

# USE OF THE PASSIVE VOICE IN MEDICAL JOURNAL ARTICLES

By Robert J. Amdur, MD<sup>a</sup>; Jessica Kirwan, MA<sup>b</sup>; and Christopher G. Morris, MS<sup>c</sup>

<sup>a</sup>Professor and Interim Chair; <sup>b</sup>Research Coordinator; and <sup>c</sup>Biostatistics Consultant  
Department of Radiation Oncology, University College of Medicine, Gainesville, FL

## ABSTRACT

A common criticism of medical writing is excessive use of the passive voice, but there are no published data on its frequency in medical journal articles. The purpose of this study was to evaluate the frequency of passive voice in 3 types of medical journal articles. We studied the frequency of sentences with a passive voice construction in 3 types of articles from 3 medical journals: Opinion Papers, Review Articles, and Original Research Reports from the Journal of the American Medical Association, the New England Journal of Medicine, and The Lancet. To compare these results with those for a mainstream nonmedical publication, we also analyzed the frequency of passive voice in articles from the front page of The Wall Street Journal. The median passive voice frequency was similar in all types of medical journal articles but much higher than in The Wall Street Journal articles (20%-26% vs 3%;  $P < .0001$ ). The range in percentages was very large for each medical journal, and the lowest percentage among all medical journals was less than 10%. There was no meaningful correlation between the frequency of passive voice and the use of first person pronouns (I or we) in the medical journal articles.

The wide range of passive voice frequencies recorded in this study suggests that writing with a high passive voice frequency is a style of choice rather than a requirement for publication. Our data suggest that a passive voice frequency of 10% is a reasonable upper limit for all types of medical articles because there were multiple articles in every analysis that met this standard. We recommend that medical journal editors make a passive voice frequency of  $\leq 10\%$  a publication requirement for all types of articles.

A common criticism of medical writing is excessive use of the passive voice.<sup>1-6</sup> According to medical writing expert Anitra Sheen:<sup>1</sup> "Passive voice is the bane of medical writing. It pervades medical literature with the haze and heaviness of stagnant air. Writers sometimes use passive voice in an attempt to make their work sound scholarly and scientific, when actually they are perpetuating a writing tradition that is fraught with ponderous and obscure language."

The grammatical "voice" of a sentence is defined by the relationship of the verb to the subject. In an active voice sentence, the subject does the acting. In a passive voice sentence, the subject is acted on, or not men-

tioned.<sup>7</sup> The sentences "Data were collected by a member of our research team from patients with pneumonia" and "Data were collected from patients with pneumonia," use passive voice constructions. An active voice version of these sentences is "A member of our research team collected data from patients with pneumonia."

Authors, editors, and publishers have a choice about the role of the passive voice in their publications, and there is considerable debate about what that role should be. On one side of the debate is the argument that medical writers should minimize use of the passive voice because it is less clear, less forceful, and more verbose than active voice alternatives.<sup>1-6,8</sup> The opposing argument is that the passive voice should be the predominant style of

most types of medical writing because the passive voice reflects the objectivity of the scientific method,<sup>6,9-12</sup> avoids using a first person pronoun in a way that would be impolite,<sup>1,3-5,12</sup> and conforms to the style with which medical peers are most familiar.<sup>2,3,6,9</sup>

An important void in the discussion of the use of the passive voice is the lack of data about the frequency and pattern of its use in medical writing. The primary goal of this study is to fill that void by reporting the frequency of passive voice sentences from a sample of papers from 3 major medical journals. Our secondary goals are to present a scientific framework for studying the passive voice in medical writing and to produce a reference that explains the passive voice issue.

## METHODS AND MATERIALS

We calculated the percentage of sentences with a passive voice construction in 3 types of articles from 3 major medical journals: *The Journal of the American Medical Association* (JAMA), *The New England Journal of Medicine* (NEJM), and *The Lancet*. We chose these journals primarily because their high impact factors suggest that they are well respected and thus serve as a model for writing style. Secondary considerations were that these journals have different publishers and editorial staffs and that each issue contained articles from many different fields of medicine.

We evaluated 3 types of articles from each journal: Opinion Paper, Review Article, and Original Research Report. We use the term "Opinion Paper" to describe peer-reviewed commentaries whose author is not a journal editor.

In a study such as ours, it is difficult to interpret results without understanding how they relate to nonmedical writing. To provide a perspective on our results, we also evaluated 30 articles in *The Wall Street Journal* (WSJ) as a so-called nonmedical article control group. We chose the WSJ as a control publication because we thought that there are similarities between the readership of the WSJ and that of medical journal articles in terms of level of education and because the articles that we selected contain detailed analyses of complex subjects.

The year of publication of all medical journal articles in this study was 2006; the WSJ articles were published in 2007. We selected the medical journal articles at random yet ensured that the authors of the articles represented many different medical specialties. We did not screen the articles for writing style or any other feature of composition before selecting them for inclusion in the study. The sample size was 30 articles from each journal, with 10 of each type of article from each journal. Therefore, we evaluated a total of 90 medical articles: 30 Opinion Papers (10 from each journal), 30 Review Articles (10 from each journal), and 30 Original Research Reports (10 from each journal). The 90 medical journal articles and 30 WSJ articles are listed in the appendix, which is available in the online version of this article.

The main endpoint in this study was the percentage of sentences that contained at least 1 passive voice construction. We coded sentences with both active and passive constructions as passive voice sentences, and we counted sentences with 2 or more passive constructions as one passive voice sentence. We manually identified passive voice sentences. Specifically, one of us (RA) evaluated every sentence in each article to determine the number of sentences with passive voice construction. For the first 20 articles, another one of us (JK) repeated the process so that both of us independently recorded the voice as active or

passive in every sentence in the article. We then discussed any discrepancies and made a final determination that we both agreed on. After doing the 2-person analysis on 20 articles, there were no differences in our calculations in the next 10 articles, so, for the remaining 90 reviews, only one of us determined passive voice frequency without a double check by the other.

Some word processing programs include a grammar-checking program that calculates passive voice frequency. It is much easier to count passive voice frequency with such a program than with a manual approach. However, the accuracy of the calculations of grammar-checking programs is unknown. To determine the accuracy of a computer program in identifying passive voice sentences, we compared the results obtained by the manual approach with the calculations made by the grammar-checking program in Microsoft Office Word 2003 (Microsoft Corporation, Redmond, WA). This is the only analysis for which we used a computer program to count passive voice sentences.

The example sentences in the Introduction section of this paper illustrate the 2 forms of passive voice construction, which we refer to as “doer mentioned” and “doer not mentioned,” where “doer” refers to the actor or doer of the action of the verb. For example, the sentence “Data were collected from patients with pneumonia,” is considered to be “doer not mentioned” because the person collecting the data is not identified. For each passive voice sentence, we recorded if the form was “doer mentioned” or “doer not mentioned.”

To address the use of first person pronouns, we recorded the percentage of sentences with an active voice construction involving a first person pronoun. Sentences with more than 1 first person pronoun were counted only once.

For all analyses in this study, we evaluated only text that was directly related to the composition of the article. We excluded text that was associ-

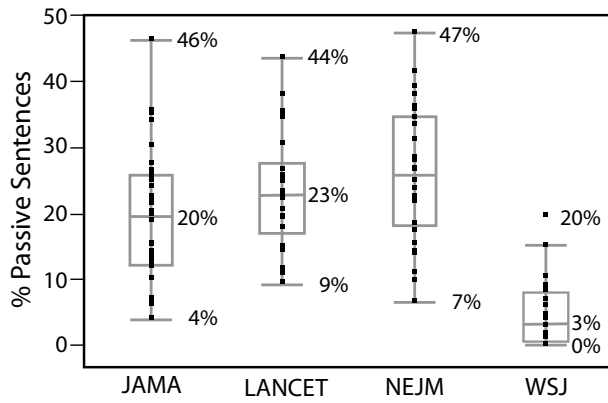
ated with the title of the article, header or footer text, footnotes, figure legends, text boxes, margin notes, references, conflict-of-interest statements, and references. We also excluded text that was part of a quotation because the authors of the article had no control over the construction of a passage from a previously published work or anything spoken by a person.

We used SAS and JMP software (SAS Institute, Cary, NC) for all statistical analyses. The standard analysis of variance (ANOVA) procedure provided a test of whether the percentage of sentences with passive voice differed according to both publication and type of article. For each ANOVA, the Tukey adjustment for multiple comparisons controlled the experiment-wise error rate so that it did not exceed  $\alpha=.05$ . Among Original Research Reports, accurate analysis of all possible pairings of paper sections (Abstract vs Introduction vs Methods vs Results vs Discussion) required a repeated-measures ANOVA to adjust for the fact that any given paper contributes data points to the analysis; as with standard ANOVA, the Tukey adjustment controlled the experiment-wise error rate. ANOVA with Dunnett’s multiple-comparison procedure provided the analysis of WSJ vs each of these individual sections; Dunnett’s test facilitated comparison of multiple groups within a given variable to a single control (in this case, WSJ).

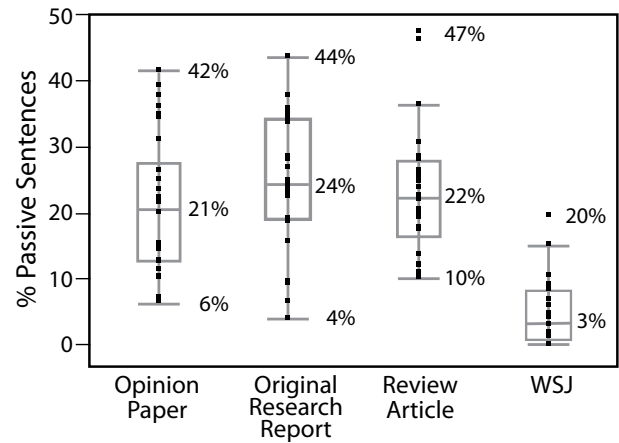
## RESULTS

### Passive Voice Frequency

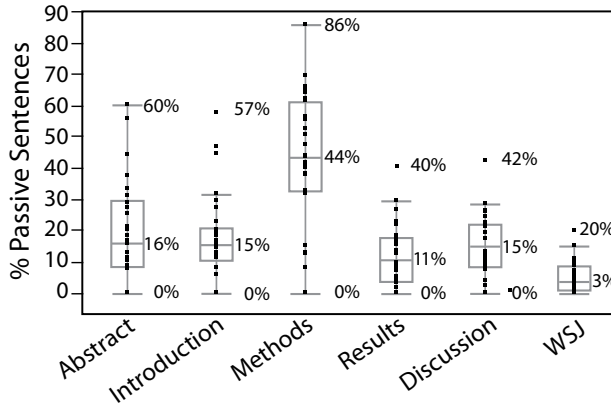
The median percentage of passive voice frequency was similar for articles in the 3 medical journals but was much higher than in the WSJ articles (20%-26% vs 3%,  $P<.0001$ ; Figure 1). The range of percentages within each medical journal was large, and the lowest percentage among all the journals was less than 10%. There was a significant difference between the median percentages for each medical journal and the WSJ ( $P<.0001$ ), but the only comparison between medical jour-



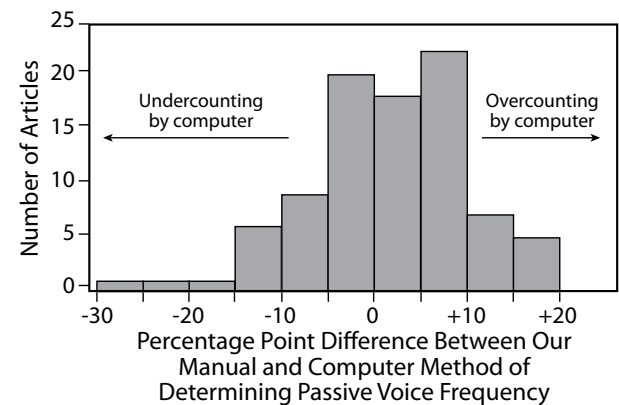
**Figure 1.** Box plot of the distribution of the percentages of passive voice frequency for the 4 publications that we analyzed in this study. The standard deviation was 10% for The Journal of the American Medical Association (JAMA) and The New England Journal of Medicine (NEJM), 9% for The Lancet, and 5% for The Wall Street Journal (WSJ). The horizontal line in each box marks the median percentage. The T-bars that extend from the lower and upper borders are defined by the interquartile range; their length is 1.5 times the distance from the 25th to the 75th percentile, which is the length of the box. The length of the upper and lower T-bars may differ because the end of the T-bar must be anchored to observed data points.



**Figure 2.** Box plot of the distribution of the percentages of passive voice frequency for the 3 types of medical journal articles and The Wall Street Journal (WSJ) articles. The standard deviation was 10% for Opinion Papers and Original Research Reports, 9% for Review Articles, and 5% for WSJ articles. The horizontal line in each box marks the median percentage. The T-bars that extend from the lower and upper borders are defined by the interquartile range; their length is 1.5 times the distance from the 25th to the 75th percentile, which is the length of the box. The length of the upper and lower T-bars may differ because the end of the T-bar must be anchored to observed data points.



**Figure 3.** Box plot of the distribution of the percentages of passive voice frequency for the 5 sections of an Original Research Report and The Wall Street Journal (WSJ) articles. The standard deviation was 16% for the Abstract, 14% for the Introduction, 20% for the Methods section, 10% for the Results section, 9% for the Discussion, and 3% for WSJ articles. The horizontal line in each box marks the median percentage. The T-bars that extend from the lower and upper borders are defined by the interquartile range; their length is 1.5 times the distance from the 25th to the 75th percentile, which is the length of the box. The length of the upper and lower T-bars may differ because the end of the T-bar must be anchored to observed data points.



**Figure 4.** Histogram of the difference in passive voice frequency between our manual method (reading every sentence) and the grammar-checking program in Microsoft Office Word 2003. The 90 data points in this histogram correspond to the 90 medical articles that we analyzed. We did not include The Wall Street Journal (WSJ) articles in this analysis. The formula for calculating each datum point was passive voice frequency from the computer program - passive voice frequency from our manual method. A positive number indicates that the computer program overcounted, and a negative number indicates that the computer program undercounted, the passive voice sentences. The main parameters of this histogram are median difference, +3%; standard deviation, 9%; and range, -25% to +19%. We were not able to explain the computer inaccuracy in terms of factors in the article or the format of the text.

nals to reach statistical significance at the  $P < .05$  level was between JAMA and NEJM (20% vs 26%,  $P = .03$ ).

The frequency of the passive voice in the 3 types of medical journal articles compared with the WSJ articles mirrored the results across publications (Figure 2). The median percentages were similar for the 3 types of medical journal articles, but these percentages were much higher than that for the WSJ articles (21%-24% vs 3%,  $P < .0001$ ). Again, the range in percentages was large for each type of medical journal article, and the lowest percentage was less than 10% across all medical journals. The differences in the percentages between the 3 types of medical journal articles and the WSJ articles was highly significant ( $P < .0001$ ), but the differences between the 3 types of medical journal articles were not significant ( $P > .2$ ).

When the passive voice frequency was plotted by the 5 sections of Original Research Reports, the median frequency was higher in all sections than in the WSJ articles (Figure 3). The highest median percentage was in the Methods sections, with a passive voice frequency that was more than twice that in the other sections. The following pairwise comparisons were significant ( $P < .0001$ ): Abstract vs Methods; Introduction vs Methods; and Methods vs Results and Discussion. All other pairwise comparisons were not significantly different ( $P > .5$ ). With regard to the comparison of the Original Research Report sections with WSJ articles, pairwise comparisons between the WSJ articles and the Abstract, Introduction, Methods, and Discussion sections were significant ( $P < .005$ ), whereas the comparison between WSJ articles and the Results section was not significant ( $P = .09$ ).

Evaluation of the accuracy of passive voice frequency calculated by the Microsoft Office Word 2003 grammar-checking program demonstrated that the median difference between our manual method and the computer program was small (+3%), but the range

was large (-25% to +19%), with a standard deviation of 9% (Figure 4). This finding indicates that there were major errors in the results from the computer program in a small percentage of articles. We could not identify a feature that explained the major errors.

#### Form of the Passive Voice: Doer Mentioned or Not Mentioned

The “doer not mentioned” form of passive voice construction was by far the

most common form among all publications, all types of medical journal articles, and all sections of Original Research Reports (Table 1).

cal journal articles (median, 2%-4%) as well as WSJ articles (0), but the ranges were wide, with values as high as 34% in the medical journal articles compared with a high of 4% in the WSJ articles (Table 2). Among the 5 sections of the Original Research Reports, the use of an active voice construction with a first person pronoun varied from a median of 3% for the Results section to a median of 12% for the Introduction. Again, there were wide

**Table 1.** Passive Voice Form: Doer Mentioned or Doer Not Mentioned

	Median Percentage of Passive Voice Sentences		
	Overall Frequency <sup>a</sup>	Doer Mentioned <sup>b</sup>	Doer Not Mentioned <sup>b</sup>
<b>Publication</b>			
JAMA	20	12	88
NEJM	26	15	85
<i>The Lancet</i>	23	9	91
<i>The Wall Street Journal</i>	3	21	79
<b>Medical Journal Article Type</b>			
Opinion Paper	21	15	85
Review Article	22	17	83
Original Research	24	7	93
<b>Original Research Report Section</b>			
Abstract	16	0	100
Introduction	15	0	100
Methods	44	5	95
Results	11	0	100
Discussion	15	14	86

<sup>a</sup>Passive voice frequency = (passive voice sentences/total sentences) x 100

<sup>b</sup>Passive voice form distribution = (passive voice sentences with doer mentioned (or not mentioned)/total passive voice sentences) x 100

JAMA = *The Journal of American Medical Association*, NEJM = *The New England Journal of Medicine*.

most common form among all publications, all types of medical journal articles, and all sections of Original Research Reports (Table 1).

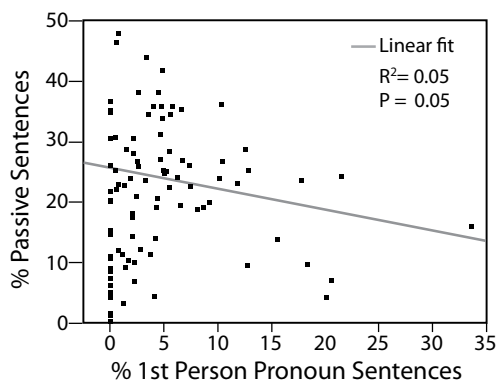
#### First Person Pronouns

When the passive voice frequency was plotted as a function of the frequency of active voice sentences that also contained a first person pronoun, there was no meaningful correlation between the 2 variables (Figure 5). The frequency of active voice sentences with first person pronouns was low in medi-

cal journal articles (median, 2%-4%) as well as WSJ articles (0), but the ranges were wide, with values as high as 34% in the medical journal articles compared with a high of 4% in the WSJ articles (Table 2). Among the 5 sections of the Original Research Reports, the use of an active voice construction with a first person pronoun varied from a median of 3% for the Results section to a median of 12% for the Introduction. Again, there were wide

#### DISCUSSION

Our data show that there is a high frequency of the passive voice in medical journal articles. In our study, more than 20% of the sentences in such articles had passive voice constructions and percentages greater than 30% were not uncommon. These percentages are much higher than the



**Figure 5.** Scatter plot of frequency of passive voice vs frequency of sentences with an active voice construction and a first person pronoun (“I” or “we”) in the 90 medical articles that we evaluated in this study (this plot does not include The Wall Street Journal (WSJ) articles). The visual pattern and low correlation coefficient show that there is no meaningful correlation between these 2 variables. The low P value is misleading. If we exclude the small number of articles with a frequency of first person pronouns of more than 15%, the P value is high (P=.9).

median frequency of 5% that we found in WSJ articles. We cannot compare our results on passive voice frequency with those of other studies because our results are the only published data on this subject. The results of our study validate what writing experts have been saying for many years about excessive use of the passive voice in medical writing.

We could not find a survey study or consensus statement addressing the question of why authors of medical journal articles use the passive voice so frequently. No publication guideline mentions goals or limits for the use of the passive voice, and some of the most prestigious references are worded in a way that may

encourage authors to use the passive voice whenever it is acceptable to do so. For example, the *AMA Manual of Style* says that, “Authors should use the active voice, except in instances in which the actor is unknown or the interest focuses on what is acted on.”<sup>7</sup>

Experts have suggested five possible reasons that medical writers use the passive voice so frequently: to reflect objectivity, to avoid first person pronouns, to appear scholarly and sophisticated, to avoid responsibility, and to conform to established writing style.

### Reflect Objectivity

We could not find a publication that recommends using the passive voice specifically to demonstrate objectivity. The experts who do make a value judgment criticize the objectivity argument as being fundamentally incorrect and an obstacle to clear writing.<sup>1,10</sup> Lester King explains it this way:

The alleged objectivity of science has hypnotized many otherwise capable scientists, who regard anything subjective as tainted...The logic is simple. The active voice will necessarily require abundant use of the first person; *I* and *we* are subjective, to be avoided as unscientific; the only alternative is the passive voice. With this point of view I must disagree in the strongest possible terms. I maintain that objectivity in science is in large part a myth, and that if the devotees of this methodology would apply themselves to clear expression rather than to indefensible dogma, we would have far greater general benefit.<sup>10</sup>

### Avoid First Person Pronouns

Some journals prohibit first person pronouns in the Abstract, but no publication guidelines require that authors use the passive voice when an active voice construction would be grammatically appropriate. In fact, many writing experts are passionate about changing the convention in medical writing of avoiding active voice sentences with a personal pronoun. For example,

**Table 2.** Frequency of Sentences with an Active Voice Construction and First Person Pronoun

	Median Active Voice Frequency <sup>a</sup> (%)	Median (and Range) Frequency of Active Voice Construction with a First Person Pronoun <sup>b</sup> (%)
<b>Publication</b>		
JAMA	80	2 (0-34)
NEJM	74	4 (0-16)
<i>The Lancet</i>	77	3 (0-18)
<i>The Wall Street Journal</i>	97	0 (0-4)
<b>Medical Journal Article Type</b>		
Opinion Paper	79	2 (0-11)
Review Article	78	2 (0-16)
Original Research	76	7 (1-34)
<b>Original Research Report Section</b>		
Abstract	84	8 (0-40)
Introduction	85	12 (0-23)
Methods	56	8 (0-70)
Results	89	3 (0-29)
Discussion	85	9 (0-26)

<sup>a</sup>Passive voice frequency = (passive voice sentences/total sentences) x 100.

<sup>b</sup>First person pronoun frequency = (sentences with an active voice construction and a first person pronoun/total sentences) x 100.

The percentage of active voice sentences that do not contain a first person pronoun = 100 minus the first person pronoun frequency.

JAMA = *The Journal of American Medical Association*, NEJM = *The New England Journal of Medicine*.

the readability expert, Robert Flesch, noted: "If you want to write like a professional, you have to get used to the first person singular. Never mind the superstitious notion that it's immodest to do so."<sup>14</sup> Also, in the fifth edition of his classic book on scientific writing, Robert Day reiterates this advice in the form of an appeal to young scientists: "I herewith ask all young scientists to renounce the false modesty of the previous generations of scientists. Do not be afraid to name the agent of the action in a sentence, even when it is 'I' or 'we.'"<sup>5</sup>

### **Appear Scholarly and Sophisticated**

We agree with Anitra Sheen's advice to writers who use passive voice in an attempt to appear more scholarly and sophisticated: "Formal, unassertive language does not make a work scholarly. Nor does it make it scientific; it just makes it lifeless and vague."<sup>1</sup>

### **Avoid Responsibility**

There is some overlap between this motive and concern about the impropriety of a first person pronoun, but the references we reviewed focus on the psychologic urge to avoid "going out on a limb" as a reason for writing in the passive voice.<sup>14</sup> Flesch does not mince words on this subject: "If you want to write well, about anything at all, you must be prepared to face the consequences and portray yourself quite mercilessly whenever the occasion arises."<sup>13</sup>

### **Conform to Established Style**

We agree with those who say that frequent use of the passive voice in medical writing is a habit that writers acquire by mimicking the style of writing that they see in their medical journals and learn from reviewer feedback, without understanding the alternatives. Matthews et al "suspect that scientific writing's heavy reliance on the passive voice is more a matter of tradition than a formal requirement."<sup>6</sup> Goodman et al also refer to reliance on the passive voice as a "fashion" that the medical

community is now in the process of rejecting.<sup>3</sup>

We have had a journal reviewer recommend that we revise a manuscript to use the passive voice as much as possible because it would make the paper "sound better." Other seasoned writers report the same experience and lament how this kind of feedback decreases the quality of medical publications.<sup>2</sup> In the book *Successful Scientific Writing*, Matthews et al explain how mentors indoctrinate young writers to use the passive voice without explaining the drawbacks of this style: "Young researchers often report that their professors have changed their vigorous sentences back into the passive, because 'that is the way science is written.'"<sup>9</sup>

We agree with authors like Tim Albert who think that in medicine and science, "Writing cultures have grown up that are, frankly, destructive of effective communication and individual talent."<sup>9</sup> However, we are not ready to accept Dr Albert's view that the situation is so bad that authors now strive for poor-quality writing: "What seems to have happened is that authors, far from seeing pompous writing as bad, have come to value it."<sup>15</sup>

### **Recommendations**

The distinguishing feature of the passive voice is that it makes the receiver of the action more important than the doer.<sup>4</sup> Every resource on medical writing that we have cited in this paper gives examples of situations where it is appropriate to use a passive voice construction, with the main one being when the action is more important than the doer. However, writers who are concerned about using the passive voice too frequently need more detailed instructions. We recommend the following.

- Use the active voice in place of "doer mentioned" passive constructions.
- Limit the use of the passive voice to the Methods section of an Original Research Report because this is a section where describing *who* did

the action distracts the reader from *what* was done methodologically.

- Use passive voice frequency in the overall paper as an endpoint for evaluating the quality of the writing.
- Medical journal editors should make a passive voice frequency of  $\leq 10\%$  a publication requirement for all types of articles.

The real question is not whether authors of medical journal articles use the passive voice too frequently, but why prestigious medical journals routinely publish articles that would be shorter, clearer, and easier to read if the author or an editor revised the manuscript to minimize passive voice constructions. Several veteran editors attribute the problem to a change in the role academic publications play in modern society and the workload of journal editors: "It seems that many medical articles are written to be published and cited, but not to be read."<sup>2</sup> In addition,

Editors say that they try to keep things simple, but are overwhelmed by the sheer volume of articles written in bad English. To stem the flow many of them write editorials urging simpler English, or run training sessions teaching likewise. But nothing changes, which means that we need to look further than what appears to be the current assumption, which is that pompous medical prose is a kind of infection that can be cured with a quick dose of 'common sense.'<sup>15</sup>

Excessive use of the passive voice is not the only problem with modern medical writing, but it is a well-defined problem with a simple solution: medical journal editors should make passive voice frequency a standard for publication. Our data suggest that a passive voice frequency of 10% is a reasonable upper limit for all types of medical articles, as there were multiple articles in every analysis that we performed that met this standard. Commercial grammar-checking programs make it easy to

calculate passive voice frequency, but they are inaccurate in a small percentage of articles. The manual method is time consuming but manageable and brings considerable value to the finished product.

**Author disclosure:** *The authors note that they have no commercial associations that may pose a conflict of interest in relation to this article.*

#### References

1. Sheen AP. *Breathing Life into Medical Writing: A Handbook*. St. Louis: Mosby; 1982:21-22.
2. Taylor RB. *The Clinician's Guide to Medical Writing*. New York: Springer; 2005:1-40-43.
3. Goodman NW. *Medical Writing: a Prescription for Clarity*, ed 2. New York: Cambridge University Press; 1997:121;126.
4. St James D, Sprio H. *Writing and Speaking for Excellence: A Guide for Physicians*. Boston: Jones and Bartlett Publishers, Inc; 1996:37.
5. Day RA. *How to Write & Publish a Scientific Paper*, ed. 5. Phoenix: Oryx Press; 1998:209.
6. Mathews JR, Bowen JM, Matthews RW. *Successful Scientific Writing: A Step-by Step Guide for the Biological and Medical Sciences*, ed. 2. New York: Cambridge University Press; 2000: 106, 120.
7. American Medical Association. *AMA Manual of Style: A Guide for Authors and Editors*, ed. 10. New York: Oxford University Press; 2007:320.
8. Strunk W, White EB. *The Elements of Style*, ed. 4. Boston: Longmon; 1999.
9. Albert T. *The A-Z of Medical Writing*. London: BMJ Books; 2000:137-138.
10. King LS. *Why Not Say It Clearly: A Guide to Expository Writing*, ed. 2. Boston: Little, Brown and Company; 1991:31.
11. Dirckx JH. *Dx + Rx: A Physician's Guide to Medical Writing*. Boston: GK Hall & Co.; 1977:127-128.
12. Spector T. Writing a scientific manuscript: highlights for success. *J Chem Educ*. 1994;71:47-50.
13. Flesch R. *How to Write, Speak, and Think More Effectively*. New York: Harper; 1960:142.
14. Zinsser W. *On Writing Well: The Classic Guide to Writing Nonfiction*, ed. 25. New York: Quill; 2001:23.
15. Albert T. Why are medical journals so badly written? *Med Educ*. 2004;38:6-8.

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**Appendix. Articles Analyzed in Study**

<b>Category of Article</b>	<b>First Author</b>	<b>Title of Article</b>	<b>Date, Volume, Issue, and Pages</b>	<b>Overall Percentage of Passive Sentences (%)</b>
<b>Opinion</b>				
JAMA	Albertsen PC	PSA Testing Public Policy or Private Penchant?	2006 Nov 15;296(19):2371-3	15
	Carragee E	Surgical Treatment of Lumbar Disk Disorders	2006 Nov 22;296(20):2485-7	7
	Flum DR	Interpreting Surgical Trials with Subjective Outcomes Avoiding Unsportsmanlike Conduct	2006 Nov 22;296(20):2483-5	21
	Ford JM	Predicting and Preventing Hereditary Colorectal Cancer	2006;296:1521-1523	12
	Graham DJ	Cox-2 Inhibitors, Other NSAIDS, and Cardiovascular Risk	2006 Oct 4;296(13):1653-6	14
	Little P	Delayed Prescribing—a Sensible Approach to the Management of Acute Otitis Media	2006;296:1290-1291	10
	Msall ME	Complexity of the Cerebral Palsy Syndromes –Toward a Developmental Neuroscience Approach	2006; 296:1650-1652	6
	Simpson RJ	Challenges for Improving Medication Adherence	2006 Dec 6;296(21):2614-6	20
	Thompson PD	Protecting Athletes from Sudden Cardiac Death	2006;296:1648-1650	13
	Wisner KL	Postpartum Depression: a Major Public Health Problem	2006 Dec 6;296(21):2616-8	10
<i>The Lancet</i>	Abgrall S	Initial Strategy for Antiretroviral-Naive Patients	2006 Dec 16;368(9553):2107-9	35
	Berer M	Hospital Admission for Complications of Unsafe Abortion	2006 Nov 25;368(9550):1848-9	34
	deIrala J	Changes in Sexual Behaviours to Prevent HIV	2006;368:1749-1750	22
	Eyer P	Pralidoxime for Organophosphate Poisoning	2006 Dec 16;368(9553):2110-1	38
	Ferguson N	Poverty, Death, and a Future Influenza Pandemic	2006 Dec 23;368(9554):2187-8	26
	Garcia LA	The Ever-Growing Story of Cyclo-Oxygenase Inhibition	2006;368:1745-1747	14
	Horton R	The Evolving Doctor	2006;368:1750-1751	22
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NEJM	Currier JS	Getting Smarter—the Toxicity of Undertreated HIV Infection	2006 Nov 30;355(22):2359-61	26
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	Karlawish J	Alzheimer's Disease—Clinical Trials and the Logic of Clinical Purpose	2006;355:1604-1606	7
	Mccullough AJ	Thiazolidinediones for Nonalcoholic Steatohepatitis—Promising but not Ready for Prime Time	2006 Nov 30;355(22):2361-3	21

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	Muscucci M	Reducing the Door-to-Balloon Time for Myocardial Infarction with ST-Segment Elevation	2006 Nov 30;355(22):2364-5	14
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	Werner RM	Relationship Between Medicare's Hospital Compare Performance Measures and Mortality Rates	2006;296:2694-2702	36
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<i>The Lancet</i>	Cannon CP	Cardiovascular Outcomes with Etoricoxib and Diclofenac in Patients with Osteoarthritis and Rheumatoid Arthritis in the Multinational Etoricoxib and Diclofenac Arthritis Long-Term (Medal) Programme: a Randomized Comparison	2006;368:1771-1781	25
	Chaparro CM	Effect of Timing of Umbilical Cord Clamping on Iron Status in Mexican Infants: a Randomised Controlled Trial	2006;367:1997-2004	19
	Cleland J	Sexual Abstinence, Contraception, and Condom Use by Young African Women: a Secondary Analysis of Survey Data	2006;368:1788-1793	10
	Danel C	CD4-Guided Structured Antiretroviral Treatment Interruption Strategy in HIV-Infected Adults in West Africa (Trivascan Anrs 1269 Trial): a Randomised Trial	2006;367:1981-1989	27

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	Lindstrom J	Sustained Reduction in the Incidence of Type 2 Diabetes by Lifestyle Intervention: Follow-Up of the Finnish Diabetes Prevention Study	2006 Nov 11;368(9548):1673-9	44
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	Thomas RE	Effect of Enhanced Feedback and Brief Educational Reminder Messages on Laboratory Test Requesting in Primary Care: a Cluster Randomised Trial	2006; 367:1990-1996	23
	Vanags D	Therapeutic Efficacy and Safety Of Chaperonin 10 in Patients with Rheumatoid Arthritis: a Double-Blind Randomised Trial	2006 Sep 2;368(9538):855-63	22
NEJM	Belfort R	A Placebo-Controlled Trial of Pioglitazone in Subjects with Nonalcoholic Steatohepatitis	2006;355:2297-307	35
	Bloom SL	Fetal Pulse Oximetry and Cesarean Delivery	2006;355:2195-202	27
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<b>Review</b>				
JAMA	Berger JS	Aspirin for the Primary Prevention of Cardiovascular Events in Women and Men: a Sex-Specific Meta-Analysis of Randomized Controlled Trials	2006;295:306-313	13
	Brandes JL	The Influence of Estrogen on Migraine: a Systematic Review	2006;295:1824-1830	26
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	Low N	Global Control of Sexually Transmitted Infections	2006 Dec 2;368(9551):2001-16	25
	Moss M	Alcohol Abuse in the Critically Ill Patient	2007 Jan;368(9554):2231-2242	25
	Sliwa K	Peripartum Cardiomyopathy	2006 Aug 19;368(9536):687-93	30
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	Wellings K	Sexual Behaviour in Context: a Global Perspective	2006 Nov 11;368(9548):1706-28	21
	Yoon KH	Epidemic Obesity and Type 2 Diabetes in Asia	2006 Nov;368(9548):1681-1688	12
NEJM	Bergan JJ	Chronic Venous Disease	2006 Aug 3;355(5):488-498	22
	Bowen JL	Educational Strategies to Promote Clinical Diagnostic Reasoning	2006 Nov 23;355(21):2217-25	23
	Darouiche RO	Spinal Epidural Abscess	2006 Nov 9;355(19):2012-20	36
	Eder W	The Asthma Epidemic	2006 Nov 23;355(21):2226-35	28
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	Kaushansky K	Lineage-Specific Hematopoietic Growth Factors	2006 May 11;354(19):2034-2045	17
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