

CHAPTER ELEVEN

ABSTRACT AND MANUSCRIPT PREPARATION

Once data analysis is complete, the natural progression of medical research is to publish the conclusions of the study in abstract and/or manuscript form. The International Committee of Medical Journal Editors and the Ad Hoc Working Group on Critical Appraisal of the Medical Literature have proposed guidelines for the preparation of abstracts and manuscripts. This chapter will discuss the key points of each of these sets of guidelines.

SCIENTIFIC ABSTRACT PREPARATION

Scientific abstracts are a frequent “first step” in the reporting of research studies and clinical trials. On average, there is a 1 to 2 year delay between the completion of a study and the publication of its results in a medical journal. Abstracts provide a method by which to inform the medical community of more recent findings and discoveries as well as research that is still “in progress”. They report the major conclusions of a study and are most commonly presented at scientific meetings. These abstracts are usually published in a special edition of a journal. Submission to an appropriate journal of an expanded manuscript which presents the study in detail usually follows.

The aim in writing an abstract for a scientific session is to concisely report the study hypothesis, methods, results, and main conclusions in a manner which allows the reader to apply the study conclusions to clinical practice. Guidelines for preparing abstracts vary with each academic society, and the reader is encouraged to obtain the guidelines and abstract format for the specific scientific meeting of interest. The basic format, however, is the same for all meetings and is depicted in Figure 11-1.

- Introduction
- Hypothesis
- Methods
- Results
- Conclusions

Figure 11-1: Format for scientific abstract preparation

Some investigators consider abstracts to be more difficult to prepare than manuscripts because of the space limitations within which the study information must be conveyed. Most meetings limit the length of abstracts for presentation, which requires careful editing on the part of the investigator to communicate the necessary information. Because of these space limitations, the use of abbreviations and non-grammatical sentences is common in the writing of scientific abstracts. A sample abstract illustrating the format from Figure 11-1 is included at the end of the chapter (8).

STRUCTURED ABSTRACTS IN MANUSCRIPTS

The abstract is also an important part of a manuscript. It appears at the beginning of a manuscript and, like a scientific abstract, summarizes the conclusions of the study. In 1987, in an attempt to standardize abstracts, the Ad Hoc Working Group on Critical Appraisal of the Medical Literature published guidelines for the preparation of what has become known as the **structured abstract**. These guidelines are widely accepted and have become the standard for many medical journals.

The purpose of the 1987 guidelines is to make abstracts “more informative” by using a standardized format. This is intended to allow the reader to quickly determine the applicability of the study and its conclusions to his or her clinical practice. The new abstract format is also intended to facilitate peer review, improve the precision of computerized literature searches, and encourage authors to concisely summarize their work. A suggested limit of 250 words is placed on the length of an abstract to facilitate these goals. As with scientific abstracts, phrases are frequently used, rather than complete sentences, in order to save space. The structured abstract is based on the following headings:

- **Objective**

An abstract should contain a clear and concise statement regarding the primary and important secondary hypotheses which the study addressed. Frequently, a brief **introduction** which details the rationale and background for the study is included as well.

Example:

Objective: To evaluate the clinical usefulness of right ventricular end-diastolic volume index and pulmonary artery occlusion pressure in predicting preload recruitable increases in cardiac index in patients with acute respiratory failure receiving treatment with positive end-expiratory pressure.

- **Design**

The study design (prospective versus retrospective, randomized versus non-randomized, controlled versus uncontrolled, etc.) should be identified.

Example:

Design: Prospective non-randomized trial.

- **Setting**

To facilitate application of the study results to clinical practice, the setting in which the study was performed (urban versus rural, university medical center versus community hospital, etc.) should be described.

Example:

Setting: Surgical intensive care unit in a Level I trauma center/university hospital.

- **Patients or other participants**

Demographic data regarding the patients upon which study observations were made should be detailed as well as any inclusion and/or exclusion criteria. The method of treatment allocation (random, consecutive, non-consecutive, etc.) should be identified. If there were patients who met the entrance criteria, but were excluded, this should also be indicated including the reason for exclusion.

Example:

Patients: Sixty-five critically ill surgical patients with acute respiratory failure.

- **Interventions**

The therapeutic treatments or procedures which were performed should be described including method and duration of treatment.

Example:

Interventions: All patients were being treated for acute respiratory failure with titrated levels of positive end-expiratory pressure (PEEP) with the goal of increasing oxygen saturation to ≥ 0.92 and reducing inspired oxygen fraction to < 0.50 . Serial determinations of right ventricular end-diastolic volume index, pulmonary artery occlusion pressure, and cardiac index were recorded as patients underwent resuscitation with crystalloid solutions, blood products, and inotropes. The goal of resuscitation was to maximize oxygen delivery and reduce intrapulmonary shunt to ≤ 0.20 .

- **Main outcome measures**

The variables of interest studied, as they pertain to the study hypothesis, should be described.

Example:

Main outcome measure: Successful extubation from mechanical ventilation for > 7 days duration.

- **Measurements and Main Results**

The main results of the study are summarized along with the statistical analysis of differences between study groups. This should include not only measures of statistical significance (such as p values or confidence intervals), but also the specific statistical methods that were used. This illustrates to the reader that appropriate statistical tests were utilized in the data analysis. No data should be reported in the abstract that does not also appear in the manuscript itself.

Example:

Results: Two hundred sixty-four sets of hemodynamic variables were recorded in 65 patients. The level of PEEP ranged from 5 to 50 cm H₂O with a mean of 12 ± 9 cm H₂O. At all levels of PEEP, cardiac index correlated significantly better with right ventricular end-diastolic volume index than with pulmonary artery occlusion pressure in patients with right ventricular ejection fractions $\geq 20\%$. At levels of PEEP ≥ 15 cm H₂O, cardiac index had an inverse correlation with pulmonary artery occlusion pressure while the correlation with right ventricular end-diastolic volume index remained highly significant.

- **Conclusions**

The main conclusions which are directly supported by the data presented under **Results** and their clinical application are given.

Example:

Conclusions: Cardiac index correlates significantly better with right ventricular end-diastolic volume index than pulmonary artery occlusion pressure in patients with right ventricular ejection fractions $\geq 20\%$ at all levels of PEEP up to 50 cm H₂O. Right ventricular end-diastolic volume index is a more reliable predictor of volume depletion and preload recruitable increases in cardiac index. This is especially true in patients receiving higher levels of PEEP where the pulmonary artery occlusion pressure is difficult to interpret.

Although abstracts prepared in this structured format tend to be longer than the traditional narrative abstract form, they have been found to be easier to read and review, and are now required for manuscript submission to most of the major medical journals.

MANUSCRIPT PREPARATION

The preparation of a manuscript for publication follows virtually the same guidelines discussed above for abstract preparation with a few exceptions. The purpose of a manuscript is to present the study in detail including the methods utilized, the complete results (including the actual data where appropriate), a discussion of the results as they apply to clinical practice and in relation to previously published research, and the conclusions, both primary and secondary, of the study.

In 1979, the International Committee of Medical Journal Editors issued recommendations for the publishing of scientific research. These recommendations are now the accepted standard for over 300 journals around the world. Each journal has its own specific requirements as well, however, with regard to number of manuscript copies to be submitted, number of illustrations permitted, etc., and the reader is advised to review the "Instructions for Authors" found in each journal for its specific manuscript submission requirements.

The uniform requirements for manuscript submission are depicted in Figure 11-2. Manuscripts should be typed double-spaced throughout with 1 inch margins and with pages numbered consecutively. Each section of the manuscript should begin on a new page.

- Title page
- Structured abstract and key words
- Text
 - Introduction
 - Methods
 - Statistics
 - Results
 - Discussion
- Acknowledgements
- References
- Tables
- Legends for illustrations

Figure 11-2: Uniform requirements for manuscript submission

- **Title page**

The title page should contain:

- the title of the manuscript

- each author's name (first, middle initial, and last name with highest academic degree)
- the department name and institution where the work was performed
- the corresponding author's name and address
- the source of funding, if applicable
- an abbreviated running title of no more than 40 characters.

- **Structured abstract and key words**

The structured abstract is prepared as previously described. Up to 10 key words from the Medical Subject Headings (MeSH) list of *Index Medicus* should be included.

- **Text**

Introduction

The purpose of the study should be clearly identified and relevant research from the medical literature discussed as it pertains to the current study.

Methods

Sufficient detail of techniques, equipment, and procedures used in the study should be provided such that another investigator could reproduce the results if desired. Established techniques and procedures should be referenced and newer techniques briefly described. Manufacturer names and addresses (i.e., "Baxter Edwards Critical Care, Irvine, CA") should be provided. All drugs utilized (including their manufacturer) should be referred to using the generic name.

Statistics

The statistical methods utilized to analyze the data should be described in sufficient detail to allow another investigator to replicate the results given the raw data. The significance level used to define statistical significance should be identified as well as the power and sample size calculations determined prior to initiating the study. The method of treatment allocation should be described including any inclusion and/or exclusion criteria.

Results

The data should be summarized and presented in the form of text, tables, or other illustrations. Tables, charts, and graphs should be used, when appropriate, to save space. Data should not, however, be presented in both table and text form. The mean \pm standard deviation of important outcome variables should generally be given for each study group as well as the measurements of statistical significance (i.e., p values and/or confidence intervals) which identify significant differences between the groups.

Discussion

Previously published research on the study topic should be reviewed. The conclusions of the present study should be discussed, based on the data presented in the Results section, as they pertain to the previous research. A description of the clinical applications of the current research should follow as well as an outline of the implications of the study for future research.

- **Acknowledgements**

Those individuals who have contributed to the research, but do not warrant authorship, those who have provided technical assistance, and those who have provided financial help are appropriately recognized at this point in the manuscript.

- **References**

Referenced articles from the medical literature should be listed in the order in which they were discussed using the accepted formats found in *Index Medicus* and in reference 4 at the end of this chapter.

- **Tables**

Each table should be typed double-spaced on a separate page accompanied by its title, legend, and footnotes. Symbols and abbreviations utilized should be clearly explained.

- **Illustrations**

The preparation of illustrations for manuscripts is heavily dependent upon the individual requirements of specific journals. The reader is referred to the "Instructions for Authors" from each journal for specific illustration requirements.

- **Legends for illustrations**

A separate page should be utilized to list the legends for illustrations.

GUIDELINES FOR REPORTING DATA AND STATISTICS

Whenever data is reported in the manuscript, the units of measurement should be included. The International System of Units (SI) should be used (see reference 6) preferentially, although some journals require both the American and SI units to be reported. Data should not be presented with more significant digits than can be conventionally measured (i.e., PaCO₂ = 40 torr, not 39.62 torr).

When data is summarized, appropriate estimations of measurement error should be included such as the standard deviation and preferably, confidence intervals. When p values are used, the exact p value should be reported rather than the traditional "p < 0.05" or "p value not significant", which fail to adequately provide information regarding the statistical significance of the measurement. If significance levels (p values) are utilized, confidence intervals should also be included rather than significance levels alone.

When groups of data are presented, the number of observations should be included to provide the reader with an idea of the sample size upon which the statistics are based.

Statistical methods utilized in data analysis should be described in detail in the Methods section. The statistical method utilized should then be specified along with the data when presented in the Results section. For example, reporting that [p=0.01] is meaningless unless the statistical test used to calculate that value is indicated; thus, [p=0.01; unpaired t-test] would be appropriate. When computer statistics packages have been used in the data analysis, the program name and manufacturer should be identified.

SUGGESTED READING

1. Haynes RB, Mulrow CD, Huth EJ, Altman DG, Gardner MJ. More informative abstracts revisited. *Ann Intern Med* 1990;113:69-76.
2. Ad Hoc Working Group for Critical Appraisal of the Medical Literature. A proposal for more informative abstracts of clinical articles. *Ann Intern Med* 1987;106:598-604.
3. Mulrow CD, Thacker SB, Pugh JA. A proposal for more informative abstracts of review articles. *Ann Intern Med* 1988;108:613-615.
4. International Committee of Medical Journal Editors. Uniform requirements for manuscripts submitted to biomedical journals. *Ann Intern Med* 1988;108:258-265, *Brit Med J* 1988;296:401-405.
5. Bailar JC, Mosteller F. Guidelines for statistical reporting in articles for medical journals: amplifications and explanations. *Ann Intern Med* 1988;108:266-273.
6. Lundberg GD, Iverson C, Radulescu G. Now read this: the SI units are here [Editorial]. *JAMA* 1986;255:2329-2339.
7. Altman DG. Statistics and ethics in medical research: VIII - Improving the quality of statistics in medical journals. *Brit Med J* 1981;282:44-47.
8. Cheatham ML, Chang MC, Eddy VA, Safcsak K, Nelson LD. Right ventricular end-diastolic volume index and pulmonary artery occlusion pressure vs cardiac index in patients on positive end-expiratory pressure [Abstract]. *Crit Care Med* 1993; 22:A98.

SAMPLE SCIENTIFIC ABSTRACT**RIGHT VENTRICULAR END-DIASTOLIC VOLUME INDEX AND PULMONARY ARTERY OCCLUSION PRESSURE VS CARDIAC INDEX IN PATIENTS ON POSITIVE END EXPIRATORY PRESSURE**

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Introduction: Right ventricular ejection fraction (REF) can now be measured using a modified thermodilution pulmonary artery catheter. Using the REF, the right ventricular end-diastolic volume index (RVEDVI) can be calculated and used as an indicator of preload status in critically ill patients.

Hypothesis: RVEDVI correlates significantly better with cardiac index (CI) than does pulmonary artery occlusion ("wedge") pressure (PAOP) in patients with acute respiratory failure treated with PEEP.

Methods: 61 surgical patients [Trauma 24, General Surgery 22, Vascular 11, other 4] were monitored using a REF pulmonary artery catheter (93A-754H-7.5F, Baxter Edwards Critical Care). Patients were ventilated with Servo 900C/E (Siemens) or 8400ST (Bird) ventilators. Oxygenation dysfunction was treated with PEEP titrated to maintain a PaO₂ of ≥ 60 mmHg with FiO₂ ≤ 0.40 . CI was increased through the use of fluid boluses, blood transfusions, or inotropes. The therapeutic goal was to maximize oxygen delivery. Hemodynamic changes on both increasing and decreasing levels of PEEP were recorded. 264 separate sets of data (CI, RVEDVI, PAOP, and level of PEEP) were collected. $p < 0.05$ was considered significant.

Results: Univariate regression analysis demonstrated that CI correlated significantly better with RVEDVI than PAOP at all levels of PEEP. PAOP has an inverse correlation with CI at levels of PEEP > 15 cm H₂O.

	PEEP	5	6-14	15-29	30-50
PAOP vs CI	n	110	72	63	19
	r value	0.08	0.04	-0.36	-0.3
	p	NS	NS	0.003	NS
RVEDVI vs CI	r value	0.24	0.82	0.52	0.71
	p	0.01	<0.001	<0.001	<0.001

Conclusions: CI correlates significantly better with RVEDVI than PAOP at all levels of PEEP. RVEDVI is a more reliable predictor of volume depletion and preload recruitable changes in CI particularly in patients on higher levels of PEEP. Limiting volume resuscitation by arbitrary maximum PAOP values in patients on PEEP may result in under resuscitation.