Seven easy steps to getting started in scientific writing…

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Once you've analyzed all the results from your study, then comes the often daunting task of getting started with the writing. Here are seven "easy" steps that should get you well on the road to writing your manuscript as well as make you feel good about the task that lay ahead. The steps are:

1- In one sentence, what is your main message?
2- So what? Importance What are you saying that we don't already know? How important is your message?
3- Who cares? Audience To whom do you wish to communicate your message? Your audience(s).
4- What are the main issues you want to write about? To answer this question you will use the structured abstract format as a working document with bullet point answers.
5- What's the title, a provisional title?
6- Who are the authors?
7- Which journal? What format?

Write short answers to the 7 questions. No need for elaborate answers; this is just a starting point. Writing is a constant process of surveying all you could write about and making discriminating decisions about your purpose, your audience, and your forum. Below are comments about each step, followed by an example.

Getting started in 7 easy steps…

*1- What is your **main message**?*

Imagine that someone comes up to you and asks you: What's the main conclusion, the bottom line from your study? In one sentence, what would you answer? What's your main message? The answer to this question will become the centerpiece, corner stone of your paper.

*2- What are you saying that we don't already know? How **important** is your message?*

Journal editors, and the eventual readers, see this as the "So-what?" question. What does your study and results add of substance to the literature? What are you saying that we don't already know? This question addresses issues of importance and relevance. What are you contributing to the field that is worth paying attention to? Studies may have tremendous local importance but do not add substantially to the literature. You need to convince the editor that your manuscript does contribute significantly to the field.

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*3- To whom do you wish to communicate your message? Your **audiences**, one main, one alternate.*

Given your research topic and specific study, to whom do you wish to tell your results, your conclusions? This is the "Who-cares?" question. You can think of audiences in terms of three broad categories of people: teachers (the practical outcomes), administrators (the organizational outcomes), and researchers (the theoretical and methodological outcomes). (Note that the audiences may also be closely related to the previous question on relevance and importance.) You may be interested in communicating your results to all three audiences, but scientific journals may only focus more precisely on certain audiences; for example, while *Medical Teacher* is oriented towards practical outcomes and advice for teachers, *Advances in Health Professions Education* is more oriented towards theoretical and methodological issues. Of the multiple audiences, first state the one that you would pick first, and then your second alternative choice. In reality you may find a journal that caters to both or you may eventually split the manuscript in two, one for each journal (audience). Answer this question by stating your (a) main audience and (b) an alternative.

*4- What are the main issues, **key points**? …using a working **structured abstract format**.*

The ultimate purpose of an abstract is to present to the readers a summary of your study and findings. Usually this is done once you have written the whole manuscript and the pieces are all laid out. Another way of looking at this is to use one particular type of abstract, called the structured abstract, as an initial advance organizer to help you as you begin to write your paper. It has the advantage of forcing you right from the beginning to lay out the key topics and main points that you will be writing about. It is in essence a paper in miniature, and thus its usefulness as an organizer. The classic "structured abstract" contains nine sections, each addressing a main question in the reader's mind, that is:

1- Background (What's already known? Why did we do this study?)
2- Objectives (What did we intend to do? What are the goals, research questions?)
3- Design (How did we answer the research questions?)
4- Subjects (Who participated?)
5- Setting (Where did it take place?)
6- Intervention (In the case of an experiment, what did we manipulate?)
7- Outcomes (What did we observe, measure?)
8- Results (What did we find?)
9- Conclusions (What do the results mean? So what?)

Write your working abstract spontaneously, as you see the information in your mind at this time. Remember this is an advance organizer and a working document. You will have the chance to refine it as you go along. Don't worry about details for the moment, just focus on the main issues or key topics that you want to address in each section. Write in a bullet form, not in complete sentences, and limit the number of bullets in each section, focusing only on the main issues. It's like making an initial list of key points. This working abstract, especially in its structured format, forces you to state the central messages, to make decisions about what is crucially important in the work you want to report. It also helps you get a sense of the big picture and all the components that will eventually go into your paper. Thus when you are deep into writing the details of any one particular section of your paper, this initial structured abstract is always there to remind you of where that particular section fits and how it relates to other parts of the paper. It's a big-print roadmap.

The structured abstract itself has many advantages. It is a uniform way of reporting information to the

readers. It covers all the components of the study and guarantees that more complete information is presented. The usual length of a structured abstract is 250 words; some electronic forms allow up to 400 or 450 words (you will need to check the maximum length allowed by the journal you will be submitting your manuscript). For the moment don't worry about length, just make an initial list of key points. The details and writing will come later. Also, remember that this is a work in progress. You will have ample opportunities as you go along to add or subtract. The purpose for the moment is to get you started and to have a clearer sense of the big picture of the manuscript you are going to write.

*5- A **working title**.*

On the basis of this brief information in your working structured abstract, if you were going to give a title to your prospective paper, what would it be? The same way that a working abstract helps you organize things, a working title will help you focus on your central messages. At times, your title will help guide the structure of your paper, but at times the content of your paper will force you to reconsider your title.

Huth (the former editor of the *Annals of Internal Medicine* and a scholar of scientific writing in medicine) describes two types of titles, the ***indicative*** title, that is, what the study was about, and the ***informative*** title, that is, the message emanating from the study. Combining both aspects, indicative and informative, makes a title even more complete. For example, consider the following title: "A Factor Analysis of an Oral Examination in Pediatrics." This title is indicative. It tells the readers what was done but not what the results showed, what factors were important. To add an informative aspect to this title, the author could say: "A Factor Analysis of an Oral Examination in Pediatrics: Importance of Problem Solving, Communication, and Satisfaction." The latter part of the title now conveys the message, the factors. Remember, the title will become your shortest possible abstract! The decision to read an article often rests on the appeal of the title, thus its crucial importance.

To help you prepare a title, begin by making two lists of keywords, one indicative, the other informative. Then play with the keywords until you have a clincher! The use of a colon can help you combine the two dimensions (indicative : informative). For now, the purpose is simply to get you started and to have a provisional title to hang your study on as you write the paper. It too will evolve, grow on you with time.

*6- Who are the **authors**?*

The last piece of information you need to think about at this stage is authorship. Authorship presents two challenges. Who is an author? And, who is the first author? Huth and the scientific community overall are becoming very specific about criteria for authorship because of the ever growing inflation in the number of authors included on papers. The following criteria should be applied (from Huth):

"Each author should have participated sufficiently in the work to take public responsibility for the content. Authorship credit should be based only on substantial contributions to:

(1) Conception and design, or analysis and interpretation of data; and to
(2) Drafting the article or revising it critically for important intellectual content; and on
(3) Final approval of the version to be published.
Conditions (1), (2), and (3) must all be met."

Huth defines responsibility for the content as the ability to defend publicly the intellectual content of the paper, that is, to justify the conclusions of the paper, including defending the evidence and counter

evidence weighed in reaching them. Certain other conditions, in and of themselves, do not justify authorship, namely:

1- Acquisition of funds,
2- Collection of data,
3- General supervision (administrative leadership), and
4- Proofreading or editing the drafts for style and presentation, not ideas.

The opposite phenomenon to gift authorship is also important to notice, namely "absent" authorship where contributors eligible for authorship are left out, either because of personal or political reasons.

Second, who is the first author? The first author assumes the leadership and the main responsibility for the paper. There is no universal interpretation or rule for the order of the authors, except that the first is the main author and the main person responsible for the study and paper overall. As for overall order, a good strategy is to list by order of involvement or in alphabetical order if no other method works. Remember that you have two other options to acknowledge people's contribution to the study. You can list them in the *Acknowledgements* section or in the *Collaborators* section (e.g., in a multi-center study). Some scientists and readers consider the last author as the "senior" author, the one who mentored the research team. Be aware that there is no steadfast rule about the meaning of the last author.

There are three main reasons for determining authorship at this early point, if not sooner. The first is to make sure that every author satisfies the criteria for authorship. Second, the first author becomes the leader for the writing task ahead, assigning specific tasks to each of the remaining authors. Finally, by postponing the decision about authorship, not only will individual responsibilities be blurred, but also bad feelings may arise if more than one author believes (feels) they should be the first author. Better settle the matter early and clearly based on sound criteria and civil discussions. Remember that journals will require that each author individually sign a statement indicating that they satisfy the criteria for authorship. Some research teams decide authorship even before beginning the study and assign responsibilities accordingly.

7- Which journal? What format? What's the best match for your "topic or message" and your "audience." Sample journals in your library or on-line for similar topics and note the journals that publish articles on your topic and assess your chances of being accepted for publication. Overall one can classify the journals into 5 main categories:

1- Journals entirely devoted to medical or health professions education (e.g., Acad Med, Med Educ)
2- General clinical journals (e.g., JAMA, CMAJ, NEJM)
3- Specialized or local clinical journal (e.g., Annals Surgery. J. Fam Practice, Eastern Mediterranean J)
4- Specialized health journals (e.g., Evaluation and the Health Professions)
5- Education, psychology, or sociology journals.

In addition you can consider three other types of publication media: conference proceedings (e.g., The Ottawa Conference, the October RIME Supplement in *Academic Medicine*), bulletins, (e.g., PERN – Professions Education Researcher Quarterly, CAME – Canadian Association for Medical Education), or books (e.g., the Springer series).

You also need to decide on the best format. Should it be published as an Original research, Short report, Case report, Review, Really Good Stuff, or a Letter to the editor?

Select your one preferred journal plus one alternative and indicate your preferred format. Gather examples of similar articles and get a copy of the Instructions to authors.

An example

Here is an example of the seven steps, written in bullet form.

1- Main message: To fulfill their job, directors of educational programs use a variety of managerial & leadership skills, that can be learned, while maintaining a vision, an open-mind, and trust.

2- Importance:
- little is known about the skills and attributes of directors of educational programs
- the list of skills and attributes can be used to hire new directors, evaluate existing ones, or plan educational programs for them

3- Audience:
- departmental heads, deans, employers
- directors of educational programs themselves

4- Working structured abstract:

(1) *Background*:
- educational program directors have multiple and diverse duties, "wear many hats"
- they must constantly adjust to current and future demands
- little has been published on skills and attributes
- various conceptual frameworks to categorize skills and attributes

(2) *Objective*:
- obtain a list of desirable skills and attributes of prospective educational program directors (defined generically)
- as perceived by superiors or employers

(3) *Design*:
- international mail survey
- one-page, open-ended questionnaire

(4) *Subjects*:
- potential employers of program directors
- non-random sampling; n=623 solicited
- from the various health professions
- deans, department heads, chief executive officers
- schools, hospitals, professional organizations

(5) *Setting*: - survey from DME at UIC

(6) *Outcomes*:
- skills of directors of educational programs
- personal attributes

(7) *Intervention*: N/A

(8) *Results*:
- 139 subjects of 623 solicited; 22.3% response rate; proportional to professions solicited and regions sampled worldwide
- number and nature of the responses quite similar across health professions
- data combined across professions
- nine leading skills: oral communication (53%), interpersonal skills (40%), competent

practitioner (31%), educational goal-definition skills (29%), instructional design skills (29%), decision-making skills (29%), team worker (28%), written communication (23%), and fiscal manager (23%)
- three leading personal attributes: visionary (34%), open-minded (27%), and trustworthy (21%)
- five rubrics: health professional, educator, leader & manager, researcher, personal attributes

(9) ***Conclusion***: - importance of leadership compared to managerial responsibilities
- need to train future educational program directors
- lists can be used by employers or administrators to build checklist items for hiring or reviewing program directors or to plan and evaluate training programs

5- ***Working title****:* An international Survey of Skills and Attributes of Educational Program Directors: Importance of Leadership Qualities

6- ***Authors****:* G. Bordage, R. Foley, & S. Goldyn

The first two authors initiated and conducted the study. S. Goldyn started as a research assistant on the project. She quickly became involved in the design of the study, by suggesting important conceptual frameworks, and in the interpretation of the results and the writing. Her role went beyond simply processing data and satisfied all three criteria for authorship.

Note the bullet points. At a glance, you already have a glimpse into the paper as a whole, a sense of the big picture. Not the details, simply the key points. These will serve as reference points, buoys to guide the detailed writing to come. You can go through the six steps in just an hour or so, a great investment for things to come and a great sense of accomplishment towards something worthwhile and useful.

7- ***Journal***. To give you a sense of the finished product, here's the reference to the published paper: *Med Educ* 2000; *34*:206-210.

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1- In one sentence, what is your main message?

2- So what? Importance What are you saying that we don't already know? How important is your message?

3- Who cares? To whom do you wish to communicate your message? Your audience(s). *Who cares?*

4- What are the main issues you want to write about?
Structured abstract format:

1-	Background	What's already known? Why did we do this study?
2-	Objectives	What did we intend to do? What are the goals, research questions?
3-	Design	How did we answer the research questions?
4-	Subjects	Who participated?
5-	Setting	Where did it take place?
6-	Intervention	For experiments, what did we manipulate?
7-	Outcomes	What did we observe, measure?
8-	Results	What did we find?
9-	Conclusions	What do the results mean? *So what?*

5- What's the provisional title? Indicative (what the paper is about)
Informative (the message)

6- Who are the authors? Substantial contributions to:

(1) Conception and design, or analysis and interpretation of data; and
(2) Drafting the article or revising it critically for important intellectual content; and
(3) Final approval of the version to be published.

7- Which journal? Best match for your topic and your audience.
One preferred journal plus one alternative; instructions to authors.
Format? Original research, Short report, Review, Really Good Stuff, Letter to editor…

Getting down to writing. Some helpful tips…

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Ce que l'on conçoit bien s'énonce clairement,
Et les mots pour le dire arrivent aisément. Boileau – L'Art Poétique, 1674
What one conceives well is stated clearly,
And the words to say it come easily.

With some clear idea about what you want to write, then comes the actual writing… Here are some elements to consider while writing your manuscript.

1- Organization:

- Protected writing time. Set aside some protected time for writing such that you don't lose your momentum, for example half a day, twice a week, or one whole week dedicated to writing. Without a set schedule you run the risk of tending to other "pressing" priorities and losing the necessary momentum to sustain your writing. Then you end up having to "start all over again" every time you sit down to write, a discouraging prospect! What will your writing schedule be?

- Responsibilities. Who is responsible for what section? Who is responsible for coordinating the work?

- Deadlines. When is each section due? When is the final manuscript due?

2- Steps in writing.

- Pre-writing. With your working title, bullet-point structured abstract, and format in hand, prepare a detailed plan (extended bullet points) for each section of the manuscript, that is, Introduction, Methods, Results, and Conclusion.

- First draft. Remember, it's a first draft, not perfection. Write as the ideas come to you. Don't worry about style or logic. Just get the ideas on paper. There will be plenty of time to refine later. Number your lines in your manuscript to facilitate communication with other authors.

  There is no rule that says you must start with the Introduction and move through each section to the Conclusion. Start where you feel most comfortable. Often the Methods section is the most straightforward and might be a good starting point. Avoid writers block by referring back to your pre-writing plan and by going to whichever section you feel most comfortable with.

- Second, third, fourth… drafts, each time refining progressively. There are three dimensions to writing:

- Conceptual: more abstract, including:
  - expressing your ideas directly (don't have the readers inferring or guessing)
  - making your logic clear
  - selecting only relevant information
  - using precise, accurate words

- Structural: the components (sections, paragraphs, sentences), including:
  - Result section only contains results, no interpretations
  - Methods section contains all that is necessary to understand the results
  - Discussion section contains a summary of the findings and the authors' interpretation
  - Paragraphs: Leading sentence – Body – Transition or conclusion
  - One topic per paragraph
  - One idea per sentence
  - Sentence: Subject- Verb – Complement
  - Parallel structure (verb-verb; noun-noun; three goals – three results)
  - Order: importance, alphabetical, chronological, sequential, classification

- Mechanical: concrete aspects including:
  - Spelling (use a spell checker)
  - Style (e.g., active voice; use first person only if allowed by journal)
  - Grammar
  - Uniform terminology (don't vary the terminology; always use the same word or expression; otherwise the reader may be confused whether you are referring to something new).

Start refining at the conceptual and structural levels first; then tackle the mechanical. Also | remember to number each draft because you may want to come back to earlier versions later on. If you overwrite or cut and paste you will lose what you wrote initially.

- References. Use the style required by your intended journal, either Vancouver style (sequential numbers) or Harvard (written alphabetically). Consider using a reference manager software.

- Title. Now you are ready to finalize your title. Is the title:
  - Indicative (what was done)
  - Informative (the message)
  - Representative of the content and scope of the study (not misleading)
  - Clear
  - Concise (shortest possible abstract)
  - Captivating; grabs the attention of the reader.

- Abstract. Prepare the abstract (summary) according to the format used by your selected journal. Even if the journal uses a free style or an IMRAD (Introduction-Methods-Results and –Conclusion) format, try to include all the information contained in a structured abstract. Is your abstract:
  - Complete (see elements of the structured abstract)

- Precise, accurate
- Well supported (including data)
- Scientific tone
- Uses maximum word limit allowed

- Authors. Each author has brought substantial contributions to:
  (1) Conception and design, or analysis and interpretation of data; and
  (2) Drafting the article or revising it critically for important intellectual content; and
  (3) Final approval of the version to be published.

  Other contributions can be included in an Acknowledgement or Contribution section.

3- Before submitting your manuscript:

- Friendly critique. Before submitting your manuscript to your selected journal, have a couple of colleagues read and provide a friendly critique of your manuscript. Select colleagues that were not involved so that you can get a fresh perspective on your work. What might appear quite logical or clear to someone involve in the project, may not be that obvious to some else. If you're not sure about your writing, consider hiring a copy editor.

- Cover letter. Remember: So what? Who cares?

Top 20 reasons (negative comments) given by reviewers recommending rejection of a manuscript. (123 manuscripts out of 155 submitted to RIME in 1997 and 1998 (79%)). *From Bordage, G. Acad Med, 2001, 76:889-896.*

	Nbr	%	Cum. %
1- Inappropriate, incomplete, or insufficiently described statistics	111	10.9	10.9
2- Over-interpretation of the results	92	9.0	19.9
3- Inappropriate, sub-optimal, insufficiently described instrument	77	7.6	27.5
4- Sample too small or biased	59	5.8	33.3
5- Text difficult to follow, to understand	41	4.0	37.3
6- Insufficient or incomplete problem statement	41	4.0	41.3
7- Insufficient data presented	36	3.5	44.8
8- Inaccurate or inconsistent data reported	36	3.5	48.3
9- Inadequate, incomplete, inaccurate, or outdated review of the literature	31	3.2	51.5
10- Title not representative of study	27	2.7	54.2
11- Defective tables or figures	27	2.7	56.9
12- Scores insufficiently reliable or unknown reliability	22	2.2	59.1
13- Unimportant or irrelevant topic	22	2.2	61.3
14- Intervention (independent var.) insufficiently described or confusing	21	2.1	63.4
15- Subjects insufficiently described	20	2.0	65.4
16- Lack of conceptual or theoretical framework	19	1.9	67.3
17- Under-interpretation of results; ignoring results	18	1.8	69.1
18- Incomplete abstract	17	1.7	70.8
19- Potential confounding variables not addressed	17	1.7	72.5
20- Inappropriate or insufficient description of sampling procedure	15	1.5	74.0
Total:	751		74%

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