Some Concrete Ideas About Manuscript Abstracts

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The journal article, the publication of scientific results of a study, is a beautifully constructed document with several well-known key components, the so-called *IMRaD style* of introduction, methods/materials, results, and discussion. While most scientists are cognizant of these components and generally are able to write them reasonably well, the abstract of the article is often a mystery. What is the purpose of the abstract? What should it contain? How does the abstract relate to the full manuscript? How can a 250-word limit do justice to all the data collected? Can the skills needed for writing the abstract of a manuscript be learned? I hope to show that manuscript abstracts indeed are not abstract (*ie*, free form), but rather that they abstract (*ie*, pull out) necessary information and compel the reader into the full article.

Main Points to Consider

Format

Before starting the writing process, the wise author will check the instructions-to-authors section of the journal on its Web page for the most current information. **CHEST** requires scientific manuscripts to contain a structured abstract with a maximum of 250 words (fewer are fine) with four subcategories: background; methods; results; and conclusions. The abstract for a manuscript often is, and probably should be, the last item to be written, since it summarizes the entire study.

- Background: generally, this section consists of one or two sentences that briefly set the stage for your research question, followed by a clear statement of the question or hypothesis. If no research question is posed, the abstract is meaningless, providing no anchor for understanding the methods or the results. The background section is written in the present tense.
- Materials and Methods: this section describes the population studied, the techniques and equipment used, the drugs or other agents administered, and the statistical methods used. Note that **CHEST** has specific instructions in that the number of observations (*ie*, the number of patients or animals) must be provided in the abstract. This section is written in the past tense.
- Results: This section describes the most important findings in the same order as the methods that produced the data. It is important that each result has a method and that each method has a result, even if the result was not one that you expected or wanted. This section is written in the past tense.
- Conclusions: This section summarizes the study findings and may include a sentence that describes or speculates on the significance of the findings. This section is generally written in the present tense.

Style

When writing the informative abstract, it is important to use a writing style similar to that used in the manuscript. The abstract is part of the manuscript; a different writing style signals that perhaps little thought went into its preparation. Avoid jargon, both in the abstract and in the body of the article, in deference to the large number of international readers of the journal. Generally, the abstract is written in

complete sentences, and uses transitional works and phrases to maintain coherence. Because of the limitation on words, each one should be chosen carefully. If it is possible to write a clear and concise abstract in fewer than 250 words, do not add frivolous information to reach the 250-word mark.

Potential Problems

Make sure that any result reported in the abstract is also reported in the body of the manuscript (in the same order) and that the numbers are identical. Generally, writers have far too much information, and far > 250 words, in the first draft of the abstract. While the tendency is to cut the word count by using abbreviations, do not do this! An abstract is meant to convey information, summarize the important data, and make the reader want to read the full article. An "alphabet soup" abstract is difficult to read; the purpose of an abstract is to encourage the reading of the full article, not annoy or confuse readers. Limit your use of abbreviations to no more than three standard, widely accepted abbreviations, all of which should be defined at first use.

Explication

What does a good abstract look like? I have provided an example, which is fictional, and have added explanatory notes to suggest why this abstract is good. Please note, the abstract can be rewritten any number of ways and still contain the relevant information, so do not consider this example the model for all other abstracts. This abstract is for an article that tests a hypothesis (*ie*, that drug N is better than drug S), but some of the same principles can be applied to abstracts for articles that are observational studies. Abstracts for review article generally are not structured.

Background

The current first-line treatment for patients with advanced non-small cell lung cancer (NSCLC) includes chemotherapy and palliative radiotherapy, but new biological therapies are available that target the EGFR gene mutation and cause apoptosis or inhibit the action of tyrosine kinase or both. We were interested to know whether drug N, a new therapy that targets the tyrosine kinase receptor, improves patient outcome compared with drug S, which causes apoptosis. (One sentence of background information sets the scene and the research question is given.)

Patients and Methods

Between January 1, 2003, and December 30, 2004, 315 patients with stage I or II NSCLC were randomly assigned to receive either drug N, 150 mg/d, or drug S, 100 mg/d. The primary end point was the proportion of patients who did not have progressive disease measured after 12 months of therapy. Secondary end points were survival time and the need for palliative radiation therapy. (The time frame of the study is given, which may be important with new and developing therapies. Other important information includes the number of patients, stage of disease, the experimental treatments, doses, primary and secondary end points, and when the primary end point was measured.)

Results

Three hundred eleven patients received drug N ($n = 156$) or drug S ($n = 155$). Patients receiving drug N had a lower rate of disease progression at the 12-month time point compared with patients receiving drug S (2% vs 15%, respectively; $p < 0.001$), a longer median survival time (23 vs 18 months, respectively; $p < 0.01$), and less need for palliative radiation (2% vs 10%, respectively; $p < 0.001$). Both drugs were generally well-tolerated, and the adverse events reported were typical of this patient population and the known drug profiles. (The number of patients who were treated is given, and it differs from the number

assigned to treatment; the reasons for "drop outs" will be discussed in the body of the article. The results for the primary end point and both secondary end points are given, and a p value is provided. A statement about the safety of the treatments is minimal, but a section of the article will provide more details about deaths, withdrawals, and severe and life-threatening adverse events.)

Conclusions

Drug N provided a lower rate of disease progression for patients with stage I or 11 NSCLC than drug S and had an acceptable toxicity profile. (One sentence provides the authors' take on the usefulness of the therapies. Note that the authors did not extend the conclusions to patients with stage III disease or patients with other types of cancer. The authors also acknowledged that that the drug had side effects: all drugs that are effective have side effects in the general population.)

Take-Home Lesson

A good abstract is invaluable to the authors because it encourages other scientists to read the work, and is invaluable to science in general because it adds to the general knowledge base and allows others to conduct further research in the field. The hallmarks of a good abstract include the following:

- Clear, concise writing;
- Limited use of abbreviations;
- Number of observations; in the case of patients, the number randomly assigned to treatment and the number who received treatment is useful;
- Interventions used, including dosage;
- Identification of primary and secondary end points, and how and when they were measured, if necessary;
- Results of the primary and secondary end points, in the same order as in the methods section;
- Notification of toxicities; and
- A conclusion based on the data in the article, not conclusions extrapolated for other populations.

By using a few concrete rules, an abstract for your manuscript can encourage other scientists and researchers to read the full article, possibly citing your article in other work. In a forthcoming article in this series, I plan to look more closely at the body of the article; some of the same principles of good abstract writing will surface there.