Analysis of the Language in Titles of Research Articles in Medical Sciences

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Abstract

The purpose of this study was to investigate types, components, length, and inner elements of titles of research articles in medical sciences, including nursing science. A corpus of 992 research titles in four leading journals, from 2003 to 2005, was analyzed. Research instruments were four computer programs: the Microsoft Word for word count, Microsoft Excel for data preparation, a concordancing program for displaying concordances of the required words, and SPSS for calculating the mean and standard deviation. This analysis found that most research titles (96.17%) were indicative, and only 3.83% were informative titles. Three hundred and twenty one (33.65%) indicative titles had subtitles, which more than half (59.81%) indicating type of study. In addition, most head nouns of indicative titles were without indefinite articles (84.80%). In this corpus, important components of titles were variables (100%), population or subjects (79.44%), type of study (40.52%), and venue of study (4.03%). An average length of titles was 13.33 words (S.D. = 4.11), with a maximum of 27 and a minimum of 3 words. The top five prepositions were *of* 816 (82.26%), *in* 662 (66.73%), *with* 196 (19.76%), *on* 91 (9.17%), and *to* 78 (7.86%).

Introduction

The title is the first and most read part of a research article (Loke, Silverman, & Spirduso, 1998). The most obvious reason may be because it presents information that every reader wants to know, particularly the topic under investigation. In general, there are two types of titles, indicative and informative (Huth, 1983). An indicative title is a noun phrase telling what the paper is about, whereas an informative title tells briefly in a sentence form the message of the paper. An indicative title may be followed by a colon and a subtitle, which illustrates, extends, amplifies the preceding title, or indicates type of study.

The principal function of a title is to summarize the main idea of the article and to inform readers about the actual variables or theoretical issues under investigation and the relationship among them (APA, 1994). Many titles also include the population group as well as the type of research. The titles of professional articles are usually precise and concise, yet they must describe the focus of the study (Graziano, 2004). The title must also be accurate and appealing (Loke, Silverman, & Spirduso, 1998). In addition to this, the title should not include such words as "An Approach to," "A study of," and "An Investigation of" (APA, 1994; Wilkinson, 1991). A large number of titles of research articles in medical sciences and their related fields, however, often include these empty words. In addition, both indefinite and definite articles are often used in front of the head nouns of indicative titles. Above all, some titles are very short, while others are rather long.

There have been several studies on research articles in science, medical sciences, and nursing. Notable among these studies is that of Swales (1990), which analyzed the discourse structure of article-introductions from a corpus of 48 article-introductions randomly selected from sciences, biology/medicine, social sciences, education, management and linguistics. This study found a general four-move introduction: establishing the field, summarizing previous research, preparing for present research (indicating the gap), and introducing the present research (stating the purpose). In 1981, Wingard carried out an analysis of verb forms in medical papers, while in 1984 Smith

investigated medical discourse focusing on aspects of author's comment. Nwogu (1997) studied the structure and functions of medical research papers. In 2000, Marco conducted a genre-based study of collocational frameworks in medical papers. In line with other researchers, in 2002, Peacock performed an analysis of communicative moves in discussion sections of research articles in seven disciplines, including sciences, language and linguistics, and law.

These examples clearly indicate that a variety of topics regarding research articles in medical sciences have been addressed in the past two decades. However, there is no study that focuses on the language in titles of research articles in medical sciences. Therefore, the purpose of this study was to investigate types, components, length, and inner elements of titles of research articles in medical sciences, including nursing science

Objectives

1. To examine types of titles

2. To identify the titles with subtitles and functions of the subtitles

3. To explore top ten head nouns in indicative titles

4. To examine definite and indefinite articles in front of the main head nouns of indicative titles

5. To identify average length of the titles

6. To examine the five most used prepositions in titles

Scope of study

1. This study was primarily quantitative.
2. The study was not aimed at comparing titles in selected journals.
3. Journals eligible for the study did not prescribe one obvious type of title, particularly the journals prescribing the title and subtitle

Methods

Subjects

A corpus of 992 research titles, consisting of 12,418 words, from four leading journals in medical sciences and nursing in three consecutive years, 2003 – 2005, was studied (Table 1). The main inclusion criteria for journals are that they are world leading journals, available online, and do not prescribe one particular type or style of title, such as those requiring only the title and the subtitle that indicates type of study. These four selected research journals were: *The American Journal of the Medical Sciences (AJMSci)*, *The American Journal of Psychiatry (AJP)*, *The Annals of Internal Medicine* (AIM), and *Nursing Research* (NR), which are available online under the following URLs:

Table 1: Journals and number of articles

Journals	2003	2004	2005	
AJMSci	17	40	30	87
AJP	185	188	180	553
AIM	82	80	77	239
N R	39	38	36	113
Total	323	346	323	**992**

http://www.amjmedsci.com/
http://ajp.psychiatryonline.org/
http://annals.org/
http://www.nursingresearchonline.com/

Instruments

In this study, four computer program, the Microsoft Word 2002, Microsoft Excel, a concordancing program by Watts (2004), and SPSS were used. Microsoft Word was used to count the number of words in each title, while Excel was used to prepare raw data for the SPSS program. The concordancing program was used to display the concordances, or instances of the required key

words with their concordances, or instances of the required key words with their contexts, as shown in Figure 1. SPSS for Windows version 10.5 was used to calculate the mean and standard deviation of words in titles.

Figure 1: Concordances of "Study"

Procedures

Data preparation

Since different journals group research articles under different headings, an initial survey to locate eligible articles in each journal was performed. This brief survey has revealed that each journal categorizes research articles under various headings, namely original articles (*AJMSci*), new research (*AJP*), articles (*AIM*), and features (*NR*).

For data collection, the titles of all eligible articles in each journal, from 2003 to 2005, were copied and saved in 12

Word document files (*.doc), such as AJMSci31.doc, AJMSci41.doc, and AJMSci51.doc. These files were kept as original or master files. However, most concordancing programs, including that of Watts (2004), usually require text files (*.txt). Therefore, these original files were saved as text files, forming 12 individual corpora, such as AJMSci32.txt, AJMSci42.txt, and AJMSci52.txt. These text files, finally, became individual corpora ready for analyses.

Word count

When all text files were prepared, Microsoft Word was used to count the number of words in each title of every individual corpus. For word count, the following steps were used: open each file, or individual corpus, in Microsoft Word, highlight each title, click at the Tools menu, click at Word Count, and finally, record number of words in each title in coding forms.

The coding forms used in this study had two columns "No. of title" and "Length." When word count was done for all 12 individual corpora, title numbers and title length scores were keyed into the Microsoft Excel, running from Title 001 until Title 992. This Excel file serves as a data file for the SPSS program to calculate the mean and standard deviation of the study corpus, which were derived from all 12 individual corpora previously described.

Installation of a concordance

When word count for every individual corpus was done, inner elements of the titles were thoroughly and extensively examined. The first step was to download the Concordance by Watts (2004) into the computer. To do this, http://www.concordancesoftware.co.uk/ was typed into the Google and the Enter key was pressed, or Go was clicked. Then, the instructions were followed until installation was completed. In general, this evaluation version would be valid for only 30 days without registration and subsequent purchase.

Types and inner elements of titles

Each title was carefully examined to determine its type: indicative or informative. Following this was an in-depth analysis of the title to determine whether it was in a sentence form (a statement or a question), or a noun phrase. If the title was a noun phrase, further examination was carried out to identify its head noun, its pre-modifier, the article preceding the head noun, subtitle, and what the subtitle indicated. To answer these questions, the titles obtained were examined manually.

Components of indicative titles

Apart from presenting such pertinent information as topic and variables, some titles also indicate the population or sample, type of study, and venue of study. Several strategies were used to identify these components.

As regards variable, various phrase structures were used to identify the study variables. For example, the structure "*Effect of X on Y,*" where X stands for an independent variable and Y for a dependent variable, was used to assess if variables were included in the title. In addition, "A *Comparative Study of A and B*" is followed by two groups of study variables, A and B. Also, the structure "*Relationship between A and B*" certainly indicates two variables, A and B.

After assessment of variables, data regarding subtitles (Table 2) were reviewed to set up an initial criterion for identifying words and phrases that indicate types of study. Information derived from this step suggests various words and phrases that indicate types of study, both in the first part and the second part of the title. Examples of these words and phrases were: "*A Placebo-Controlled Trial Study of*", "*Case Control Study of*", "*A Comparative Study of*", and "*Relationship Between*". To gain more insight into this criterion, concordances of several words such as the following were retrieved: "*Study*", "*Investigation*", and "*Analysis*". Finally, every title was manually assessed for types of study. However, for titles that met the criterion described above, this manual procedure was just to confirm the type of the study,

whereas for those that did not comply with it, type of study was carefully assessed.

In the next step, a quick survey was performed to explore words or phrases that represent the study population or subjects. From this survey, it was found that several words and phrases denote the sample group, such as "*in Patients*", "*among patients*", "*for Patients*", and "*of Elderly Adults*". To have more details about words or phrases representing study population, concordances of the following propositions were retrieved: "*in*". "*of*", and "*among*". Finally, every title was carefully assessed.

The last component of titles is the venue of study. In the initial step, the concordances of the preposition "*in*" were retrieved. This step revealed some place names, such as *Hong Kong, Japan, U.S.A.* Then, the first column of the concordancing program was looked at one more time to look for place names. The words should be clicked at to see the whole titles and to accept or reject the names as the study venue. To avoid any identification error, every title was again manually examined for the study venue.

Length of titles

To estimate the average length of titles, length scores from all of the 12 individual corpora were keyed into Microsoft Excel as described earlier, and these scores were loaded into SPSS program to determine the mean, standard deviation, maximum score, and minimum score.

Prepositions

When the main focuses of the study had been analyzed, the concordancer was used to determine the five most used prepositions. Since most prepositions retain their forms and functions, their occurrences were easily found in the first column labeled "Headword" of the concordancer. However, in case of the word "*to*", which can be both a preposition and an infinitive, the frequency of occurrences provided in this first column is not valid. Therefore, it was necessary to have the concordancing program display all concordances of "*to*". To do this, the headword "*to*" was

clicked at. After that, the occurrences of the preposition "*to*" were manually counted.

Statistical analysis

Obtained data were recorded in the coding forms and keyed into Microsoft Excel, and saved as an Excel file. This raw data file was then loaded into the SPSS program to determine the mean, standard deviation, maximum and minimum length.

Results

This study investigated 992 titles of research articles in medical sciences and nursing. The main findings were as follows:

Types and inner elements of titles

1. Regarding type of study, this analysis found that there were 954 (96.17%) indicative and 38 (3.83%) informative titles. Of 38 informative titles, there were 22 (57.89%) statements and 16 (42.11%) questions (Table 2).

Table 2: Types of titles

Journals	Indicative	Informative		
		Statement	Question	
AJMSci	74	11	2	87
AJP	541	1	11	553
AIM	227	10	2	239
N R	112	-	1	113
Total	**954**	**22**	**16**	**992**

2. Of 954 indicative titles, 321 (33.65%) titles had subtitles. Among these subtitles, 192 (59.81%) indicated types of

study, and 129 (40.19%) presented details, hypotheses, or focus of the study.

Table 3: Subtitles

Journals	Subtitles		
	Type of study	Others	
AJMSci	8	11	19
AJP	94	77	171
AIM	79	25	104
N R	11	16	27
Total	**192**	**129**	**321**

Inner elements of titles

1. Head noun

Top ten head nouns of indicative titles are presented in Table 4.

Table 4: Top ten head nouns of indicative titles (n = 954)

No	Head nouns	Frequency	%
1.	Effect / Effects	67	7.02
2.	Study / Studies	24	2.52
3.	Association	18	1.89
4.	Relationship	17	1.78
5.	Factor / Factors	16	1.68
6.	Prevalence	16	1.68
7.	Impact	15	2.29

No	Head nouns	Frequency	%
8.	Comparison / Comparisons	14	1.47
9.	Predictors	14	1.47
10.	Difference	13	1.36

2. Articles in front of head nouns of the titles and subtitles

2.1 Most head nouns of indicative titles were without indefinite or definite articles (84.80%).

2.2 There were 145 (15.20%) of the first part of indicative titles that were preceded by articles, while there were 216 (67.29%) subtitles, or the second part of the titles, that were preceded by articles (Table 5).

Table 5: Articles in front of head nouns

Article	Head nouns of main part of titles (n = 954)		Head noun of subtitles (n = 321)	
A	44	(4.61%)	161	(50.76%)
An	10	(1.95%)	27	(8.41%)
The	91	(9.54%)	28	(8.73%)
Total	**145**	**(15.20)**	**261**	**(81.31%)**

Examples of the titles introduced by these articles are shown in Appendix B.

Components of titles

As shown in Table 6, this study found that 992 titles in this corpus presented variables (100%), population or subjects (79.44%), type of study (40.52%), and venue of the study (4.03%).

Table 6: Components of titles (N = 992)

Components	AJMSci (n=87)	AJP (n=553)	AIM (n=239)	N R (n=113)	Total (N=992)
Topic & Variable	87 (100%)	553 (100%)	239 (100%)	113 (100%)	992 (100%)
Population	70 (80.46%)	427 (77.22%)	198 (82.85%)	93 (82.30%)	788 (79.44%)
Type of study	32 (36.78%)	200 (36.17%)	125 (52.30%)	45 (39.82%)	402 (40.52%)
Venue	5 (5.75%)	16 (2.89%)	8 (3.35%)	11 (9.73%)	40 (4.03%)

Note: Apart from 192 subtitles that indicated type of study, some titles without subtitles also indicate type of study. These titles usually contained such noun phrases as *"Comparisons of"*, *"Prospective Study of"*, *"A Longitudinal Study of"*, *"Relationship between"*, and *"A Placebo-Controlled Trial of"*.

Length of titles

An average length of titles of research articles in medical sciences and nursing was 13.33 words (S.D. = 4.11), with a minimum of 3 words and, a maximum of 27 words.

Prepositions

Five most used propositions were *"of," "in," "with," "on,"* and *"to"* respectively (Table 7).

Table 7: Frequency of top-5 prepositions

No	Preposition	Frequency	%
1.	of	816	82.62
2.	in	662	66.73
3.	with	196	19.76
4.	on	91	9.17
5.	to	73	7.36

Discussion and Conclusion

This study analyzed a corpus of 992 titles of research articles in four leading journals in the medical sciences, including nursing, in three consecutive years, 2003 to 2005. It was found that most titles (96.17%) were indicative titles, or noun phrases, whereas only 3.83% of titles were informative, or sentence, titles. This may be because informative titles are usually long, and most journals would probably not accept them (Day, 1983; Huth, 1983). An overly long title is often less meaningful than a short title. Nevertheless, sometimes informative titles are useful as they summarize or present the result of the study (Columbia.edu, 2006), or pose a rhetorical question to attract the readers' interest.

As regards head nouns, it was found that titles in this study included several head nouns considered "empty word," by APA (1994), such as *"Study"* and *"Investigation"*. Most of these head nouns of indicative titles (84.80%) were without articles. Only 145 head nouns (15.20%) were introduced by articles. The head noun *"Effects"*, however, was also introduced by the definite article *"The"* as shown in Figure 2.

Figure 2: The head noun "Effects" and "The'

The result that articles rarely preceded head nouns of indicative titles partly supports Turabian (1996) who states that initial articles are omitted when the title is in English. It is also consistent with Creswell's (1994) recommendation that most articles and prepositions should be eliminated. A reason may be because initial articles are not considered part of the title (Ebbitt & Ebbitt, 1978), and many authors (APA (1994; Huth, 1983; Day (1983) have suggested that some head nouns, such as "A Study of" and "An Investigation of" are "waste" or "empty" words.

Concerning components of both indicative and informative titles, this study found that these titles presented variables (100%), population (79.44%), type of study (40.52%), and venue of study (4.03%), respectively. Venue of study was the least component included in titles. This may be because most readers probably want to know the topic, variables, and population to help them decide whether a study is relevant to their need. Therefore,

venue is not as important a piece of information as other components.

Another controversial issue is whether there are any of the existing titles that are composed of more than 12 words. This study found that the average length of titles in research articles in medical sciences and nursing was 13.33 words. This finding does not support APA (1994) and Shaughnessy & Zechmeister (1997), which recommend the length of 10 to 12 words. Also, it was found that some titles in this study corpus were excessively long, with the maximum of 27 words. This discrepancy may be because in medical sciences and nursing the name of a disease or sickness may require more than one word, and there may be several study variables in the titles.

This study also examined five prepositions with high frequency. It was found that "*of*" was the most used prepositions and "*to*" comes fifth. The result that the preposition "*of*" was most used is consistent with the result reported by Carroll, Davies and Richman (1971), who have found that "*of*" is one of the high frequency prepositions. In addition, according to Biber et al. (1999) about 60-65% of all post-modifying prepositional phrases begin with the preposition "*of.*" Moreover, six prepositions (*of, in, for, on, to* and *with*) account for about 90% of all prepositional phrases as post-modifiers. This result also confirms the finding reported by Leech, Rayson and Wilson (2206) in that the prepositions "*of,*" "*in,*" "*to,*" "*for,*" "*with,*" and "*on*" were the most frequent used prepositions. Finally, studies in medical sciences and nursing are usually involved with patients. To refer to patients, different prepositions are used, particularly "*of,*" "*on,*" "*in,*" and "*with*" as in the following examples:

- ... of Homeless Youth

- ... on Metabolic Syndrome

- ... in Hear Failure

- ... in Patients with Schizophrenia.

- ... Patients with Cancer.

Therefore, prepositions *"of,"* *"on,"* *"in,"* and *"with"* were highly used in titles.

Implications for ESL or EFL

The findings of this study suggest some implications for English as a second language (ESL) and English as foreign language (EFL).

1. As regards type of title, the teacher should point out the importance of titles because both indicative and informative titles inform readers of important information the readers should know before reading an entire article. Moreover, these two types of titles focus on different information. For example, informative titles usually report on the result of the study or they may pose a rhetorical question to focus or attract the readers' attention, whereas indicative titles mainly present a topic, variables, population or subjects, type of study, and study venue.

This study has also revealed that most research articles (96.17%) have indicative titles, while only 3.83% have informative titles. Therefore, students who need to read research articles should be prepared to cope with this type of title. In addition, indicative titles may be one-part titles, or two-part titles. The second part often (59.81%) indicates type of study. This information is very important to help students read the titles more efficiently because they already know what the titles should present and what type of study has been carried out.

For the teaching of writing, students should be taught to choose the type of title that meets their needs. In other words, they should be able to decide whether to use an indicative or informative title. If they are to use an indicative title, they should be able to decide if they want a one-part title or a two-part title.

2. The present study has revealed that indicative titles are composed of several components, especially topic, variables, population or subjects, type and venue of study. Students should be taught to utilize this knowledge to help them form a sketch of the study and become more fluent readers. They should be taught

to anticipate information in each part of the articles based on information obtained from the titles. For example, if the title states that patients with schizophrenia were the subjects of the study, students should be able to anticipate that the subheading "Subjects" should contain this information and gives more details about these schizophrenic patients. Thus, in this process students just check what the subheading presents against their content schema. This process, in fact, is a top-down process, not the bottom-up. In addition, students should be taught to constantly confirm, reject, or adjust what they have anticipated.

Concerning academic writing, students should be taught to write research titles that include the important components of titles, which have been described in this paper.

3. Regarding definite and indefinite articles, the teacher should make students aware of the fact that articles are rarely used in front of the head nouns of one-part indicative titles or the first-part of two-part indicative titles. However, indefinite article "*A*" or "*An*" is frequently used in front of the head noun of the second part of an indicative title as in the following example:

Duration of Antibiotic Therapy for Early Lyme Disease: *A Randomized, Double-Blind, Placebo-Controlled Trial*

Therefore, when writing a title for an article, students should comply with these international standards, especially not to put any indefinite article in front of such head nouns as "*Study*", "*Analysis*", or "*Investigation*".

4. This study found that the average length of titles in medical sciences and nursing was 13.33 words, while APA (1994), and Shaughnessy & Zechmeister (1997) recommend 10 to 12 words. However, an important fact is that a very short title may inadequately present relevant information, while an excessively long title may lose focus. Worst of all, the title may be uninteresting. At the same time, a title of 13 to 14 words may not be too long. Therefore, a compromise may be that the length of a research title in medical sciences and nursing should be 10 to 14

words. However, further research with a larger corpus made up from more journals is required to confirm this suggestion.

5. This study found that the five prepositions that occurred most frequently in titles from the selected journals were "*of*," "*in*," "*with*," "*on*," and "*to*." However, this does not mean that students must use these prepositions. Instead, they should use the correct and appropriate ones. As for reading research titles, the teacher should point out that there are several prepositions that come before the noun indicating study population or subjects as described earlier. Exercises on reading research titles should be constructed, including some that focus on identifying populations or subjects.

Limitation of study

Despite empirical data and reliable instruments used for data analysis, this study has some limitations. An obvious limitation is concerned with identification of type of study. In this study, some key words were used as a guideline to identify type of study. However, due to the author's lack of expertise with regard to the technical words and phrases in medicine, there might be some words and phrases that also indicate type of study, but were not included in the basic list. This might affect the total number of titles that indicate type of study. Another limitation is concerned with the study corpus because to gain more study precision, a larger corpus is required.

Future research

This study analyzed a corpus of 992 titles in four leading journals, some of which are more general than others. Therefore, future research should investigate titles of journals in specific fields of medicine. In addition, to gain more reliability, a further study should investigate a larger corpus. Further research should also investigate other parts or sections of research articles in different disciplines, such as introductions, materials and methods, the results, and discussions and conclusions.

The Author

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Appendices

Appendix A:

How to make a concordance from this concordancing program

To use the concordance, click at the Concordance icon on Desktop, click at the File menu, Make Full Concordance, and finally From File ... Alternatively, click at the first icon (Book) and start adding files to the Concordance.
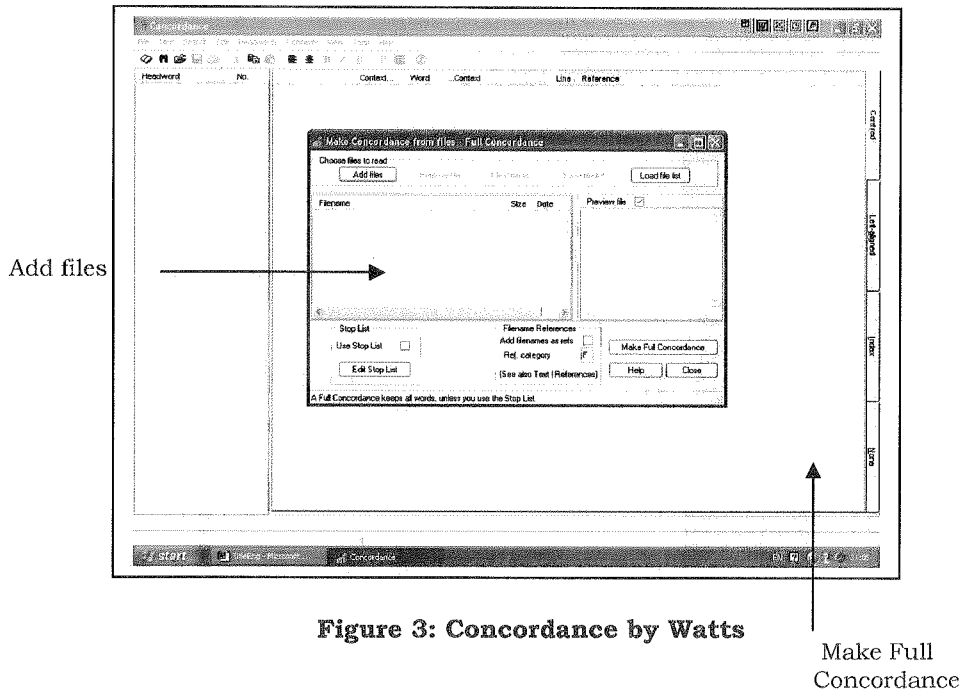

Add files

Make Full
Concordance

Figure 3: Concordance by Watts

Next, click at Make Full Concordance on the bottom right corner. When every file is loaded, the main corpus is automatically constructed and, the Concordance program will sort words in alphabetical order. To see concordances of a word, click at the word. The program will now list every line where this word occurs as shown in Figure 1.

Appendix B

Examples of head nouns introduced by articles

1. Indefinite article *A*

- A Meta-Analysis of the Effect of hospital-Based Case Management on Hospital Length-of-Stay and Readmission

- A Comparison of HIV-Positive Patients with and without Infective Endocarditis: An Endocarditis Due to Staphylococcus aureus

- A Randomized, Controlled Trial of Cognitive Behavioral Social Skills Training for Middle-Aged and Older Outpatients with Chronic Schizophrenia

- A Randomized, Double-Blind, Placebo-Controlled Trial of Quetiapine in the Treatment of Bipolar I or II Depression

- A Prospective Study of Aspirin Use and the Risk for Colorectal Adenoma

2. Indefinite article *An*

- An fMRI Study of Episodic Encoding and Recognition of Words in Patients with Schizophrenia in Remission

- An Outbreak of Hepatitis C Virus among Outpatients at a Hematology / Oncology Clinic

- An Intervention to Increase Safety Behaviors of Abused Women: Results of a Randomized Clinical Trial

- An Analytic Strategy for Modeling Multiple-Item Responses: A Breast Cancer Symptom Example

- An HIV Self-Care Symptom Management Intervention for African American Mothers

3. Definite article *The*

- The Role of Psychiatric Disorders in Predicting Drug Dependence Treatment Outcomes

- The Effect of Parental Alcohol and Drug Disorders on Adolescent Personality

- The Impact of Comorbid Posttraumatic Stress Disorder on Short-Term Clinical Outcome in Hospitalized Patients with Depression

- The Cost-Effectiveness of Cyclooxygenase-2 Selective Inhibitors in the Management of Chronic Arthritis

- The Relationship among Previous Antimicrobial Use, Antimicrobial Resistance, and Treatment Outcomes for *Helicobacter pylori* Infections