteria are able to develop antibiotic resistant variants, a less well-appreciated fact is that a small number of bacteria, including some of nature's nastiest pathogens, can resist antibiotics and escape antibiotic treatments without relying on variants.
- Many diseases can cause bone marrow failure, resulting in greatly reduced to absent hematopoiesis with subsequent pancytopenia.
- An in-house-developed enzyme-linked immunosorbent assay was used for determining plasma IgG antibodies against p16-derived antigens in 122 HCC patients and 134 healthy controls.
- Tape-lifting is a very useful and surprisingly non-destructive alternative to swabbing when you have to collect any biological materials deposited on surfaces, especially on porous substrates like paper, untreated wood, cardboard, sponge, and fabric.

47

Knowledge Check

Keep your writing simple! Which sentences are appropriately concise?
Select all that apply.

- While it is no secret that pathogenic bacteria are able to develop antibiotic resistant variants, a less well-appreciated fact is that a small number of bacteria, including some of nature's nastiest pathogens, can resist antibiotics and escape antibiotic treatments without relying on variants.
- Tape-lifting is a very useful and surprisingly non-destructive alternative to swabbing when you have to collect any biological materials deposited on surfaces, especially on porous substrates like paper, untreated wood, cardboard, sponge, and fabric.

48

Chapter 3:

Peer Review

49

Feedback From Your Peers

Peer review is an irreplaceable part of the scientific writing process.

As part of the peer review process:

- Ask colleagues, friends, co-writers and other collaborators.
- Collect opinions, suggestions and comments.
- Incorporate feedback into revision process.

Ask early, ask often!

- Don't wait for a complete draft.
- Get feedback in "pieces" to avoid being overwhelmed.

50

Feedback From Experts

When seeking outside reviewers:

- Contact 3-4 experts outside your organization.
- Ask them to review your work informally.
- Provide guiding questions around any key issues.
- Be open to feedback.
- Be kind and appreciative.
- Acknowledge these reviewers in your manuscript.

51

Your Reviewers

Take a moment to write down your thoughts about potential sources of feedback for your paper.

- Think about your colleagues, peers and mentors.
  - Who would be good peer reviewers?
  - How will you contact them about your work?
  - Take notes and keep them for later reference.
- Think also about the experts in your field, like the authors of papers that have guided your work.
  - How might you ask them to review your manuscript?

52

Becoming a Good Reviewer

- **Be mindful**
  - Time and deadlines
  - Ask for an extension if needed
- **Be intentional**
  - Approach the work with a desire to review
  - Take your time with the review
  - Take note of what the author has asked
- **Be detailed and specific**
- **Be thoughtful**
  - Read the guidelines
  - Ask for guidelines if none are given

The scientific community needs good content!

53

Becoming a Good Reviewer

Read

Be Thorough

Be Specific

Be Constructive

- Read the *entire article*.
- Assess all figures, tables and data.
- Discuss the article in full *and* its component parts.
- Demonstrate your understanding of the article.
- Provide *detailed* comments.
- Include concerns and criticism in constructive, respectful ways.
- Avoid derogatory comments or tone.
- Treat others as you would like to be treated.
- Focus your comments on the scientific content.

54

Becoming a Good Reviewer

Think about structuring your feedback like an inverted funnel. The most important information goes at the top and takes up the most space. Follow this with supporting details.

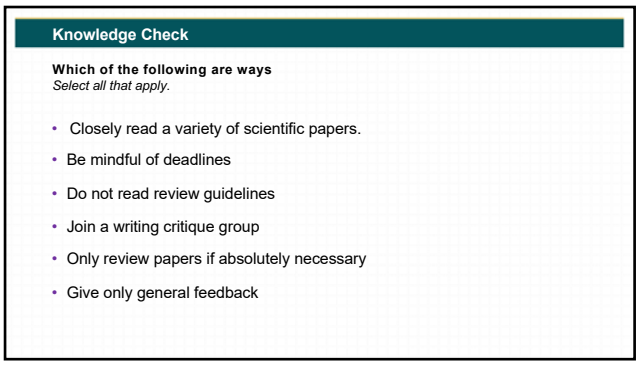
55

Knowledge Check

Which of the following are ways
Select all that apply.

- Summary of the research
- Criticisms of the author
- Major and minor issues
- Other points
- Reviewer's overall feedback

56

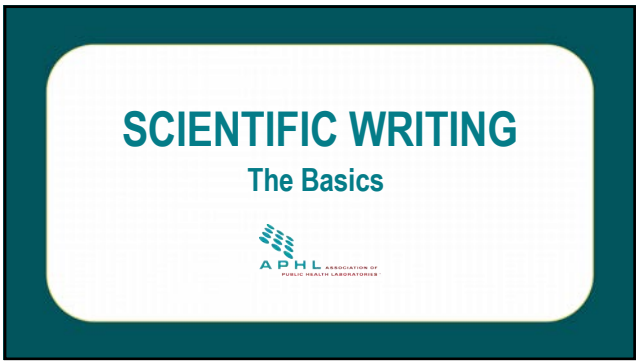

Knowledge Check
Which of the following are ways
Select all that apply.
Closely read a variety of scientific papers.
Be mindful of deadlines
Do not read review guidelines
Join a writing critique group
Only review papers if absolutely necessary
Give only general feedback

57


Congratulations!
You've now completed
Module 3: Manuscript Writing and Revision

58

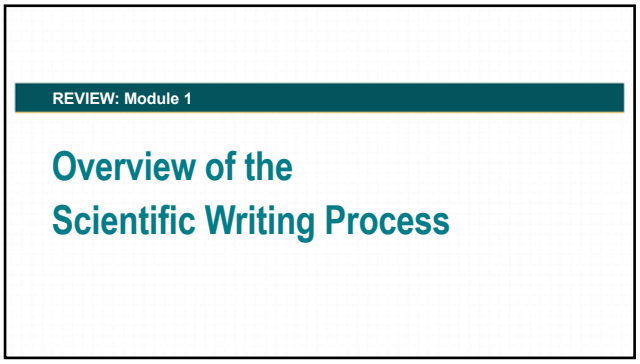
Module 4: Wrapping up


SCIENTIFIC WRITING
The Basics
APHL

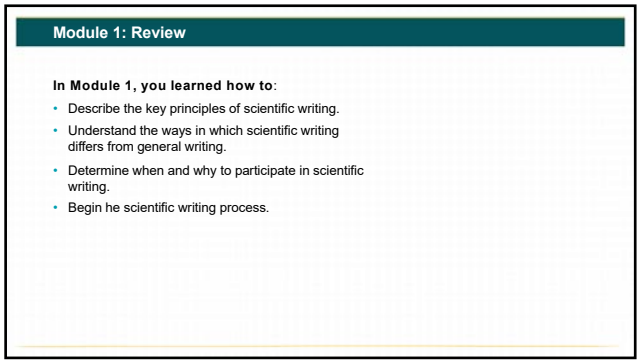
1


Module 4
Wrapping Up

2


REVIEW: Module 1
Overview of the
Scientific Writing Process

3


Module 1: Review
In Module 1, you learned how to:
Describe the key principles of scientific writing.
Understand the ways in which scientific writing differs from general writing.
Determine when and why to participate in scientific writing.
Begin he scientific writing process.

4

Module 1: Review

Summary of Scientific Manuscript Writing

- Scientific manuscripts are about getting messages across clearly, concisely, and completely.
- Strive to convince your audience that your work is important, valid, and relevant.
- In the *Introduction*, emphasize the motivation for your work.
- In the *Conclusion*, emphasize the outcome of your work.
- In the body of the manuscript (*Methods, Results, Discussion*), present enough evidence to establish the validity of this outcome.
- At the paragraph level, present first what you want your readers to remember before developing this message in the rest of the paragraph. With each sentence, convey one idea.
- After you have drafted your manuscript, revise it using whatever tools are most helpful to you.

5

Module 1: Review

Conducting a Literature Review:

- Conduct a literature review:
  - Before you conduct your study.
  - To enhance your knowledge of the topic.
  - To identify gaps in existing scholarship.
  - To better understand your work's significance.

6

Knowledge Check

Which of the following options best completes this sentence?

Scientific writing is _____ writing.

- ☐ general
- ☐ technical
- ☐ impressive
- ☐ unreviewed

7

Knowledge Check

Which of the following reasons support your writing a scientific manuscript?
Select all that apply.

- My Study fills a gap in existing knowledge
- My work has already been published in other journals
- My work takes a leap into new territory.
- My work explores well known studies, but tests a new method or approach
- My work is only interesting to my intended audience.

8

Knowledge Check

True or False?

The abstract distills your entire paper down to one simpler sentence.

9

REVIEW: Module 2

Manuscript Preparation

10

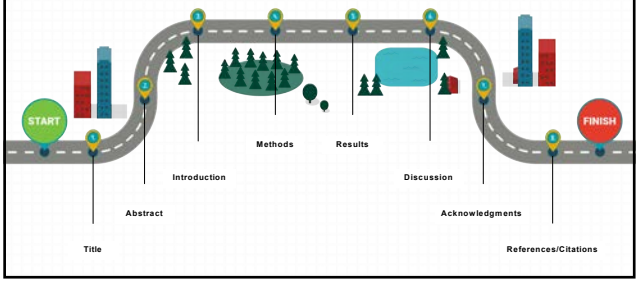
Module 2 Overview

Module 2, you learned how to:

- Describe and understand the importance of each section of scientific manuscript
- Demonstrate an understanding of and ability to analyze and present data.

11

The Scientific Writing Roadmap



12

Knowledge Check

What is the most frequently read part of any scientific paper?

Select the correct answer.

- Title
- Abstract
- Introduction
- Methods
- Results
- Discussion

13

Knowledge Check

Which section of the manuscript do many scientists write first?

Select the correct answer.

- Title
- Abstract
- Introduction
- Methods
- Results
- Discussion

14

Knowledge Check

You should evaluate the results of your study in which section of the manuscript?

Select the correct answer.

- Title
- Abstract
- Introduction
- Methods
- Results
- Discussion

15

REVIEW: Module 3

Manuscript Revision

16

Module 3: Review

In Module 3, you learned how to:

- Understand the importance of revision to the scientific writing process.
- Follow the proper methods for analyzing and reviewing scientific papers.
- Request feedback from your peers and outside experts.
- Improve your writing through reviewing others' work.

17

Module 3: Review

Writing Style and Scientific Voice

- To develop your writing style and the scientific voice:
  - Make informed choices about content and organization.
  - Keep things simple.
  - Avoid using jargon, acronyms or abbreviations.
  - Read the literature and adopt the language used in scientific publications.
  - Define and label things consistently in your paper.

18

Module 3: Review

Asking for Feedback

Ask others to review your manuscript!

- Ask colleagues, friends, co-writers and other collaborators.
- Contact 3-4 experts outside your organization.
- Provide guiding questions around any key issues.
- Collect opinions, suggestions and comments.
- Incorporate feedback into revision process.

19

Module 3: Review

Reading Others' Work

Developing your skills as an editor by:

- Reading articles published in peer-reviewed scientific journals.
- Offering to review your colleagues' manuscripts.

A finished draft does not become a manuscript that you would be proud to submit without revision.

20

Knowledge Check

Which of the following activities may help improve your editing skills?
Select the correct answer.

- Taking a break from reading scientific articles so they won't influence your writing.
- Joining a journal club or writing group where you can read and critique others' work.
- Rejecting requests to review your colleagues' work so you can focus on your own manuscript.
- Taking English lessons or using language apps to practice good grammar, fluency and comprehension.
- Ignoring multiple reviewers' suggestions to change a particular section in your manuscript.

21

Knowledge Check

How should you handle acronyms in your scientific manuscript?
Select the correct answer.

- Don't include acronyms in your scientific manuscript. Write everything out so you won't confuse the reader.
- Use acronyms as much as possible to make your paper easier to read
- Use acronyms consistently and define each acronym in its first instance.

22

Knowledge Check

What is the recommended writing style to adopt when writing a scientific manuscript?
Select the correct answer.

- APA Style
- The writing style of your target publication
- American English
- British English

23

Congratulations!

You've now completed
Module 4 and the Introduction to Scientific Writing course!

24

Case Study Content

A case study is a written description of a hypothetical situation that is used for analysis and discussion. It is a detailed account of a real or hypothetical occurrence that can reflect events participants might encounter. In this course, you will meet three case study characters, all of whom are at different stages of their scientific writing careers.

Module 1: Teo Barrera

Part 1
I am a clinical researcher, which means I'm more comfortable viewing specimens through a microscope than writing about them for a journal. Still, my team and I noticed an unusual pattern of infections transmitted from blood donations made at rural clinics. When we performed a literature review, we found plenty of articles on transfusion infections. We were surprised and excited to find that no one had written about the issue we identified in our area. Our research could improve the intake process and reduce infection risks in rural communities around the world. My supervisor has been encouraging us to publish our findings. I have contributed to a few scientific papers, but I've never been a lead author before. I'm worried that I don't have enough experience to be a lead writer on a paper. If I'm being honest, I'm also nervous about writing the bulk of a paper in English, since it's not my first language.

Part 2
Asking myself questions about whether or not to write and submit a manuscript helped me discover that I truly am ready to write a scientific manuscript and publish our important findings. Now, I just need to understand the steps involved in writing a scientific manuscript.

Part 3
Conducting a thorough literature review is so important. My team and I read more research than we could possibly fit into our final paper, but it gave us a full background on our subject matter and confirmed that we weren't doing the same work as someone else. We limited our search to recently published papers in well-known journals, such as The Lancet, the New England Journal of Medicine and the Journal of Hematology and Oncology. Then, we took detailed notes on what we read, summarized what we learned and organized that information in a table that we could access later when writing the manuscript.

Part 4		
Mr. Barrera's Research Question	**Mr. Barrera's Main Findings**	**Key Message of Mr. Barrera's Manuscript**
Why are blood donations collected in rural areas of our community testing positive for high rates of transfusion-transferrable infections?	Blood donors were not disclosing infections because our screening tools did not effectively explain the need for this information. We can reduce donations of infected blood by creating new educational materials for blood donors and by making our screening tools and procedures easier to use.	Improved donor education and screening procedures may prevent blood donations that test positive for transfusion-transferrable infections.

Module 2: Netra Chey

Part 1
Staying organized and taking notes as you work will help you manage the writing process. I referred to the manuscript outline, or roadmap, many times as I wrote–to add new details, make changes, or track what I was missing. If you're working on a scientific journal article, like I am, you may already be familiar with the **IMRaD** structure. **IMRaD** is a mnemonic device that helps us remember the most important elements of a journal article, which are also part of the manuscript outline. These are the Introduction, Methods, Results and Discussion.

Part 2
The abstract may seem intimidating at first because it's so short, but that's actually what makes it easy. Think of writing the abstract as taking one or two sentences from each of your manuscript sections and reworking it. When you break it down, the abstract needs an introductory sentence, a sentence stating the research question, a sentence outlining your main techniques or procedures, a few sentences describing your results and one final sentence describing your major conclusion. Easy!

Part 3
If I think about the IMRaD method, I view the Introduction as the starting point of my journal article. This is where my team and I will introduce our problem statement and give readers enough information to fully appreciate the specific research question and objectives. Remember: the Introduction is like a funnel. It starts broad and gets narrower. Begin with the broadest scope, then get progressively more defined in your focus. This leads your reader steadily to your statement of objectives, which should be at the end of your introduction.

Part 4
I love data, which is why I love working on the Results section of my papers. However, it's easy to overdo it with the statistics, tables and drawings and overwhelm your readers. That's why I always devote some time to planning the most effective ways to communicate my research, both with text and with visualizations. I focus on only the most meaningful statements supported by the evidence. I keep all text short and delete any places where my paragraphs are needlessly repeating information that readers can already find in the figures or captions. I ask myself, "Am I presenting the evidence in a logical order?" Evidence

does not explain itself, so it's up to me to present the facts in the right order and explain them in a way that answers the research questions found in my Introduction.

Part 5
When it's time for me to write the Discussion section, I begin by re-reading the Introduction to my manuscript. That way I can relate my results back to what I first presented in the Introduction. I can explain how my work answers my original research question, compare or contrast my findings with other published literature and describe the wider implications or areas for future exploration.

Part 6
Acknowledgments are easy! Thank the people who helped you and make note of how they helped. Here is my acknowledgments section. First, I thanked the doctors and staff of the National Institute of Hygiene and Epidemiology in Hanoi, Vietnam, because they provided most of the serum and respiratory specimens used in our study. Next, I thanked Dr. James Luby, an expert in the isolation and propagation of human enteric coronaviruses, who provided the strains we used in our study. I didn’t thank any of my co- or sub-authors, because they get credit for writing the paper as well!

Module 3: Dr. Sara El-Tenobi

Part 1
Finishing my fellowship doesn't mean I've finished writing my manuscript on locating and accessing health data. Coming home has been wonderful, but I haven’t been working much on my manuscript. Between writer's block, too much data and burnout, I have experienced many of the issues one faces when writing a manuscript. I want my writing to be perfect but putting that pressure on myself makes it so difficult to write at all. When I get stuck, I return to my outlines or notes and remind myself of the “worst possible draft.” I write the worst version of what I’m working on and let it stay that way until my next revision.

Part 2
Technically, my paper is written, but an unrevised article is nowhere near complete. It may sound strange, but to prepare for the revision process, I am doing a lot of reading. Each week, I read at least two scientific papers, sometimes more. I take my time, read carefully and pay attention to what I like and don't like about the writing, presentation and style of each paper. Analyzing other articles helps me to better analyze my manuscript. This reading and analysis also help me practice English, which is not my first language. I have asked some of my professors and colleagues to read and edit my manuscript, but I have to finish a good draft before I am ready for them to see it.

Knowledge Checks

The following knowledge checks help support and reinforce information throughout the course. These questions are not graded, but they will be collected by your facilitator.

All of the knowledge checks also appear as slides in the course content section so that you can continue to take notes and reflect upon them later.

Module 1

Knowledge Check 1
Which of the following are true about scientific manuscripts? *Select all that apply.* ☐ Scientific manuscripts aim to inform, not impress. ☐ Scientific manuscripts are essential to the evolution of modern science. ☐ Scientific manuscripts feature technical, clear and concise writing. ☐ Scientific manuscripts follow the scientific method.

Knowledge Check 2
Which of the following are good reasons to write a scientific manuscript? *Select all that apply.* ☐ When your work advances the knowledge of the field ☐ When your work would add new and original results or methods to the scientific conversation ☐ When your work has already been published ☐ When your work would fill a gap in existing knowledge

Knowledge Check 3
Literature reviews are important because they... *Select all that apply.* ☐ Explain the background of research on your study topic. ☐ Exhaustively detail every work written on your topic. ☐ Discover relationships between previously performed research studies and ideas. ☐ Identify important research themes, concepts and writers who have focused on your topic. ☐ Identify gaps and disagreements that your study may address.

Knowledge Check 4

When should you conduct a literature review?
Select one answer.

- ☐ Before conducting your study
- ☐ After conducting your study

Knowledge Check 5

True or False?
Performing a literature review will make you an expert on your topic.

- ☐ True
- ☐ False

Knowledge Check 6

When formulating a key message, which of the following questions should you ask yourself?
Select all that apply.

- ☐ What have I found that is interesting?
- ☐ What have I found that is new?
- ☐ What have I found that could have an impact?

Module 2

Knowledge Check 1

True or False?
The abstract is a simple summary of your manuscript.

- ☐ True
- ☐ False

Knowledge Check 2

How should the methods section be organized?
Select one answer.

- ☐ Alphabetically
- ☐ Chronologically
- ☐ Thematically
- ☐ Whatever way seems easiest

Knowledge Check 3

What is p-hacking? Choose the correct definition.
Select one answer.

- ☐ Methods of breaching the defenses and exploiting the weaknesses of a computer system or network
- ☐ When researchers misuse their results by analyzing data in multiple ways or multiple times until they get their desired result

Knowledge Check 4

What graph types would you use if you were comparing values?
Select all that apply.

- ☐ Column
- ☐ Stacked Bar
- ☐ Bar
- ☐ Line
- ☐ Line
- ☐ Dual-Axis Line
- ☐ Histogram

Knowledge Check 5

What graph types would you use if you were analyzing trends in data?
Select all that apply.

- ☐ Dual-Axis Line
- ☐ Column
- ☐ Scatter Plot
- ☐ Stacked Bar
- ☐ Line

Knowledge Check 6

Using the examples below, choose which one is the more appropriate way to conclude your Discussion.
Select one answer.

- ☐ We found that providing a Session Zero was feasible in our setting and appeared to contribute to the success of the lifestyle change program.
- ☐ Our study proves that providing a Session Zero is feasible and effective.

Knowledge Check 7

Using the examples below, choose which one is the more appropriate way to conclude your Discussion.
Select one answer.

- ☐ There was no difference in weight loss between participants enrolled based on a risk test only and those with a blood test diagnosis of prediabetes.
- ☐ The difference between participants enrolled based on a risk test only and those enrolled based on a blood test diagnosis or prediabetes did not reach statistical significance at the p-.05 level.

Module 3

Knowledge Check 1
Use verbs, not nouns, to express crucial actions. *Select the correct way to express crucial actions below.* ☐ Demonstration of progress made by laboratories is done through improvement project data. ☐ Laboratories demonstrate their progress through improvement project data.

Knowledge Check 2
Use verbs, not nouns, to express crucial actions. *Select the correct way to express crucial actions below.* ☐ Researchers investigated the epidemic. ☐ Researchers conducted an investigation into the epidemic.

Knowledge Check 3
Which of the following examples uses the most effective scientific voice? *Select one answer.* ☐ It is well known that inadequate maternal nutrition can lead to compromised pregnancies. ☐ The aim of this study was to assess the causes of severe lipemia and to better define the relationship between lipemia and hemolysis. ☐ We thought it could be important to promote quality practices in the mycobacteriology laboratory.

- [ ] This study deals with diagnostic principles and procedures for Mycobacterium tuberculosis.

Knowledge Check 4

Some helpful ways to address writing issues are...
Select all that apply.

- [ ] Setting aside dedicated time for writing
- [ ] Making deadlines and sticking to them
- [ ] Adding unnecessary data to the paper
- [ ] Returning to the outline and using bullet points, sentence fragments, or notes to push ahead
- [ ] Refusing to ask for help
- [ ] Allowing yourself to create a “worst possible draft” rather than trying to achieve perfection the first time around
- [ ] Working straight from a study protocol
- [ ] Waiting until the last moment to write

Knowledge Check 5

What qualifies someone as an author or co-author on a scientific manuscript?
Select all that apply.

- [ ] They are the director of your institution.
- [ ] They have significantly contributed to the concept/design or analysis/interpretation of data or acquisition of data.
- [ ] They financially contributed to the study.
- [ ] They have significantly contributed to drafting the manuscript or they performed critical revisions.
- [ ] They are your boss.
- [ ] They have approved the manuscript for publication.
- [ ] They are a departmental supervisor.

Knowledge Check 6

True or False?

You *must* write your Introduction first, then the Methods section, then the Results section and finally the Discussion. This is the *only* approach you may take to writing.

☐ True

☐ False

Knowledge Check 7

Keep your writing simple! Which sentences are appropriately concise?

Select all that apply.

☐ While it is no secret that pathogenic bacteria are able to develop antibiotic resistant variants, a less well-appreciated fact is that a small number of bacteria, including some of nature's nastiest pathogens, can resist antibiotics and escape antibiotic treatments without relying on variants.

☐ Many diseases can cause bone marrow failure, resulting in greatly reduced to absent hematopoiesis with subsequent pancytopenia.

☐ An in-house-developed enzyme-linked immunosorbent assay was used for determining plasma IgG antibodies against p16-derived antigens in 122 HCC patients and 134 healthy controls.

- [ ] Tape-lifting is a very useful and surprisingly non-destructive alternative to swabbing when you have to collect any biological materials deposited on surfaces, especially on porous substrates like paper, untreated wood, cardboard, sponge and fabric.

Knowledge Check 8

Which of the following are the standard sections of peer review feedback?
Select all that apply.

- [ ] Summary of the research
- [ ] Criticisms of the author
- [ ] Major and minor issues
- [ ] Other points
- [ ] Reviewer's overall feedback

Knowledge Check 9

Which of the following are ways to be a good reviewer?
Select all that apply.

- [ ] Closely read a variety of scientific papers.
- [ ] Be mindful of deadlines.
- [ ] Do not read review guidelines.
- [ ] Join a writing critique group.
- [ ] Only review papers if absolutely necessary.
- [ ] Give only general feedback.

Module 4

Module 1 - Review 1

Which of the following options best completes this sentence?
Scientific writing is _____ writing.

- ☐ general
- ☐ technical
- ☐ impressive
- ☐ unreviewed

Module 1 - Review 2

Which of the following reasons support your writing a scientific manuscript?
Select all that apply.

- ☐ My study fills a gap in existing knowledge.
- ☐ My work has already been published in other journals.
- ☐ My work takes a leap into new territory.
- ☐ My work explores well known studies, but tests a new method or approach.
- ☐ My work is only interesting to my intended audience.

Module 1 - Review 3

True or False?
The abstract distills your entire paper down to one simple sentence.

- ☐ True
- ☐ False

Module 2 - Review 1

What is the most frequently read part of any scientific paper?
Select one answer.

- ☐ Title
- ☐ Abstract
- ☐ Introduction
- ☐ Methods

- ☐ Results
- ☐ Discussion

Module 2 - Review 2

Which section of the manuscript do many scientists write first?
Select one answer.

- ☐ Title
- ☐ Abstract
- ☐ Introduction
- ☐ Methods
- ☐ Results
- ☐ Discussion

Module 2 - Review 3

You should evaluate the results of your study in which section of the manuscript?
Select one answer.

- ☐ Title
- ☐ Abstract
- ☐ Introduction
- ☐ Methods
- ☐ Results
- ☐ Discussion

Module 3 - Review 1

Which of the following activities may help improve your editing skills?
Select all that apply.

- ☐ Taking a break from reading scientific articles so they won't influence your writing
- ☐ Joining a journal club or writing group where you can read and critique others' work
- ☐ Rejecting requests to review your colleagues' work so you can focus on your own manuscript
- ☐ Taking English lessons or using language apps to practice good grammar, fluency and comprehension
- ☐ Ignoring multiple reviewers' suggestions to change a particular section in your manuscript

Module 3 - Review 2

How should you handle acronyms in your scientific manuscript?
Select one answer.

- ☐ Don't include acronyms in your scientific manuscript. Write everything out so you won't confuse the reader.
- ☐ Use acronyms as much as possible to make your paper easier to read.
- ☐ Use acronyms consistently and define each acronym in its first instance.

Module 3 - Review 3

What is the recommended writing style to adopt when writing a scientific manuscript?
Select one answer.

- ☐ APA Style
- ☐ The writing style of your target publication
- ☐ American English
- ☐ British English

Surveys

The following surveys are intended to collect measurable participant data. The first survey is a Pre-Training Survey for Participants. Each participant must fill out the survey and turn it in to the facilitator before training officially begins.

The last survey is the Post-Training Participant Survey. All participants must complete this survey before dispersing following the conclusion of training.

Pre-Training Participant Survey

Before you begin the training, please complete a brief survey. Your responses will not be graded. Instead, your responses will help us make future enhancements to the training.

A. Demographic Information

1. Where are you located?
    a. North America
    b. Central America
    c. South America
    d. Europe
    e. Africa
    f. Asia
    g. Australia
    h. Caribbean Islands
    i. Pacific Islands
    j. Other (Please specify):
    k. Prefer not to say

2. What is the primary language you use in the workplace?
    a. English
    b. Spanish
    c. Portuguese
    d. French
    e. Mandarin
    f. Arabic
    g. Other (Please specify):
    _____

3. Which of the following best describes your primary profession? Select all that apply.
    a. I am a laboratory technician.
    b. I am a laboratory manager/supervisor.
    c. I am a laboratory director.
    d. I am an epidemiologist.
    e. I work in research or academia.
    f. I work for the health ministry (non-lab work).
    g. Other (Please specify):
    _____

4. What is the highest degree or level of education you have completed?
    a. High School/ Secondary School
    b. Some college credit, no degree
    c. Bachelor's Degree (or equivalent)
    d. Master's Degree (MS, MPH, MA, etc.)
    e. Professional Degree (MD, PharmD, DO, etc.)
    f. Doctorate Degree (PhD, PsyD, EdD, etc.)
    g. Other (Please specify):
    _____

B. Scientific Manuscript Writing Experience

1. Have you published a scientific manuscript prior to taking this training?
    a. Yes, I have served as first author on one or more papers published in a peer-reviewed journal.
    b. Yes, I have served as a second author or other co-author on one or more papers published in a peer reviewed journal, but I have not yet been a first author.
    c. Not yet, but my manuscript has been submitted to a peer-reviewed journal for review and publication.
    d. Not yet, my manuscript is currently in progress.
    e. No, I have not yet started writing my manuscript.
    f. Other (Please specify): _____

2. Have you had previous scientific manuscript writing training? Select all that apply.
    a. Yes, collegiate or graduate coursework.
    b. Yes, coursework or professional training taken courtesy of my employer.
    c. Yes, coursework or professional training taken independent of my employer.
    d. Yes, I've received informal training through peer mentorship, journal clubs or similar support.
    e. No, I have not had any scientific manuscript training experience.
    f. Other (Please specify): _____

3. How confident do you feel about your ability to write and submit a scientific manuscript for peer-reviewed journal publication?
    a. Very confident
    b. Fairly confident
    c. Somewhat confident
    d. Slightly confident
    e. Not confident at all

C. Course Learning Objectives

The following questions will help gain insight into what you are hoping to learn from this online training course. Please feel free to add additional comments at the end of the survey.

1. What is your primary reason for taking this course? Select all that apply.
    a. To understand the basics of the scientific manuscript writing process
    b. To understand the purpose and structure of each of the sections in a scientific manuscript
    c. To understand how to analyze and present data
    d. To understand how to analyze and review scientific manuscripts
    e. Other (Please specify): _____

2. Please rate the following learning objectives in order of importance, as they relate to your reasons for taking this course.

	Not important	Somewhat important	Important	Very important
Describe the scientific writing process and its key stages.				
Describe the purpose and structure of each of the sections in a scientific article.				
Demonstrate an ability to present data.				
Analyze and review scientific manuscripts for key messages, consistency and justification.				
Understand the importance of informal peer review and feedback.				

3. What do you hope to do or achieve after completing this training course?

Daily Evaluations

Evaluation and learning sheet: Day 1

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Today's topic is relevant to my work.	▢	▢	▢	▢	▢
2. There was enough time devoted to today's topic.	▢	▢	▢	▢	▢
3. The facilitator effectively conveyed key messages.	▢	▢	▢	▢	▢
4. The materials were easy to understand.	▢	▢	▢	▢	▢
5. The content helped me reflect on my work as a scientist.	▢	▢	▢	▢	▢
6. I was satisfied with this session.	▢	▢	▢	▢	▢

Please provide feedback on this session for the facilitator. (For example, what was the most important part of this session for you? What do you wish the facilitator spent more time explaining? What is the facilitator doing well? What could the facilitator improve upon?)

Evaluation and learning sheet: Day 2

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Today's topic is relevant to my work.	☐	☐	☐	☐	☐
2. There was enough time devoted to today's topic.	☐	☐	☐	☐	☐
3. The facilitator effectively conveyed key messages.	☐	☐	☐	☐	☐
4. The materials were easy to understand.	☐	☐	☐	☐	☐
5. The content helped me reflect on my work as a scientist.	☐	☐	☐	☐	☐
6. I was satisfied with this session.	☐	☐	☐	☐	☐

Please provide feedback on this session for the facilitator. (For example, what was the most important part of this session for you? What do you wish the facilitator spent more time explaining? What is the facilitator doing well? What could the facilitator improve upon?)

Evaluation and learning sheet: Day 3

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Today's topic is relevant to my work.	☐	☐	☐	☐	☐
2. There was enough time devoted to today's topic.	☐	☐	☐	☐	☐
3. The facilitator effectively conveyed key messages.	☐	☐	☐	☐	☐
4. The materials were easy to understand.	☐	☐	☐	☐	☐
5. The content helped me reflect on my work as a scientist.	☐	☐	☐	☐	☐
6. I was satisfied with this session.	☐	☐	☐	☐	☐

Please provide feedback on this session for the facilitator. (For example, what was the most important part of this session for you? What do you wish the facilitator spent more time explaining? What is the facilitator doing well? What could the facilitator improve upon?)

Post-Training Participant Survey

Thank you for your dedication to improving your skills and knowledge related to scientific writing! Now that you have completed this training, please complete the survey on the following slides. Your responses will not be graded. Instead, your responses will help us make future enhancements to the training.

A. Overall Experience

1. Please rate your overall experience with this training:
    a. Excellent
    b. Good
    c. Satisfactory
    d. Poor
    e. Very poor

2. The table below lists the course learning objectives. Do you feel confident that you achieved these objectives? Please rate your confidence level for each objective.

	Not confident	Somewhat confident	Confident	Very confident
Describe the scientific writing process and its key stages.				
Describe the purpose and structure of each of the sections in a scientific article.				
Demonstrate an ability to present data.				
Analyze and review scientific manuscripts for key messages, consistency and justification.				
Understand the importance of informal peer review and feedback.				

3. After completing this course, how confident do you feel about writing and submitting a scientific manuscript for peer-reviewed journal publication?
    a. Very confident
    b. Fairly confident
    c. Somewhat confident
    d. Slightly confident
    e. Not confident at all

4. When it comes to learning how to write a scientific manuscript, are there any topics missing from the training that you would like to learn about? If yes, please describe on the next page.

5. Mark the extent to which you agree or disagree with the statements in the table below.

	Strongly disagree	Disagree	Agree	Strongly agree
The level of the material was appropriate for my background.				
Much of the content covered was new information to me.				
I will utilize the information and techniques presented in the training.				
Overall, the course was worth the time I spent to take it.				
The teaching strategies were effective.				

6. Would you recommend this course to others?
    a. Yes
    b. No

7. Are there any additional comments or feedback that you would like to share?