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Information sources for developing the nursing literature

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Abstract

Background: Journals are an important method for disseminating research findings and other evidence for practice to nurses. Bibliometric analyses of nursing journals can reveal information about authorship, types of documents cited, and how information is communicated in nursing, among other characteristics.
Objectives: The purposes of our study were to describe the types of documents used to develop the clinical and research literature in nursing, and extent of gray literature cited in those publications.
Design: This was a descriptive study of 18,901 citations of articles in clinical specialty and research journals in nursing published between January 2004 and June 2005.
Methods: The research team reviewed each citation to assess if the cited document was a journal article, book chapter or book, or document falling into the category of gray literature. Frequency counts for each type of cited document were recorded.
Results: Most of the citations were to journal articles ($n = 14,392$, 76.1%) and among those, to articles in medical journals ($n = 7719$, 40.8% of all the citations). This was true for the literature as a whole and for the clinical specialty and research literature separately. Although citations to medical journals were most common, in the clinical nursing literature there was a significantly higher proportion of citations to medical journal articles ($n = 6332$, 44.5%) than in the nursing research literature ($n = 1387$, 29.7%) ($LR^2_X = 326.7$, $p < 0.0001$). Nearly 10% of the citations were to gray literature. There was an increase in citations to websites (5.7%) compared to a study done only a few years earlier.
Conclusions: Our study documented that journal literature was the primary source of information for communication within nursing. This is consistent with other biomedical and hard sciences where the transfer, assimilation, and use of information occur mainly within the scientific community. With a reliance on journal articles for dissemination of research and evidence for clinical practice, improved methods will be needed for integrating this knowledge and presenting it in a usable form to clinicians. As journals proliferate, it will become increasingly difficult for clinicians to keep current with research findings to guide their practice. The development and testing of new methods for integrating and disseminating research evidence to busy clinicians will be increasingly important in nursing. Gray literature was nearly 10% of the citations. The study also revealed an increase in citations to websites, which is anticipated to continue in the future. Further study is needed on the indexing of gray literature relevant to research use and evidence-based

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practice in nursing and on how to make this literature easily available to clinicians.

Keywords: Citation analysis; Gray literature; Nursing literature; Scientific communication

What is already known about the topic?

- Journals are the most frequently cited document in the nursing literature.

What this paper adds

- Most information sources in the nursing literature are medical journal articles followed by articles from nursing and other journals.
- This is particularly true among articles in clinical specialty journals.
- About 10% of the citations in articles in nursing journals are to gray literature.
- Citations to websites have increased compared to a study done only a few years earlier.

1. Introduction

Scientific knowledge is communicated to members of a profession through its literature. The literature reflects the body of knowledge of a discipline and how that knowledge is used in practice. The literature is a vehicle for transmitting research results, which can then be evaluated by nurses and used to develop new practices or confirm existing ones. Studies published in the literature also are used for meta-analyses and other types of research reviews that critically appraise and synthesize studies to answer specific clinical questions.

Bibliometrics is the application of statistical methods to study a body of literature (Pritchard, 1969). Traditional bibliometric studies are quantitative analyses, typically using frequencies, although newer studies also use data mining to examine patterns in the development of publications (Nicholson, 2006). Bibliometric analyses of the nursing literature reveal information about authorship, types of documents cited, how works are connected, and journals. These analyses describe how information is communicated in nursing including the flow of information from the research to the practice literature. Bibliometric studies suggest how research findings are disseminated to readers of clinical journals, an important outcome in light of evidence-based practice. These studies also contribute data for librarians' decisions about core journals in a discipline and whether certain journals are worth their costs, and are used for determining journal impact factors (Urquhart, 2006).

The purposes of our study were to describe the types of documents used to develop the clinical and research literature in nursing, and the extent of gray literature cited in those publications. Our goal was to better understand information sources used to develop the nursing literature.

2. Scientific communication

Björk (2005) developed a model of scientific communication that links research and generation of new knowledge with use of that knowledge in practice. The model has four main components: conduct the research; communicate the knowledge gained through informal means, such as oral presentations at conferences, and formal means, i.e., publishing the results in scholarly journals; apply the knowledge to improve quality of life and solve practical problems; and evaluate the research or researcher. Journals are an important link in the communication between researcher and practitioner. Journal articles communicate research to practitioners and provide a mechanism for practitioners to debate potential changes in clinical practice and treatments based on that research (Urquhart, 1998).

Early scientific communication began with journals developed in the 17th century from correspondence from members of scientific societies. Scholars would meet to share ideas and papers on their research and would write short accounts of their work as private letters to society members who could not attend meetings (Correia and Teixeira, 2005). These early journals were a means of communicating new ideas and scientific discoveries among members of a society who had a particular interest in that area of science. Gradually discipline-specific societies were developed, which in turn published specialized journals (Hurd, 2004). Over the years, journals have become even more specialized, meeting the needs of researchers and practitioners in a defined area of study or practice. The *Cumulative Index to Nursing and Allied Health Literature* (CINAHL®) database (2006) lists 542 nursing journals, many of which disseminate information in highly specialized areas of nursing.

3. Bibliometrics and the nursing literature

Some recent bibliometric studies have been done of the nursing literature. In one study, O'Neill and Duffey (2000) examined the flow of information between the nursing research and practice literature. They found that 42.5% of the citations in clinical practice articles were to research articles. Estabrooks et al. (2004) used a variety of bibliometric techniques such as citation analysis to map the research utilization literature. They analyzed 630 articles on research utilization in terms of authorship, the source of citations, the growth of publications in the field, journals, and other characteristics. These researchers found a growth of articles on research utilization over the last two decades. Most citations in this literature were from nursing publications. To describe the origin and development of nursing theories, Beckstead and Beckstead (2006) analyzed citations to determine similarities in the epistemic origins of nurse theorists' ideas. Seventy-four scholars from various fields were cited by at least two nurse theorists, yielding 319 citations for analysis. Using multidimensional scaling, Beckstead and Beckstead identified fields that influenced the foundational ideas of nurse theorists, namely psychology (and particularly humanistic personality theorists), philosophy, and biology (and more specifically, general systems theory).

A task force of members of the Nursing and Allied Health Resources Section of the Medical Library Association undertook 18 studies to map the nursing literature. They examined the general nursing literature including journals such as *Nursing Standard*, *Nursing Times*, *Australian Nursing Journal*, *American Journal of Nursing*, and *RN*, and journals in various specialty areas of nursing. Journal articles were cited most frequently (65.5%), more than 60% of the cited documents were published within the prior seven years, and a small core of journals accounted for a third of the citations (Allen et al., 2006).

In another study, Oermann and colleagues examined 768 articles and 18,901 citations in those articles to map the extent of research published in clinical nursing journals and communication between the research and clinical literature in nursing (Oermann et al., in review). Citations were analyzed to determine if they were references to research, clinical practice, or other publications. Almost a third of the clinical articles were research reports, and another third were on updates and other topics about clinical practice. There were 14,232 citations analyzed in clinical nursing journals: 43.2% ($n = 6142$) of those were to research reports and a similar number of citations were to clinical documents ($n = 5844$, 41.1%) (Oermann et al., in review). In a smaller study of maternal child nursing journals, 112 articles were analyzed. Almost half ($n = 51$, 46%) of those articles were research reports, suggesting that the journals were disseminating research to a clinician readership (Oermann, Blair et al., in review).

4. Method

The research had two parts. In the first part we assessed the number of research studies published in clinical nursing journals (Oermann et al., in review). In the second part of the study, described in this paper, the goal was to examine the information sources used to develop the nursing literature.

This was a descriptive study of 18,901 citations of articles published in clinical and research journals in nursing between January 2004 and June 2005. The journals for analysis were selected from 177 nursing journals (print or electronic subscriptions) available at the University. In a prior study by two of the authors (MO, NW), the journals were categorized into three groups: clinical specialty, nursing research, and popular or general readership journals. The clinical nursing journals focused on a specialized area of clinical practice such as *Journal of Neuroscience Nursing* or on a practice role such as *Nurse Practitioner*. The nursing research journal category included research journals such as *Nursing Research* and scholarly journals such as *Journal of Nursing Scholarship*. The third group of journals was labeled popular or general readership journals such as *Nursing Times*.

The journal groups were verified using CINAHL subject headings and expert review. The clinical journals were categorized by CINAHL based on their clinical specialty, for example, *Heart & Lung* was listed as a journal in Cardiovascular Care, or were in the subheading Advanced Nursing Practice. In that subheading were journals that pertained to a practice role such as *Nurse Practitioner*. Journals in the nursing research group were classified by CINAHL in the subheadings Nursing Research and Nursing Science. These subheadings included journals such as *Nursing Research, Nurse Researcher*, and *Advances in Nursing Science*. In the current study we excluded the popular or general readership journals. In addition to CINAHL subject headings, the categorization of the journals was verified by 5 experts in our College of Nursing that included 3 nurse practitioners and 2 nurse researchers.

From our list of clinical specialty journals, we randomly selected 16 for analysis, and from our list of research journals, we randomly selected 4 for analysis (Table 1). In a pilot study to evaluate our process and recording form, we decided to limit our study to the analysis of 20 journals in line with our resources. The number of issues published in each journal was counted and half of those issues randomly selected for analysis. For each journal, ordering was based on the sequential volume and issue numbers, and a subset of 50% of the

Table 1
Journals included in study

Clinical journals	Research journals
AACN Advanced Critical Care	Nursing Research
Cancer Nursing	Western Journal of Nursing Research
Clinical Nurse Specialist: The Journal for Advanced Nursing Practice	Advances in Nursing Science
Dermatology Nursing	Journal of Nursing Scholarship
Heart & Lung: The Journal of Acute and Critical Care	
Home Healthcare Nurse	
Journal for Specialists in Pediatric Nursing	
Journal of Infusion Nursing	
Journal of Neuroscience Nursing	
Journal of Perinatal & Neonatal Nursing	
MCN, The American Journal of Maternal/Child Nursing	
Nursing 2004/2005	
MEDSURG Nursing	
The Nurse Practitioner	
Pediatric Nursing	
Urologic Nursing	

issues was randomly selected using QuickCalcs from GraphPad Software. In the issues chosen using this protocol, the citations of all of the original and feature articles were analyzed. The original articles were the main articles in that issue such as research reports, clinical practice articles, systematic and integrative literature reviews, and other types such as case reports. We limited our study to the original or feature articles to examine the citations used to develop the nursing literature. In many journals these were labeled as original or feature articles. However, we also did periodic cross-validations of our classifications. News items, columns, editorials, association committee reports, and letters to the editor were excluded.

The following definitions were adopted for the study. Citation was defined as a reference to another publication such as a journal article, a chapter, a book, a website, or other type of document. If journal article A cites journal article B, article A is *citing* article B. The *citing document* in this example is journal article A. Article B is *cited by* journal article A and thus article B represents the *cited document*.

The research team reviewed each citation to assess if the cited document was a journal article, book chapter or book, or document falling into the category of gray literature. When the citation was to a journal article, it was coded as a reference to a nursing journal, medical journal, or journal in another field of study. Gray literature is not published through regular peer-reviewed processes. Therefore, it is not indexed in the databases that nurse researchers and clinicians would search. Reports from governmental and non-governmental organizations, policy briefs, newsletters, theses and dissertations, and other unpublished documents are considered gray literature (Turner et al., 2005).

To ensure accuracy in the classification of the citations, when members of the research team were unsure about a classification, they sought assistance and confirmation from the principal investigator (MO) or librarian (NW). We also did periodic cross-validations of our classifications, and the statistician made quality control checks to ensure there were no data entry errors.

The information obtained from the citation analysis was recorded on a tool developed for the study and used in the first phase of the analysis. The tool collected publication information about the journals, articles analyzed in the study, and citations of those articles. Frequency counts for each type of cited document were recorded on the tool. For the gray literature, members of the research team described the document including its source. Documents available at websites were coded separately.

Data were analyzed using SAS v9.1. Descriptive statistics were obtained for the sample as a whole and for the clinical and research journals individually. Chi-square tests were used to examine if there were differences in the types of information sources used for articles published in clinical and research journals.

5. Results

5.1. Types of cited documents

Most of the citations were to journal articles ($n = 14,392$, 76.1%) and among those, to articles in medical journals ($n = 7719$, 40.8% of all the citations). This was true for the literature as a whole and for the clinical and research literature separately (Fig. 1). The second largest percentage of cited references were to nursing journals ($n = 3473$, 18.4%), followed closely by citations to journals in other fields ($n = 3202$, 16.9%). Fourteen percent ($n = 2634$) of the citations were to book chapters and books, and the remaining 9.9% ($n = 1873$) of the citations were to gray literature.

Although citations to medical journals were most common, in the clinical nursing literature there were a significantly higher proportion of citations to medical journal articles ($n = 6332$, 44.5%) than in the nursing research literature ($n = 1387$, 29.7%) ($LR^2_X = 326.7$, $p < 0.0001$). Another difference was found in the frequency of citations to nursing journals articles. In the research literature, a larger proportion of the citations were to nursing journal articles ($n = 1156$,

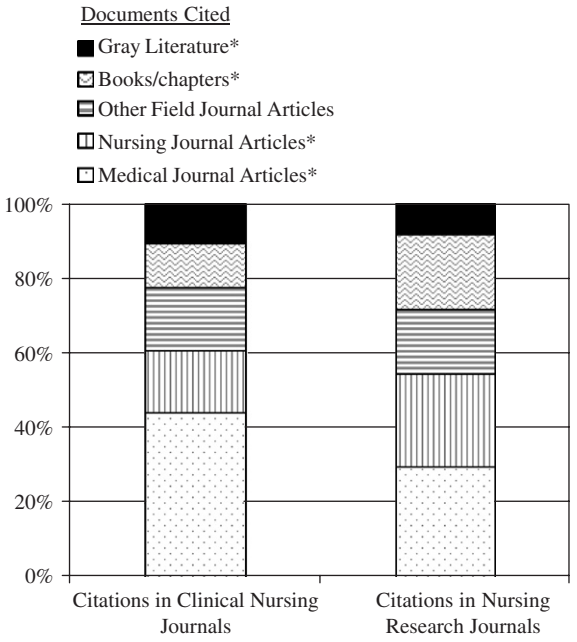

Fig. 1. Types of cited documents. $^{*}p<0.0001$ from χ^2 test for between group differences.

24.7%) than in the clinical literature ($n = 2317$, 16.3%) ($LR_X^2 = 160.2$, $p<0.0001$). There also were more citations to book chapters and books in research ($n = 931$, 19.9%) versus clinical ($n = 1705$, 12.0%) journals ($LR_X^2 = 174.5$, $p<0.0001$). The proportion of citations from journals in other fields was similar in the clinical and research literature in nursing (Fig. 1).

The median number of citations to medical journals per article was 5 ($Q3 = 13$, 90th percentile = 26) and to nursing journals 2 ($Q3 = 6$, 90th percentile = 13). However, in articles in nursing research journals, there were more citations per article to nursing journals (median = 6, $Q3 = 13$, 90th percentile = 18) than in the clinical nursing literature (median = 1, $Q3 = 6$, 90th percentile = 12).

5.2. Use of gray literature as information resources

Gray literature is not commercially published and does not appear in peer-reviewed journals. It is typically not indexed, making it difficult to access. Government reports, documents produced by healthcare and other organizations, fact sheets, policy briefs, conference proceedings, and other unpublished documents, in both print and electronic formats, are some examples of gray literature. In our study, 1873 (9.9%) citations were to gray literature. These included citations to websites ($n = 1080$) and an array of other documents: unpublished data and papers ($n = 209$), healthcare organization documents ($n = 105$), reports from governmental organizations ($n = 97$), theses and dissertations ($n = 85$), WHO publications ($n = 33$), newspapers ($n = 19$), university reports ($n = 17$), and newsletters ($n = 11$). The remaining documents were varied, and each was cited less than 10 times.

There were significantly more citations to websites in articles in clinical journals than in research journals. In the clinical literature, websites were cited 885 times, 6.2% of the citations, compared to 195 citations (4.2%) in the research literature ($LR_X^2 = 29.0$, $p<0.0001$). Citations to other types of gray literature were similar in clinical and research journals ($n = 604$, 4.2% vs. $n = 189$, 4.1%).

6. Discussion

Journal articles were the predominant cited document in the nursing literature. In the study by Allen et al. (2006), journals were 65.6% of all cited references. In our study they accounted for 76.1% of the citations. By studying the sources of citations, one can learn how information is communicated in a field. Our study documented that serial literature was the main source of information for communication within nursing. This finding is consistent with other biomedical and hard sciences where the transfer and use of information occurs mainly within the scientific community (Glänzel and Schoepflin, 1999, p. 32; Larivière et al., 2006). In a recent study by Larivière and colleagues, journal articles were the most important source of information in the health sciences, with 93% of all citations made to journal articles. The trend in referencing journal articles has increased steadily in the biomedical fields consistent with the growth of research in those fields. Our study represents a starting point to document if journal articles continue to represent the main source for communicating scientific and clinical knowledge within nursing. Consistent with other health fields, the reliance on journal articles may grow as the pace of research increases in nursing.

In other fields, information sources may be predominantly books, monographs, reports, and other non-serial literature. For example, in the study by Glänzel and Schoepflin, only 34.7% of the citations in the history, philosophy of science, and social sciences literature were to serials. In the research by Larivière et al., (2006), citing practices varied greatly across fields. Engineers, for example, cited fewer journal articles than in the biomedical and natural sciences but published more in conference proceedings. In the social sciences and humanities, less than 1 citation out of 2 was to a journal article.

The predominance of citations to medical journal articles in our study may reflect the connections between

medicine and nursing consistent with Beckstead and Beckstead's (2006) conceptualization of the health sciences (medicine and nursing) as having a body of established scientific knowledge used and adapted by both disciplines (p. 114). Although we documented a closer connection to medical than social science journals, this might have been the result of the journals included in our sample. Had our sample contained, for example, rehabilitation or gerontology nursing journals, authors might have cited more social science literature than found among the journals in our study.

For research articles published in nursing journals, citations to the medical literature may represent findings that were used to develop the research or were built upon in the current study. In writing a paper for a clinical journal, nurse authors often draw heavily on the medical literature to provide readers with a background to understand a clinical problem, why and how it develops, and its medical management as a segue to describing nursing interventions. Shams' (2006) analysis of the nurse practitioner literature revealed a heavy reliance on the medical literature. She suggested that nurse practitioners, as primary care providers, need more than only nursing knowledge for their practice.

Journal articles have an important role in the communication system between researcher and practitioner (Oermann et al., 2006). They disseminate research findings to practitioners for critical appraisal and evaluation of their relevance for clinical practice. This process, however, is not straightforward nor does it move linearly from research awareness, through publications and other dissemination methods, into use. French (2005) found that the process of using research in patient care involved stages of practical reasoning that included research identification, confirmation, evaluation, and application. At each of these stages, there was significant work involved for nurses to decide if and how the research might benefit their practice.

Studies have shown that nurses and nurse practitioners rely on their own experiences or seek information from colleagues when questions arise about patient care rather than using the literature or online resources (Estabrooks, et al., 2005; McCaughan, et al., 2005; Pravikoff et al., 2005). Research suggests that nurses in practice do not access research publications when they have a question about patient care even if that research is readily available. However, as McCaughan, et al. (2005) pointed out, the nurse's personal experience or the colleague's information may be informed by research. It may be that the colleagues with whom nurses consult are aware of current research and its relevance to clinical practice in that setting, thus serving as a way of transmitting research-based information to other nurses.

In our study we did not categorize the medical journals represented; however, a future study should examine what types of journals (e.g., biomedical research, general clinical medicine, specialty, and other) are cited in the nursing literature to better understand the transfer of information into nursing. While we found that medical journal articles were often cited in the nursing literature, we did not examine the extent of nursing knowledge that is diffused into the medical literature, which would be an interesting area of research to pursue.

In our study, about 14% of the citations were to book chapters and books. In an analysis of the nurse midwifery literature, Seaton (2006) found that 20.4% of the cited documents were to books, generally to the standard obstetrics and gynecology textbooks. In a mapping of the medical surgical nursing literature, from 1996 to the present, books accounted for 18.3% of the citations, close to our percentage (Taylor, 2006). We might have found more citations to chapters and books had we analyzed other nursing journals such as ones that focus on theoretical and philosophical perspectives of nursing.

Few studies have examined the use of gray literature in nursing. In our research nearly 10% of the citations were to gray literature. Citations to websites were 5.7% of the references compared with 0.5% in Allen et al.'s (2006) earlier study, spanning a period of 1996–2000. We analyzed journals published between January 2004 and June 2005, only a few years later, and references to websites increased significantly. It is likely this trend will continue. Thelwall (2002) suggested that the Web was a new medium for research dissemination, through e-journals, digital libraries, online conference proceedings, and other electronic documents, allowing researchers to communicate their findings to a broad audience. A follow up study should investigate more closely the citations to websites in clinical and research journals in nursing. Counting only the number of citations does not reveal the information those websites may have contributed to the work. Thelwall (2006) outlined both direct and indirect approaches for interpreting links to websites, which would be useful in a future study to understand how the Web is influencing scholarly communication in nursing.

Among the journals we examined, there were 793 (4.2%) citations to other sources of information, not very different from Allen et al.'s work. Allen et al. (2006) counted government documents separately, which were 4.3% of all cited documents, and other cited formats, which were 5.6% of all citations (p. 210).

Gray literature is potentially valuable to both nurse researchers and clinicians, but its lack of indexing makes it difficult to access, if at all. The nurse may be aware of some of this literature, such as reports from governmental, healthcare, and non-profit organizations, and know how to search for those documents. However, other information that may be significant to a study or

to answer a clinical practice question may not be accessible. Gray literature allows nurses to learn about studies, projects, clinical initiatives, practice guidelines, and innovations in other clinical settings and to build on this work. Access to documents of this nature also may provide examples of successful interventions to stakeholders and decision makers (Turner et al., 2005). There are many ways in which gray literature can be used by nurse researchers and clinicians.

Strategies to improve access to gray literature will become increasingly important in future years. One promising development is digital libraries. With their open access, greater variety of information sources, sharing of information, and continuous availability, among other benefits, digital libraries provide access and increased coverage to gray literature (Barroso et al., 2006). Barroso and colleagues described the development of the Sandbar Digital Library, containing 114 qualitative research reports available electronically. Reports can be searched by author name, title keywords, ethnicity of the sample, and publication date.

The study analyzed only original and feature articles in the journals. By excluding editorials, letters to the editor, news items, and other non-peer reviewed documents, we may have omitted documents that have a role in the communication between researcher and clinician. For example, Huth (1999) commented that editorials may critically judge a paper, provide a different interpretation of the findings, or view the findings in light of other recent research. Editorials may emphasize the practice implications of a research study and how that research can be used in clinical practice (Oermann, 2002). Letters to the editor serve as a forum for debate and further discussion about a scientific article that had been published in the journal. Such discussion helps clinicians interpret studies and guides future research (Winker and Fontanarosa, 1999). These types of publications as well as news items, columns, and reports from associations may keep clinicians informed of new research findings and their use in practice and may raise important questions for researchers. Not all journals, though, contain these types of publications, and while they may inform researchers and clinicians, they are frequently opinion pieces written without citations. For those reasons we did not include documents of this type in our study; this may be a limitation of the study because with some journals these documents communicate valuable clinical and research information to readers.

Our findings may not be generalizable beyond the 20 journals we examined. A limitation to the study was the journals available in our University library, most of which are North American or European titles. This may limit the validity of findings to nurse researchers in other parts of the world. Follow up studies should be done of journals originating in other countries, using this study for comparison.

7. Summary

This study provided a description of the types of information resources used to develop the nursing literature. Consistent with other biomedical sciences, journals were the main information source for communication within nursing. Book chapters and books were cited less frequently in the literature we examined. We noted the growth of citations to websites, compared with earlier studies, paralleling the Web as an information resource in healthcare.

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