

**Manuscript Type: Word Limits, Supplement**

Title

Abbreviations

Summary Statement

Key Results

Abstract

Introduction

Materials and Methods

Registered Studies and Data Sharing Statement

AI or Deep Learning

Systematic Review/Meta-Analysis

Results

Discussion

References

Figures

Tables

Common Issues

How to Present Numbers

# Scientific Style Guide: Writing a Manuscript for *Radiology*

## Manuscript Type: Word Limits, Supplement

- This guide focuses on Original Research (3000 words).

- Check **author instructions** for other manuscript types.
- Online-only publication of supplemental material is available but will not be copyedited.

[Back to top ↑](#)

## Title (15 words)

Include **modality** (for which body part), **disease**, and/or problem being studied. Be concise (15 words). If space allows, indicate study type (eg. randomized clinical trial) and clinical trial or cohort name (eg, DETERMINE, MESA)

## Abbreviations (10 at most)

- Include list of up to 10 standard abbreviations.
- Each abbreviation in the list should appear at least ten times in paper (Introduction to Discussion). Otherwise, write them out and do not include them in the list.
- Define all abbreviations/acronyms at first mention in both Abstract and main text.
- Do not define common imaging modalities (eg, CT, MRI, US, SPECT, PET).
- Do not abbreviate adjusted values (aOR; adjusted odds ratio). Instead write "In the adjusted model, the OR was XX; after multivariable adjustment, the OR was XX."
- **Define/Write out abbreviations in Summary, Key Results, first and last paragraph of Discussion.** Readers often look to those areas first for a synopsis.

Advertisement

Advertisement

[Back to top ↑](#)

## Summary Statement (30 words)

Provide a single sentence summarizing your findings that best conveys the message of your study or emphasizes an important point of your study. Tip: If title includes a modality and disease, then so should summary.

[Back to top ↑](#)

## Key Results (75 words)

- Include up to 3 main study results with summary data (use past tense and not present).
- Mention type of study (eg, retrospective, prospective, clinical trial).
- Mention number of patients/participants, disease, modality.
- Include percentages, ratios, and p-values but not confidence intervals.
- P-values need comparison values, such as odds ratios.
- Avoid repeating summary statement or using vague language.

- In a retrospective review of 222 patients with cirrhosis, 63% had a spontaneous portosystemic shunt (SPSS) on CT, 28% of which had a diameter of at least 1 cm.
- Portal vein thrombosis (odds ratio [OR], 5.5;  $P = .008$ ) and Child-Pugh class C (OR, 3.0;  $P = .03$ ) were associated with SPSSs of any size.
- Previous hepatic encephalopathy (OR, 4.4;  $P = .001$ ) and portal vein thrombosis (OR, 5.3;  $P = .002$ ) were associated with an SPSS of at least 1 cm.

[Back to top ↑](#)

## ABSTRACT (300 words)

### Background

---

Include one or two sentences stating why study was performed and/or why it is relevant.

### Purpose

---

Describe question trying to answer. Avoid vague statements or description of a process.

### Materials and Methods

---

- Name study as **retrospective** or **prospective**. See definitions below.
  - In a **prospective study**, data collection was planned before the index test and reference standard were performed. Enrollment of participants with consent, data analysis, and outcomes were specified prior to initiating the study.
  - If main prospective study did not include your study purpose in original design, classify as a **secondary analysis of a prospective trial**.
  - A **retrospective study** looks backwards and examines exposures to suspected risk or protection factors related to an outcome established at start of the study.
- For prospective studies, enrolled patients become *participants*. Refer to them as such.
- For registered studies, provide registry name and number (ClinicalTrials.gov: NCT01234567)
- If animals, provide type/number. For humans, number/sex ratios/ages go in results.
- Specify disease, groups compared (eg, women with and without breast cancer).
- Beginning, end dates of study or participant accrual, follow-up (July 2019 to June 2020).
- **Reference standard** is usually the best test currently available and the standard against which the **index test** is compared. It should be clear what each of these are.
- Describe modalities/procedures performed.
- Describe pre-specified primary outcome measure(s), as well as secondary and other variables, interventions being compared, treatment group, control group.
- Provide sentence on statistical analysis, such as tests performed.

### Results

---

- In the first sentence, indicate the number, sex, and mean age  $\pm$  standard deviation or median age and interquartile range of the patients/participants enrolled. For example, for 100 patients of 60 men and 40 women, write *100 patients (mean age, 47 years  $\pm$  10 [standard deviation], 60 men)* were evaluated. Provide sex of larger number of patients.
- Numerical data, P-values for all comparisons (group A,  $25 \pm 4$ , group B  $50 \pm 5$ ,  $p = .01$ )

## **Conclusion**

---

Must correspond to the purpose statement and derive directly from the results. Do not elaborate on the importance of the study or other implications.

[Back to top ↑](#)

## **INTRODUCTION (400 words)**

### **How to present Claims of Priority**

---

If you must indicate novelty, use the phrase “the finding of [whatever the finding is] has not previously been well established in the literature.” If discussing study size, do not refer to your study as “the largest study to date,” instead write, “large studies have not yet been performed on [whatever topic].” Only state these claims once in the introduction.

### **Provide Hypotheses (prospective studies only)**

---

At end of introduction, mention any prespecified hypotheses before your purpose/aim. Do not include a hypothesis for retrospective studies, meta-analysis/systematic review, or technical development papers.

[Back to top ↑](#)

## **MATERIALS AND METHODS (800 words)**

### **IRB/HIPAA/Written Informed Consent/ Animal Care Committee approval**

---

In the first paragraph of Materials and Methods, name study as **retrospective** or **prospective** and include

1. IRB/Ethics Committee approval
2. Informed consent obtained (specify written, verbal) or waiver granted.
3. HIPAA approval (United States only)
4. Animal Care Committee approval (animal studies only).

### **Use Appropriate subheadings**

---

For example: Participants, Imaging Protocol, Image Analysis, Statistical analysis

### **Eligibility (Inclusion and Exclusion Criteria)**

---

Eligibility criteria may include disease type and stage, other medical conditions, previous treatment history, age, and sex. Specify factors used to determine whether participants were eligible (inclusion criteria) or not eligible (exclusion criteria). Specify both **inclusion** and **exclusion** criteria. This should match study flowchart (typically figure 1).

- or participant accrual, follow-up [eg, July 2020 to June 2021]).
- Sample selection: consecutive, random, or convenience series.
- Indicate how sample size was derived.

## Overlap

---

Report overlap in study participants, even if in a different type of study with different outcome assessments. Reference all studies published (or in press) that include part or all of the same participants. **Also, explain if there was a different analysis of data.** If too many to reference, make an online appendix.

## Imaging Protocols

---

- For MRI, include **enough detail** that the imaging could be repeated for the **key sequences**, such as repetition time (TR) and echo time (TE). If more detail is needed to understand results, full pulse sequence is likely better placed in an online supplement.
- For CT, indicate contrast or non-contrast, plane, section thickness, and section interval.

## Product Name and Manufacturer

---

When first mentioned, identify any used instruments or drugs (including contrast) with brand/trade names and manufacturer's name in parentheses. Thereafter, if information can be accurately conveyed, use generic terms. Data presentation should be unbiased and not promotional.

## Investigators

---

- Provide expertise and years of experience of the individual(s) performing important portions of study (ie, index tests, readings). If authors, then also provide initials. If mentioning authors more than once, you only need to list expertise once.
- Identify how investigators were anonymized (eg, to clinical indication for examination, other imaging test results, etc.)

## Subgroup analysis

---

Mention if subgroup analysis was pre-specified (required for randomized controlled clinical trials) or post-hoc:

- Pre-specified analysis is planned during the initial experiment design stage, before looking at any data.
- Post hoc analysis is decided on and planned after the data has come in. If using a post hoc analysis, address in methods and include as a limitation in discussion.

## Readers/Evaluations

---

For any authors executing index tests or performing readings/evaluations, give initials. If those contributors are not authors, mention in **Acknowledgments** but obtain written permission to do so.

### Give all relevant specifics:

- Provide number, training/expertise, and years of experience for persons executing and reading index tests.
- For resident readings, indicate "in-training."

- For one/multiple readers, indicate how intra- or inter-reader variability was measured.
- **Note that single observer studies are discouraged, as are “consensus” reads.**
- Mention anonymizing of data or images. State what readers anonymized to, not anonymized to.
- Provide time interval between readout sessions. For readings of several studies of the same subject over longer time intervals, this is important to eliminate recall bias.

## Statistical Analysis

---

The **last paragraph(s)** of Materials and Methods should be titled *Statistical Analysis*. In the paragraph(s), state the statistical tests used, on what data, and for what determinations. Provide the P-value used for significance. Indicate statistical software used, including version and manufacturer. If statistical analyst is an author, then provide initials. **A statement of justification of sample size and/or power calculation is strongly recommended.**

**Avoid net reclassification index and integrated discrimination index** to make inferences regarding a new radiology imaging test being better than an old test. Traditional AUC analysis or change in standard metrics (eg, test positivity rate) is sufficient. AUC is preferred to C-index.

[Back to top](#) ↑

## REGISTERED STUDIES AND DATA SHARING STATEMENT

If your study is registered on or is a secondary analysis of a study registered on a national or international database (for example: <https://clinicaltrials.gov/>, <https://www.who.int/clinical-trials-registry-platform>, then provide registry name and number (eg, ClinicalTrials.gov: NCT01234567) both at the end of the Abstract, and again in Materials & Methods.

Include one of the following statements verbatim on the full title page.

- Data generated by the authors or analyzed during the study are available at: (author provides citation to data).
- Data analyzed during the study were provided by a third party. Requests for data should be directed to the provider indicated in the **Acknowledgments**.
- Data generated or analyzed during the study are available from the corresponding author by request.
- All data generated or analyzed during the study are included in the published paper.
- No data were generated or analyzed during the study.

[Back to top](#) ↑

## ARTIFICIAL INTELLIGENCE (AI) ARTICLES

Many terms fall under the umbrella of AI, including machine learning, deep learning, and convolutional neural networks. For tips on writing about AI, see **“Top 10 Tips for Writing about AI in**

### **Describe all Datasets and Include a Dataset Characteristics Table and Flowchart**

Each dataset should be independent, without overlap.

1. **Training set:** The initial dataset used to train your AI model according to a reference standard. Typically, this should be your largest dataset.
2. **Validation set:** The subset of data held-out from your training set to tune or optimize your model (ie, fine-tuning hyperparameters) before testing.
3. **Internal test set:** The subset of data held-out from your training data and used for testing.
4. **External test set:** A completely external dataset (ie, images from another institution) used for final statistical reporting of your model's performance.

### **Computer Code (Required for Publication)**

Deposit all computer code in a publicly accessible repository such as Github: <https://github.com>, BitBucket: [www.bitbucket.org/](http://www.bitbucket.org/), or SourceForge: <https://sourceforge.net/>. In materials and methods, provide a link to this code.

[Back to top ↑](#)

## **SYSTEMATIC REVIEW AND/OR META-ANALYSIS PAPERS**

Specify databases searched and exact search terms used. Indicate why records were excluded from your study. Include a flow diagram as Figure 1 in your results, showing initial number of records identified through database searching and those excluded for any reason. Document the number excluded for each reason.

### **RESULTS (1000 words)**

- Give results for all items mentioned in the Materials and Methods.
- Results headings should mirror Materials and Methods subheadings, as appropriate.
- First paragraph should be titled *Patient Characteristics* or *Participant Characteristics*
- When reporting results, avoid hedge terms like trend or marginal.
- If readers, give results for each reader; inter and/or intra-reader reliability/agreement.
- Regression coefficients or mean values of compared groups must be given along with p-values for all comparisons (group A,  $25 \pm 4$ , group B  $50 \pm 5$ ,  $p=.01$ )
- Report the results for all variables collected and analyzed, not just for those which exhibited statistical significance. Give all p-values, even if non-significant.
- Report the numerator and denominator for percentages: sensitivity 20 of 25 (80%).
- Include confidence intervals: (AUC, 0.70; 95% CI: 0.64, 0.77;  $P < .001$ ).

### **Exclusion numbers (Cite Figure 1 flowchart)**

---

In the first paragraph of results, document the number of patients/participants excluded for each exclusion criteria described in methods. Cite figure 1 flow diagram, showing initial number of

An example **STROBE flow diagram** (see figure 1 on page 381): [/doi/pdf/10.1148/radiol.2017161218](https://doi.org/10.1148/radiol.2017161218)

An example **STARD flow diagram** (see page 830): [/doi/pdf/10.1148/radiol.2015151516](https://doi.org/10.1148/radiol.2015151516)

---

### Summarize Characteristics (Cite Table 1)

---

In the first paragraph, summarize characteristics of patients/participants. At a minimum, indicate number, mean age  $\pm$  standard deviation (SD) or median age and interquartile range (IQR), and number of men vs women. Cite table 1.

---

### Avoid overuse of the term *significant*

---

In your Methods, statistical analysis section, define the level of statistical significance (eg,  $p < .05$ ). Thereafter, repeating the term *significant* or *significantly* is redundant and should be minimized. Simply state the p-value.

Use *significant* only in the statistical sense. Delete unless referring to something being *clinically significant* or having *clinical significance*. Then use that exact wording.

---

### Wording of nonsignificant results

---

Do not write "There was no difference between groups A and B." Write "**We found no evidence of a difference** between groups A and B."

[Back to top](#) ↑

## DISCUSSION (800 words)

### Discussion Structure

- Provide a succinct 1 paragraph summary of entire study. Briefly restate background: why study was done. Then state major findings. Instead of providing general statements that something was better or superior, provide specific metrics with data and p-values (key results).
- Subsequently, briefly review what others have reported and why your findings are better/confirmatory/different in 2-4 paragraphs. If multiple prior studies on the topic, consider including a small summary table of prior results in the literature, rather than making the reader search for all prior articles.
- In the 2nd to last paragraph, state limitations of your study, such as sources of potential bias, statistical uncertainty, and generalizability.
- In the last paragraph, restate conclusion and offer what you think should be done in the future to advance study. If an animal study, then discuss practical applications.

### Do not include

- Figures/tables
- Any results not mentioned in Results section. If wish to include in Discussion, also give results in Results section and appropriate information in Materials and Methods (what was done, by whom, etc.).

## REFERENCES

- Reference limit is 35 for original research. This limit is not applicable to meta-analyses.
- Avoid citations of personal communication.
- Do not refer to a reference as recent unless it is a newer study ( $\leq 5$  years).

## FIGURES

- Number all figures in the order they first appear in the text.
- For each figure, define all abbreviations in the caption and include all units. Each figure must be understood on its own.
- Each graph needs labels and units for x and y axes.
- Do not use graph abbreviations unless full terms cannot fit on the axes.
- Include a labeled color bar for figures that use color.
- For histologic sections, provide the stain used and the magnification.
- Label all features you describe in the captions.
- Review recently published articles in *Radiology* for the degree of labeling required.
- Avoid using equilateral triangles for arrowheads (difficult to determine labeling point).
- For all MRI, include the specific pulse sequence information (e.g. TR, TE, etc.) in the caption if not described (or different) from that described in methods.

### **Kaplan Meier curves**

---

Add the censored data points and the number at risk below the graph.

### **Box Plunger Plots**

---

Avoid box plunger plots. Present data as a box whisker plot or show actual data points in box plot.

Examples:

1. <https://simplystatistics.org/posts/2019-02-21-dynamite-plots-must-die/>

RADIOLOGY publications:

1. [/doi/10.1148/radiol.2018181168](https://doi.org/10.1148/radiol.2018181168)
2. [/doi/10.1148/radiol.2018181131](https://doi.org/10.1148/radiol.2018181131)

### **Provide Clinical Images**

---

Provide at least one or two actual scan images that demonstrate your main findings.

### **Figures based on individual patients/participants**

---

Include a separate figure for each individual patient/participant. Figure legends should include age, sex, clinical history/disease, type of image (eg, CT, MRI, US), plane, and other relevant details such as whether contrast was used or not. Use present tense.

**Example:** Image in a 65-year-old man with coronavirus disease 2019 (COVID-19) pneumonia admitted to intensive care unit. Unenhanced axial chest CT image shows bilateral patchy ground-

[Back to top ↑](#)

## TABLES

- Number all tables in the order they first appear in the text.
- Fit each table on one page. Limit main tables to no more than 40 rows and 6-8 columns.
- Every column must have a heading and follow the same heading all the way down.
- Each row must follow the same heading all the way across
- Use rows for independent (X) variables, columns for dependent (Y) variables.
- For each table, define all abbreviations and data values in a footnote and include all units of measure, if not already included. Each table must be understood on its own.

### Table 1: Demographic Characteristics of Study Sample

---

For manuscripts with human participants, include a table of demographic characteristics. Minimum information should include number and sex of participants, mean age  $\pm$  standard deviation (SD) or median age interquartile range (IQR), age range, and key clinical characteristics. Provide relevant covariates needed to describe participants (eg, women: pre/postmenopausal status; cardiovascular disease: diabetes status, smoking.).

IF biologically reasonable and a large study, provide mean age  $\pm$  standard deviation (SD) or median age and interquartile range (IQR) separately for men and women, in addition to giving the same information for all individuals as one group. Also, report any statistically significant differences in age between the men and women.

### Multivariable analysis tables

---

- Include key parameters: regression coefficients, odds or hazard ratios with confidence intervals, and p-values.
- Include the number of events ( $n = \_$ ). See table 2, page 113 for example: [/doi/10.1148/radiol.2019182871](https://doi.org/10.1148/radiol.2019182871)

Most studies have participants dropped out due to missing data. For example, if adjusting for age, sex, and medication, some participants may not have their medications known (dropped out). We cannot otherwise tell unless the number is indicated.

[Back to top ↑](#)

## COMMON ISSUES

### Terminology

---

- For Area Under the Receiver Operating Characteristic (ROC) Curve, abbreviate as AUC and not AUROC.
- Avoid overuse of the term *biomarker*.
- Change density (for CT) to *attenuation*.

equation, then multivariate may be (rarely) appropriate.

### **Incomplete Reporting of Results**

---

In general, always report p-values with corresponding comparison values (group A,  $25 \pm 4$ , group B  $50 \pm 5$ ,  $p=.01$ ). Authors often provide one or the other but not always both. Provide both numerical data and p-values for all comparisons.

### **Accuracy vs Performance**

---

These terms are often confused. AUC measures the performance of a model. So, for AUC you would refer to diagnostic performance instead of diagnostic accuracy. Refer to accuracy when referring to accuracy percentage (fraction of predictions model got right).

### **Limit the term Cases**

---

Do not use *cases* when you could use a more specific word (*patients, participants, lesions*).

### **Define all terms at first use**

---

For example, "Conventional" and "high resolution" MRI are vague. Be specific. Conventional compared to what? High spatial resolution or high temporal resolution? There is no standard accepted definition of "high resolution" MRI or CT. Terms such as Ultra high resolution/Low dose/Ultra low dose should be used sparingly and defined in Methods.

### **Provide correlation coefficient if using term *Correlated***

---

Use "correlated" only in the statistical sense and provide correlation coefficient. Otherwise use another appropriate word (associated, compared).

### **Study sample vs study cohort vs population**

---

**Study sample** is a subset of the population.

**Population** is the wide-ranging group of people to whom you aim to generalize the study results. The population is who you are interested in and not what your study results show from your observed *study sample*.

**Study cohort** is only appropriate for a longitudinal study that samples and observes a cohort over a period of time.

[Back to top ↑](#)

## **HOW TO PRESENT NUMBERS**

### **Remove excess digits**

---

- ADC should have up to three decimal places; greater precision is rare.
- AUC, ICC, and Kappa values should have 2 digits only (eg, .82).

### **Odds ratios, risk ratios, and hazard ratios**

---

digits extending to the one hundredths place (eg, 1.01, 5.26, 9.85, 0.15). Numbers extending beyond the one hundredth place should be rounded.

### Correlation coefficients

---

- Number of digits depends on number of patients (correlation with 24 patients should have 2 digits of correlation; 243 patients could have 3 digits of correlation).
- Specify if  $r$  or  $r^2$ . If using standard correlation coefficients, then express as  $r^2$ .

### Percentages

---

**Number of digits:** The number of digits in a percentage should correspond to the number of digits in the X/Y values of the proportion. Be consistent for similar data. Generally, a minimum of 2 digits should be shown. 22 of 50 = 44% and not 44.0%.

### Sensitivity, Specificity, Accuracy, NPV, PPV

---

Use percentages and avoid decimals. E.g. Sensitivity 85% rather than sensitivity 0.85.

### P-values

---

Adjust all P values according to *Radiology* style:

- Use two digits for P values (unless providing Bonferroni-corrected P values) (e.g.  $p=.52$ ;  $p=.04$ )
- If P value < .01, then use three digits (e.g.  $p=.005$ )
- For values close to .05, you may provide a third digit (ie, .046)
- Give exact P value unless < .001
- Smallest P value should be <.001, largest >.99
- Do not include leading zeros for P values
- Avoid scientific notation (see examples below)
  - $p = 5 \times 10^{-3}$  should be  $p=.005$
  - $p = 5 \times 10^{-5}$  (0.00005) should be  $p<.001$
  - $p = 6.2 \times 10^{-2}$  (0.062) should be  $p=.06$

[Back to top](#) ↑



820 Jorie Blvd., Suite 200  
Oak Brook, IL 60523-2251  
U.S. & Canada: 1-877-776-2636  
Outside U.S. & Canada: 1-630-571-7873

[Terms of Use, Policies, Accessibility](#)

© 2025 Radiological Society of North America