# AMA Manual of Style 11th Edition

***A Practical Guide to Medical Terminology, Ethics, Inclusive Language, Editing, Peer Review, Digital Sources, and Publication***

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# INTRODUCTION

**Welcome to a practical journey into clearer, more accurate, and more confident medical and scientific writing.** Have you ever struggled to determine how a medical term should be written, when an abbreviation is appropriate, or how numbers, units, and statistics should appear in a scholarly manuscript? Have you questioned whether a citation is correctly placed, whether a reference contains all the necessary information, or whether a table or figure communicates evidence effectively? Perhaps you have wondered how to prepare a manuscript for submission, respond to peer-review comments, avoid ethical or publication mistakes, or navigate the demands of modern scholarly publishing. For undergraduate and graduate students, medical and health-science students, researchers, clinicians, teachers, professors, academic editors, reviewers, and scholarly authors, these challenges can make otherwise valuable work difficult to present with precision and credibility.

This book provides a **clear, practical, and accessible approach to applying the AMA Manual of Style, 11th Edition** across the writing and publication process. You will explore medical terminology, scientific language, inclusive communication, ethics, manuscript structure, editing, citations, references, numbers, statistics, tables, figures, digital sources, peer review, and scholarly publishing. Throughout the chapters, practical explanations, important notes, examples, **correct-versus-incorrect comparisons**, common mistakes, useful tips, quick-reference guidance, and key takeaways are designed to help you understand not merely what to do, but why it matters. Whether you are writing your first research paper or refining manuscripts for professional publication, the goal is to make complex style decisions easier to recognize, understand, and apply.

As you move forward, prepare to **strengthen your writing, sharpen your editorial judgment, improve your research communication, and approach publication with greater confidence**. The standards of medical and scientific communication continue to evolve, but the need for accuracy, clarity, integrity, and responsible scholarship remains constant. Turn the page and begin building the knowledge and practical skills needed to communicate evidence with precision—and to become a more informed, capable, and trusted contributor to the scientific record.

# CHAPTER 1

# UNDERSTANDING THE AMA MANUAL OF STYLE 11TH EDITION

## THE EVOLUTION OF AMA STYLE

Medical publishing has changed dramatically over the past several decades. Scientific articles are no longer prepared only for print journals and physical libraries. Research now moves through digital databases, online journals, preprint platforms, data repositories, multimedia content, social media, and other rapidly changing channels. Yet one requirement has remained constant: scientific information must be communicated clearly, accurately, consistently, and responsibly. The evolution of AMA style reflects this changing environment. What began as a relatively compact internal editorial resource eventually developed into a comprehensive framework for authors, editors, researchers, clinicians, and publishers working across medicine and related health sciences.

### Historical Development of the Style

The history of the style can be traced to **October 1962**, when the American Medical Association produced its first editorial manual for its scientific journals. That initial publication was only 68 pages and was designed primarily for internal editorial staff, with authors as a secondary audience. Its purpose was practical: to establish consistency in the preparation and editing of scientific material.

The resource expanded as medical publishing became more sophisticated. The second edition appeared in 1963 at approximately 90 pages, while the sixth edition, published in 1976, exceeded 154 pages. During these early years, the primary audience remained the organization's scientific publications staff, but its usefulness increasingly extended beyond the organization. Authors and editors working for other publishers were beginning to use it as a reference for medical and scientific writing.

A significant transition occurred with the **seventh edition in 1981**. Its title changed to *Manual for Authors & Editors*, reflecting the growing recognition that the resource served a broader professional community. It was also published externally for the first time. This change was more than a publishing decision; it demonstrated that consistent medical writing and editorial practice had become concerns shared by a much larger community of scientific communicators.

The **eighth edition, published in 1989**, introduced another important development in how the resource was produced. A committee of professional editors from JAMA and the Archives journals became responsible for its content, with external peer review applied to the sections. The edition expanded substantially, reaching 377 pages. One particularly notable area of growth was nomenclature, which increased from approximately 11 pages in the preceding edition to 54 pages. This expansion illustrates an important characteristic of medical publishing: as scientific knowledge becomes more specialized, terminology requires increasingly careful treatment.

The **ninth edition, published in 1998**, expanded to 660 pages. Nomenclature grew again, but major development also occurred in statistics and ethical and legal considerations. Statistics expanded from a relatively small treatment to approximately 60 pages, while ethical and legal material increased substantially as concerns about research conduct, publication responsibility, and professional accountability became increasingly important to scientific communication.

By the time the **10th edition appeared in 2007**, medical publishing was already being transformed by the internet and digital technologies. The edition reached more than 1,000 pages and expanded its treatment of nomenclature, ethics, manuscript preparation, references, and visual presentation of data. It also reflected the growing international scope of scientific communication and the effects of electronic publishing on writing, editing, and dissemination.

This progression reveals a useful lesson: the development of medical style has never been simply about punctuation or formatting. It has evolved alongside **scientific knowledge, research methods, technology, ethical expectations, terminology, and publishing practices**.

## Major Revisions Introduced in the 11th Edition

The 11th edition, published in **2020**, represents another substantial stage in that development. Its preparation involved a committee of 10 JAMA Network editorial staff members who researched, drafted, revised, consulted experts, and responded to external peer review over approximately five years. The result was a resource of nearly 1,200 pages, reflecting the increasing complexity of modern medical publishing.

One of the most important changes was the **reorganization of content**. The previous edition contained 25 chapters arranged into five sections. The 11th edition reduced the number to 23 chapters and removed the former indexing chapter because sophisticated

electronic searching had reduced the need for a dedicated treatment of traditional indexing. The chapters on typography and manuscript editing and proofreading were also consolidated into a broader treatment of editing and publication display.

The organization was redesigned to make information easier to locate. Although the chapters generally retained their previous sequence to provide continuity for experienced users, the former five-section structure was eliminated. More detailed subsection levels and cross-references were introduced, allowing readers to move more precisely between related topics. This matters because a professional style resource should not merely contain correct information; users must also be able to **find the relevant information efficiently**.

The 11th edition also substantially strengthened guidance in several areas:

- **References:** expanded treatment covers traditional and digital materials, including journal articles, books, reports, websites, databases, social media, and other electronic resources.
- **Tables and figures:** visual presentation received expanded attention, including full-color examples and updated approaches to displaying scientific information.
- **Ethical and legal issues:** coverage addresses authorship, conflicts of interest, scientific misconduct, intellectual property, corrections, open access, and public access.
- **Usage and inclusive language:** guidance was updated for respectful and precise terminology concerning patients and populations, including sociocultural descriptors.
- **Nomenclature:** scientific terminology received extensive revision across areas such as genetics, organisms, drugs, and radiology.
- **Statistics and study design:** the treatment was significantly expanded, with greater attention to statistical concepts, terminology, and examples.
- **Grammar and manuscript preparation:** examples and guidance were refreshed to reflect contemporary scientific communication.
- **Digital publishing:** references and publishing guidance were adapted to the realities of electronic research and publication.

The edition also introduced or expanded guidance relevant to contemporary writing, including treatment of singular *they*, updated approaches to inclusive language, digital references, and newer forms of scientific communication.

Importantly, the evolution did not stop when the print edition was published. The online resource continues to receive policy updates. For example, recent updates have addressed terminology concerning homelessness and age-related language, added nomenclature for GLP-1 receptor agonists, revised guidance concerning figure titles, and introduced short-form reference guidance for space-limited materials such as posters and slide presentations.

This ongoing revision demonstrates a central principle for anyone using a medical style guide: **a current edition is a foundation, not an excuse to stop checking for later developments**.

## Why Current Standards Matter for Modern Medical Publishing

Consistency in scientific writing is not merely cosmetic. A reader should be able to concentrate on the evidence and interpretation without being distracted by inconsistent terminology, confusing references, ambiguous numbers, poorly constructed tables, or unclear presentation.

Consider a manuscript that uses an abbreviation differently in several sections. Or imagine a reference list containing incomplete digital information, a statistical result presented without sufficient context, or a figure whose labeling makes interpretation unnecessarily difficult. None of these problems necessarily means that the underlying research is wrong. However, each can interfere with comprehension, editorial assessment, reproducibility, or the reader's ability to locate supporting evidence.

Current standards provide a common framework for addressing these problems. They help writers make deliberate decisions about **language, terminology, numbers, units, references, statistical presentation, tables, figures, manuscript structure, and publication practices**. They also help editors evaluate manuscripts consistently and help readers interpret scientific information with fewer avoidable obstacles.

Modern standards are especially important because scientific communication now crosses disciplines and platforms. A medical researcher may prepare a manuscript, supplementary material, data visualization, online reference, conference presentation, or digital publication within the same project.

Each format introduces different editorial considerations. A style framework that recognizes these environments helps preserve consistency even as the medium changes.

The 11th edition also reflects a broader understanding of what responsible scientific communication requires. Accuracy involves more than correctly spelling a technical term. It includes using terminology thoughtfully, presenting research findings honestly, acknowledging relevant ethical responsibilities, documenting sources adequately, and communicating about people and populations with care. The expanded treatment of ethics, inclusive language, statistics, nomenclature, and digital publishing illustrates this broader perspective.

**Practical Tip**

When working on a medical or scientific manuscript, do not wait until the final proofreading stage to consider style. Establish your conventions early. Check terminology while drafting, record references as sources are used, verify numbers and units during analysis and revision, and review tables and figures alongside the text. This approach prevents small inconsistencies from accumulating into major editorial problems.

**Quick Reference**

| Period | Major Development | Broader Significance |
|---|---|---|
| **1962** | First editorial manual, 68 pages | Established an internal framework for scientific publication |
| **1963–1976** | Early editions expanded progressively | Greater attention to consistent editorial practice |
| **1981** | Seventh edition broadened its author/editor identity | Recognized a wider professional readership |
| **1989** | Eighth edition introduced committee-based development with external peer review | Strengthened expert review and expanded scientific coverage |
| **1998** | Ninth edition greatly expanded statistics and ethical/legal material | Reflected growing complexity in research and publication |
| **2007** | Tenth edition exceeded 1,000 pages | Responded to digital publishing and expanding scientific disciplines |
| **2020** | Eleventh edition reorganized and substantially updated | Addressed contemporary research, technology, ethics, language, and |

| | | |
|---|---|---|
| | | publishing |
| **2020 onward** | Online guidance continues to be revised | Keeps recommendations responsive to emerging developments |

## CORE PRINCIPLES OF SCIENTIFIC WRITING

Scientific writing has a demanding purpose: it must communicate complex information in a way that is **accurate, precise, consistent, objective, and understandable**. In medical and scientific contexts, wording is not simply a matter of style. A misplaced decimal, ambiguous statement, inconsistent term, or unsupported conclusion can change how readers interpret evidence. For that reason, strong scientific writing requires deliberate choices at every stage, from selecting terminology and reporting measurements to presenting results and interpreting findings.

The principles discussed in this section provide a practical foundation for students, researchers, clinicians, educators, editors, and authors who need to communicate scientific information responsibly.

### Accuracy, Precision, and Consistency in Medical Communication

Accuracy means representing information faithfully. A scientific writer should ensure that statements, measurements, terminology, quotations, citations, and descriptions correspond to the evidence or source material being presented. Accuracy begins with the research itself but must continue through writing, editing, data presentation, and publication.

Precision is closely related but addresses a different concern. Accurate writing can still be imprecise if it uses vague language or fails to distinguish between closely related concepts. Consider the difference between saying:

**Less precise:**

The treatment substantially improved patient outcomes.

**More precise:**

The treatment was associated with a 12% increase in the proportion of patients achieving the prespecified clinical outcome at 12 weeks.

The second statement gives readers information that can be evaluated. It identifies the nature of the outcome, the magnitude of the reported difference, and the relevant time

point. When the evidence supports such detail, specificity generally improves scientific communication.

However, precision should never be confused with unnecessary complexity. A sentence does not become more scientific simply because it contains more words or specialized terminology. The objective is to provide **the level of detail necessary for accurate interpretation**.

Consistency is equally important. A manuscript becomes difficult to follow when the same concept is described using several terms without explanation, when abbreviations change, or when formatting varies without a meaningful reason. Consistency applies to terminology, abbreviations, capitalization, numbers, units, headings, references, tables, figures, and other elements of manuscript presentation.

A practical consistency check should ask:

1. Is the same concept identified by the same term throughout the manuscript?
2. Is each abbreviation introduced appropriately before repeated use?
3. Are numbers and units presented according to a consistent convention?
4. Are tables and figures labeled and discussed consistently?
5. Do citations and references follow the same system throughout?
6. Does the manuscript maintain consistent terminology between the text, tables, figures, and supplementary material?

Consistency does not mean mechanically making every element identical. Different circumstances may require different treatment. The important point is that differences should be **intentional, justified, and understandable**.

**Accuracy vs Precision vs Consistency**

| Principle | Main Question | Example of a Problem |
|---|---|---|
| **Accuracy** | Is the information correct? | Reporting an incorrect laboratory value |
| **Precision** | Is the information specific enough? | Describing an effect as “large” without relevant quantitative information |

| | | |
|---|---|---|
| **Consistency** | Is the information presented uniformly? | Using different abbreviations for the same condition |
| **Clarity** | Can the intended meaning be understood easily? | Constructing a sentence with an unclear subject or relationship |

These principles work together. Accurate information that is poorly expressed may still confuse readers. Precise information presented inconsistently may create uncertainty. Consistent formatting cannot compensate for inaccurate evidence. Strong scientific communication therefore requires all of these qualities to operate together.

## Writing for Healthcare Professionals and Academic Audiences

Scientific writing should be designed around its intended readers. A manuscript written for a specialist medical journal does not necessarily require the same level of explanation as educational material written for students or a broad clinical audience. Understanding the audience helps the writer determine which terminology needs explanation, how much background information is appropriate, and what level of methodological detail readers will expect.

Healthcare professionals generally need information that allows them to **understand, evaluate, and potentially apply evidence**. Researchers and academic readers may place greater emphasis on methodology, statistical interpretation, limitations, reproducibility, and the relationship between new findings and existing literature.

This does not mean that every scientific audience requires a completely different writing style. The fundamental expectations remain: accuracy, clarity, evidence, logical organization, and responsible reporting. What changes is the amount and type of contextual information required.

For example, a specialist research article might state:

Participants underwent magnetic resonance imaging at baseline and at 24 weeks to assess changes in lesion volume.

In a manuscript intended for a broader educational audience, the writer might need to explain what magnetic resonance imaging is and why lesion volume is relevant. The scientific fact remains the same, but the amount of explanation changes according to reader needs.

A useful approach is to ask three questions before drafting:

**Who will read this?**

Identify whether the audience consists primarily of clinicians, researchers, students, educators, policymakers, or a mixed professional readership.

**What do they already know?**

Avoid explaining concepts that the intended audience can reasonably be expected to understand, but do not assume specialized knowledge that readers may not possess.

**What do they need to understand?**

Focus explanation on information necessary to interpret the research, evaluate its significance, and understand its limitations.

Writing for professionals does not justify obscure or unnecessarily elaborate language. In fact, specialized readers often benefit from direct prose because they must process substantial quantities of information efficiently.

Compare:

**Less effective:**

It is important to note that the findings that were obtained from the present investigation appear to indicate that there may potentially be an association between the intervention and improved outcomes.

**More effective:**

The findings suggest an association between the intervention and improved outcomes.

The revised sentence preserves the central idea while eliminating unnecessary words and weakening qualifiers.

## Maintaining Objectivity and Evidence-Based Language

Scientific writing should distinguish clearly between **what the evidence demonstrates, what the investigators observed, and what they infer from those observations**. This distinction is central to responsible scientific communication.

A common problem occurs when writers make conclusions stronger than their study design or data justify. For example, an observational study may identify an association between an exposure and an outcome, but that association alone does not necessarily establish causation.

**Overstated:**

The medication prevents cardiovascular disease.

**More appropriately qualified:**

Use of the medication was associated with a lower incidence of cardiovascular events in the study population.

The second statement does not weaken scientific communication. Instead, it accurately communicates the evidentiary limits of the finding.

Evidence-based language also requires careful handling of uncertainty. Scientific findings may be preliminary, statistically uncertain, limited by study design, or affected by potential sources of bias. Writers should communicate these circumstances rather than presenting every result as definitive.

Useful distinctions include:

- **The study found:** appropriate when directly describing an observed result.
- **The results suggest:** appropriate when interpretation extends beyond the immediate observation but remains reasonably supported.
- **The findings are consistent with:** useful when evidence supports compatibility with a particular explanation without establishing it conclusively.
- **The evidence does not establish:** useful when a stronger conclusion cannot be justified.
- **Further research is needed:** appropriate when important uncertainty remains, although it should not be used as a vague substitute for explaining specific limitations.

Objectivity does not require eliminating all interpretation. Scientific papers necessarily involve interpretation, particularly in discussions of implications and limitations. The goal is to ensure that interpretations are **proportionate to the evidence**.

**Common Mistake: Confusing Confidence with Certainty**

Writers sometimes believe that authoritative scientific prose should sound absolute. This can lead to statements such as:

This intervention is the best treatment for the condition.

Unless the evidence genuinely supports such a broad conclusion, the statement is too categorical. A more defensible formulation might be:

In this study, the intervention was associated with improved outcomes compared with the comparator.

The revised statement identifies what was actually evaluated rather than making an unsupported universal claim.

**Practical Workflow for Strong Scientific Prose**

When reviewing a paragraph, use the following sequence:

**Step 1: Verify the facts.**

Check every important numerical value, terminology choice, measurement, study characteristic, and factual statement against the underlying evidence.

**Step 2: Remove ambiguity.**

Replace vague expressions with specific information whenever the evidence permits.

**Step 3: Check terminology.**

Use accepted scientific and medical terms consistently and avoid unnecessary variation.

**Step 4: Evaluate the audience.**

Determine whether readers need additional explanation or whether technical details can be stated directly.

**Step 5: Test the strength of every conclusion.**

Ask whether the evidence supports the wording used. Look particularly for absolute claims, causal language, and broad generalizations.

**Step 6: Review the structure.**

Make sure each paragraph has a clear purpose and that ideas progress logically.

**Step 7: Edit for economy.**

Remove repetition, unnecessary qualifiers, inflated expressions, and words that do not contribute meaning.

**Practical Tip**

One of the most effective editing techniques is to examine every sentence and ask: **"Could a reasonable reader interpret this differently from what I intend?"** If the answer is yes, revise the sentence before moving forward. This simple test can uncover ambiguous pronouns, unclear comparisons, vague terminology, unsupported conclusions, and misleading descriptions.

## ESSENTIAL AMA FORMATTING STANDARDS

A strong scientific manuscript can contain valuable research and still lose clarity when its presentation is inconsistent. Readers should not have to decipher irregular headings, ambiguous abbreviations, confusing numbers, poorly expressed statistics, or inconsistent terminology before they can understand the research itself. Formatting standards exist to reduce these distractions and create a predictable structure through which scientific information can be read, evaluated, and communicated.

For medical and health-science writing, formatting should therefore be treated as part of **scientific communication rather than decoration**. The writer must make deliberate decisions about manuscript organization, sentence construction, capitalization, abbreviations, numerical data, units, and statistical results. These decisions become particularly important when a manuscript moves between student work, research reports, clinical publications, conference materials, and peer-reviewed journals.

### Structure of Scientific Manuscripts

A scientific manuscript should have an organization that allows readers to understand the research progressively. Although exact requirements vary by journal and article type, a conventional research article commonly moves from the problem being investigated to the methods used, the findings obtained, and the meaning of those findings.

A useful general sequence is:

1. **Title** — identifies the subject of the research clearly and efficiently.
2. **Abstract** — provides a concise overview of the study and its major elements.
3. **Introduction** — establishes the background, explains the problem or research question, and provides the rationale for the investigation.
4. **Methods** — explains how the study was conducted sufficiently for readers to understand and evaluate the methodology.
5. **Results** — presents the findings without confusing the results themselves with their broader interpretation.
6. **Discussion** — interprets the findings, relates them to existing evidence, addresses limitations, and considers implications.
7. **References** — documents the sources used in developing the manuscript.

Not every scientific paper will use this exact structure. Case reports, reviews, editorials, educational articles, clinical reports, and other publication types have different organizational requirements. Authors should therefore distinguish between **general scientific organization and the specific requirements of the target journal**.

The central principle is logical progression. Each section should answer a particular question.

| Section | Reader's Primary Question |
|---|---|
| **Introduction** | Why was this study necessary? |
| **Methods** | How was the study conducted? |
| **Results** | What was found? |
| **Discussion** | What do the findings mean? |
| **References** | Where can the supporting information be verified? |

A frequent structural mistake is placing interpretation into the Results section or methodological details into the Discussion. Keeping the functions of sections distinct makes the manuscript easier to evaluate.

## Grammar and Sentence Construction

Scientific writing requires grammatical correctness, but grammar should serve meaning rather than become an exercise in complexity. Clear sentences usually identify the subject, action, and relevant information without unnecessary wording.

**Less effective:**

Due to the fact that the patients who were included in the study had received the intervention previously, they were excluded from the analysis.

**More direct:**

Patients who had previously received the intervention were excluded from the analysis.

The second version communicates the same information more efficiently.

Writers should also pay close attention to modifiers. A misplaced modifier can create ambiguity about who performed an action or what information a phrase describes.

**Potentially unclear:**

After reviewing the records, the treatment response was assessed.

The wording incorrectly suggests that the treatment response reviewed the records. A clearer construction identifies the person or group performing the action:

After reviewing the records, the investigators assessed treatment response.

This distinction becomes especially important in scientific writing because ambiguity can affect interpretation.

## Punctuation and Capitalization

Punctuation should make relationships between ideas clear. Commas, semicolons, colons, parentheses, dashes, and other punctuation marks should be used deliberately rather than inserted wherever a pause might occur in speech.

Scientific writing also benefits from restraint. Excessive punctuation can make sentences harder to process, while insufficient punctuation can obscure relationships between clauses.

Capitalization should likewise be systematic. Writers should distinguish between proper names and general terms and should avoid capitalizing ordinary medical or scientific terms simply because they appear important.

For example:

- **Correct:** patients with diabetes
- **Incorrect:** patients with Diabetes

The same principle applies to disease names, procedures, anatomical structures, and other terminology unless a recognized proper name or specific naming convention requires capitalization.

## Abbreviations and Acronyms

Abbreviations can make technical writing more efficient, particularly when a long term occurs repeatedly. However, they can also make a manuscript inaccessible when introduced unnecessarily or used without adequate explanation.

A practical approach is:

**Step 1:** Write the term in full at its first occurrence.

**Step 2:** Give the abbreviation immediately after it, usually in parentheses.

**Step 3:** Use the abbreviation consistently afterward when repeated use improves readability.

For example:

The investigators evaluated magnetic resonance imaging (MRI) findings.

Later references can use **MRI** when the abbreviation remains clear and useful.

However, not every term needs an abbreviation. If a term appears only once or twice, repeatedly introducing an abbreviation may create more work for the reader than simply using the full term.

Abbreviations should also be checked carefully for ambiguity. The same abbreviation may have different meanings in different specialties. Writers should consider whether their intended readers will understand the abbreviation without confusion.

**Common mistake:** Introducing several abbreviations in the opening paragraph and expecting readers to remember all of them.

**Practical tip:** Before final submission, review the manuscript specifically for abbreviations. Confirm that each one is necessary, introduced appropriately, used consistently, and understandable within its context.

## Numbers and Units of Measurement

Numbers are fundamental to scientific communication. They describe sample sizes, laboratory findings, doses, measurements, percentages, statistical results, time intervals, and many other elements of research. Because numerical information often carries the substance of scientific findings, even minor presentation errors can create confusion.

The treatment of numbers depends on context, and writers should not rely on a simplistic rule such as “always spell out numbers” or “always use numerals.” Scientific writing commonly favors numerals when presenting quantitative information, measurements, statistical findings, and other data where numerical precision is important. At the same time, numbers used in ordinary prose may be treated differently depending on their function and context.

Consider:

The study included 8 participants.

This is more immediately useful in a research context than an unnecessarily elaborate expression such as:

The study included eight participants.

The important point is not simply whether a number is written as a numeral. Writers should consider **what the number represents, how it interacts with surrounding information, and what convention applies to the specific context**.

**Units Must Be Clear and Consistent**

A numerical value without its unit may be incomplete or misleading.

Compare:

The patient received 5.

with:

The patient received 5 mg.

The second statement identifies what the number represents. In scientific manuscripts, units should be presented according to accepted scientific conventions and applied consistently.

Writers should verify:

- the correct unit;
- the appropriate unit symbol;
- whether a space is required between the number and unit;
- whether the unit should be singular or plural in the relevant construction;
- whether the measurement has been converted consistently;
- whether the same unit is used across comparable values.

A particularly important point is that **unit consistency improves comparison**. If one part of a manuscript reports a measurement in milligrams and another reports the same type of measurement in grams, readers may need to perform unnecessary conversions. When a single unit is appropriate for a set of comparable measurements, consistent presentation usually improves readability.

**Avoiding Numerical Ambiguity**

Numbers should be expressed with enough precision to support the scientific claim without implying greater accuracy than the measurement or analysis warrants.

For example, reporting a laboratory measurement as **4.23791 units** may suggest a degree of measurement precision that the underlying method does not support. Conversely, rounding a result too aggressively may conceal a meaningful difference.

The number of decimal places should therefore be determined by the measurement method, study design, statistical analysis, and reporting requirements—not by visual preference alone.

## Statistical Reporting

Statistical information must be presented so readers can understand both the result and its significance within the study. A statistical value should not be treated as an isolated number. Its meaning depends on the analysis performed, the variables examined, the study design, and the question being investigated.

A useful reporting approach provides enough information for readers to understand what was analyzed and what the reported statistic represents.

For example, rather than writing:

The treatment was significant.

a more informative statement would identify the outcome and relevant statistical result:

The treatment group had a lower mean systolic blood pressure than the control group (mean difference, −8.4 mm Hg; 95% CI, −12.1 to −4.7).

The second statement gives readers substantially more information. It identifies the comparison, the direction and magnitude of the difference, and the confidence interval.

**Statistical Significance Is Not the Same as Clinical Importance**

One of the most important distinctions in medical writing is the difference between **statistical evidence and practical or clinical significance**.

A statistically significant result does not automatically mean that an effect is clinically meaningful. Conversely, a clinically important difference may fail to achieve statistical significance in a study with limited statistical power.

Scientific writing should therefore avoid treating a single statistical threshold as a complete explanation of the research finding.

**Weak interpretation:**

The intervention was effective because the result was statistically significant.

**Better approach:**

The intervention was associated with a statistically significant reduction in symptom scores; however, the magnitude of the reduction should be considered in relation to the clinically meaningful difference established for the outcome.

This wording encourages readers to consider the size and relevance of an effect rather than focusing exclusively on statistical significance.

**Common Mistakes in Formatting**

Several problems occur repeatedly in student and professional manuscripts:

- inconsistent heading levels;
- unnecessary capitalization;
- unexplained abbreviations;
- inconsistent terminology;
- missing or incorrect units;
- inconsistent decimal places;
- unclear statistical notation;
- presenting interpretation as though it were a result;
- excessive use of abbreviations;
- failure to follow the target journal's specific instructions.

These errors are often preventable through systematic review.

**A Practical Final-Formatting Check**

Before submitting a manuscript, perform a dedicated formatting review rather than assuming that general proofreading will catch everything.

**1. Review the structure.**

Confirm that each section performs its intended function and that the manuscript follows the requirements of the intended publication.

**2. Review terminology.**

Check medical and scientific terms for accuracy and consistency.

**3. Review abbreviations.**

Identify every abbreviation and confirm that each is necessary, appropriately introduced, and consistently used.

**4. Review numbers.**

Check sample sizes, percentages, decimal values, ranges, dates, and other numerical information against the original data.

**5. Review units.**

Verify unit symbols, spacing, conversions, and consistency.

**6. Review statistics.**

Confirm that statistical results are accurately reported and that interpretations do not exceed what the analysis supports.

**7. Review tables and figures.**

Make sure numerical information agrees with the main text and that labels and captions are sufficiently clear.

**8. Review the target journal's requirements.**

General style principles do not replace specific submission instructions. Journal requirements may determine manuscript organization, word limits, article structure, display material, reference limits, and other publication details.

**Quick Reference**

| Element | Professional Practice |
|---|---|
| **Manuscript structure** | Organize information logically according to article type and journal requirements |
| **Grammar** | Favor clear, direct constructions that preserve scientific meaning |
| **Punctuation** | Use punctuation to clarify relationships between ideas |
| **Capitalization** | Capitalize according to established conventions rather than emphasis |
| **Abbreviations** | Introduce necessary abbreviations clearly and use them consistently |
| **Numbers** | Present quantitative information consistently and accurately |
| **Units** | Use appropriate scientific units and maintain consistency |

| | |
|---|---|
| **Statistics** | Report findings clearly and interpret them in proportion to the evidence |
| **Final review** | Compare the entire manuscript against both style principles and journal instructions |

# CHAPTER 2

# MEDICAL TERMINOLOGY AND SCIENTIFIC LANGUAGE

## MASTERING MEDICAL TERMINOLOGY

Medical terminology is the working language of healthcare and biomedical science. It allows clinicians, researchers, educators, students, and editors to describe anatomy, disease, diagnosis, treatment, procedures, laboratory findings, and patient characteristics with a degree of precision that ordinary conversation often cannot provide. Yet specialized vocabulary is useful only when it is used correctly. A technically sophisticated term can still create confusion if it is inaccurate, poorly defined, inconsistently applied, or inappropriate for the context.

For students and professionals, developing medical vocabulary is therefore not simply a matter of memorizing thousands of terms. It involves learning **how medical words are constructed, how related concepts differ, how terminology functions within clinical and research contexts, and how to communicate specialized information without introducing unnecessary ambiguity**.

### Building a Strong Medical Vocabulary

A strong medical vocabulary begins with understanding the structure of medical words rather than attempting to memorize every term independently. Many medical terms contain recognizable components that provide clues about their meaning. These commonly include a **prefix**, **root or combining form**, and **suffix**.

For example:

**bradycardia** = brady- + cardi- + -ia

The prefix *brady-* indicates slowness, *cardi-* relates to the heart, and *-ia* indicates a condition or state. Understanding these components makes unfamiliar terminology easier to interpret.

Other examples include:

- **tachycardia** — *tachy-* indicates rapidity and *cardi-* refers to the heart.
- **hypoglycemia** — *hypo-* indicates below or deficient, *glyc-* relates to glucose or sugar, and *-emia* refers to a blood condition.

- **endoscopy** — *endo-* indicates within, while *-scopy* refers to examination or visualization.

This method is useful, but word components should not be treated as infallible definitions. Medical terminology develops through different linguistic traditions, historical usage, and specialty-specific conventions. A writer should verify the meaning of an unfamiliar term rather than assuming that breaking it into components provides the complete definition.

**A Practical Vocabulary-Building Method**

Instead of learning terms as isolated vocabulary items, organize new terminology around clinical concepts.

**Step 1: Identify the concept.**

Determine whether the term relates primarily to anatomy, pathology, diagnosis, treatment, pharmacology, physiology, laboratory medicine, or another area.

**Step 2: Examine its components.**

Look for recognizable prefixes, roots, combining forms, and suffixes.

**Step 3: Learn the complete meaning.**

Do not stop at the literal word construction. Understand what the term means in actual clinical or scientific use.

**Step 4: Study related terms together.**

Learning *tachycardia* alongside *bradycardia*, for example, helps establish the conceptual relationship between rapid and slow heart rates.

**Step 5: Use the term in context.**

A word becomes easier to remember when connected to a realistic clinical statement, research finding, or anatomical description.

**Step 6: Verify before publication.**

When terminology is unfamiliar, specialized, newly developed, or potentially ambiguous, consult an authoritative medical or scientific reference.

This approach develops vocabulary while also strengthening conceptual understanding.

## Correct Use of Anatomical Terminology

Anatomical terminology requires particular precision because location, direction, structure, and relationship often carry clinical significance. Terms such as *anterior*, *posterior*, *medial*, *lateral*, *proximal*, and *distal* are not interchangeable descriptions of general position. Each communicates a specific spatial relationship.

For example:

The lesion was located on the **lateral** aspect of the knee.

is different from:

The lesion was located on the **distal** aspect of the knee.

The first describes position relative to the body's midline, whereas the second describes position relative to a reference point along a limb or structure.

A similar issue occurs with directional terms such as *superior* and *inferior*. Their meaning depends on the anatomical reference framework being used. Writers should therefore use recognized anatomical terminology rather than relying on informal descriptions such as “above,” “below,” “inside,” or “near the top” when a more exact anatomical term is appropriate.

**Anatomical Precision in Research Writing**

Anatomical terminology becomes particularly important when describing study populations, imaging findings, surgical procedures, injuries, or experimental outcomes.

Compare:

**Less precise:**

The tumor was found near the kidney.

**More precise:**

Imaging demonstrated a mass adjacent to the left kidney.

If the evidence permits even greater specificity, the writer can identify the relevant anatomical region or structure. The principle is simple: **use the most precise description that the evidence supports**. However, precision should not become speculation. If imaging cannot establish the exact anatomical origin of a lesion, the writer should not imply certainty merely to make the sentence sound more technical.