TYPES OF ARTICLES IN BIOMEDICAL RESEARCH AND STUDY GUIDELINES

INTRODUCTION

Three main types of articles can be found in scientific and clinical literature: research reports; review articles; and non-research, non-review articles. Research reports provide novel research findings; review articles synthesize literature available in specific fields; and non-research, non-review articles typically provide opinion, commentary, or perspectives on topics of interest in research and clinical research fields. Here we provide brief overviews of the main article types and general guidelines described in the *American Medical Association Manual of Style*. Because article types and journal guidelines vary by journal, always review the specific author guidelines of your target journal before writing your manuscript.

RESEARCH REPORTS

Research reports are used when publishing original preclinical research or clinical findings that relate to patient care. Research reports often follow this structure: Title, Abstract, Introduction, Methods, Results, Discussion, References, Tables/Figures, Article Information, Acknowledgments, Supplemental Information, and Multi-Media Files. Always consult journal-specific guidelines before proceeding.

When publishing preclinical and clinical studies, follow reporting guidelines. These guidelines help ensure that all necessary information is included in your research publication. To identify necessary guidelines, refer to the EQUATOR (Enhancing the Quality and Transparency of Health Research) Network, an international initiative to improve the rigor and reliability of research publications by promoting transparent and accurate reporting. The EQUATOR Network provides a full library of reporting guidelines.

Here we summarize types of preclinical and clinical research studies. We include information on the purpose, general features, and guidelines required for each type of study. This document serves as a starting point; please consult the author guidelines for your target journal and reporting guidelines for your study type for more details.

Basic and Preclinical Research Reports

Basic and preclinical research studies include laboratory studies (e.g., studies about molecular mechanisms, studies that report promising compounds) and animal studies, which are often used to test ideas in relevant models and determine treatment effectiveness or complications in living organisms. Preclinical work serves as the foundation for later clinical research. Experiments may be in vitro, in vivo, or in silico.

Key Features

- Length of article varies by journal, often 3,000 to 8,000 words or more (refer to journal guidelines)
- Title, which should identify independent and dependent variables and the model system used, can be descriptive or declarative depending on journal guidelines
- Requires an unstructured, free-text abstract
- For in vivo animal studies, methods must state study approval by IACUC (Institutional Animal Care and Use Committee) and any applicable protocol numbers or licenses
- Should include tables and figures

Guidelines

- For general guidelines on reporting preclinical guidelines, refer to NIH Principles and Guidelines for Reporting Preclinical Research

- For in vivo studies, follow ARRIVE (Animal Research: Reporting In Vivo Experiments)

Clinical Research Reports

Clinical research studies involve humans and are often designed to test new medical treatments or medical devices. Clinical research may also be used to study specific populations, test means of improving the quality of life for specific patient groups, or identify complications that arise from medical treatments over time.

Randomized Clinical Trial

A randomized clinical trial is the gold standard for clinical research. Randomized clinical trials are prospective studies that test how a group of patients undergoing clinical intervention, such as drugs, treatments, or devices, compare with a control group. Typically, these studies are designed to examine health outcomes and efficacy of the clinical intervention.

Key Features

- 3,000 to 3,500 words
- Title should mention the condition/disease, intervention tested, and the overall goal of the study
- Subtitle should state “A Randomized Clinical Trial” to indicate study design
- Requires a structured abstract
- Publication should include tables and figures
- Must include trial registration and ID (e.g., from clinicaltrials.gov) in Methods; some journals/guidelines also require the ID be listed in the structured abstract
- Often the full trial protocol must be published along with the research manuscript
- Requires a CONSORT (Consolidated Standards of Reporting Trials) flow diagram, which illustrates flow of participants through the clinical trial (see CONSORT website for example)

Guidelines

- For clinical trial research report, follow CONSORT
- For trial protocol, follow SPIRIT (Standard Protocol Items: Recommendations for Interventional Trials)

Non-Randomized Clinical Trial

Non-randomized clinical trials are used to evaluate interventions when randomization is not feasible or ethical. In these studies, participants are assigned to treatment groups in a non-random fashion. Treatments may be self-selected by the participant or physicians may assign treatments as they see fit. Although the non-randomization may cause bias in the study, this study design is at times required, for example when it is unethical to withhold life-saving treatment to patients or when the number of potential study participants is small.

Key Features

- 3,000 to 3,500 words
- Title should mention the condition/disease, intervention tested, and the overall goal of the study
- Subtitle must include “A Non-Randomized Clinical Trial” to indicate study design
- Requires a structured abstract
- Include figures, tables, and a trial flow diagram, which illustrates the flow of participants through the study

- Must include trial registration number and trial ID (e.g., from clinicaltrials.gov) in Methods; some journals/guidelines require the ID also be listed in the structured abstract

Guidelines

- Follow TREND (Transparent Reporting of Evaluations with Non-Randomized Designs)

Meta-Analysis

Meta-analyses provide a comprehensive and objective summary of evidence on specific clinical research topics. To perform a meta-analysis, researchers use statistics to synthesize findings from multiple independent clinical research studies. It is this use of statistics that distinguishes a meta-analysis from a systematic review. Through meta-analyses, researchers can more confidently make generalizable conclusions to guide clinical decisions.

Key Features

- 3,000 to 3,500 words
- Title should indicate the topic/condition, the patient population, and the overall goal of analysis
- Subtitle should contain “A Systematic Review and Meta-Analysis” to indicate study design
- Requires a structured abstract
- Include figures and tables
- Should contain a flow diagram to show the movement of information through the review

Guidelines

- Follow PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses) and/or MOOSE (Meta-Analysis of Observation Studies in Epidemiology)

Cohort Study

Cohort studies are used to identify risk factors or potential causes of disease or other negative outcomes, such as death. A cohort of patients is selected for study based on inclusion and exclusion criteria, such as age, exposure to risk factor, or presence of specific disease or comorbidities. Cohorts are proactively followed up over time, and outcomes of interest are noted by researchers. In cohort studies, groups are compared (e.g., exposed versus unexposed, treatment versus no treatment).

Key Features

- 3,000 to 3,500 words
- Title should indicate the topic/condition, the patient population, and the overall goal of study
- Subtitle should contain “A Cohort Study” to indicate study design
- Requires a structured abstract
- Include figures and tables
- Use of flow diagram to show how patients moved through cohort study is encouraged

Guidelines

- Follow STROBE (The Strengthening the Reporting of Observational Studies in Epidemiology)

Case Series

Case series follow a group of individuals who have the same disease or underwent the same treatment for a specific disease. Case series do not include a control group and instead

are observational and descriptive. Case series can be prospective or retrospective. Case series are best used for reporting new diseases or outcomes, rare cases, or for describing observations that generate novel hypotheses.

Key Features

- 3,000 to 3,500 words
- Title should immediately make the focus of the case series clear
- Subtitle should indicate this study is a case series and should include the number of patients included in case series (e.g., “A Case Series of X Patients”)
- Requires a structured abstract
- Include figures and tables

Guidelines

- Follow CARE (Case Report) guidelines, which were originally developed for reporting a single case but can be adapted for a case series
- Follow PROCESS (Preferred Reporting of Case Series in Surgery)
- Follow Appropriate Use and Reporting of Uncontrolled Case Series in the Medical Literature Guidelines

Comparative Effectiveness Study

Comparative effectiveness studies are used to compare the effectiveness of 2 or more interventions that prevent, diagnose, treat, or monitor disease. Often, these studies include diverse patient populations and may apply a pragmatic randomized trial or observational study design. Comparative effectiveness studies help clinicians understand which patients respond to treatment under which conditions; this information can be used to make informed decisions about the effectiveness of treatment or care for specific patients.

Key Features

- 3,000 to 3,500 words
- Title should state the patient population, the interventions compared, and the primary outcomes of interest for the study
- Subtitle should indicate that this is a comparative effectiveness study
- Requires a structured abstract
- Include figures and tables

Guidelines

- If using a pragmatic randomized trial study design, follow CONSORT and CONSORT extension for pragmatic trials
- If performing an observational study, use STROBE guidelines

Genetic Association Study

Genetic association studies examine that statistical association between genetic variants and specific traits, diseases, or conditions. Often, these studies involve 2 groups: disease and no disease. These studies enable researchers to identify genes and variants that increase or decrease the risk of specific health outcomes, and this information can be used to pinpoint biological mechanism that contribute to health outcomes or identify potential therapeutic targets.

Key Features

- 3,000 to 3,500 words
- Title should define the genetic marker and the phenotype or disease studied and clearly

state the type of relationship that was investigated between the genetic marker and the phenotype/disease (e.g., association with risk, association with prognosis)
- Subtitle should indicate that this a genetic association study
- Requires a structured abstract
- Include figures and tables

Guidelines

- Follow STREGA (Strengthening the Reporting of Genetic Association Studies); these guidelines are an extension of the STROBE guidelines

Survey Study

Survey studies are performed to gather self-reported information about knowledge, behaviors, or opinions within a specific study population. Self-reported information is typically gathered via standardized survey or through interviews with trained professionals. Researchers then use the self-reported information to analyze the relationships between variables. Survey studies are typically used to gather patient-reported outcomes, public health practices, and patient behaviors.

Key Features

- 3,000 to 3,500 words
- Title must mention the study population, variable(s) of interest, and study type
- Requires a structured abstract
- Must state the overall response rate and discuss non-responders to avoid non-responder bias
- May also include the survey instrument as a supplemental file

Guidelines

- Follow AAPOR (American Association for Public Opinion Research)

REVIEW ARTICLES

Review articles summarize and synthesize available evidence or information on a specific topic. Review articles are especially helpful for identifying strengths and weaknesses in published research studies, remaining gaps in knowledge that must be addressed, and future directions in specific fields. Review articles also help clinicians identify and understand up-to-date clinical information and guidelines. Here we cover the 2 main types of review articles: systematic reviews and narrative reviews.

Systematic Reviews

Systematic reviews provide clinicians and researchers with a reliable summary of current knowledge on a specific topic. Systematic reviews, in contrast to narrative reviews, rely on a systematic method to identify literature and determine which studies and which data will be included in the systematic review. Although systematic reviews are similar to meta-analyses in regard to the comprehensive literature review, systematic reviews do not include statistical pooling of data; thus, this use of statistics to pool data is what distinguishes a systematic review from a meta-analysis.

Key Features

- Often 3,000 to 3,500 words but can vary depending on the journal
- Title should state the population, disease and/or intervention, and outcomes assessed
- Subtitle should clearly state that this is a systematic review

- Requires a structured abstract that must state sources used for literature search, criteria for study eligibility/inclusion, and method of data appraisal and synthesis
- Should contain a flow diagram to show the movement of information through the review
- Includes figures and tables

Guidelines

- Follow PRISMA (Preferred Reporting Items for Systematic Reviews and Meta Analyses)

Narrative Reviews

Narrative reviews provide a descriptive overview of a given topic. Unlike systematic reviews, which require a systematic method for literature search and data collection, narrative reviews offer flexibility in which studies are discussed within the review. Narrative reviews are often structured thematically and cover history of topic, key findings, and emerging areas of interest. Although the structure and content covered in a narrative review is flexible, authors should reference recent data, systematic reviews, and up-to-date guidelines, as applicable.

Key Features

- Word count varies depending on the topic of the narrative review and author guidelines for specific journals
- Title should summarize the main topic of the review and include keywords
- Requires an unstructured, free-text abstract
- Subsections are determined by author based on the narrative they want to present and often include Introduction, Main text (author-defined subsections), and Conclusions/Future Research Directions

Guidelines

- Follow SANRA (Scale for the Assessment of Narrative Review Articles), which provides general guidelines for assessing the quality and completeness of narrative reviews
- Journal-specific guidelines serve as an excellent reference for how to write and organize your review

NON-RESEARCH, NON-REVIEW ARTICLES

Non-research, non-review articles enrich scientific dialogue and touch on issues or emerging topics that are important to scientific and medical communities. The types of non-research, non-review articles included in journals and the author guidelines will differ depending on the journal; thus, we chose not to included key features. Please refer to author guidelines for your target journal for specific guidelines. Here, we provide a brief overview of types of non-research, non-review articles.

Opinion

Opinion-based articles, sometimes called Viewpoints or Perspectives, are often short (1,200 to 2,000 words) and may or may not include figures and tables. Opinion articles often address important topics in research, medicine, public health, ethics, and more. These articles are not usually in response to a specific research article but instead focus on broad topics of interest to the research and clinical community.

Correspondence

Correspondence articles are written in response to a recent article in the journal. Often called Letter to the Editor, these articles are short (about 500 words) and may provide a critique of the published work, corrections of errors or misinformation, praise for the rigor and impact of

the work, or presentation of alternative perspectives or interpretations of data. Authors of the published article can respond to Letters to the Editor via Letters in Reply, which are also short (about 500 words).

ADDITIONAL RESOURCES

Fontanarosa PB. Types of Articles. In: *AMA Manual of Style: A Guide for Authors and Editors.* 11th ed. Oxford University Press; 2020:1–12.