

# Preparation of Scientific Studies

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## **ABSTRACT**

*The present article aims to guide plastic surgeons in the preparation of scientific studies, whether for publication in domestic or international journals, theses, dissertations or as articles by full members of our society. Three aspects are approached: the initial strategy for developing the study, description and analysis of the parts of a scientific study and the choice of the type of journal. In relation to the strategy for developing the study, the authors describe the usual format, the preparation of the research project, how to obtain grants and scholarships, in addition to guidelines for writing and editing articles. As to the analysis of the parts of a scientific study, the article makes comments on the title, introduction, methods, results, discussion and conclusion. Methods are focused on studies carried out in plastic surgery. How to prepare the abstract and captions is also discussed, in addition to how to prepare pictures and drawings. Choosing the right journal, an essential factor for a scientific article to be accepted, is reviewed, trying to understand how editors choose an article. Special-format articles, such as case reports, literature reviews and theses and dissertations, are also discussed.*

## PREPARATION OF SCIENTIFIC STUDIES

Scientific research should be promoted to enable science to advance. Studies may be presented at scientific meetings or published in books or journals. More recently, the Internet has become another option for promoting research. The presentation of scientific studies in congresses has the advantage of allowing researchers to exchange ideas on the same topic. Written material, however, although not eternal, lasts longer than the spoken word. The scientific life of a book is estimated to vary between 1 and 2 years, while a written article in a journal has a 10-year scientific durability. In the United States, the academic weight of a book chapter is 0.1, while the weight of an article published in a major journal is 1, for selecting university professors. The weight of the authorship of a whole book varies between 1 and 2, depending on its importance<sup>(1)</sup>. Thus, new themes should be published preferably in journals.

### I. INITIAL STUDY DEVELOPMENT STRATEGY

It is not always easy to publish articles in journals. An article may be rejected due to several aspects. The most obvious reason for rejection is when the study is badly designed or conducted. Generally, preparation errors occur due to insufficient or inadequate information, biased samples, misleading parameters, unclear hypotheses and objectives. There are, however, another two common types of errors that may not be detected easily by authors. The choice of the wrong journal is one of these factors. All journals describe their objectives, generally on the instructions page for authors. This is called the journal's focus and it should be respected or the article may be rejected. A journal whose focus is experimental research in plastic surgery will not publish articles on case studies, no matter how good they are. Another factor for rejection is writing. Poorly written articles containing errors in grammar or style may be rejected. Special attention should be paid to articles written in a foreign language in which these types of errors are more common.

### STUDY DESIGN

The format of the study is essential in its preparation. Studies can be classified as follows:

#### I. As to material or cases

- a) Clinical
- b) Experimental
- c) Anatomic
- d) Case Study

#### II. As to the study period

- a) Prospective
- b) Retrospective

#### III. As to selection

- a) Randomized
- b) Non-randomized

The studies currently considered as the "gold standard", that is, most widely accepted within the scientific community, are prospective, randomized, double-blind studies. Double-blind studies are those in which neither patients nor researchers know if the patients included in the study belong to the control or experimental group. Nevertheless, any study model capable of answering the study question (objective) is valid.

### STUDY PREPARATION

The preparation of scientific work begins with the choice of the topic to be studied. Selecting the topic is essential and will impact on the feasibility of carrying out the work proposed and on its contribution to science. Every scientific study should begin with a question, preferably one yet unanswered in medical literature. The articles on the topic selected that were found while studying it, may be the starting point. Every article leaves unsolved issues that may originate new studies.

After defining the topic, one develops an idea of what aspect will be studied. An international literature review begins by using databases, Medline (Index Physician), Exerpta Médica (European origin), Current Contents, LILACS (Latin-American). The search is for the same line or even the same studies. If similar studies are found, one should reconsider whether it is worthwhile carrying out the study proposed. Repeating something that has already been proven may invalidate the work. Nevertheless, studies can be repeated by different methods and achieve results that are different from the stud-

ies found in the literature. Moreover, confirming previous studies, by different methods, may be of vital scientific importance. Systematic literature review, using various databases, may itself offer an answer to that question and may deserve to be published.

After reading the references, a brainstorm on the topic should be performed. Questions on the issue are raised, along with the methods and material utilized and possible variations that could make the work easier to be carried out. Ideally this kind of reflection should be carried out in a group, preferably with colleagues that have some affinity with the area chosen. However, the line of thought should flow freely so as to not inhibit new ideas because of criticism.

## PROTOCOL

The next step is writing the protocol. The protocol is a synthetic way for organizing all the data that need to be obtained to carry out the study. All possible necessary data for the study should be anticipated, because it is better to have more data than less. The researcher should make an effort to spend time on this item. A poor protocol may have negative consequences or even bring the work to an end.

If there is a tutor, the study should be presented, during this phase, as follows:

- I. Introduction (and objective)
- II. Methods
- III. Protocol
- IV. References

The sample (n) is a group selected that should be representative of a universe. The selection of the sample should obey inclusion and exclusion criteria that ought to be defined during this phase. The sample size should be estimated in cooperation with statisticians who will base themselves on standard deviations. A pilot plan may be valuable for determining the number of cases to be studied. At this point, an ethics committee should evaluate the study. Currently in Brazil, any clinical, experimental or anatomical study is required to be submitted to and assessed by the institution's ethics committee.

After discussion with the tutor, the study is carried out and data collected. The data will be submitted to statistical analysis (when necessary) and the study will be written. With the results in their hands, researchers write the Results, Discussion and Conclusion.

## WRITING SCIENTIFIC STUDIES

Some points should be observed when writing scientific articles: 1) Use direct order in sentences; 2) avoid long sentences, dividing them with a period; 3) always use the most simple term possible; 4) always use concrete and specific terms.

All articles undergo some maturation phases. It is difficult to specify these phases, because they happen simultaneously. The sequence should be: 1) put down ideas in writing; 2) put ideas in order (re-group paragraphs, coordinating topics in a logical sequence); 3) brush up the text (correct grammar, agreement and style). It is worth printing out the article in order to make corrections at each phase to make it easier to see the points to be corrected.

Physicians who are beginning in the art of writing very commonly make the mistake of using the pronoun "we" in scientific texts. This is a habit transferred from oral presentations, in which "we" can be used. When writing an article, the author should be careful to be formal, by using terms such as "The study proved..." or "The results indicate...".

## II. ANALYSIS OF THE ITEMS OF A SCIENTIFIC STUDY

### TITLE

The title is the major tool for convincing the reader that the article is worth reading. That is why it should be short but complete, easy to understand and convey the proposition of the scientific work. Ideally and if possible, it should be one line in length. If it is difficult to create a title and it can be phrased as a question, based on the objective of the study. This type of title generally translates the purpose of the study and attracts the reader.

### INTRODUCTION

The introduction aims to inform the reader about what is available in the international literature on

the topic. It should be short and objective, above all in articles for journals. This item should demonstrate the relevance of the study, with concise quotes and statistics. The objective of the study should be put in the last paragraph.

The objective is the question the study proposes to answer and, at the end, it should do so, whether positive or negative. There usually is only one question; however, throughout the study, other answers can arise, even unexpected ones.

The introduction and abstract are the first impression the reviewers of the journal get from the article. In this manner, they merit special attention from the author, because they increase the chances of an article being accepted.

## METHODS OR CASES AND METHODS

This item describes the material used in the work (or cases, in the case of patients) and how the experiment was performed.

The details that limit and describe the sample should be included at this point. When the study involves animals, types (race), gender, age groups, etc. should be described. In the case of corpses, gender, age, race, origin and *post-mortem* condition should be reported. When the study focuses on synthetic material, the technical standards, description of the substance from which it is made and reference to the company that manufactures it are essential data that should be described. For patients, gender, age, period in which the study was performed, type of selection (random, consecutive, etc.), origin (hospital, clinic, etc.) are the basic data that should be included. The sample should also include Body Mass Index (BMI) in studies of body contouring and anthropometric measurements.

## MATERIAL

Some considerations and particularities of the different types of Material or Cases will be described below:

### 1. *Synthetic Material*

A study is *in vitro* whenever it only utilizes synthetic material. This type of study is rare in plastic surgery, although silicone, polyurethane prostheses, biocompatible materials can be tested in the lab.

This type of research is generally carried out along with experts in bioengineering.

*In vitro* studies can also be performed with biological products such as botulinic toxin, tissue culture and growth factors (related to molecular biology).

### 2. *Animals*

In studies with animals, care should be taken as to the experimental model to be selected. The fact that some animals may grow, depending on their age, should be taken into consideration. In these cases, the final parameters of studies that need linear or surface measurements (flaps, donor grafting area, expanders, etc.) will change. There are animals whose subcutaneous cell tissue is minimal and generally located in the inguinal region (rodents, for example). In this fashion, in order to study liposuction, some kinds of pigs are good experimental models. In relation to the subcutaneous space, it is important to point out that almost all mammals have a structure named *panniculus carnosus*. This structure is a layer of lamellar muscle located under the skin, whose function is to contract the wound fast. The functional purpose of the *panniculus carnosus* is to decrease hemorrhage and reduce the bleeding area, reducing second intention healing time. In humans, over evolution, this layer regressed and has been replaced by reminiscent equivalents such as the SMAS, platysma and probably the Scarpa fascia. Animals with *panniculus carnosus* are not adequate models for studying healing or burns, because the reference points are lost after the procedure.

Other factors should be taken into account whenever using animals. The action of Animal Defense Committees has been growing in Brazil. In the United States, these committees are made up of veterinarians, physicians and members of animal protection associations. In the US, each animal can be submitted to only one intervention or experiment. These committees judge if the type of experiment does not make the animal in question suffer and they even discuss the experiment method. The more highly developed the animal is on the biological scale, the more these groups resist these experimental studies. Protocols with monkeys, dogs and cats are less likely to attain approval.

The size of the animal is directly related to the cost of the experiment. Small animals (mice, rats, guinea

pigs) are cheaper, require less expenditure, and anesthesia can be intraperitoneal, making the presence of a technician unnecessary. Large animals (pigs, dogs and monkeys), on the other hand, require more ample accommodation and general anesthesia; therefore they cost more. The aggressiveness of each animal should also be taken into account. Guinea pigs and mice are tamer and easier to work with. Some types of rats are more aggressive. Animals should be separated in different compartments in the postoperative period in order to prevent them from injuring others' postoperative incisions or wounds. There is also a chance that some animals may die, so the number of animals for the research project should be overestimated. The choice of the animal to be studied can be based on studies similar to those found in the literature.

### 3. *Corpses*

The major advantage of utilizing corpses in studies is the fact they do not need follow-up; but the major challenge is finding something that has not been studied in anatomy yet. For plastic surgeons there are dissection limits that generally should be respected in fresh corpses (face, hands and legs). The *post-mortem* period determines the level of deterioration and post-mortem rigidity and should be taken into consideration depending on the type of study. Corpses should be selected by age group and gender, according to the group to be studied. In a study on the changes of the abdominal wall during pregnancy, for example, corpses of 70 to 80 year-old men cannot be selected.

### 4. *Patients*

Patient selection should be based on the target group of the study. For example, when selecting 100 30-year-old patients in order to study face proportions and apply them to 55 year-old patients that wish to submit themselves to face-lifts. This study would be affected by a method planning error. Another similar example is to study childless patients, applying this knowledge to cases of abdominoplasty. In other words, the sample has to be significant in relation to the universe to which the thesis will be applied. The random selection, of consecutive patients, generally decreases the possibility of error, when well applied. For example, in order to study the next 20 patients to be submitted to abdominoplasty, these patients, in general, should

have a mean of two children and be in the 30 to 45 year-old group, which will be representative of the universe to which the conclusions may be applied. Thus, age, gender and the form of selection are major factors.

The advantage of studying patients is that they are generally the ideal experimental model. However, the ethical limits that should be respected may restrict the array of methods to be utilized, thus limiting conclusions. The major obstacle in this type of study is the follow-up, because people can move or lose contact due to change of address, telephone or still simply because they do not want to return.

## METHODS

The key features of methods should be feasibility, reproducibility and simplicity. In order to accomplish that, there should always be a pilot plan. The pilot plan consists in testing, with some people, animals, corpses, or aloplastic materials, what we plan to do as method. These tests may be included in the paper or not. The pilot plan has the purpose of checking possible flaws in the method and improving it, or checking its feasibility.

Any value that may vary when measured should be checked by more than one observer. If there are two observers, the method should include how to break a tie (maybe including a third observer), except if the statistical method does not need to break ties. Evaluation can be done by physicians and, in aesthetic surgery, by laypeople (even by patients themselves).

The description of the method should be detailed so that it is reproducible. In the case of theses, the description should be thoroughly explained, irrespective of the number of words. In contrast, in papers to be published in journals, this item should be at one time descriptive and as brief as possible.

## STATISTICAL ANALYSIS

At the end of the method, the author should explain the statistical analysis used. There are basically two large groups of statistical tests: 1) parametric (best known); 2) non parametric (not so widely used). If the method is unusual, some journals ask authors to describe them in the methodology. The most widely known methods should be used whenever possible. A professional statistician

should be involved in the study so as to avoid mistakes. Although there are software packages that perform statistical calculations, if there is any mistake in the preparation or interpretation of the tests, it may affect the conclusions of the study. Researchers should pay attention to statistical results that do not have clinical relevance. These results should be excluded from the study or mentioned as data without clinical validity.

## RESULTS

Results should be reported clearly and may be shown in three manners: A) in the text, for single values or little data; B) in tables that facilitate the presentation of some types of data. In the case of numbers with decimal or centesimal places, data are better visualized than when presented in the form of charts; C) in charts that display the notions of evolution, comparison, and fractions of a total. Values are easily seen when the right charts are used; charts grab readers' attention

When numbers are written in the text, they should usually be written as figures. However, there are some journals that tell authors to spell numbers from one to ten. At the beginning of sentences, numbers should be spelled, for example: "Twenty of the animals studied...". When numbers are separated by commas, close to each other in a sentence, one of them should be spelled and the other should be written as an Arabic numeral. For example: "Of the four, 3 presented...". When there is a measure unit or a percentage symbol associated with the number, they should always be represented by Arabic numerals, "4 ml, 5%, etc".

Results should not appear twice in the paper, in different forms of presentation. If values are put in a table, they should not be also presented in charts. Both tables and charts should have a self-explanatory title.

Tables have great visual effect. They may have words, numbers or statistical data. Tables are used to summarize results and not to present all the data collected. There is a practical rule according to which there should be approximately one table for every 1,000 words.

There are many types of charts; however, the most widely used are:

1. Line Chart (x-axis/y-axis). It is good to provide the idea of evolution (growth, reduction). It is also indicated in more complex studies to represent several variables;
2. Bar Chart. It can be used to give the idea of evolution. A chart with multiple bars (double, triple) can be used to compare groups, over time, for example. In this case, it is better than a linear chart, because it facilitates reading. It is generally used with bars on the vertical position. It may also have horizontal bars, to show cause and effect relations.
3. Pie Chart. It is ideal to represent fractions. It is indicated to present distribution by gender, age, localization of injuries, etc.

Tables and charts should have a concise and clear title. The size of the sample should also be specified ("n"). The statistical test used, standard deviation and p value (or equivalent) should always be mentioned, no matter how the results are presented (in tables, charts or in the text).

In the item Results, values should only be reported, and never commented on or justified. The interpretation of results should be done in the Discussion.

## DISCUSSION

The discussion is the soul of scientific papers. It expresses the opinions of authors in relation to the study theme and enables comparison of the results obtained with the data available in the literature.

There is a well-defined order that makes understanding the discussion easier, however, it is hardly ever followed in scientific studies.

It should start with the discussion of the introduction. In this phase, the current scenario of the focus-problem is discussed, in depth, mentioning the relevance of the practical application of the study.

Next, the discussion should address the reasons for choosing the materials or cases. In the case of studies with animals, the reasons for which animals were chosen. In the case of corpses, what led researchers to use them and what are their advantages in relation to living beings (muscles may vary with anesthetics, making their in-vivo evaluation difficult).

Each item of the method used in the evaluation should be addressed.

After this analysis, the results obtained should be discussed and analyzed. The values obtained should be compared against data from the literature and comparisons should be discussed.

The discussion continues with the free expression of the authors in relation to the results and their potential consequences and applications. It is then that authors may talk more freely about the theme, presenting their hypotheses and considerations. Future paths to be followed in the study of that issue are mentioned.

## CONCLUSION

Today, there is a trend toward writing the conclusion as a last paragraph of the discussion, without making it into a separate item.

Authors should necessarily close with an answer to the initial question of the study, expressed in the objective. Every paper should have at least this conclusion. Nevertheless, other conclusions may have been achieved during the study.

## ABSTRACT

The abstract should only be written after the whole paper is ready. It should include as much detail as possible, as objectively as possible. It should follow the sequence of items in the paper. In this manner, the introduction, methods, results, discussion and conclusion are summarized. All items should be included. It is extremely important that the abstract be like that, because it has the role of inviting readers to read the full version of the paper.

## FIGURES (PHOTOS AND ILLUSTRATIONS)

### *Photos*

Photos should always show, as far as possible, aspects of the operated areas. They should include easily identified areas (for example, ear or nose, for face injuries). Whenever possible, patient identification should be avoided (in the case of body photos, it is not necessary to include the face). Preoperative photos should frame a similar area and contrast with postoperative photos. In this manner, it

is important that photos follow a pattern for the background, distance, light, and frame (or angle). Any patient having their photo published, even for scientific purposes, should sign a consent form giving permission for the public exposure of the material.

### *Illustrations*

Illustrations should be easily identifiable anatomically. The role of these figures is to be as self-explanatory as possible. It should be mentioned that color photos or illustrations are paid for by authors; therefore, they should only be used when necessary for understanding the text.

## CAPTIONS

They should not repeat the text, but complement it. After reading captions, readers should completely understand the figure they refer to. They are very important in capturing the interest of readers towards the paper.

## BIBLIOGRAPHICAL REFERENCES

Only references quoted in the text should be listed in this item. Every journal has its own system for writing and grouping references. Some request that references be put in alphabetical order and others in the order they appear in the text. References, with rare exceptions, should only be quoted in the introduction and discussion. When a method cited or described in another paper is used, it may be necessary to include some reference to them in the Methods section.

There are software packages that collect references on the Internet, format them according to the guidelines of the journal chosen, and put the reference in the text.

## III. CHOOSING A JOURNAL

There are many factors to be taken into account when choosing a journal to publish a paper. Initially, poor quality journals or those with limited circulation do not reward the effort of preparing a scientific study for them, although it is easier to be accepted for publication in them. On the other hand, not every paper is accepted by major journals. The scientific relevance of the study should be considered, and then it should be submitted to a suitable journal.

The journal should be chosen at an early stage, so that its preparation follows, from the beginning, the guidelines for authors. Some items are fundamental in the choice of a journal, such as whether it is indexed or not, who is its reading public, the language it is published in, and the impact of the publication.

Certain articles will only find space in national journals, because the issues they address are only relevant to a specific country or region.

Good journals are impartial because they are controlled by companies that seek profit, and, therefore, they should publish the greatest number possible of quality developments in a given specialty. Journals are rated by the "Journal Citation Report"<sup>(3)</sup>, responsible for ranking indexed publications. Each journal receives a score called "Citation Index", calculated in the following manner: the number of times articles published in the journal were cited in the past 2 years, divided by the total number of articles published by the journal in the same period (Table I). An article that was cited 30 thirty times is regarded an important scientific contribution.

## EDITORIAL EVALUATION IN JOURNALS

The material submitted to the editor is sent to one or two reviewers who are experts in that specific matter. The report of reviewers is based on free observation and on a questionnaire about the study. Reviewers answer questions like: 1) Has any similar article been published in the past five years? 2) Has the article been written: objectively, unclearly, is it too wordy (a common mistake among Latins)? 3) How much review is necessary: a little, a moderate amount, a lot?

Reviewers may accept it, reject it or ask the author to review it, suggesting corrections. If it needs reviewing, the editor of the journal will return the paper to the author. After corrections are made, the paper will be re-assessed by the same panel of

reviewers of the journal. In this manner, it is important to correct the flaws initially indicated so as to improve the chances of the study being accepted. Studies are hardly ever accepted without reviewers asking authors to make corrections to them.

The chances of an article being accepted by major journals is 11%<sup>(1)</sup>. The experience of the author may certainly make this percentage more favorable. There are some journals that allow authors to choose reviewers. These journals also allow authors to indicate reviewers who they would not like to evaluate the study (for example, the *British Journal of Surgery*). The literature confirms that in these conditions<sup>(1)</sup>, the chances of a paper being accepted by a journal increase.

Two questions emerge then:

1. Are all accepted studies excellent and will they provide the guidelines for the following steps in the specialty?
2. Should studies that were not accepted be abandoned and destroyed?

There are many papers whose ideas are just abandoned or replaced by new techniques in a few years. In this manner, although these studies are of excellent quality and were assessed by strict editors, their content may not provide the expected contribution.

The second answer is also negative. Many prize-winning papers were initially rejected. This may occur for many reasons: 1) The scientific community is bound to rigid concepts; 2) The reviewer may have a line of thought that disagrees with the author's; 3) political motivation. For this reason, one should not give up trying other publication sources after being rejected once.

When writing a paper in English, send it to a specialized proofreader if you are not absolutely confident of what you have written. Coates *et al.* analyzed 120 studies sent for revision, and proved that poorly-written papers exert a negative or subliminal influence on the evaluation by reviewers<sup>(2)</sup>.

## SPECIAL PAPERS

### Case Report

Initially, authors should check if

Table I

Journal	"Citation Index" <sup>**</sup>
Aesth. Plast. Surg.	0.414 <sup>†</sup>
Ann. Plast. Surg.	0.864 <sup>†</sup>
Plast. Reconstr. Surg.	1.423 <sup>†</sup>

"Citation Index" of some plastic surgery journals.

\*According to the "Institute for Science Information". <sup>†</sup>These values are periodically updated.



the journal accepts this type of article, because not all of them do, or they only accept a limited number of them. The case report should contain new and highly relevant scientific findings. The summary of the case should be objective and the patient should not be identified. It should have an introduction, case description, and discussion.

#### *Literature Review*

The author should find out if the journal accepts this type of study. The author should understand that reviews are arduous tasks; therefore, they should be written in a dynamic manner, placing emphasis on the latest developments to the theme. Its structure does not follow that of a study scientific (Introduction, Material and Methods, etc.). However, there should be a logical division by topics. In these studies, it is important to make clear the reason that led the author to choose the theme, his literature search methods, the limitations of the papers studied and the conclusions of that review. They should focus on the systematic review of the literature, which gives more relevance to the study.

#### *Theses and Dissertations*

Their introductions are longer and, in this type of publication, the item Literature Review is adequate. There is no space limit; however, they should not have too many words so as to not hinder readabil-

ity and be unpleasant to evaluators. In the case of theses, all the data should be put in tables in the item Annexes. For both of them, there usually is a writing manual supplied by the institution to which they will be submitted.

In short, everyone involved in the treatment of patients has a duty to publish data, studies and clinical cases. Every scientific study is a little piece that will form a larger mosaic, which will be the base of plastic surgery to be inherited by the fellow professionals who start it.

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