SCIENTIFIC STYLE GUIDE: 
WRITING A MANUSCRIPT FOR 
RADIOLOGY

TITLE PAGE

Title

Original research titles should include a modality and a disease. Titles should be concise and to the point. Use common abbreviations to imaging such as MRI and CT. IF space allows, indicate the study type (randomized trial). If the registry or clinical trial has a recognized name (eg, MESA, DETERMINE, etc) include that in the title.

Abbreviations

Please provide a full abbreviation list. Abbreviate only frequently appearing terms, up to 10 abbreviations maximum. An abbreviation should only be used if the term appears at least five times in your manuscript. Use only standard abbreviations. Obvious abbreviations like MRI, CT, PET, US are fine. All abbreviations/acronyms must be defined at first occurrence both in your Abstract and main text.

Please define or write out all abbreviations/acronyms in your Summary Statement, Key Results, abstract conclusion, and first and last paragraph of discussion. These areas of your paper are often looked at first by readers to get a synopsis of the entire manuscript.

Key Results

Maximum length: 75 words

Please include up to 3 main study results with summary data (eg, percentages, ratios, p-values, etc...) Do not add confidence intervals. Avoid repeating your summary statement or using vague language. Key Results will translate directly to visual abstracts.

Summary Statement

Maximum length: 30 words

The summary statement is a single sentence summarizing your findings that best conveys the message of your study or emphasizes an important point of your study. It will be used to promote your paper.
ABSTRACT

Word Limit
Please limit abstract to 300 words upon revision (Background through Conclusion).

Avoid First Person Pronouns
Avoid first person pronouns (we, our) in your abstract. They are fine for the rest of your paper except for key results and summary statement.

Background
A Background section is required for all structured abstracts for original research and technical development papers. The Background section will be the first section followed by the Purpose. In the Background section, please include a brief introduction (1-2 sentences) stating why your study was performed and/or why it is relevant.

Purpose
The statement of purpose should clearly describe the question that you are trying to answer. Please avoid vague statements or statements describing a process.

Materials and Methods
- You must name this as a retrospective or prospective study in both your abstract & materials and methods.
  - In a prospective study, data collection was planned before the index test and reference standard were performed. “Prospective” means that enrollment of study participants with consent, data analysis, and outcomes were specified prior to initiating the study. If the main prospective study did not include your study purpose/aim in the original study design, you may classify this as a secondary analysis of a prospective trial.
  - A retrospective study looks backwards and examines exposures to suspected risk or protection factors in relation to an outcome that is established at the start of the study.
- For prospective studies, please refer to all study participants as study participants or participants. Please avoid the term patients. For retrospective studies, the term patients is fine.
- If your study was registered (prospective studies only) in a clinical trials registry such as ClinicalTrials.gov, please give the clinical trials registry number and name of the registry in the abstract.
- Please mention the beginning and end dates (eg. July 2017 to June 2018) of your study (or of study participant/patient accrual and follow-up).
- Do not use product names in the abstract if possible.
Please include in your abstract a sentence on statistical analysis, such as tests performed. This should summarize your statistical analysis paragraph, which should be included in your methods section. See comment in the methods section for more information.

**Results**

- The first sentence of the Results in the abstract should indicate the number, sex, and mean age ± standard deviation (SD) or median age and interquartile range (IQR) of the study participants enrolled. For example, if there are 100 patients of 60 men and 40 women, then write *100 patients (47 +/- 10 years, 60 men)* were evaluated.
- Provide sex of the larger number of patients.
- Please include numerical data in addition to p-values in the abstract.
- For all percentages, please also report the numerator and denominator. Please check entire manuscript for this.
- Please identify your study in title and/or abstract as a study of diagnostic accuracy (using at least one measure of accuracy, such as sensitivity, specificity, predictive values, or area under the ROC curve).

**Conclusion**

- Please note that the conclusion in the abstract should directly correspond to the purpose statement of the abstract and must derive directly from the results. Do not elaborate on the importance or other implications of your study.
- Write out abbreviations in abstract conclusion.

**INTRODUCTION**

**Word Limit**

**Original Research**

The word limit for original research is 3000 words.

Introduction: 400 words  
Materials and Methods: 800 words  
Results: 1000 words  
Discussion: 800 words

**Technical Development**

The word limit for technical developments is 2000 words.

**Hypotheses for prospective trials/experimental studies**

Did you have any prespecified hypotheses? If so, please mention in your introduction before your purpose/aim. *Note*: Hypotheses are not needed for retrospective studies, meta-analysis/systematic review, or technical development papers.
MATERIALS AND METHODS

Overlap (If mentioned in ScholarOne)

*Radiology* style is to report overlap in study participants, even if in a different type of study with different outcome assessments. Please reference all studies that included part or all of your same participants. *Also, please explain if there was a different analysis of data.* If there are too many to reference, you can make an online appendix.

IRB/HIPAA/Written Informed Consent

In the Materials and Methods first paragraph, please include: 1) a statement regarding Institutional Review Board (Ethics Committee) approval, 2) mention if you obtained written informed consent or if it was waived 3) HIPAA approval if your article is from the United States.

Animal Care

In the Materials and Methods, please include a statement regarding Animal Care Committee (or other such committee) approval.

Waiver for written informed consent

Did you obtain written informed consent from all study participants? If 'no' or 'waived by IRB', please include a copy of your waiver or exemption (in English) with your submission and state clearly in your cover letter and methods section why it’s not needed.

Clinical Trials

If your study is prospective and was registered in a clinical trials registry such as ClinicalTrials.gov, then please give the clinical trials registry number and name of the registry. Mention where the full study protocol can be accessed. Give information on sources of funding and other support (such as supply of tests).
ICMJE clinical trial registration and data sharing statement:
https://pubs.rsna.org/page/policies#clinical

As of July 1, 2018, submitted manuscripts that report the results of clinical trials must contain a data sharing statement. Find more information at ICMJE:


Authors must include one or more of the following statements verbatim:

- 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 Acknowledgements.
- 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.

Subheaders

Please provide appropriate subheadings for each portion of the Materials and Methods section (e.g., "Study Participants", "Analysis", etc.).

Dates of Study

Please mention the beginning and end dates of your study (or of study participant/patient accrual and follow-up). This should also be in your abstract.

Inclusion/Exclusion/Eligibility

Please specify your inclusion and exclusion criteria. Be sure to indicate eligibility criteria. On what basis were potentially eligible participants identified (such as symptoms, results from previous tests, inclusion in registry), where and when were potentially eligible participants identified (setting, location and dates), and did participants form a consecutive, random, or convenience series?

Systematic Review and/or Meta Analysis

Specify databases searched and exact search terms used. Indicate why records were excluded from your study. We recommend including a flowchart/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. Here is an example: http://images.rsna.org/index.html?doi=10.1148/radiol.2017171260&fig=fig1
Product information / Manufacturer

When a product or device is first mentioned in the Materials & Methods section, please include the name, manufacturer, and city and state of manufacturer if produced in the United States, or city and country of manufacturer if from outside the United States. Thereafter, if your information can be accurately conveyed, please use generic terms to refer to the product/device, rather than referring to the specific manufacturer. Your data presentation should be unbiased and not promotional.

Initials of Investigators

Please state the initials of the individual(s) who performed the important portions of your study (ie, analysis) if these individuals are authors and state the individual’s expertise and years of experience. If authors are mentioned more than once in your manuscript, you only need to list their expertise once.

Blinded Investigators

Please identify how investigators were blinded (for example, to clinical indication for examination, other imaging test results, etc.)

Subgroup pre-specified for prospective clinical trials

Were the subgroups of your analysis pre-specified? If not, you need to address this in methods and as a limitation of your study.

Index test and reference standard

Describe the index test and reference standard in sufficient detail to allow replication.

Reader Study Details

In the materials and methods section, please ensure you have given all relevant specifics of each evaluation performed. For example, who did the ratings (one author, one of several authors, more than one author by consensus or independently)? What was the area of expertise of the readers? How many years of experience did each reader have? What information were the readers blinded to, and not blinded to? What was the interval between readout sessions? If more than one reader, how were disagreements handled? If one reader, how was variability measured?

Statistical Analysis

The last paragraph(s) of Materials and Methods should be titled "Statistical Analysis." In the paragraph(s), please state the statistical tests used, on what data, and for what determinations. Give the P-value used for significance. Also state if any specific statistical software was used (give manufacturer, year, and version).
Software

For all software, give version/year, manufacturer, city and state. Please mention if each software package used is commercially available, in-house, or open source.

MRI – Needed items

For all MRI, include enough detail that the imaging could be repeated for the key sequences (repetition time (TR) and echo time (TE). If more detail is needed to understand the results, full pulse sequence is likely better placed in an online supplement.

CT – Needed items

Please provide details such as contrast or non-contrast, plane, slice thickness, slice interval. When referring to CT, pick one term (studies, exams, scans) and use in a consistent manner throughout your paper.

RESULTS

Mirror Methods

Results should clearly mirror methods; use subtitles if needed. Check for consistency in data in text, tables, and figures.

Summarize Table 1 Demographics

In the first paragraph of results, at a minimum, please indicate number of patients/participants, mean age ± standard deviation (SD) or median age and interquartile range (IQR), and number of men vs women.

For most patient/human manuscripts there should nearly always be a table of participant demographics/characteristics. This should be Table 1 of your paper. Otherwise, the reader does not know who is being studied. Paragraph 1 of Results should summarize and cite the table 1 demographics. See detailed note in table section for examples.

Exclusion numbers (Cite Figure 1 flowchart)

Indicate the number of participants excluded for each exclusion criteria described in methods in the first paragraph of your results. We recommend including a flowchart/diagram as Figure 1 in your results, showing initial number of participants and those excluded for any reason. Please document the number excluded for each reason.

An example STROBE flowchart (see figure 1 on page 381): http://pubs.rsna.org/doi/pdf/10.1148/radiol.2017161218

An example STARD flowchart (see page 830): http://pubs.rsna.org/doi/pdf/10.1148/radiol.2015151516
Give all p-values

Give all p-values, even if non-significant. Exact p-values are preferred. Report the results of the statistical analysis for all variables collected and analyzed, not just for those which exhibited statistical significance.

In your Methods, statistical section, define the level of statistical significance (eg, p<.05). Thereafter, do not state “our results were statistically significant (p<.05),” as this is redundant. Simply state the p-value.

Data and p-values

In general, do not state p-values without the corresponding comparison values. Please include numerical data in addition to p-values (eg. group A, 25 ± 4, group B 50 ± 5, p=.01)

Numerator/denominator

For all percentages, please also report the numerator and denominator. Please check entire manuscript for this. For example, this format may be used: sensitivity 20 of 25 (80%).

DISCUSSION

Avoid Abbreviations in First Paragraph (Introduction)

Avoid abbreviations or redefine them in the first paragraph of the discussion. Some readers look at the first part of the Discussion to get a synopsis of the entire manuscript. Use this first paragraph to summarize your entire manuscript

Structure and Word Count

Try to reduce any unnecessary redundancy between the Discussion and other areas of the text. A reasonable discussion length is 800 words. Structure discussion as follows:

a. Paragraph 1 of discussion: Provide a succinct 1 paragraph summary of your entire study: please restate briefly the background for your study, why it was done. Then state your major findings. Instead of providing general statements that something was generally better or superior, provide specific metrics (key results) and p values that support your statements.

b. Subsequently, please briefly review what others have reported and why your findings are better/confirmaatory/different. Typically, this involves 2-4 paragraphs. If there were 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 the prior articles.

c. In the 2nd to last paragraph, state the limitations of your study. All studies have limitations; state the “main” limitations as you understand them.

d. If appropriate, offer what you think should be done in the future to advance your study.
Do not include

Please make sure you do not include in the Discussion any results of your study that have not been mentioned in the Results section. If you wish to include such information in the Discussion, then also give the results in the Results section and also give appropriate information in Materials and Methods (as to what was done, by whom, etc.).

Do Not Cite (Figures, Tables)

Do not call out figures or tables in the discussion, as these may be distracting to the reader.

Study Limitations

Please include a study limitations paragraph before the last paragraph of the Discussion. This paragraph should include sources of potential bias, statistical uncertainty, and generalizability.

Avoid Abbreviations in Last Paragraph (Conclusion)

Avoid abbreviations or redefine them in the last paragraph of the discussion (concluding paragraph)

REFERENCES

Reference Limit (except meta-analysis)

Reference limit is 35 for original research articles. This limit is not applicable to meta-analyses.

Personal Communication

Radiology style does not allow for citations of personal communication.

FIGURES

Abbreviations and Units

Figures should be written to stand alone, and must be interpretable independently of the manuscript.

Therefore, for each figure, please define all abbreviations in the caption and include all units, if not already included.
Graphs
All graphs need units on the axes and axes labels for x and y (not abbreviations, unless you cannot fit the full terms on the axes). Each figure must be understood on its own without reference to your paper.

Production Quality Figures
For revision, production quality figures should be uploaded separately. Please review our Figure guidelines (for revised manuscripts) prior to submitting your revision.

Collages
When submitting multipart figures with an original submission, please compile figure parts (i.e. a, b), sized to fit on single 8.5" × 11" or A4 paper, with the legend below the figure. In laying out information in a figure, the objective is to maximize the space given to presentation of the data. Avoid wasted white space and clutter. When submitting multipart images with a revised submission, please submit your figures as individual files and not as a collage. Do not put the figure parts (i.e. a, b) directly on the figure, as these will be added during production.

Kaplan Meier curves
Please add the censored data points for the Kaplan-Meier curve and the number at risk below the graph.

Box Plunger Plots
Do not use a box plunger plot. Present the data as a box whisker plot or show the actual data points in a box plot.

Examples:
1. https://simplystatistics.org/2019/02/21/dynamite-plots-must-die/

RADIOLOGY publications:

Color Bars
Please include a color bar for figures that are in color.

Labeling
For all of your figures, it is essential that you label all features you describe in the captions. Please review recently published articles in Radiology to familiarize yourself with the degree of labeling we require.
Equilateral Triangles

Please do not use equilateral triangles for arrowheads, as it is difficult to determine which the labeling "point" of the arrowhead is.

Histologic Sections

Please make certain that for ALL histologic sections you provide the stain used and the magnification. Identify the important aspect of the histologic images in the figure caption and annotate the images accordingly.

Clinical Images

Please provide at least one or two actual scan images that illustrate the major "take home" points of your manuscript.

MRI Pulse Sequence Info

For all MRI, include the specific pulse sequence information (e.g. TR, TE, etc.) in the caption if these have not been described (or are different from those described) in the methods.

Figures based on individual patients/participants

For figures based on individual patients/participants, each patient/participant should have a separate figure. Figure legends should include age and sex. Also indicate plane, type of image (acquisition modality such as CT, MRI, etc.), contrast used/non-contrast

Standard Format

Please provide in our standard format for figure legends in Radiology instructions for authors. For example: 50-year-old man with XX. Fluoroscopy-guided lumbar injection in the a) anterior and b) lateral views. The typical contrast agent distribution in which location.....

Figures citation order

The figures should be numbered in the order in which they are cited in the text.

TABLES

Abbreviations and Units

For ALL tables, please define ALL abbreviations in a footnote and include all units, if not already included. Each table must be understood on its own without reference to your paper.

Table Headings

Include a heading for each table column
Table rows and columns

In general, rows should be used for independent (X) variables. Columns should be used for dependent (Y) variables.

Table 1: Demographics

For most patient/human manuscripts there should nearly always be a table of patient demographics/characteristics. This should be Table 1 of your paper. Otherwise, the reader does not know who is being studied in the research. Minimum information should include number of participants, mean age ± standard deviation (SD) or median age and interquartile range (IQR), and sex. Also, include co-variates that are needed to describe your study participants, relevant to the question that is being asked (eg, if women, then include pre/postmenopausal status; if studying cardiovascular disease, then include diabetes status, smoking, etc.).

- Include number of participants for your first row.
- Each table needs column headings. For example, Characteristic/Variable and Value. Indicate what values mean in footnote. See recent Radiology issues for examples.
- Give number of men/women

IF there is a biologically reasonable to break out the stats (and large study): Give mean age ± 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 significant statistical difference in age between the men and women.

SPECIFIC PAPERS

MACHINE LEARNING & RADIOMICS (AI)

Training, test, validation sets

Clearly describe training, test, and validation sets
See definitions https://pubs.rsna.org/doi/10.1148/radiol.2017171920

Submission of code/ algorithms

We request that all computer code used for modeling and/or data analysis (eg, for artificial or machine learning applications) be deposited in a publicly accessible repository. Authors should indicate in their article, Materials and Methods section:

1. A link to the webpage where the software can be found, and
2. The unique identifier for the revision of the code used in the publication.

Some git archive providers for code storage include:
1) Github: https://github.com
2) BitBucket: www.bitbucket.org/
3) SourceForge: sourceforge.net/

TERMINOLOGY

Area under the receiver operating characteristic (ROC) curve
Please abbreviate as AUC.

Biomarker
Please avoid the term biomarker

Cases
Don't use "cases" when you mean "patients," "studies," or some other more specific word. Use the specific word instead. Please check entire manuscript for this.

Claims of Priority
Please avoid claims of priority. It is unnecessary in this setting to explicitly state that "we were first." If you need to indicate that something may be novel, you may want to use the phrase "the finding of [whatever the finding is] has not previously been well established in the literature." If discussing the size of your study, do not refer to your study as "the largest study to date," instead please write, "to our knowledge, our study is the largest to date."

Conventional
"Conventional MRI" is vague. Conventional compared to what? Please be specific throughout your paper.

Correlated
Use "correlated" only in the statistical sense. Otherwise use another appropriate word (e.g. "compared," etc.).

Decrease/Increase
This term “decrease” and “increase” implies change over time. If used regarding your study, "decrease" means that imaging is obtained at two points of time. If you do not mean to imply change over time, please use a different term such as less than, lower, etc...

Density
We prefer not to use the term "density" when referring to CT. Please change it to "attenuation" or a variant of attenuation depending on its use.
Disease/Patient

Avoid using the disease to label the patient such as Alzheimer disease (AD) patients. It should be patients with Alzheimer disease (AD).

Effective Dose

In its 2007 report (ICRP publication 103. Ann ICRP 2007;37:1–332) the International commission on Radiological protection suggested that effective dose is defined only for the ICRP reference human. Since effective dose does not include consideration of the effect of patient size on dose or specific organ risk we prefer that authors provide CTDIvol and DLP as the primary dose-related parameters for all studies involving CT.

Elderly

Do you mean persons 65 years and older? If so, you may want to use this specific terminology.

Per AMA style guide: When referring to the entire population of elderly persons, use of the elderly may be appropriate (as in the impact of prescription drug costs on the elderly, for example). Otherwise, terms such as older persons, older people, elderly patients, geriatric patients, older adults, older patients, aging adults, persons 65 years and older, or the older population are preferred.

Note: In studies that involve human beings, age should always be given specifically

Gender

Use sex rather than gender.

Gold Standard

Use reference rather than gold standard.

High resolution MRI/ High resolution CT/ Ultra high resolution/ Low dose/ Ultra low dose etc.

There is no standard accepted definition of “high resolution MRI” or CT. Please be specific (e.g., high spatial resolution, high temporal resolution, etc.). Use these terms sparingly and define what you mean in Methods.

Kill/Sacrifice

For animal studies, use the term kill rather than sacrifice.

Male/Female

Use man/woman rather than male/female.
MRI vs MR Imaging

Use **MRI** instead of **MR Imaging**. Your manuscript is approximately 2-4 times more likely to be cited using the term MRI.

Multivariable/Univariable

Use multivariable and univariable, rather than "multivariate" and "univariate." A multivariable regression equation has multiple x variables and a single y (dependent) variable. If you have multiple Y variables in one regression equation, then multivariate may be (rarely) appropriate.

New/Novel

We discourage the use of the words "new," "novel" or "unique" in the title or text. Please remove them wherever used.

Normal

Do not use the word **normal** to describe a patient or participant. Use **healthy**. The word normal may be used to describe an organ but not a person.

Patients/Participants

For prospective studies, please refer to all study participants as **study participants** or **participants**. Please avoid the term **patients**. For retrospective studies, the term **patients** is fine.

Population

Study population is who you are interested in and not what your study results show from your observed “study sample” or “study participants.” Do a search for “population” to ensure that you are using this term correctly.

Radiograph vs. Plain film

Use radiograph instead of **plain film**.

Recent

Do not use recent if you are referring to a study more than 5 years old.

Significant

Use **significant** only in the statistical sense (with P-value). Otherwise use another appropriate word (e.g. substantial, important, etc.).

Significantly

Please give p-value and remove word **significantly** when used as an adverb to describe something being “higher” or “lower.”

15
Study sample vs study cohort

*Study sample* is a more appropriate term than *study cohort* for most of our papers. *Population* is the wide-ranging group of people to whom you aim to generalize the study results. Study sample is a subset of the population.

The term *study cohort* would be appropriate for a longitudinal study that samples and observes a cohort over a period of time.

Subjects

Avoid the term *subjects*.

Utilize

Change *utilize* to *use*

DIGITS

ADC

Typically 3 decimal points/ digits are used; it is rare that greater precision is available.

AUC

Please express AUC values 2 digits to the right of the decimal point.

Confidence Intervals

Please write confidence intervals for sensitivity and specificity as percentages and not decimals.

Correlation coefficient

Correlation with 2 digits of patients (24) should have 2 digits of correlation. (For correlation with 3 digits of patients (243) it might be reasonable to have 3 digits of correlation).

Specify if you are stating $r$ or $r^2$. If you are using standard correlation coefficients, we prefer that you express $r^2$.

Even numbers for patients/participants

Please provide whole numbers for patients/participants. Avoid decimals. Round to even number

- $14.2 \rightarrow 14$
- $14.5 \rightarrow 15$
Hazard Ratios / Odds Ratios / Relative Risks

Do not express excess decimal points in these ratios. Review your confidence intervals. If the confidence intervals are wide, say HR = 3.12, CI 1.21 to 5.01, there is no need to express hazard ratios beyond decimal point: simply state 3.1 (CI 1.2,5.0).

Mean/Median Age

For mean/median age, year and SD/IQR rounded to the whole digit are sufficient (21 +/- 6 years, instead of 21.2 +/- 5.7 years).

P-values

Correct format

P-values should be expressed to 2 digits to the right of the decimal point (regardless of whether the p-value is significant) unless p <.01 in which case the p-value should be expressed to 3 digits to the right of the decimal point. The exception to this rule is when rounding p from 3 digits to 2 digits would result in p appearing non-significant (such as p=.046). Give exact p-value unless <.001. The smallest p-value that should be expressed is <.001. The largest p-value is >.99.

Avoid scientific notation

Avoid using scientific notation for expressing p-values

- p = 5x10^{-3} (0.005) should typically expressed as be p =.01
- p = 5x10^{-5} (0.00005) should be p<.001
- p = 6.2x10^{-2} (0.062) should be p=.06

Sensitivity, Specificity, NPV, PPV

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