ONCE a group of investigators have chosen a research topic, designed and conducted a study, and analyzed the data, they are ready to prepare the study for publication. This article discusses the process of manuscript publication, from the selection of the right journal and article format to responding to reviewers’ comments.

SELECTING THE RIGHT JOURNAL

Although there are many steps required to successfully publish a research study, the first step is selecting a proper journal for publication. Issues to consider include the “level” or “tier” of the journal, the scope and readership of the journal, and whether the journal has published similar studies in the past. If the author selects a journal characterized by extremely stringent peer review and the study is not of sufficient quality and impact, a rejection may end the motivation for resubmission and effectively kill the project or, at the least, it will delay publication in an appropriate venue. Conversely, if the manuscript is submitted to an “easy” journal (a journal that has a reputation for a low rejection rate) and is accepted rapidly, the article may not reach the widest and most appropriate readership, or it may not be published in the highest-quality journal possible, reducing its impact.

It is important for authors to assess their goals and motivations for publishing their work, as these will affect the selection of an appropriate journal. Do they wish to publish the project in a journal with very large and broad readership (e.g., The New England Journal of Medicine, JAMA, Lancet, British Medical Journal) or do the authors want to reach a predominantly emergency medicine (EM) readership (e.g., Academic Emergency Medicine, American Journal of Emergency Medicine, Annals of Emergency Medicine, Journal of Emergency Medicine)? Furthermore, individual investigators may have different reasons for preferring one journal over another. For example, an author in an academic tenure-track position should try to publish in journals that are respected by his or her institution’s promotions and tenure committee. Alternatively, an author may want to impact the practice of a particular subset of clinicians or gain the most publicity among his or her peers for a particular project/publication. This may best be achieved by publishing in an EM journal that has high readership among emergency physicians.

Although the issue of whether to publish inside or outside of the EM literature is controversial, some authors assume the review process will be more difficult in non-EM journals than in EM journals. This may not be the case and, in general, the better EM journals are becoming increasingly selective. It is of the utmost importance that authors consider the differences in focus and scope between EM and non-EM journals. In many cases, the focus...
of the journal is described in the “Instructions for Authors.”

PICKING A MANUSCRIPT FORMAT

There are several formats from which an author can choose to use in presenting the study. The primary differences between them are outlined below.

Letter to the Editor. This format is usually the easiest to write and reflects the author’s opinion on some subject. Usually the author is commenting on a previously published article in the same journal, or providing information on a similar subject. Case presentations that do not lend themselves well to case reports can also be published in this format. Letters to the editor are sparsely referenced and may or may not undergo formal peer review.

Case Report/Series. This format provides the author with an opportunity to present a unique case or series of patient cases. The merits of case reports are based on the degree with which the case provides a new approach to managing a common disease, illuminates the pathophysiology of a rare disease, or teaches concepts applicable in other settings. Authors should avoid “me too” papers describing an interesting scenario that has been reported previously. The most important step in writing a good case report is to perform an exhaustive review of the literature to avoid unnecessary duplication of reports.

Collective Review/Review Article. A review article attempts to summarize a defined area of clinical knowledge, based on an exhaustive compilation and analysis of the available literature. The review should attempt to answer important clinical questions that are not clearly answered by single studies. In some respects, the traditional review article has been largely replaced by meta-analytic studies. While there are many similarities between review articles and meta-analytic studies, a formal meta-analysis defines clearly the methods by which individual articles were chosen for review, the methods for abstraction of the data from individual articles, and the statistical methods used to combine results from different studies. While the validity of meta-analysis has been somewhat controversial, it is still generally believed to be a superior approach to the more “free-form” review article.

Original Contribution/Research Article. This is the most common format for the presentation of research data. The exact structure depends on the research question, the type of study performed, and the results. Differences in required formats for different journals are usually clearly explained in the “Instructions for Authors” from the intended journal. In addition, there are a number of consensus statements regarding reporting formats and the details that need to be reported for interventional, controlled trials.

Editorial. An editorial is intended to communicate opinion or interpretation of fact, and is usually written by an author specifically invited to do so. The editorial usually addresses a controversial issue in a medical specialty or scientific field. Editorials usually undergo less detailed peer review than other types of submissions.

JUDGING THE QUALITY OF YOUR ARTICLE

How do you judge the quality of your research project? Although this question may seem easy to answer, quality is subjective and, as such, may be difficult to determine. Characteristics such as the type of study design, the specific methodology, the importance of the study question, and other concrete and intangible factors play a role in determining the quality and potential impact of a particular project. Reading articles in the intended or related journals may provide insight on the relative quality of your study, how it might fare in the submission process, and how it might best be presented. Also, having your article read by someone familiar with the research area and potential journals for submission can be very helpful. The resulting feedback can then be used to improve the manuscript, as well as to help select the correct journal.

JOURNAL CATEGORIES

Non-Emergency Medicine Journals. The intended audience for your manuscript, and its clinical or scientific area, should guide your choice of journal. Broad-based journals with large readerships include The New England Journal of Medicine, JAMA, British Medical Journal, and Lancet. All are considered excellent journals. In general, these journals publish only articles that will be of interest to large numbers of clinicians or that have unusual medical, scientific, or historical merit.

Each medical specialty has one or two journals that are recognized as premier journals for that specialty. Senior investigators in that specialty can help you select the most appropriate journal in their area of expertise. Other resources (available at medical libraries) that may guide you to journals that seem to have a focus and readership similar to your research include:
1. Directory of Publishing Opportunities in Journals and Periodicals—This reference lists topic areas, their audience, and publishing requirements for more than 4,000 publications.

2. Journal Citation Reports—This is an annual volume in Science Citation Index and has a list of indexed journals grouped by subject field.

3. List of Journals Indexed in Index Medicus—This lists more than 2,600 journals that are grouped by subjects.

4. Current Contents—This is published weekly, listing the current table of contents of more than 1,300 journals.

Emergency Medicine Journals. If your research is most likely to be of primary interest to emergency physicians, then it is probably most appropriate for it to be published in an EM journal. In the United States, the primary EM journals are Academic Emergency Medicine, the American Journal of Emergency Medicine, Annals of Emergency Medicine, the Journal of Emergency Medicine, and Pediatric Emergency Care. [Editor’s note: the EM journals are listed in alphabetical order.] In choosing between different EM journals, prospective authors should consider each journal’s circulation, readership, and perceived quality and impact, and whether the journal has previously published similar articles.

WRITING THE MANUSCRIPT

Authorship. Traditionally, the first author of a manuscript does most of the work on the study and most of the writing, and the last author is the most senior investigator. Additional authors usually perform specific tasks during the conduct of the study. The most senior and established investigator usually takes correspondence and requests for reprints. Technicians or ancillary personnel should appear as authors if their contribution modified the overall scope and direction of the study, and if they participated in the writing and review of the manuscript. Persons who solely perform data analysis that does not modify study conclusions should not be listed as authors. Basic requirements for authorship have been discussed elsewhere. All authors should be able to defend the work and in some way have influenced the study’s conclusions. In some centers, there is a tacit understanding that the chair of each department appears on all publications. Such practice is unwise and misleading.

Instructions for Authors. No one has unlimited time to rewrite text, recalculate statistics, or replot figures, so the “Instructions for Authors” section of the intended journal should be read carefully before writing any of the paper. This section describes editorial style, statistical analysis, and content requirements. Some journals provide extraordinary detail (e.g., guidelines for font, grammar, abbreviations, acceptable measures of dispersion, figure size), while other journals provide only a brief overview of the journal’s mission and basic manuscript requirements. Regarding the mechanical details of biomedical writing, the American Medical Association’s Manual of Style can help guide composition, sentence structure, and diction.

Putting Ideas on Paper. Obvious enthusiasm for the subject matter and a belief in its importance are necessary elements of a strong manuscript. Clear writing begins with focusing this enthusiasm, however. Focus implies a well-defined and clinically valid question, around which the manuscript is built. The introduction of the paper poses the question and asserts its importance, the Methods detail the strategy used to answer the question, the Results section provides the raw answers, and the Discussion section places the answers into perspective.

For most scientists, initiating the writing process is more difficult and frustrating than any other part of research. Usually, writing problems fall into one of two categories: organizational or formulative. Organizational problems occur when one attempts to place many divergent ideas or too much data into one manuscript. To solve this problem, the author must focus on the one concept or question that is most important. Once this focus is identified, an outline can be set up for each section of the paper (Introduction, Methods, Results, Discussion) to provide the logical structure for the reader. While an outline provides skeletal structure around which the text can be written, some authors perform better using free-flowing or “brainstorming” techniques. Using this method, many authors feel more at liberty to tell the “story” of the project in a smooth and hopefully captivating style. Regardless of the technique used to jump-start the writing process, the most important step is to begin putting words down so that the editing process can begin.

Formulative problems can also plague medical writing. This is the sense of chasing intellectual soap bubbles; when ideas don’t happen and the writer’s own words disappoint even the writer. No easy solutions are available for this problem, except to take a step back and recall the initial motivation for the study.

The Introduction Section. The Introduction conveys the reason the study was performed, by defining and establishing the importance of the re-
search question. It should elucidate previous controversy in the subject of study, and explain why the previous state of knowledge was inadequate and why more study was needed. The Introduction should briefly review the results of previous studies closely related to the work, noting especially when earlier work was insufficient, or when different studies yielded contradictory results. The Introduction may propose a specific explanation for inconsistencies within the current literature, and explain how the proposed study addresses the shortcomings of previous work. Because the tone and direction of this putative explanation may depend on the results of the current study, the writer may benefit by completing the Results section prior to the Introduction.

The Introduction can be quite brief. In some cases, a few paragraphs can explain the controversy or gap in current knowledge and why the current study was needed. In other settings, a more detailed history of the subject is required. In general, however, novice scientific writers produce Introductions that are too long. The Introduction should provide a natural flow toward the Discussion. In addition, it is important to introduce and explain any novel methods, treatments, or diagnostic procedure implemented in the study.

The Methods Section. The Methods section should ideally provide enough information so that a knowledgeable reader could reproduce the study. This section describes the sequence of data collection and how data were obtained. Accordingly, the Methods section should be written and continually revised as the study is being conducted, preferably before writing any other section. Methods should be concise; where possible, details of analysis procedures should be referenced rather than explained at length. The reader should be informed if limitations in facilities or support necessitated unusual methodology or “shortcuts.” For elaborate projects (especially laboratory studies that induce pathology, followed by parallel or serial treatment regimens), a diagram of the experimental protocol is useful. Similar diagrams may be useful in reporting complex clinical study designs as well. Usually the Methods section should be divided into subsections (e.g., subjects or enrollment criteria, instrumentation and/or baseline data collection, experimental protocol or interventions, outcome data collection, and statistical analysis.)

The Results Section. The Results section should be written as soon as data collection is complete. Efficient data handling greatly accelerates the writing process. First, original data sources (e.g., photocopies, data sheets, chart writer printouts, photographs) should be safely stored. Before beginning to write the Results section, data should be entered into a database program, and possibly transferred to an analysis system that can perform the statistical calculations needed for the analysis. There are many database and statistical analysis software packages that can serve these purposes. Data should be printed out in spreadsheets, tables, or figures, collated, and available for constant review as the text is written. Many authors find that generating a structured outline of the Results is helpful. The flow should proceed temporally.

The following list presents a logical sequence that is acceptable by many journals. Parenthetical examples of the contents in each section are presented for the hypothetical study of a new drug intended to lower blood pressure compared with standard treatment.

1. Baseline demographic or biologic characteristics of study group(s) (age, gender, weight, diagnoses, ethnicity, etc.).
2. Data characterizing the pathologic state or baseline conditions (arterial blood pressure, other vital signs, % with left ventricular hypertrophy on electrocardiogram, etc.).
3. Compliance with intervention(s) (fraction of patients in each group who receive the intended treatment).
4. Outcomes of intervention(s) or diagnostic strategies. These data may be presented in conjunction with previous items (change in blood pressure vs baseline blood pressure, by treatment group).
5. Figure or table of other important findings (e.g., table of cost reduction relative to standard treatment).
6. Supporting or ancillary data (e.g., change in self-reported health status with treatment).

Figures and tables should simplify data presentation. A figure should be accompanied by a legend that describes symbols, groups, abbreviations, and statistical results in enough detail that the figure plus legend together can stand alone without further explanation. For complex experimental designs that apply and remove independent variables (e.g., drug infusion, vascular occlusion, pain stimulus), relevant figures are enhanced by a timeline inset to denote where an effect begins and ends. Tables should be explained by the title, and symbols or notations may be affixed to certain words or data in the table to refer the reader to a description that elucidates the importance of the results or how they were derived.

The text within the Results section may be somewhat choppier than other sections; it is often sufficient to succinctly state the facts in a logical fashion. This goal may not lend itself to fluid writing. As always, the first sentence of each paragraph should introduce the concept being described and give the reader an idea of what lies
TABLE 1. Basic Items to Include in a Cover Letter

- What journal is the manuscript being sent to?
- What section of the journal should this manuscript be considered for?
- A statement regarding the originality of the manuscript and prior or duplicate publication or submission of part of the manuscript.
- A statement of each author’s contribution to the original work.
- A statement that all authors have read and approved the manuscript.
- Name, address, telephone and facsimile number of the corresponding author.
- Signatures of all authors.

ahead. Transition statements may help the reader “switch gears” when reading different parts of the Results section (e.g., “Although cardiovascular parameters were unaffected by treatment, a clear effect was demonstrated in metabolic measurements . . . ”). Any statement that indicates a crucial difference between variables (or absence thereof) should be clearly supported by data written either in the text or in an indicated figure or table. Judgment plays a large role in deciding the extent of interpretation to use within the results. Many authors are hesitant to speculate or provide opinion within the Results section. On the other hand, a surprise result can distract the reader from the main point. If the author clearly knows the reason for the surprise (e.g., skewing of data by a few measurements, or recognized error in a criterion standard), then a presentation of the data in a hypothetical context (e.g., if these outlying patients’ measurements are deleted . . . ) may clarify the surprise within the Results section.

The Discussion Section. The Discussion section integrates the findings of the study with the current state of knowledge. This section allows the author a chance to explain the importance of the work. The key objective of the discussion is to place the most important findings of the paper into their clinical or scientific context. The journal type will guide the content and scope of this analysis. For more basic science journals, the results may be discussed in light of cellular mechanisms, and for clinical journals, the discussion may center on the degree with which the results should change clinical practice.

Discussion style ranges from safe (but unnecessary) recapitulations of the results to aggressive speculation outside of the scope of the actual measurements. This style depends upon many variables. Among these are the state of knowledge in the subject, confidence in methodology, and author personality. In general, both extremes should be avoided—a safe discussion can bore a reviewer and a cutting-edge discussion can seem too daring or bombastic.

One way to get started with the discussion is to write an outline of the concepts that are most important in the paper. These concepts may include the novelty of the work, a comparison with previous work, elucidations of differences compared with previous studies, quirks in methodology, or the clinical relevance of a basic science study. It is often wise to begin the discussion with a brief paragraph that restates the most salient findings of the study. This paragraph can then make assertions, that will then be developed, about how the findings could alter current thinking about the subject. After this first paragraph, the discussion can be a sequence of paragraphs that address major concepts in the outline. As such, it remains imperative that each paragraph begins with a sentence that introduces the next concept under discussion.

The References. Thorough documentation of background information is a fundamental characteristic that distinguishes scientific writing from other writing forms. Accordingly, extreme care must be exercised in listing references even for noncontroversial statements. Regarding the EM literature, it has been estimated that nearly 35% of all reference lists contain errors in which a reference simply does not say what the referencing author implies. Compulsiveness and quality should guide reference selection. Authors should never reference papers that they do not have in file, or have not read completely. Duplication of references that make similar points should be avoided; if one particular citation is widely recognized for a finding, it should be cited alone.

In recent years, organization of references has been greatly facilitated by software programs that construct versatile reference databases. These programs allow the citations to be entered in any convenient order, using a standard structure. Then, manuscripts can be typed on a word processor using template reference numbers from a corresponding database. By executing the referencing software program, references will be correctly sequenced and formatted according to a selected journal style. Examples of these packages include Reference Manager and Papyrus.

The Abstract. The abstract should be written last, after the author has virtually memorized the manuscript. The goal of the abstract is to succinctly summarize the main findings of the paper, using about 250 words. This word limit is practical since MEDLINE truncates abstracts at 250 words. The abstract should open with a one- or two-sentence introduction that provides the reason for the study. Methods should be kept general. Each journal publishes requirements about length and structure for the abstract that should be studied.
before writing. The results section of the abstract should provide concise indications of statistical significance or, preferably, include confidence intervals for main results. The conclusion should be limited to one or two sentences.

**SUBMITTING THE MANUSCRIPT**

When the manuscript is ready for submission, it is important for the author to consult the “Instructions for Authors” page of the journal to review the details of submission. To whom should the manuscript be sent and where? How many paper copies should be sent? Are there manuscript-on-disk requirements? Are there specific requirements for collating and packaging the manuscript and supporting materials? If there are manuscript-on-disk requirements, some general rules of submission on disk should be followed: 1) make sure the latest version of the manuscript is on disk; 2) make sure the diskette is labeled clearly with the file name(s) and computer hardware and software used; and 3) make sure the file is not infected with a computer virus.

The author should also send a cover letter with the manuscript. Many journals have specific requirements for the cover letter and authors should consult the “Instructions for Authors” page for details. Important items to be included in the cover letter are summarized in Table 1. If available, a copyright agreement form should also be filled out and sent with the manuscript. Alternatively, some journals send this form to the corresponding author after the manuscript has been received.

**THE REVIEW PROCESS**

When the manuscript arrives at the journal office, the editor or managing editor decides whether the manuscript’s subject falls within the scope of the journal and whether the manuscript is in a suitable form for consideration. If these criteria are met, the manuscript is logged in and the appropriate tracking process is begun. If the journal sends out acknowledgment of receipt notices, they are sent at this time. At this point, the editor (or associate editor if one is designated) determines who will review the manuscript. Usually two or three reviewers are chosen for a manuscript, drawn from the editorial board of the journal or from a group of reviewers who perform this service for the journal. After reviewing the manuscript, reviewers send their specific comments along with a recommendation to the editor. These recommendations generally fall into three categories: 1) accept the manuscript as submitted; 2) have the author revise and resubmit; or 3) reject the manuscript. The editor (or associate editor) then reads the reviews and makes a decision regarding the manuscript. This decision is then sent to the author.

The timetable for the review process can be quite variable. Usually, an acknowledgment of receipt notice is sent to the author within two weeks of sending the manuscript. The actual review of the manuscript can take from two to 12 weeks depending on the journal. The author should not be afraid of communicating with the editor or managing editor regarding the status of the manuscript. If the author has not received a notification regarding the review of the manuscript by eight to ten weeks following submission, a telephone call to the editor regarding the status is acceptable.

**AFTER THE REVIEW**

The editorial decision usually falls into one of three categories: 1) accept as submitted; 2) revise and resubmit; or 3) reject. If the author receives an “accept as submitted” response, a celebration is definitely in order, since this response is a rarity in most biomedical journals (usually <5% of submitted manuscripts). More common responses include “revise and resubmit” or “accept following revision.” Copies of the reviewer comments usually accompany these decisions. This response often means the manuscript is acceptable for publication once a few questions have been answered, but in some cases substantial revisions are necessary. The authors should look closely at the reviewers’ comments and then make a decision regarding revision. If the authors decide to revise (which they should), each comment should be addressed. The comments are generally best addressed by making the suggested changes or clarifications in the manuscript. If the authors believe the suggested change in the manuscript is not warranted, this should be stated and supported in a response letter. This clarification and/or rebuttal should be done in a point-by-point manner, avoiding antagonism. Regardless of the responses to the reviewers’ comments, the authors should provide a response letter detailing all changes made in the manuscript, along with clarifications and rebuttals of reviewers’ comments as needed. The manuscript can then be resubmitted to the journal following the editor’s instructions for resubmission.

There are several options if one receives a “reject” notification. Many journals have rejection rates near or above 50%, so the author should not be disheartened. The author should look again at the content of the manuscript and the reviewers’ comments and decide whether the journal was an appropriate choice. The author can then use the reviewers’ comments to revise the manuscript for submission to another journal.
AFTER ACCEPTANCE

Once accepted, the manuscript goes through a copyediting process where spelling and grammatical errors are corrected and the manuscript is put in the style of the particular journal. The copy editor may also direct questions to the author as “author queries.” These appear in the margins of the copyedited manuscript or galley proofs. Some journals send the copyedited manuscript back to the author prior to typesetting and others send the galley proofs with the author queries noted on them. The author should review the copyedited manuscript or galley proofs carefully and respond to each author query. The changes made in the galley proofs should be made on the actual proof and in the margin of the proof for clarity to the copy editor. Since the edited proofs no longer undergo peer review, additions to the manuscript (outside of spelling corrections, etc.) are not advised. If additions need to be made at this stage, it is best to contact the managing editor for discussion of the proposed additions. It is also important at this stage to carefully check the tables and illustrations. Numbers in the tables may have been mis-typed during data entry and illustrations may be mislabeled or reproduced poorly. It is the author’s responsibility to review the entire manuscript at this time to avoid embarrassing errors in final publication.

References