A SURVEY OF WRITING TECHNIQUES, AUTHORSHIP, TENSES, VOICES, AND LENGTH OF OPENING SENTENCES OF MEDICAL RESEARCH ARTICLES

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Abstract

A large number of genre analyses have investigated schematic units or "moves" of many parts of medical research articles. The present analysis deals with the inner element of the first move, the introduction section. It explore the techniques for writing opening sentences, and investigates authorship, tenses, voices, and sentence length. The subjects were 167 opening sentences from two world journals in medical science, the Annals of Internal Medicine and The Lancet, which represent American English and British English, respectively. A concordancing computer program, Microsoft Word, and the SPSS (v.11.5) were used. The findings of this study suggest that most opening sentences, which comprise an average of about 22 words, give facts in the present simple active by citation of previous findings.

Introduction

The opening or first sentence of the introduction section of a research article is crucial, partly because it should capture the readers' attention (McElroy, 1997, p. 40) as well as introduce or give a lead into the research topic under investigation. Article

writers, especially new entrants into the academic discourse community, often find it difficult and time-consuming to write this first sentence.   Several writing techniques have been recommended. McElroy (1997, pp. 40-41) suggests the following writing techniques, or rhetorical functions, to catch the reader's attention: giving facts, statistics, a definition, and a general statement.   Swales (1984, p. 81) has recommended that the opening sentence should attempt to establish that the field of research is useful, relevant, or important in some way or ways. Also, in his revised model for article introduction, CARS (Create a Research Space), he has established that the first move of the introduction should claim that the area of the study is an important one, implying that the topic under study is also crucial (Swales, 1990).   Brink and Wood (1994, p. 239) have proposed that the first sentence in the introduction should set the general tone and direction for the subject matter. Unfortunately, there is no empirical data about rhetorical functions, or techniques, for writing the opening sentence of medical research articles.   In addition, no study has been undertaken to investigate whether the opening sentence is written by the authors of the article themselves or is a citation of previous findings.

The use of tenses and voices is another aspect of scientific genre that has been investigated extensively. Wingard (1981) has found that in a corpus of six medical texts, the most frequent form is the simple present active (including *is/are*), accounting for 28% of cases, followed by the simple past active (22%).   The simple present passive accounts for 11%, while the simple past passive 18%.   Barber (1985, p. 8) has analyzed the frequency of different verb tenses and voices, some of which are as follows: the present simple active (64%), present simple passive (25%), present perfect passive (1.7%), present perfect active (1.4%), past simple active (1.2%), and past simple passive (1.2%). Again, these studies do not focus primarily on the opening sentence of medical research articles.

Sentence length is another important issue that worries many authors because it may affect readability, influence the credibility of the results and, worst of all, distract the reader. A very short sentence may be inadequate, whereas an excessively

long one may fail to hold the readers' attention. According to Barber (1985), the average sentence length in scientific prose is 27.6 words. However, there is no data regarding the average length of the opening sentences in medical research articles.

Although a number of studies on medical research articles have been carried out, there is no study that focuses on the first inner element of the introduction section, the opening sentence. Therefore, the purposes of this study were 1) to explore techniques, or rhetorical functions, for generating opening sentences, 2) to investigate whether these first sentences were written by the authors or were just a citation of previous findings, and 3) to examine the tense, voice and length of these opening sentences.

Methods
Subjects

There is an enormous number of professional journals in the medical sciences. Some are released weekly, some biweekly, while others come out once a month. Furthermore, some are written in American English, others in British English. This research studied two medical journals—the *Annals of Internal Medicine*, which is an American professional journal that is published biweekly, and *The Lancet*, a British journal published weekly. The main reasons for choosing these two journals are that neither focuses on a particular medical discipline and that they are two leading world journals. These journals present several kinds of articles such as general articles, research articles (or original articles), and case reports, but only research articles were studied in this study.

The initial population of this study consisted of 292 opening sentences, 72 from the *Annals of Internal Medicine* and 220 from *The Lancet*. These articles were published in 2002. However, to avoid having an overwhelming number of opening sentences from *The Lancet*, only the first and the third issues of this journal were assessed. The actual subjects of this study became 167 sentences—95 from *The Lancet* and 72 from the *Annals of Internal Medicine*.

Instruments

The research instruments used were coding forms and three computer programs: Microsoft Word, a concordancing program (or concordancer), and the SPSS (v.11.5).

Procedures
Data collection

For data collection, the first page of 167 articles was photocopied. For reference and ease of recognition, each opening sentence was numbered at the beginning and end of the sentence as in the following example: *#1011 Chronic obstructive pulmonary disease (COPD) is one of the most important problems world-wide (1,2) (#1011 Feb 19/1).* The opening sentences from the two sources—*The Lancet* and the *Annals of Internal Medicine*—were typed and saved as Corpus 1 and Corpus 2, respectively.

Table 1: Month, dates and numbers of articles

Months	Annals Date (Number of articles)			Lancet Date (Number of articles)			Total
January	1,	15	(6)	5,	19	(8)	14
February	5,	19	(6)	2 ,	16	(8)	14
March	5,	19	(6)	2,	16	(8)	14
April	2,	16	(6)	6,	20	(8)	14
May	7,	21	(6)	4,	18	(8)	14
June	4,	18	(6)	1,	15	(8)	14
July	2,	16	(6)	6,	20	(8)	14
August	6,	20	(6)	3,	17	(8)	14
September	3,	17	(6)	7,	21	(8)	14
October	1,	15	(6)	5,	19	(8)	14
November	5,	19	(6)	2,	16	(8)	14
December	3,	17	(6)	7,	21	(7)	13
	72			**95**			**167**

Note: January 1, 15 (6) refers to January 1, 2002, January 15, 2002 and (6) refers to 6 articles.

Writing techniques
Table 2: Wordlist (adjectives)

Word	Frequency
1. most	10
2. acute	9
3. common	7
4. million	6
5. major	5
6. primary	5
7. chronic	4
8. important	4
9. public	4
10. *high*	*3*
11. *long*	*3*
12. *severe*	*3*
13. *short*	*3*
14. *substantial*	*3*
15. *serious*	*2*
Total	**71**

To assess the writing techniques, McElroy's suggestion and Swales' recommendation were initially used to form a tentative rhetorical classification. The initial rhetorical functions or writing techniques derived from McElroy and Swales were *"indicating importance/usefulness/relevance," "giving facts," "expressing comments/observations," "giving definitions,"* and *"describing situations."* In this study, *"facts"* includes both general facts, generalizations, and findings cited from previous research findings. Regarding importance, the opening sentence that would be considered as expressing the rhetorical function *"indicating importance"* must have at least one essential characteristic, containing an adjective, a noun, or an adverb that signals importance, such as *important, mortality,* and *highly.*

To have a more precise sketch of the writing techniques, Corpus 1 and Corpus 2 were loaded into the concordancer to display a wordlist and frequency. Then, some potential words with high frequency, particularly those that might lead to

identification of the actual writing techniques used in the study
samples, were selected.   To avoid having a complicated list of
concordances (or a list of words from a text or group of texts,
displayed straight down from the top to bottom of the page as in
Figure 1), potential words were divided into groups, such as
adjectives, nouns, verb to be, and *modals.* When individual groups
of potential words were identified, some low frequency words
belonging to the same group as the high frequency ones were
added to the list. Table 2 displays potential adjectives that might
be an important element of *"indicating importance."* The italicized
words in Table 2 are words with low frequency added to the initial
list.   Finally, potential key words were used as key words to
generate concordances as shown in Figure 1.

Figure 1:   Concordances of adjectives from Corpus 1 and Corpus 2

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#1018  Feb2 /2)*#1019  Asthma is the most common chronic disease of childbirt
   .         (#1068  May 4 / 1)#1069  Most leg ulcers are venous.1   (#1069  M
   May 4 / 3)*#1071   Measles is the most contagious disease known to man.
128    Ovarian carcinoma is the sixth most common cancer of women worldwide ar
manglomas (strawberry naevi) are the most common soft tissue tumours of infar
      (#1130  Aug 17 / 3)#1139  The most appropriate revascularisation strat
.1     (#1148  Sept. 21 / 2)#1149  Most reviews of risk factors for asthma
nhibitors and aspirin are two of the most widely used therapeutic agents in c
ated low back pain can be one of the most challenging disorders seen in prima
(#1180  Nov 16 / 2)#1181  One of the most important milestones in HIV-1 resea
05   Colorectal cancer is the third most common cause of cancer-related deal
lmonary disease (COPD) is one of the most important problems world-wide (1,2)
ansferase (ALT) concentration is the most commonly used variable for assessm
055  Congestive heart failure is the most frequent cause of hospitalization :
ong U.S. women, breast cancer is the most common type of cancer and is the se
he common cold is one of the world's most prevalent illness.  (#2070  Dec  1
ccurs spontaneously in patients with acute coronary syndromes or during a pe:
on lowers mortality in patients with acute myocardial infarction.    (#1017
tcome.1-2  (#1025  Feb16 /2)*#1026  Acute liver failure resulting from seve:
ment of multiple organ systems, with acute renal failure, haemodynamic instal
ressive agents for the prevention of acute rejection in renal-allograft reci
reperfusion therapy in patients with acute myocardial infarction depends on t
nd major cardiovascular events after acute myocardial infarction. 1-3   (#10
n Africa. (#1114  Jul 20 /3)*#1115  Acute bacterial meningitis causes many
39  Sept. 7 / 1)#1140  Patients with acute myocardial infarction and substa
cies, including hypertension crisis, acute myocardial infarction,  and ventr
1)#2038    Emergent reperfusion for acute myocardial infarctio  (AMI) can b
se of cardiac catherization after an acute myocardial infarction are mixed.
illness.  (#2070  Dec  17 / 1)#2071 Acute liver failure is characterized by
  Feb2 /2)*#1019  Asthma is the most common chronic disease of childbirth; a
0 /1)*    #1113   Heart failure is a common and growing problem associated w
 Ovarian carcinoma is the sixth most common cancer of women worldwide and ac
omas (strawberry naevi) are the most common soft tissue tumours of infancy,
reatment of choice for patients with common bile-duct stones.1-3
sical inactivity, and obesity -- are common to both stroke and coronary hear
hepatitis B Virus (HBV) and HIV-1 is common, because  of shared modes of tra
 Colorectal cancer is the third most common cause of cancer-related death in
 / 1)#2020 Nocturnal hypoglecemia is common in patients with type 1 diabetes
emity peripheral arterial disease is common, both in community studies of un
 2)#2057   Venous thromboembolism is common after orthopedic surgery. (#2057
.S. women, breast cancer is the most common type of cancer and is the second
(1-3).  (#2069  Dec  3 / 3)#2070 The common cold is one of the world's most
   (#1020   Feb2 /4)*#1024  About 9 million people are imprisoned worldwide
re imprisoned worldwide, including 2 million in the USA and 70 000 in the UK
)*#1093  More than 70% of the 36.1 million HIV-1-infected   individuals wc
 Onchocera volvulus infects about 18 million people, *99% of whom live in su
 / 2)**#1122  There are up to half a million new cases of visceral leishmani
 At the end of 2000, an estimated 35 million people had been displaced1 by *
od pressure, which affects nearly 50 million Americans, is a serious public
hronic disease, currently affects 16 million  people in the United States, c
ductase reduce the risk of death and major cardiovascular events after acute
 function in young children may have major implications for our understandir
#1095  Type 2 diabetes mellitus is a major health problem associated with ex
lmonary hypertension, which can be a major cause of morbidity and mortality.
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The concordances in Figure 1 indicate mixed rhetorical functions, particularly *"giving fact," "expressing* a *combination of facts and importance,"* and *"indicating importance."*

After this first try, potential nouns were used as key words to generate concordances.   Examples of nouns with high frequency and those potential words are shown in Figure 2.   The

concordances in this figure reveal *"giving fact,"* *"indicating importance,"* and *"using a combination of fact and importance."* Examples of nouns that might suggest the writing technique *"indicating importance"*, were *mortality, morbidity, death(s), disease(s), risk, cause(s), severity, life,* and *cost(s).*

Figure 2: Concordances of nouns from Corpus 1 and Corpus 2

After some of the writing techniques were extracted from the concordances, individual opening sentences were assessed manually.

Authorship

To identify authorship, every opening sentence was carefully examined to see if it was cited from one or more previous findings or written by the authors. For *The Lancet*, each sentence was examined for a raised number or numbers indicating footnoting, such as the following:

> Patients who have had a stroke often have long-term
> difficulties with walking and other daily activities such
> as getting out of a chair and climbing stairs.[1]

For the *Annals of Internal Medicine*, the opening sentences were examined for the number or numbers in parentheses, such as the following:

> Colorectal cancer is the third most common cause of
> cancer-related death in men and women (1).

The frequencies were tabulated in coding forms and the percentage of the sentences composed using citation and those written by the authors were calculated.

Tenses

In this study, only the tense of the main clause of the opening sentence was examined. Tenses were initially assessed using concordances in Figure 1, together with concordances derived from the following key words: *is, are, has, have, was, were,* and *had* because these words together with the verbs in the sentence could indicate tenses. After obtaining a sketch of tenses used in the opening sentences, the tense in every opening sentence was examined manually.

Voice

Like tenses, voices were initially assessed by using concordances generated by such key words as *is, are, was, were,*

has been, have been, and *had been.* When a sketch of voices was obtained, the voice of each opening sentence was carefully examined.

Length

The number of words in each opening sentence was counted using the *Word Count* function from the menu "Tools" of the Microsoft Word software program. Finally, the maximum and minimum numbers of words were identified and the average number of words in the opening sentences was calculated.

Statistics

The data obtained was processed to determine the percentages, means, and standard deviations. Both Chi-square and Student t-tests were used to test differences between the two groups of subjects.

Results

This study investigated five aspects of the opening sentence of the introduction of medical research articles. It explored the techniques used for writing the opening sentence of research articles, by whom it was written—the authors or citation of previous works, tenses, voices, and finally it examined the length of the opening sentences. It was found that the three most common writing techniques were *"giving facts"* (53.89%), *"using a combination of facts and importance"* (24.55%), and *"indicating importance"* (14.37%) (Table 3).

Table 3: Techniques used in writing opening sentences

Technique	Annals (N = 72)	Lancet (N = 95)	Annals & Lancet (N = 167)	Chi-square test
1. Fact	42 (58.33%)	48 (50.53%)	90 (53.89%)	
2. Importance	14 (19.44%)	10 (10.53%)	24 (14.37%)	
3. Fact & Importance	11 (15.28%)	30 (31.58%)	41 (24.55%)	$\chi^2 = 5.04^*$
4. Others	5 (6.94%)	7 (9.72 %)	12 (7.19 %)	
Total	72	95	**167**	

*$p = .05$

However, *"using a combination of fact and importance"* was used more often in *The Lancet* (31.58%) than in the *Annals of Internal Medicine* (15.28%). The differences of the first three techniques were statistically significant ($p = .05$). As regards importance, it was found that many adjectives, such as *important, major, main, primary, prevalent, severe,* and *significant* were used. In addition, certain nouns were also used to indicate importance. Examples of these nouns were *death, mortality, morbidity, severity, factors, cause,* and *hospitalization* because these nouns express important things about our health and our lives, such as loss of life, intensity of sickness, and indispensable medical treatment. However, in some contexts they might suggest fact rather than importance. For instance, one of the following sentences expresses fact while the other importance:

1. The mortality rate of this disease is 1/100,000. *(Fact)*
2. This disease causes both morbidity and mortality. *(Importance)*

Table 4: Authorship of information for opening sentences

Authorship	Annals (N = 72)	Lancet (N = 95)	Annals & Lancet (N = 167)	Chi-square Test
1. Original (authors)	25 (34.72 %)	41 (43.16%)	66 (39.52 %)	
2. Citation (previous works)	47 (65.28%)	54 (56.84 %)	101 (60.48 %)	$\chi^2 = 1.22^*$
Total	72	95	**167**	

*p = .05

Regarding authorship, it was found that most opening sentences of both the *Annals of Internal Medicine* and *The Lancet* were composed by citation of one or more previous findings (60.48%). The *Annals of Internal Medicine* used more citation than *The Lancet*, 65.28% and 56.84%, respectively (Table 4). However, the difference was not statistically significant (p = .05).

As regards tense, this study found that more than half (70.06%) of the opening sentences in both medical journals were expressed in the present simple tense. *The Lancet* used more present simple tense (76.84%) than the *Annals of Internal Medicine* (61.11%). The difference was statistically significant (p = .05) (Table 5).

Table 5: Tense in opening sentences

Tenses	Annals (N = 72)	Lancet (N = 95)	Annals & Lancet (N = 167)	Chi-square test
1. Present simple	44 (61.11 %)	73 (76.84%)	117 (70.06%)	
2. Present perfect	17 (23.61%)	12 (12.63 %)	29 (17.37%)	$\chi^2 = 5.04^*$
3. Others	11 (15.28%)	10 (10.53%)	21 (12.57%)	
Total	72	95	**167**	

*p = .05

As for voice, it was found that more than three-fourths of the opening sentences in both journals were written in active voice (77.84%), whereas only 22.16% were in passive voice. When choice of voice usage was compared, the data obtained revealed that active voice was used more often than passive voice in both journals, 77.84% and 22.16%, respectively. *The Lancet* used more active voice than the *Annals of Internal Medicine*, 83.16% and 70.83%, respectively. However, the difference was not statistically significant ($p = .05$).

Table 6: Voice in opening sentences

Voices	Annals (N = 72)	Lancet (N = 95)	Annals & Lancet (N = 167)	Chi-square test
1. Active voice	51 (70.83 %)	79 (83.16%)	130 (77.84%)	$\chi^2 = 3.61^*$
2. Passive voice	21 (29.17%)	16 (16.84 %)	37 (22.16%)	
Total	72	95	167	

$^*p = .05$

Finally, this study found that the average length of the opening sentences in both medical journals was 21.89 words, with a maximum of 70 and a minimum of 5 words. However, there was no statistically significant difference between the lengths of the opening sentences in both journals ($p = .05$).

Table 7: Length of opening sentences

Length	Annals (N = 72)	Lancet (N = 95)	Annals & Lancet (N = 167)	t-test
Average	21.79 (SD = 10.37)	21.96 (SD = 9.52)	21.89 (SD = 9.89)	
Maximum	70	50	70	t = .107*
Minimum	6	5	5	
	72	95	**167**	

*$p = .05$

Discussion

The purposes of this study were to examine the techniques used in writing the opening sentence of the introduction section of medical research articles, and to investigate the authorship, tenses, voices, and length of these initial sentences. It was found that more than half of the opening sentences (53.89%) express facts, present a combination of facts and importance (24.55%), or indicate importance (14.37%). This finding confirms the technique of *"giving facts"* suggested by McElroy (1997), and *"indicating importance"* recommended by Swales (1987). However, it should be noted that *"facts"* refers to both general facts and facts reported from research findings. This finding, therefore, is also supported by the second finding, that more than half of the opening sentences (60.48%) were citations of previous findings.

It is interesting that the substance or content of the opening sentences was not generally initiated by the authors. Rather, it was a citation of previous research findings. This finding probably makes sense in that, by nature, research findings are empirical and as such rhetorically convincing. In addition, writing of the opening sentence is not an easy task. Also, it may be more convenient to write from information on hand than from scratch.   Therefore, citing previous works predominates in the authors' writing.

This study also found that the majority of the opening sentences were expressed in present simple tense (70.06%),

followed by the present perfect tense (17.37%), and other tenses (12.57%), which included the past simple tense and the present progressive tense. This finding corresponds with the finding that *"giving facts"* predominates. This may be because facts are usually expressed in present simple tense, particularly natural facts or generalizations, which are by nature timeless. Oster (1981) in her research on the use of tenses in reporting past literature has proposed that the present tense is used to refer to past literature and to refer to quantitative results of past literature that are supportive or non-relevant, whereas the present perfect is used to make general statements about past literature. Malcolm (1987) in a study on tense usage in the *Journal of Pediatrics* has hypothesized that generalizations are mainly expressed in the present tense, references to a specific study in the past tense, and references to an area of inquiry in the present perfect tense. Malcolm has concluded that the choice of tense is ultimately a rhetorical one; the authors are free to choose the time location that best suits their purposes. Moreover, Biber et al. (1999, pp. 456-458) have stated that present tense verbs are somewhat more common than past tense verbs in academic prose. Most importantly, Biber et al. have also asserted that the present tense can be used to refer to events in the past, to present states, to present habitual behavior, or to introduce future events. In fact, the present tense is used to imply a lack of time restriction. McCarthy (1991, p. 62) has stated that the tenses and aspects do not seem to depend on time as much as to issues such as the sender's purpose, focus on different elements of the message, and the projection of a shared framework within which the receiver will understand the message.

As regards voice, this study found that the active voice was used more than the passive voice, 77.84% and 22.16%, respectively. This finding is consistent with that of Wingard (1981) who found greater use of active verbs than of passive verbs. However, it should be noted that Wingard studied verb forms and functions in a corpus of four medical papers, and not the opening sentences. Moreover, as regards tense and voice, Tarone et al. (1981) have concluded that the writer's communicative purpose governs choices at the grammatical and lexical levels.

Finally, this study found that the average length of the opening sentences in both the American and English journals was about 21.89 words, with a maximum of 70 and a minimum of 5 words. This finding is inconsistent with that of Barber (1985), who reported that the average sentence length was 27.6 words. However, Barber noted that his investigation was merely preliminary and beside this it dealt with astronomy, not medicine. Moreover, although the present study found that the average length of the opening sentences was 21.89 words, there is no rule governing sentence length in other inner elements of the first schematic unit or move as other moves in medical research articles. However, an excessively long sentence is likely to be uninteresting as well as boring, while an extremely short one could be inadequate.

Implications for second and foreign language teaching

This study suggests some implications for second and foreign language teaching as follows:

1. Writing the opening sentence is difficult. To alleviate this problem, several practical techniques should be introduced to students, including the three most common techniques found in this study: *"giving facts," "using a combination of facts and importance,"* and *"indicating importance."* Also, the teacher should introduce citations to facilitate student writing of the opening sentence.

2. Criteria for choices of tenses should be taught in a succinct manner, particularly in reporting on past literature. For instance, the following three sentences have different meanings:

1. Robinson (1973) *found* that diabetes was a costly disease.
2. Robinson (1973) *finds* that diabetes is a costly disease.
3. Robinson (1973*) has found* that diabetes is a costly disease.

The first example refers to a specific study in the past. The second indicates a generalization that diabetes is a disease that costs a lot of money, regardless of time. The third example is to

claim generality about past literature—that diabetes is still an expensive disease from past to present.

3. In teaching tenses, the teacher should make it clear that the choice of tense *does not depend on time location only,* but also on the rhetorical function (illocutionary force), or the communicative function of the sentence as shown in the above examples.

4. This study found that the majority of first sentences in both *The Lancet* and *Annals of Internal Medicine* were composed by citation of previous works (60.48%). This indicates that citation of previous works is a practical and useful writing technique because both the content and structure of the sentence are already available. In addition, since the opening sentence is very important, many novice authors often experience anxiety and frustration while composing this very first sentence. Therefore, if this writing technique is introduced, it might help these inexperienced authors to have less anxiety and frustration and to feel more at ease when writing this sentence.

5. In general, a sentence should not be too short or too long because it might be inadequate or it might distract the reader's attention. This study found that opening sentences were composed of about 22 words. Therefore, it might be wise to take this length as an average length for opening sentences.

Suggestions for future research

This study examined only the first sentence of the introduction section of medical research articles, which is only the first element of the first move. Future research should investigate other inner elements, such as reporting previous findings that pave ways for elucidating gaps in research or giving reasons why a study was undertaken, the statement of the research gap as well as the statement of purpose.

Conclusion

The findings of this study suggest that opening sentences usually give facts, indicate importance, or express a combination of these two rhetorical functions. These sentences are also composed of about 22 words in the present simple in active voice. In addition, they are often a citation of previous findings.

Acknowledgements

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