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A qualitative research on the use of knowledge organization in nursing information behavior

Abstract: The use of knowledge organization is ubiquitous in our global society. This present research focuses on its use in nursing, specifically, how these knowledge organization processes are integral in nursing information behavior (NIB).

Nurses use the nursing process as a professional practice tool to systematically plan and evaluate patient care. It entails various phases, beginning from assessment, identifying nursing diagnoses and needs of the patient, planning, implementation and evaluation. Knowledge organization steps and processes are evident in each of these steps of the nursing process, where compiling, sorting, filtering, organizing, sense making and prioritizing are used.

The purpose of this study is to identify and describe these knowledge organization concepts as used by nurses in home care. These are examined vis-à-vis the nursing process, using a qualitative paradigm.

1.0 Introduction

Information behavior is a broad and distinct term used to refer collectively to human behavior in relation to sources and channels of information, including both active and passive processes of information seeking, information searching, and information use (Wilson, 2000). It is also known that information behavior is based on the contextual nature of the information and its users. Thus, nursing information behavior (NIB) encompasses all behavior that describes nurses while gathering, processing and managing information. This includes the information sources, resources, leads, and conduits they prefer and use, what problems and difficulties are encountered, and the information and knowledge processes involved while in any particular professional environmental space (PES) or clinical practice setting (Pajarillo, 2005).

The nursing process is just one such professional tool used in NIB. It is instrumental to nurses in the day-to-day practice of their profession, to assist them in systematically planning and evaluating the care provided to patients. It serves as “an organizational framework for the practice of nursing, encompassing all the steps taken by the nurse in caring for the patient: assessment, identifying the nursing diagnoses and needs of the patient, planning, implementation and evaluation (Mosby, 1998)”. Knowledge organization steps and processes are evident in each of the steps of the nursing process, such as compiling, sorting, filtering, organizing, sense making and prioritizing.

Like other professions, nursing is not unique when it comes to information processes and concepts. Practitioners of the discipline constantly handle and manage tremendous amounts of information. It is here where the importance of knowledge organization cannot be overemphasized. Rubin (1998, 171) once said that “information tends to have an entropic character: it does not organize itself, rather, it has a tendency towards randomness. Unless there are ways to organize it, it quickly becomes chaos.”

2.0 Nursing Process and Knowledge Organization

The nursing process is the information processing, management and use components of Wilson’s definition (2000) of information behavior. It begins at the time an information need is identified. It continues with seeking and searching through information leads, and then managing, processing, and eventually using the information.
Using the nursing process involves the same process of “telling and being told” that Machlup and Mansfield (1983) described. There are two parties, the nurse as the recipient, receiver or observer, and the patient as the source, sender or originator. The patient presents an array of information that includes: signs and symptoms; laboratory findings; radiological, sonic and cardiac strips; physical assessment data; past and current medical history; family history; environmental descriptions; work and social habits; and others. The nurse gathers raw, unprocessed and meaningless data during the assessment phase of the nursing process. The media or channel that the nurse uses to collect these observations (message or data) may vary from visual, tactile, auditory, to other sensorial means.

The next phase of this information processing and management in the nursing process occurs when the nurse analyzes these data. To accomplish this stage successfully, the nurse utilizes some or all of the following knowledge organization concepts and processes, namely: compiling, sorting, filtering, organizing, sense making and prioritizing.

Compiling is the process of collecting into a list, or putting together, gathering and amassing large amounts of information (The Oxford Dictionary and Thesaurus, 1996). It can also be described as putting all accumulated data next to each other for gross examination. This initial step is essential, particularly when faced with copious amounts of information gathered during the assessment phase of the nursing process.

The next process is sorting, described as a way to display data in some preferred manner of display, either by relevance, time sequence, author or source. Sorting as used in the nursing process can mean grouping similar data. This involves comparing patient-related data with the nurse’s stock knowledge, either from formal education, training or experiential learning. The nurse determines whether these are normal or abnormal. This is helpful when formulating patient’s list of needs and problems, also known as nursing diagnoses.

Filtering is another concept used in the nursing process. Shneiderman (1998, 538) defines it as a process of discarding non-meaningful or uninteresting data, with the aim of assisting the user to focus more on relevant items. As the nurse proceeds further along the nursing process, information that is obviously insignificant and meaningless is once again sorted prior to discarding, leaving only those of value.

This step is then followed by the organizing phase. Soergel (1985) identifies two approaches to organizing, namely, putting like entities into groupings, and developing a list of descriptive characteristics for each entity. It involves grouping data that are alike, similar, or related. The final step in the analysis phase is sense-making, when the nurse attempts to find some meaning out of the organized data.

Other concepts in information processing and management can be applied in subsequent steps of the nursing process such as planning and intervention. If a patient has more than one problem or nursing diagnosis, prioritizing ensues (Alfaro-LeFevre, 1999; Rubenfeld & Scheffer, 1999; Leddy & Pepper, 1998). The list of nursing diagnoses is ranked in the order of relevance. The nurse examines and judges each diagnosis and determines priority. Other tasks used during the planning phase include identifying goals or objectives of care, expected outcomes of nursing actions, short and long term goals, and time frames for goal attainment.

The same information processing steps are applied while in the intervention phase. These steps include listing all the possible nursing actions geared to address the identified nursing diagnoses and to achieve the targeted outcomes of care, and prioritizing these in the order of implementation.

In the evaluation phase of the nursing process, the nurse looks back and examines the patient’s current state in relation to the nursing diagnoses. This is achieved by reassessing and gathering data from the patient and comparing these to the initial appraisal. The same
information processing steps are followed, with the end result of identifying goal attainment or re-strategizing to refocus an ineffectual plan of care.

In all the steps of the nursing process, critical thinking is a helpful tool for the nurse when threading through the problem-solving process. Critical thinking is the analytical tool used to process data from meaningless, disjointed and vague states towards relevant and useful information. In the same manner, previously discussed knowledge organization processes and concepts (compiling, sorting, filtering, organizing, sense-making and prioritization) serve as the analytical and technical tools used in managing patient data for planning care, and its relevance in the steps of the nursing process can not be overemphasized.

3.0  The Flow of Information Behavior

Aside from Wilson’s (2000) research on information behavior, other authors describe the various steps and processes that characterize it. Ellis (1989; 1993) explains the following features of information behavior to include starting, chaining, browsing, differentiating, monitoring, extracting, verifying and ending. The highlight of Ellis’ model is its non-sequential nature, or the non-linearity of these features. It is the detailed interrelation and interaction of each of the characteristics of the information activities that a user is performing at any one particular time during any given search episode. Certain steps appear to be sequential, such as starting, ending, chaining, differentiating, extracting and verifying. Other features, such as browsing and monitoring, can be independent of the other actions, with the user being at any point in the process at any one time.

Meho and Tibbo (2003, 583) confirm Ellis’ model in their research involving the information behavior of social scientists, particularly in the area of information retrieval and enhancing research activities. Four additional steps, however, were cited as equally important in the information-seeking activities of this group of users. These include accessing, networking, verifying and information managing.

With these other steps, a revised Ellis’ model was devised by Meho and Tibbo (2003) dividing information-seeking into four interrelated stages: searching, accessing, processing and ending. The original premise by Ellis that the steps are non-sequential still holds true. With this redesigned model, users still do myriad activities in non-linear fashion such as starting, chaining, browsing, differentiating, monitoring, and extracting, particularly in the first three stages of searching, accessing and processing. Meho and Tibbo’s research simply reiterates the characteristic multiple task-based activities entailed in information seeking.

When one observes the behavior of home care nurses while pursuing work-related information needs, the same activities are noted. Whether using electronic or non-electronic sources of information, the nurse proceeds through the general steps of searching, accessing, organizing volumes of information, processing and eventually ending the process. The similarity between nurses’ use of the nursing process when managing information and Meho and Tibbo’s model is further illustrated by this researcher in Table 1:
Table 1: Comparison of Steps in the Nursing Process with Knowledge Organization Concepts

<table>
<thead>
<tr>
<th>Nursing Process</th>
<th>Knowledge Organization Concepts</th>
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| Assessment           | Step 1: SEARCHING PHASE  
Starting, searching, accessing (browsing, monitoring), chaining, differentiating, compiling |
| Nursing diagnosis     | Step 2: ORGANIZING PHASE  
Sorting, filtering, extracting, organizing, verifying, sense-making, information identification (may need to go back and do any or all of Step 1) |
| Planning             | Step 3: PROCESSING PHASE  
Processing identified information, listing available relevant information, prioritizing, identifying other information needs, using available information  
(may need to go back and do any or all of Steps 1 and 2 as necessary) |
| Evaluation           | Step 4: ENDING PHASE  
Verifying, validating, ending  
(may require repeat of any or all of the preceding steps) |

Meho and Tibbo’s (2003) first and second phases are combined into searching, which coincides with the assessment phase of the nursing process. It includes other knowledge organization steps such as starting, accessing (browsing, monitoring), chaining, differentiating, compiling. Accessing is integral to searching, and makes for this combination. This is followed by the organizing phase, corresponding to the step in the nursing process of identifying nursing diagnoses. Once data have been accumulated, an essential step is to put these into meaningful order. Doing so requires knowledge organization functions such as sorting, filtering, extracting, verifying, sense-making, and information identification. The third phase is processing, comparable to both planning and implementation steps in the nursing process. This processing phase covers other knowledge organization steps such as listing available relevant information, prioritizing, identifying other information needs, and using available information. The last is the ending phase, coinciding with evaluation in the nursing process. This ending phase includes other functions such as verifying and validating. Note that each step is not exclusive or static from the other phases; a nurse may need to go back and include other steps and functions from previous phases.

Another research (Foster, 2004) validates information seeking as non-linear and redefines the features into three core processes, namely: opening, orientation and consolidation. The opening is comparable to the starting, initialization or beginning points previously described by Ellis (1991) and Meho and Tibbo (2003). Other tasks and activities are included in the opening, such as breadth exploration (the willingness to explore beyond limits) and eclecticism (the capacity to merge active, passive and serendipitous approaches to achieve the required information, networking (a tool used to explore interdisciplinary contacts by various means such as e-mail, Internet, discussion groups, or face-to-face (F2F) contacts in conferences, meetings or social gatherings. Still other activities fall under the opening stage—those related to the use of databases, online catalogs, Internet sites and search engines and online journals. These tasks include keyword searching, browsing, monitoring and chaining. Serendipity is also included, identified as an essential aspect for achieving breadth and depth in acquiring information from uncharted sources or means.

Orientation pertains to defining the focus and boundaries of the information need, covering a range of activities such as identifying previous and existing research, current
models and thinking, prevailing key and discussion points. Other specific tasks in orientation are picture building (or concept mapping), reviewing (considering existing material), identifying keywords (to draw out the most relevant sources), and defining the shape of the existing research (referring to identifying key articles, researchers and proponents, and current opinion and concepts.

The third core process is consolidation, although Foster (2004, 234) asserts that it plays a role in every step of the information seeking process. It is the key task of judging and determining whether the required information has been achieved and the information seeking episode should cease. Otherwise, the process continues until the need for the specific information is satisfied. Tasks included in consolidation are refining, knowing enough, sifting, incorporating, verifying, and finishing.

Foster’s model reiterates that information behavior is non-linear and non-sequential. Particularly in our current networked and digitized environment, this model is seemingly more relevant and appropriate. Foster (2004, 235) aptly compares this model “to an information seeker holding a palette of information behavior opportunities, with the whole palette available at any given moment. The interactivity and shifts described in the model show information seeking to be nonlinear, dynamic, holistic and flowing.”

4.0 Research Question

Drawing from the assertion that knowledge organization is pervasive in the global society, this present research examines those processes used in nursing, specifically among home care nurses. The study focuses on two research questions.

4.1 What knowledge organization concepts are used by home care nurses to describe nursing information behavior, particularly those actions or steps used when processing, managing and using information?

This research component delves into the specific actions and measures describing how home care nurses identify information needs, name possible information leads, translate or encode the question into a manner that is congruent with the specifications of the information lead, arrive at an array of possible responses, and choose the most appropriate solution to the information quandary. Does the home care nurse follow a particular order, from starting, chaining, differentiating, extracting and verifying, to interposing these with browsing and monitoring, as described by Ellis (1989, 1993)? Does the revised Ellis’ model posited by Meho and Tibbo (2003) parallel the steps taken by home care nurses when accessing, searching and managing information? What other steps, such as sorting, compiling, prioritizing and filtering, are characteristic of home care nurses when seeking and processing information?

4.2 What knowledge organization concepts used by home care nurses are analogous to the steps used in the nursing process?

Different models influenced the development and evolution of the nursing process. Potter and Perry (1995) affirm that steps employed in the nursing process parallel those involved in scientific method and problem solving or decision-making theory. There is also evidence that the nursing process is influenced in various ways and degrees by other models such as communication, interpersonal relation, system, perception, and critical thinking. Which knowledge organization concepts and processes align with the steps of the nursing process? A description and analysis of the effects of knowledge organization on the nursing process is pertinent in describing nursing information behavior, where both nursing and knowledge organization converge.
5.0 Research Methodology

The research study is qualitative in nature, employing the use of the case study method. This paradigm is particularly helpful when providing a snapshot of the home care nurses’ daily practice, affording a more detailed description of nursing information behavior. The aim is to develop analytical generalizations from case study scenarios for use in theory development to address the specific research questions.

The unit of analysis is the home care nurse. Five case study participants and three alternates were recruited from home care nurses of the Visiting Nurse Service of New York Home Care, a large metropolitan certified home care agency in New York City, U.S.A. All represent a cross-section of home care nurses in terms of varying length of professional experience, ranging from those with less than five years of home care experience, those with 5-10 years experience, and those with more than 10 years experience.

Data-gathering involved a combination of methods to elicit comprehensive and in-depth information, including the use of daily information search logs, individual and group interviews. Nurses kept journals of information needs and encounters over a period of two weeks, detailing steps and processes taken to resolve these. The submitted transcripts were examined for completeness, clarity and appropriateness. Follow-up individual interviews were conducted to explore ambiguous or unclear entries. Finally, case study participants participated in focus group interviews. The data gathering tools made for a triangulated approach. Results from one were used to verify and validate outcomes from the other data gathering techniques. Daily write-ups submitted by the nurses were used as start-up discussion points in the focus groups. The initial group meeting was conducted, with the follow-up used to iterate and validate assumptions. Individual follow-up sessions were also done to confirm conclusions about recurring themes.

6.0 Case Study Findings and Discussion

A total of 43 information search episodes were documented and submitted by the case study nurses. These varied from clinical and administrative issues, to plain and mundane search scenarios on computer problems and locating patients’ home locations.

6.1 Knowledge Organization Processes and Steps Used in NIB

The information search logs, interview and focus group transcripts were examined for key terms describing the information searching and knowledge organization steps and processes used by home care nurses. The first phase was an analysis of each of the submitted information search logs, identifying tasks and activities in the information-seeking process. Some examples of these codified scenarios include:

- Starting, sorting, clarifying, verifying
- Starting, identifying, sorting, differentiating, picking out information choices, ending
- Assessing, identifying, seeking sources, evaluating
- Identifying needs, problems, solutions, calling resources, ending
- Sorting, identifying, prioritizing, determining
- Recognizing, sorting, calling sources, using the library, accessing Medlineplus™, sorting, reading, differentiating, determining, closing
- Determining needs, sorting, processing, choosing, achieving answer
- Asking sources, sorting sources, searching the Internet, reading results, filtering, finding, ending
Putting these information searching and knowledge organization processes together in a common list is the next phase in the inquiry. Following the procedure instituted by Foster (2004, 231), these keywords were categorized for organization and analysis purposes into three linear groupings: initial, middle and final. Table 2 (below) is a representation of all information searching and knowledge organization steps noted in the case study logs and transcripts, grouped according to the linear categories of the information-seeking process. Certain tasks are distinct, defined and expected, such as starting, problem identification, searching and ending. As in any process, there is a beginning and an end, or a point at which an information need leads to inquiry and its ultimate information discovery. However, there are tasks that come at various points in the continuum, which are recurring or circuitous. Extracting from the data, activities such as sorting, clarifying, verifying, validating, determining, chaining, browsing or refining (those marked in Table 2) occur at all the different stages in the information-seeking process.

The sorting step is an example of a recurring task. In one of the information search scenarios, the nurse began the process with the information need being unclear and unfocused because of many incidental questions and distractions. It was necessary to sort these questions and distractions to zero in on the central information need. Once the searching process yielded a string of possible relevant and useful leads, sorting became pertinent again. Subsequent steps, such as differentiating, sifting and filtering, were uneventful after results were sorted into similar groupings or categories. Another example is the browsing task, occurring in the early phase of information-seeking when specifics of an ambiguous and evolving information need have yet to be defined. Once the user begins to actively search for the identified information need, browsing steps become essential again and are interposed with searching activities.

Gleaning from the knowledge organization steps described in the various scenarios, there appears to be a wide variation in the terminology and chronology of activities used in the nursing information behavior process. As Foster (2004), Meho and Tibbo (2003), and Ellis (1993) describe, there are basic, common and essential knowledge organization steps, intertwined with various specific activities that are consequential of or contingent on preceding tasks. There are tasks and activities that are central and vital to knowledge organization and creation, falling right in the nub of information-seeking. From the case study findings, three processes (uncovering, discovery and recovery) were quite evident which aptly describe knowledge organization steps and processes as being in the nub of nursing information behavior (Pajarillo, 2005).
Table 2: Categorization of Information Searching and Knowledge Organization Steps and Processes Used in Nursing Information Behavior

Uncovering was evident as the beginning point in most of the information search episodes. Some scenarios referred to this phase as starting, beginning, or information need identification. There were some circumstances that were more clear-cut and focused, but there were situations when the starting point was fuzzy, undetermined or vague. The nurse came to terms with the exact information question after systematically following a series of other knowledge organization steps such as sorting, browsing, clarifying or differentiating.

The uncovering phase was also described in instances when the process of identifying the particular information need was hit-or-miss or serendipitous. Finding out the precise, prioritized and well-formulated information question is a process of uncovering, that of demystifying or removing the ambiguity, vagueness and fuzziness of an initially-identified and evolving information search query.

After uncovering tasks and getting the information driver on target, the second of the nub processes that constitute NIB is discovery. From the case study scenarios, this was described as the continuation of uncovering, when the user follows and picks up where it left off. Subsequent information searching and knowledge organization steps and processes include more browsing, active searching, chaining, differentiating, discriminating, sorting and filtering. Thus, a combination of searching, browsing and calling (phoning) sources, or chaining and following up ensue. From these steps, the user might discover other information...
leads. These sources require further fine-tuning to achieve the needed information. Should discovery necessitate a return to the initial process of uncovering, it is probably to reformulate information questions or search queries because results are not yielding targeted outputs.

Finally, the next step for the nurse is recovery—the third of the core processes in NIB. This can be the ultimate step once the user succeeds and fulfills the information need. The stage of recovery is not always the final step, but is sometimes a revalidation period. It is possible for the information-seeking process to be in the final stage of recovery when the user confirms the relevance and usability of the found information. However, the user can sometimes be in a feedback mode, indicating that recovery is also a moment to revalidate one’s current standing in the information search process. This feedback mechanism presents as an opportunity to re-examine information already obtained. The feedback process results in either an affirmation of the usefulness of the information, or a redirection to a previous stage when uncovering or discovery is deemed imminent.

The use of the term recovery particularly refers to stabilizing the disruption in the nurse’s working routine. Once the question is clarified and the user achieves the required information, the disequilibrium and instability also resolves. In this regard, recovery can also be referred to as the recoil process—a return to original, stable state.

These core processes, or the nub of NIB is illustrated in Figure 1.

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**Figure 1:** Schematic Representation of the Nub of Nursing Information Behavior (NIB)

6.2 Comparison of the Steps used in NIB and those of the Nursing Process

There is strong and recurring evidence from the scenarios and interview transcripts that nurses follow steps outlined in the nursing process in most of their information seeking activities. The use of the process is described as unconscious, systematic and automatic. In almost all the scenarios analyzed, the search episodes depict the methodical steps of the nursing process used by nurses when faced with an information need. Thus, nurses completed a full range of assessments, interpreting the resulting data and identifying nursing needs and problems, planning courses of action, implementing defined interventions, and finally, evaluating the outcomes.
It is also evident from closer scrutiny of the search scenarios that home care nurses adapt knowledge organization steps and processes as part of their nursing information behavior. For every phase in the nursing process, corresponding and appropriate knowledge organization steps are applicable.

It is relevant to extend the discussion by incorporating the conclusion that home care nurses employ both nursing process and knowledge organization, as shown in the preceding description of the nub of NIB. The relationship and similarities between the nursing process steps and the NIB core processes appear in Figure 2.

![Figure 2: Comparing the Nub of Nursing Information Behavior with the Steps of the Nursing Process](image)

In the uncovering phase, signifying the beginning or starting point in the information search process, the home care nurse is in assessment, or the first step of the nursing process. This is an initial move, an attempt to establish one’s baseline. Perhaps the presenting information driver is clear and focused. There is no need for sense-making, figuring out, or other recognizing steps. It is a straightforward determination of markers, benchmarks, or specific information needs. Once completed, the next step is problem identification. Here is where steps such as sorting, clarifying, verifying and determining are instituted to define specific information needs. These actions are inclusive of uncovering in the nub of NIB. Once problems are determined and identified along the nursing process continuum, the nurse progresses to planning how to address these issues. In the nub of NIB, the nurse is identifying leads and conduits, thinking of questions to ask sources, determining search terms or keywords, and drawing up courses of actions. Planning in the nursing process might still be considered a part of uncovering in NIB.

When reaching the discovery level, it is possible that the nurse realizes that earlier defined problems or information needs remain indeterminate. The nurse then reverts to further sense-making, re-conceptualization, or sorting. This is equivalent to backsliding to the problem identification step in the nursing process, when problems identified earlier have to be rethought. Only then will the process progress to planning, still being part of the discovery phase. When the nurse is able to identify specific moves aimed to achieve the needed information, the intervention step proceeds. This equates to discovery in the nub of NIB, with such specific tasks and activities as actual browsing or searching the Internet, electronic databases, books, manuals and journals, calling up leads and conduits, sorting, reading through, filtering, determining, and actually picking out the most relevant and useful from a list of search outputs.

The last stage, recovery, parallels activities related to the evaluation step of the nursing process. This entails an examination of the effectiveness of the process and the achieved
outcome. It also engages the nurse in a feedback mode when necessary, necessitating a return to assessment, or any other previous step, in order to refine and improve on results. In the nub of NIB, recovery might mean redoing either uncovering or discovery phases. It can also be that the nurse reached goal achievement or satisfaction, and the nursing process ceases. Similarly, this signifies the task of ending, another activity subsumed in recovery.

This comparative segment of the analysis is particularly relevant in emphasizing the integral role that information searching and knowledge organization steps play in NIB. This also underscores the contextual nature of nursing information behavior, with the blending of inherent principles, concepts, and models used in the nursing profession—such as the nursing process—with the global and universal tools and processes used in knowledge organization.

7.0 Conclusions and Recommendations

In summary, many knowledge organization processes used in nursing information behavior are similar to those described by Foster (2004), Meho and Tibbo (2003) and Ellis (1993). Certain steps are constant, such as starting, problem or needs identification, determining baseline, problem definition or exploration, conceptualizing, searching, deciding, finding, reviewing, feedback, ending, satisfaction, information use, and relief. But in between these are myriad processes that come into play as the needs dictate. Thus, other steps such as sorting, clarifying, browsing, validating, discriminating, verifying, determining, chaining, prioritizing and refining, are described to occur at various points in the information behavior of nurses as supported by data analyzed from the case study.

Closer examination of the nurses’ search episodes reveals three salient components that define the nub of NIB, namely: uncovering, discovery and recovery. Every search scenario is characterized by a point of uncovering, when the nurse comes to a realization that an information need exists. Uncovering is almost always the beginning or the starting point in the nurse’s pursuit of information. Depending on the nature of the information driver and the accessibility and effectiveness of the available leads and conduits, the nurse either progresses to discovery or recovery. Discovery is the active unearthing of and searching for the required information. It reverts to the first step of uncovering, when refinement or refocusing of the information driver is necessary. Or, discovery can advance to the final phase of recovery, when the requisite information is eventually found and the need is fulfilled.

Additionally, the research also revealed that knowledge organization steps correspond to every step in the nursing process and are interwoven as vital processes in nursing information behavior.

Results of this qualitative study only reiterate the inherent and integrative features of knowledge organization in our global society. Nursing is no exception, where many of the knowledge organization steps and processes are reflected and evident in the daily professional practice and information behavior of nurses.

This researcher recognizes that the study focused only on the information behavior home care nurses, and that replicating the investigation using case study participants from other nursing specializations is in order.

8.0 References


