

Spread the Word: Writing Science to Be Read

By Ruth Levy Guyer

*"It is not enough to know what to say—
one must also know how to say it." Aristotle*



Hey you. Yes you. Don't flip the page. Just stick with me for 10 more seconds and you'll know what's happening. Thanks.

I was asked to give you some pointers about writing, about how to describe your research clearly, and why it's important for you to do it. I'm talking not just about how to write an intelligible research paper (though I'll get to that at the end) but also how and why you should consider writing about your work for a lay audience.

Most researchers are loathe to tell their news directly to the public. Many fear being derided by colleagues as "popularizers." For others, the professional radar screen simply doesn't include a blip for "translate key discoveries into English." But who can explain the nuances, the strengths and weaknesses, the pros and cons of a hearing device, diagnostic test for language development, or treatment for aphasia better than the audiologist or speech-language pathologist who pioneered the work?

If you won't make the effort to tell people about treatments and devices that can improve their lives, where should they get this information—from *The Simpsons*, from *E.R.*? Are you really willing to trust Bart or Dr. Green to get the details right? I hope not.

The Start

How does one go about writing a "popular" article? First, get a good fix on your audience. Sometimes you write for people with the condition you are studying; sometimes, the audience consists of policy makers who may be considering funding for your work. Address your remarks to a single reader, because, no matter how good your article is, it's unlikely that a group will convene around a cozy fireplace to read it aloud.

Your initial task is to lure readers away from whatever they were doing before your article came into view. Select a technical, jargon-laden title and a boring first sentence and you will have no readers. Writing experts refer to potential readers as "the seducibles" or the "window shoppers," who are looking around for something that engages their attention. (I opted for a gimmicky come-on for this article to show you what I mean about "seducible," but I admit it was a cheap ploy.) If you can't

say something intriguing right away, readers will turn the page, go to the fridge, flip on the television, or take a hike. If they take a hike, they're telling you to do the same.

What grabs readers of health news every time is information that will change their lives for the better. No one is hungrier for medical news than the person who stands to benefit from it—the person who needs help managing a voice disorder, the parents of a baby who appears not to be responding appropriately to sound, the individual





whose dwindling swallow reflex makes every meal a mechanical nightmare. These people scour magazines, fact sheets, newspapers, and newsletters for treatments, tests, and devices that can improve their lives or help them cope. Sometimes the “bottom line”—your discovery—works best as the lead in a popular article. (You’re not writing a mystery, so it’s okay to give away the thrilling conclusion up front.) Sometimes, the drama of a person whose problem is just like the reader’s problem resonates most. Sometimes, the trajectory of your research can be compelling. Sometimes, the wider economic or social benefit provides the hook.

Every story has more than one possible lead. One time I told my students in a science writing workshop a true Rip Van Winkle story. A scholarly young woman, a psychology major, contracted a viral infection and then “slept” for 18 years. When she woke up, she sat upright in bed and gave a lucid commentary on one of Freud’s theories, which the two nurses changing her linens were discussing at the time. The woman, D, was eventually fine and went on to teach college courses in sociology and criminology. I asked the students to listen as I told the story and then write a lead paragraph. The nine students generated nine different leads, all of which were legitimate. (I’d say the most inventive one was “D was a vegetable before she became a college professor.”)

The title and lead have to be attention-getters and on target. But they don’t have to be good on the first draft. Chances are they won’t be, and it doesn’t really matter. With word processors, it’s straightforward enough to add, subtract, and change words. Give yourself a reasonable working title and plunge ahead.

When many of us learned to write, a teacher towering in the aisle behind our right shoulders made sure our letters stayed on the line and that we formed nice Palmer-method

loops. Anne Klauser, in her book *Writing on Both Sides of the Brain*, points out that the long-lasting effect of such instantaneous feedback during this formative period was to conflate in our minds the processes of writing and editing. Try to separate these two. Put a piece of paper over your computer monitor and start typing. Spew out all your ideas. You can’t look at what you are writing so you can’t back up and fix or perfect anything along the way. This strategy engages the writer and puts the editor on hold. When you take the paper away, there’s your first draft.

English, Not Jargon

Every biomedical and technical field has its special long Latinate words. Jargon helps practitioners communicate unerringly with one another and shrinks the time researchers and clinicians need to spend exchanging key information.

The downside of jargon is that it keeps all but the cognoscenti out of the loop.

Most jargon, but not all of it, has to go when you write about your research for a lay audience. Figure out which technical terms readers absolutely must learn and drop the rest. Whenever possible, explain new words contextually rather than with a definition in parentheses (see sidebar, “How Would You Say It in English?”).

Researchers love what I call “strings,” long non-navigable rows of nouns and adjectives: legislatively mandated statewide neonatal hearing screening programs. Help the poor reader; break the string into manageable units—screening programs for neonates that are mandated by state legislatures. Your cost on this is a few extra words; your benefit is readers whose eyes have not glazed over.

Content and Form

As you tell your story, assume that the reader knows nothing about the topic but can learn anything. The reader is not a complete know-nothing, not stupid, just someone who hasn’t yet heard this infor-

mation. Tell readers what they need to know at the very moment they need to know it—not before, not after.

Physiology, pathology, and technology are incredibly complicated subjects. Your account has to be meticulous, unfolding step by step. The “chain of logic,” like the alphabet, won’t be right if you skip anything. So, proceed from A to B to C to D... all the way to Z and do not omit a detail in your eagerness to reach the end.

Your article must be able to stand alone. The term for this is “integrity.” You can’t be sure that all your readers will have read other articles that you might refer to, including other articles that you have written. In fact, you can be pretty sure that most of them won’t have read your earlier works. It’s your responsibility to give them all the information they need for understanding what you are talking about.

And, just as your article must have integrity, so must you. Don’t hype the story. Exaggeration and misrepresentation are pitfalls in medical reporting that make many researchers rightly fearful of the press. But, if you are writing about your own work, you know exactly how good the procedure or test or treatment is and exactly how far patients can go with it. This must be part of the story you tell. Every patient dreams of the treatment that works 100% of the time. But most treatments aren’t this effective, and most patient-readers aren’t naïve enough to believe that miracle cures are invariably at hand.

Readers do not want to hear about your trials as you did the research and wrote the paper. They expect you to digest everything, explain only what’s interesting, and supply the take-home message. I recently read a student’s essay about sky diving. I was eager for the armchair adventure ahead of me. But the student, who spent 6 hours in training and then fell from the sky in a one-minute plunge, chose to give equal weight in the essay to each of the 361 minutes. A lost story-telling opportunity there.

Good Guides for Writers

Marshall J. Cook. (1995). *Leads and conclusions*. Cincinnati, OH: Writers’ Digest Books.

Robert A. Day. (1994). *How to write and publish a scientific paper* (4th ed.). Phoenix, AZ: Oryx Press.

William Zinsser. (1988). *Writing to learn*. New York: Harper and Row.

William Zinsser. (1994). *On writing well* (5th ed.). New York: HarperPerennial.

Writing Tightly

Author's version

It is important to recognize that this discussion relates to class A . . .

All that's needed

This discussion relates to class A . . .

Author's version

The purpose of this article is to report results of a study in which MLDs were obtained . . .

All that's needed

We obtained MLDs . . .

Author's version

With respect to procedural concerns, there have been problems associated with establishing standards . . .

All that's needed

Establishing standards is difficult . . .

Author's version

Questionnaires that ethnographers use to survey people on their behaviors are another potential source of information through which to gain an understanding and knowledge of families.

All that's needed

Ethnographers use questionnaires to learn about families.

Words

Writers have only one tool—words. Use language to build bridges rather than barriers between yourself and the reader. The trick as you write is to find the right word every time. “The difference between the right word and the nearly right word,” noted Mark Twain, “is the same as that between lightning and the lightning bug.”

Verbs are the most powerful words in sentences. Nouns come next. When these are on target, adjectives and adverbs don't add a thing. In the 7 years that I wrote “This Week in Science” for *Science* magazine, I don't think I ever used an adjective. I simply didn't have space to waste on one. (I also learned during those years, again as a consequence of space constraints, that I could reduce even the most complicated research findings to a seven-sentence story.)

Researchers love long words, but readers appreciate short ones. Think how much space journals would save over the years if they just made every author substitute “use” for “utilize.” The words should be short and the writing tight (see

sidebar, “Writing Tightly”).

Patient-readers want to know what will happen when they are tested or undergo a procedure or begin a treatment, and thus good details are vital. Stay away from passive voice, the beloved voice of so many medical researchers. As the term implies, passive resists action. I find articles written in passive voice useful antidotes for insomnia. Scientists alive in the 17th century considered that passive voice proved their objectivity: They were standing outside the experiment, observing the world, not imposing themselves onto the situation. But researchers actually do experiments, and medical personnel actually examine and treat patients, and patients actually respond to treatments. Medical diagnoses and treatments are active and descriptions of them should be too.

Revision

Most writing is revision. In re-vision, as the word implies, you take a second look at and revisualize the story. Revision is only effective if you can take a long break—days, weeks—between drafts. I find it painful to dump hard-won words, phrases, or sentences minutes after I craft them but cavalierly toss whole sentences, paragraphs, and pages when the salve of time has intervened.

Why Bother to Write for the Public?

The grim statistics are the following: some 70,000–100,000 technical journals are published around the world, and every article is read by 1.3 people. In the average case—the one where the paper is read by 1.3 people—chances are the author read the paper when it was published and sent a copy to a doting parent, who got one third of the way through it and then cleared a prominent spot for it on the coffee table.

So, what was the point of making that valuable discovery or even getting into health care in the first place if all that hard work serves only those in the author's immediate circle? Doesn't it make sense to broadcast your findings so that others can benefit from and build on them?

The incentives for writing a popular paper can be both altruistic and self-serving. Patients who learn of therapeutic treatments or devices will hound practitioners for them. Policy makers and others who control the biomedical purse strings

will throw their weight (and their money) behind the advances that they understand.

Writing a Research Paper

Many of the strategies that I've suggested for writing for the public are relevant also for writing research papers for peer-reviewed journals: Keep the reader in mind. Engage the reader immediately through the title, the abstract, and the lead. Proceed along the chain of logic, telling readers what they need to know when they need to know it. Use active voice. Use the right words. Break up the strings. Don't waste words. Keep your writing tight.

Research papers have a prescribed shape: a Title, an Abstract, an Introduction, Materials and Methods, Results, Discussion, Conclusion. Although that's the order in which the paper is printed and generally read, it's not the order in which you should write the paper.

You have to write the Results section first, so that you really understand what you found. Often researchers discover upon writing the Results that experiments or controls are missing and that they didn't exactly discover what they thought they had. It's smart to start writing a research paper about two-thirds of the way through the project. This will keep your research on target and show you which experiments you need to do in order to develop a complete story.

After you've written the Results, do the Discussion. Then back up to the Introduction, then write the Conclusion, and finally tackle the Abstract.

When a researcher makes the mistake of writing the Introduction first, the paper generally heads off in the wrong direction. The author will recount the original trajectory of the research, which may no longer be relevant. Readers want to learn from a research paper what you did, what you found, what it means, how it works, and who it helps. Some may be sympathetic to your false starts and suffering, but none want to hear about them.

The book *How to Write and Publish a Scientific Paper* contains valuable guidelines for writing a research paper. The author explains the sorts of information you should include in each section, what tense is appropriate for each, the relations of the sections to each other, and gives you ways to think about the shape and purpose of each part. For example, had you ever considered that

the Introduction is the inverse of the Discussion? The Introduction goes from the general—providing background on the “research space” you are entering—to the particulars of your experiments. The Discussion starts with your results, your “particulars,” and then addresses the general implications and applications of your work. Research papers are formulaic to some extent, so it’s wise to learn the formulas.

Go for the Numbers

You may be feeling pretty comfortable with the research papers you currently write. But, at a minimum, consider writing your next paper for a wider readership. Most research papers are so thick with strings and jargon that only the author’s co-workers and a few others in the field can make sense of them. They simply don’t have to be that way, and both patients and practitioners would benefit if you could let them in on what you’ve done.

The Bottom Line

If any single group understands the importance of clear communications, it’s got to be members of ASHA. Effective communi-

How Would You Say It in English?

Author’s version The primary conclusion drawn from earlier studies of speech motor development is that increased rate of speech production and decreased variability constitute a general developmental trend, reflecting the expected improvement that occurs with neuromotor maturation.	English translation We measured movement in the lower lip as subjects spoke.
English translation Speech stabilizes as individuals mature.	Author’s version Questions are being raised in the psychosocial and medical literatures as to the possibility that gender morbidity differences and higher rates of psychological distress are the result of differential symptom perception and reporting. (The symptom is hearing loss.)
Author’s version The lower lip was chosen as the articulator to be measured because of its accessibility and consistent involvement in articulation of the selected phrase.	English translation Women and men seem to react differently to hearing losses. Women suffer more from their lost ability to communicate.

cation is the subject at hand, the topic of interest. It should also be the goal. ①

Ruth Levy Guyer writes about medicine, bioethics, science, and technology. She is a consultant at the Kennedy Institute of Ethics, where she is developing bioethics curriculum materials for high schools. She teaches science

writing at Johns Hopkins University in the graduate writing program and has taught writing courses for physicians and researchers in the National Institutes of Health. Contact her via email: rlguyer@aol.com

