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Nurses' information use and literature searching skills for evidence based practices

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ABSTRACT

Medical and healthcare literature is growing exponentially, and medical professionals, including nurses, need to possess basic literature searching skills to retrieve information for clinical decision making. This study aims to investigate the use of different medical information sources by nurses and their literature searching skills. Questionnaire survey was adopted for data collection and a total of 1,486 nurses from two public hospitals in Singapore participated in this study. It was found that human and printed sources were used more frequently by the nurse, as compared to online sources. For literature searching, nurses used basic search features, and only less than one-quarter of them were familiar with Boolean and proximity operators. The study suggests that hospital libraries should play an active role in improving literature searching skills of nurses which may subsequently result in increased use of electronic information sources, where more updated clinical research information may be found.

Keywords: Information Sources; Literature Searching; Nurses; Evidence Based Practice; Singapore.

INTRODUCTION

As the largest group of professional healthcare providers, registered nurses (RNs) are responsible for not only following physicians' orders and performing routine duties, but also maintaining a constant surveillance of their patients, especially in a critical care unit (McKnight 2006). Nurses spend considerable time and efforts providing healthcare and medical treatment to patients. They need to use the latest medical knowledge to support their healthcare practices as well as provide necessary information to patients and their families (Clarke and Aiken 2003). In addition to using traditional and well-established procedures and practices, healthcare practitioners are adopting innovative interventions that are based on best practices as well as solid research-based evidence. Evidence Based Practice (EBP) is one such technique, and is quickly gaining popularity due to its potential to effectively handle clinical issues and provide better patient care.

Recognising the importance of information for patient care, since the 1990s, nursing educators began to emphasize the importance of nurses' information skills, especially seeking and use of clinical information to effectively discharge their responsibilities (Blythe and Royle 1993; Cogdill 2003; Dee and Stanley 2005). With the overwhelming amount of clinical information available, the ability to search for the desired information effectively and efficiently has become increasingly important for nurses' clinical decision making.

LITERATURE REVIEW

Evidence Based Practices

Historically, care of the patient was influenced by the experiences and opinions of those involved in providing treatment (Kania-Lachance et al. 2006). Evidenve based practices (EBP) marks a shift among healthcare professionals from a traditional emphasis on the authoritative opinions to an emphasis on data extracted from prior research and studies (Jette et al. 2003; Sackett et al. 1997). A meta-analysis done by Heater, Becker and Olson (1988) demonstrated that practice based on evidence improves patient's care as compared to traditional practices. Moreover, as nurses are increasingly more involved in clinical decision-making, it is becoming important for them to utilise the best evidence to make effective and justifiable decisions (Mantzoukas 2007).

EBP does not rely on intuitions, opinions, or unsystematic observations; instead, it emphasises the use of research evidence to guide clinical decision-making. EBP encourages using the best available evidence without eliminating the requirements of critical thinking. Silagy and Haines (1998) describe evidence-based health care as an approach that takes account of evidence at a population level as well as encompassing interventions concerned with the organisation and delivery of healthcare. Gibbs (2003) takes these ideas further and states that placing the client's benefits first, evidence-based practitioners adopt a process of lifelong learning that involves continually posing specific questions of direct practical importance to clients, searching objectively and efficiently for the current best evidence relative to each question, and taking appropriate action guided by evidence. "Judicious use" implies practitioners should know when to intervene, enlist the collaboration of the patients and closely monitor the treatment (Nolan 2008).

EBP is a multi-step dynamic process that incorporates the best research data and clinical judgment, and the number of steps involved somewhat varies according to different authors. The most commonly used is the 5-step model proposed by Sackett et al. (1997). Newhouse et al. (2005) simplified the process as PET, i.e. practice question, evidence, and translation. The Oncology Nursing Society (2010) proposes a 6-step process, comprising problem identification, finding the evidence, critique, summarizing the evidence, application to practice, and evaluation. Both of these EBP descriptions neglect the importance of sharing results with others and improving the quality of available evidence after evaluation, as highlighted by Sackett et al. (1997) in step 5 of their model of the EBP process.

Information Use and Literature Searching and Seeking Skills of Nurses

Extensive medical research and development activities all over the world are resulting in the generation of enormous amount of healthcare literature, published in a variety of sources, and at a rate that is impossible for individual medical professionals to keep up with. It is estimated that over 7800 articles relevant to family practice are published monthly, and a family medicine practitioner would need to dedicate approximately 20

hours a day to stay abreast of new evidence (Alper et al. 2004). Moreover, advances in information technology have had a radical impact on healthcare delivery. The convergence of information and technology provides faster access, but not necessarily better control for searchers of the healthcare literature. As a result, one of the key barriers to accessing the best literature by nurses is considered to be information overload. Nurses need to possess basic skills for accessing relevant, accurate and current information to keep their knowledge up-to-date and hence adopt best medical practices (Jones, Schilling and Pesut 2011). Hence, it was considered desirable to explore the frequency of nurses' use of different information sources for fulfilling their information needs and their literature searching skills.

Although nurses are becoming more educated with a growing proportion holding nursing degrees, nursing literature remained underutilised (Blythe and Royle 1993). As a result, implementation of research findings into clinical practices is often delayed, and there remains a gap between what evidence is available and what is practiced. On average, it takes 17 years for clinical research to be fully integrated into everyday practice (Balas 2001). Moreover, due to time constraint, lack of access to relevant information sources, and inadequate information literacy skills, nurses' information needs are often not fully met.

A review of nursing and library literature indicates that a number of studies have examined information seeking behaviours in various healthcare settings (Duncan and Holtslander 2012; Jones, Schilling and Pesut 2011; Hider, Griffin and Walker 2009; Coughlan et al. 2005; Dawes and Sampson 2003; Ely, Levy and Hartz 1999). Most of these studies highlight that many health care professionals prefer obtaining information from convenient, easy to use, and reliable sources (Dee and Stanley 2005; Lathey and Hodge 2001). It was also reported that the most frequently used sources for nursing information were human connections such as nursing superiors, colleagues, and other health care providers, especially physicians (Andrews et al. 2005). Electronic information sources such as online databases, electronic journals and World Wide Web were rarely used by nurses for seeking professional information (Hinder et al. 2009; Wozar and Worona 2003).

The literature further reported several factors that impeded nurses' online information seeking, including lack of access to a computer (Richwine and McGowan 2001); lack of time, and lack of knowledge about computers or online searching techniques (Jones, Schilling and Pesut 2011). Several researchers have reported that a high proportion of nurses are uncomfortable and inexperienced in the use of information technology at their work place, and some of them are even anxious about information technology and did not regard it as an aid to patient care (Marasovic et al. 1997). Most healthcare practitioners only have a basic understanding of online information searching and may only be able to find part of the relevant information, as they may be unaware of the significance and proper use of subject databases, indexes and thesaurus (Jones, Schilling and Pesut 2011). However, it is encouraging to note that with training, individuals did use more online health information resources including online databases (Brettle and Raynor 2012).

The above literature review suggests that a majority of the studies mainly focused on nurses' use of information sources, or barriers to nurses' online information seeking, while only a few have adequately investigated their information searching skills, such as use of various search features, and formulation of appropriate search strategies. Moreover, despite the large number of studies regarding nurses' information seeking behavior, only a few of them have investigated their information use and literature searching skills for a

specific medical practice. This study aims to address the identified research gaps, and to answer the following research questions:

In the context of Evidence Based Practice,

a) What medical information sources do nurses use to meet their professional information needs?
b) What search features do nurses use when searching online health care information sources?
c) How familiar are nurses with the use of different search operators?

METHOD

A survey questionnaire was used to collect data for this study. A team of experts comprising Information studies faculty of Nanyang Technological University and nursing representatives from National University Hospital developed the questionnaire. A group of experts, comprising information studies lecturers, nursing managers, nurse researchers and registered nurses reviewed the draft questionnaire for content validity. The questionnaire was then pilot-tested on 20 nurses, representing different wards and departments in three public hospitals in Singapore. Based on their feedback, some minor changes were made to the language and format of the questions.

The ethics approval for the study was obtained from the Domain Specific Review Board (DSRB), appointed by National Healthcare Group, Singapore. A wavier of informed consent was granted, as the participants were aware that by completing the questionnaire they were giving their informed consent. For the sake of anonymity, the respondents were also asked not to write their names or any other forms of identification on the questionnaire. Moreover, they were instructed to drop their completed questionnaire personally into a sealed data collection box.

The questionnaire was divided into two sections. The first section collected demographic information about the participants such as their professional education, designation, length of nursing experience, specialty, and participation in professional training, which included a component on information skills. The second section of the questionnaire solicited responses related to information sources used by nurses for patient care and clinical decision-making. It also collected information about search features used by the nurses for literature searching as well as their knowledge of Boolean and proximity operators. In order to assess the database searching skills of the nurses, a hypothetical topic was given to them along with five possible search statements. They were expected to pick the most appropriate search statement for the given topic.

All full-time and part-time registered nurses from two public hospitals in Singapore (National University Hospital and Alexandra Hospital) who were on duty roster during the two-week data collection period in the second quarter of 2009 were invited to participate in this survey. Nurses on personal, medical or maternity leave during this period were excluded from the study. Copies of the self-administered survey questionnaire were supplied to nursing managers of all wards and medical departments in the two hospitals. The nursing managers were briefed about the purpose and procedure of the study and were asked to distribute copies of the questionnaire to all nurses working in their respective units. The participating nurses were requested to drop their completed

questionnaires into a sealed survey collection box, placed either in their nursing manager's office or at the nurse's counter. For the convenience of nurses and to improve the response rate, one survey collection box each was placed in all the wards/units. These boxes were collected at the end of data collection period. A total of 2,100 copies of the questionnaire were distributed in the two hospitals and 1,486 completed questionnaires were returned, yielding an overall response rate of 70.8%.

FINDINGS

Demographic Information

For the professional qualification of the respondents, it was noted that 41% of the nurses held a certificate or diploma in nursing, while another 14.8% possessed a post-basic or advanced diploma in nursing. The percentage of nurses with a bachelor's or master's degree in nursing was 41.4% and 2.3% respectively. The majority (47.2%), of the nurses were working in inpatient wards, 21% in Intensive Care Wards (ICU) and 7.1% in outpatient units. The percentage of nurses working in operation theaters and emergency departments was 12.1% and 2.5% respectively. Over one-half of the nurses had up to 5 years' working experience as a registered nurse. The percentage of nurses with 6 to 10 years' experience was 21.9%, while another 27% of them reported having more than 10 years' experience.

Use of Information Sources

The participating nurses were asked to indicate the frequency of their using different medical information sources for nursing care and clinical decision making. In the questionnaire, these information sources were presented under three broad categories: print, electronic and human information sources.

Among the printed information sources, medical reference sources (mean score=3.48) were used most frequently (Table 1), closely followed by healthcare pamphlets and information made available by healthcare companies and hospitals (mean score=3.36). It was noted that the use of articles from professional journals was quite low. The nurses do not frequently use newspapers for getting healthcare-related information.

Table 1: Use Frequency of Printed Information Sources

Printed Information Sources	N	Mean (1~5)	Std. Deviation
Medical reference books	1462	3.48	0.88
Pamphlets/handouts (produced by healthcare companies, hospitals)	1461	3.36	0.83
Textbooks	1462	3.31	0.93
Journal articles	1461	3.23	0.94
Newspapers	1459	2.84	0.96

For the electronic information sources, Internet websites providing information about a specific disease, medicine or treatment (mean score=3.76) were the most frequently used (Table 2). It was followed by electronic information sources provided by the respective hospital, including the Standard Operation Procedure (mean score=3.64). However, the use of medical databases and healthcare blogs was quite low.

Table 2: Use Frequency of Electronic Information Sources

Electronic Information Sources	N	Mean (1~5)	Std. Deviation
Internet websites providing information about a specific medicine, treatment or symptom	1463	3.76	0.91
Hospital resources (e.g. electronic SOP)	1461	3.64	0.89
Internet resources (e.g. online tutorials from medical libraries, professional associations, overseas hospitals)	1462	3.02	1.04
Nursing e-books	1464	2.94	1.07
Digital medical and nursing libraries	1464	2.87	1.04
Medical databases	1426	2.87	1.08
Up to date; MD consult	1435	2.82	1.18
Blogs on EBP	1459	2.35	1.06

Table 3 provides mean scores for the use of different human information sources for getting healthcare information. The most frequently used human sources were nursing supervisors (mean score=3.54), ward or department colleagues (mean score=3.43) and nursing management staff (mean score=3.35).

Table 3: Use Frequency of Human Information Sources

Human Information Sources	N	Mean (1~5)	Std. Deviation
Nursing supervisor	1462	3.54	0.90
Ward/ department colleagues	1461	3.43	0.90
Nursing management staff	1464	3.35	0.92
Doctors	1455	3.23	0.95
Professional friends working in other hospital and clinics	1463	3.07	0.95
Nursing research committee/EBN Group	1462	2.89	1.03

For investigating the overall popularity of different types of information sources, the combined mean scores for printed, electronic and human sources were calculated (Table 4). It was interesting to note that the use of human sources for getting nursing care information was at the top (mean score=3.26). It was not surprising as many previous studies, investigating the information needs and seeking behavior of professionals from different disciplines, have also revealed that due to a multitude of factors professionals preferred first approaching their supervisors or peers for the needed information. The use of human information sources was closely followed by printed sources (mean score=3.25). Electronic information sources (mean score=3.03) were the least used sources by the participating nurses.

Table 4: Use Frequency of Different Information Source (combined)

Information Source	N	Mean (1~5)	Std. Deviation
Human Information Sources	1443	3.26	0.71
Printed Information Sources	1447	3.25	0.65
Electronic Information Sources	1382	3.03	0.70

Information Searching Skills of Nurses

In order to understand the nurses' literature searching behavior, they were asked to indicate how frequently they use different search features provided by online databases and Web search engines. As shown in Table 5, it was found that nurses were using the 'quick/basic search' option (mean score=3.38) more frequently than the 'advanced search' option (mean score=3.12).

For Boolean operators, the 'AND' operator was used most frequently (mean score=2.34) and 'NOT' operator the least frequently (mean score=2.17). The mean scores for the use of all Boolean operators were quite low. This means nurses do not frequently use these operators in their literature search strategies.

Nurses participating in this study were also asked about their use of different search features, provided by a majority of online databases and Web search engines. Among these search features, 'Index browsing' was used comparatively more often by the nurses (mean score=2.89), followed by the 'Search limits' (mean score=2.62). The use of certain other useful search features such as 'Medical Subject Headings (MeSH)', 'truncation/wild cards', and 'proximity operators' was quite low. On the whole, it appeared that the use of Boolean operators and other search features, which can help retrieve more relevant information, was quite low. This means nurses may not be able to retrieve relevant and high quality literature for their professional development.

Table 5: Use Frequency of Different Search Features

Search Features		N	Mean (1~5)	Std. Deviation
Quick/basic search		1457	3.38	1.00
Advanced search		1460	3.12	1.66
Boolean Operators	'AND'	1414	2.34	1.04
	'OR'	1422	2.31	1.03
	'NOT' or 'AND NOT'	1405	2.17	0.99
Index browsing		1452	2.89	1.00
Search Limits		1430	2.62	1.096
Medical subject headings		1415	2.51	1.08
Truncations/wild cards		1406	2.28	1.02
Proximity operators		1421	2.09	0.97

Table 6 shows a relationship between the use frequencies of different search features and the years of nursing experience. It was found that nurses with up to five years' experience tend to use those search features more frequently, while nurses working for more than 10 years were least likely to use different search options.

Table 7 shows the influence of attending professional training on nurses' use of different search features. The results demonstrate a positive impact of training on the use various search features.

Table 6: Use Frequency of Search Features and Years of Nursing Experience

		Mean Score of Use Frequency		
Years as Nurse		**≤ 5 yrs**	**6-10 yrs**	**> 10 yrs**
Quick/basic search		3.52	3.35	3.17
Advanced search		3.20	3.12	2.98
Truncations/wildcards		2.35	2.25	2.16
Boolean Operators	'OR'	2.43	2.34	2.07
	'AND'	2.46	2.36	2.07
	'NOT' or 'AND NOT'	2.28	2.14	1.96
Proximity operators		2.20	2.05	1.91
Search Limits		2.63	2.69	2.53
Medical subject headings		2.55	2.47	2.43

Table 7: Use Frequency of Search Features and Attending EBP Training

Search Features		**Mean Score of Use Frequency**	
		No Training	**Training Attended**
Quick/basic search		3.34	3.60
Advanced search		3.06	3.39
Truncations/wildcards		2.82	3.17
Boolean Operators	'OR'	2.25	2.39
	'AND'	2.25	2.62
	'NOT' or 'AND NOT'	2.28	2.62
Proximity operators		2.12	2.38
Search Limits		2.08	2.15
Medical subject headings		2.51	3.09

Knowledge of Search Operators

In order to further investigate the nurses' familiarity with different search operators, they were asked if they knew how the use of these operators could change their search results. It was shocking to note that 92.1% of the nurses expressed their unfamiliarity with different proximity operators (Table 8). The percentage of nurses not familiar with Boolean 'AND', 'OR' and 'NOT' was 75.9, 77.2, and 85.2 respectively. However, it was noted that as compared to nurses with other qualifications, graduate nurses had comparatively better understanding of Boolean and proximity operators.

Table 8: Nurses' Familiarity with Search Operators

Search Operator	**Yes, I am familiar**	**No, I am not familiar**
Boolean 'AND'	24.1%	75.9%
Boolean 'OR'	22.8%	77.2%
Boolean 'NOT'	14.8%	85.2%
Proximity operators	7.9%	92.1%

The limited familiarity of nurses with search operators was also evident from the data presented in the previous section (Table 5) where the use of these operators was quite low. It can, therefore, be concluded that limited understanding of different search

operators had resulted in their low use by the nurses. It is evident that with limited search capabilities, nurses cannot develop complex search strategies, which may either result in information overload or missing important professional literature.

Ability to Develop Search Strategies

The previous section has presented nurses' perceptions of their knowledge of different search operators. In order to assess their actual ability in developing an effective search statement by using Boolean operators, the nurses were given a simple hypothetical topic "Effect of cigarettes on lung cancer". Use of certain other search features, such as truncations and proximity operators, were avoided to keep these statements simple. Similarly, extensive use of synonyms was also avoided.

The nurses were asked to pick the most appropriate statement from a list of five possible search statements. It was found that 41.1% of the nurses picked a statement that used the exact wording of the topic (Table 9). Out of these nurses, 85.7% of them earlier said that they usually use quick/basic search option for searching their information. Usually clinical questions are quite complex and obviously a 'natural language' or 'basic' search cannot retrieve all the relevant articles. Another 24% of the nurses selected the search statement which used only one keyword 'cigarettes' and a phrase 'lung cancer'. Only 13.2% of the nurses picked a more appropriate statement, using some synonyms of the concepts 'cigarette' and 'lung cancer' and put them in parentheses.

Table 9: Selection of Search Statements

#	Search Statement	Frequency
1	Effect of Cigarettes on Lung Cancer	560 (41.1%)
2	Cigarettes AND Lung Cancer	327 (24.0%)
3	Effect AND Cigarettes AND Lung Cancer	130 (9.5%)
4	(Cigarettes OR Smoking OR Tobacco) AND ("Lung Cancer OR "Lung Tumor" OR "Lung Neoplasm")	180 (13.2%)
5	Cigarettes AND Smoking AND Tobacco AND "Lung Cancer" AND "Lung Tumor" AND "Lung Neoplasm"	165 (12.1%)

Table 10 shows a cross-tabulation between selection of different search statements by nurses and their familiarity with Boolean operators. It was found that considerably more nurses with better understanding of 'AND' or 'OR' operators selected the search statement 4, which correctly used Boolean operators to connect search concepts and their possible synonyms. On the other hand, nurses with limited familiarity with Boolean operators preferred using the statement which was more suitable for natural language searching.

Table 10: Selection of Search Statement and Familiarity with Boolean Operators

			Search Statement				
			#1	#2	#3	#4	#5
Familiarity with Boolean Operators	'AND'	No	474	83	248	86	131
		Yes	77	45	73	94	31
	'OR'	No	485	85	251	83	131
		Yes	67	42	68	97	31

DISCUSSION

Regarding nurses' preference of information sources, the findings of this study is consistent with prior studies (e.g. Jones, Schilling and Pesut 2011; Andrews et al. 2005; Wozar and Worona 2003). Human information sources and print information sources were found to be used more frequently by them. This was probably due to their higher accessibility and the convenience of using these sources. It was worth noting that the use of electronic information sources was the least popular among the nurses, in spite of the fact that a considerable amount of the latest research information is only available in electronic format. The low use of electronic information sources could be due to lack of knowledge about the existence of such sources and limited literature searching skills of the nurses (Jones, Schilling and Pesut 2011; Hider et al. 2009).

It was worth noting that a majority of the nurses revealed that they were not familiar with the proper use of Boolean and proximity operators. This situation was further aggravated by the fact that the use of different search operators was also quite low. Nurses' limited familiarity with Boolean operators also became evident in this study when only a very small percentage of nurses picked up an appropriate search statement for a given hypothetical topic. It was also a matter of concern that the use frequency of certain other useful search features such as Medical Subject Headings, truncations and wildcards, search limits, and index browsing was also quite low. As clinical issues and related clinical questions are usually very complex, proper understanding and appropriate use of different search options can help retrieve more relevant professional literature (Andrews et al. 2005).

It was also found that young nurses with up to 5 years' working experience were more likely to use a variety of search features as compared to their senior colleagues. It is understandable as many previous studies also suggest that younger individuals were more likely to use ICT tools and services. Similarly, it was found that participation in professional training, with a component on literature searching, had a positive impact on the use of various search features by the nurses. This finding was in line with some previous studies which suggested that training and education could improve practitioners' information seeking skills (Byrnes, Kuligk and Sghwartz 2004; Kronick et al. 2003). Moreover, familiarity with Boolean operators was found to be important in nurses' ability to formulate appropriate search statements.

CONCLUSION

Like many other disciplines, the healthcare sector is experiencing major changes due to extensive research and development activities. As nurses play a crucial role in the delivery of healthcare, they need to embrace new and innovative techniques to provide effective and best possible treatment and care to their patients. With the availability of large amount of medical information and information communication channels, it is desirable that nurses should know how to effectively identify, locate, evaluate and use quality information for their healthcare practices.

Like many previous studies, this study also found that nurses preferred consulting their supervisors and colleagues for obtaining the needed information. Hospital management can create a conducive environment by providing socializing opportunities to nurses for promoting peer-to-peer knowledge sharing. The electronic information sources were

underutilised, probably due to lack of adequate literature searching skills. Library and information professionals working in hospitals can play a significant role in improving nurses and other medical practitioners' awareness of different healthcare information sources and their literature searching skills through appropriate training.

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