Richard P. Smiraglia—Institute for Knowledge Organization and Structure, Inc.
Elizabeth Milonas—New York City College of Technology (CUNY)
Sergey Zherebchevsky—Long Island University
Edmund J. Y. Pajarillo—Adelphi University

Nursing Information Behavior (NIB) in the Pandemic: Resilience of a Knowledge Base

Abstract

Health care assumed epic proportions in 2020 as the COVID-19 coronavirus pandemic swept the globe, crossing all social, geographic, economic and political lines. A key component of care at every phase of the pandemic has been home care nursing. A virtual domain analysis clinic (DAC) was constructed around the focus of nursing information behavior (NIB). An important question for research was the extent to which the ontological base underlying NIB might be the subject of conceptual evolution during the pandemic. The clinic began by using domain analytical techniques to extract a NIB taxonomy from a key text; the taxonomy was then mapped to an international nursing classification and published online where it could be available for scholarship. As the pandemic evolved the DAC employed ethnographic techniques to discover ways in which the knowledge base represented by the pandemic was affected over time. The knowledge base of NIB is resilient. The taxonomy of the domain originally drawn from research and mapped to a classification of practice is sustainably efficacious throughout this project. The analysis of video transcripts reveals ethnographic contexts emerging over the course of the pandemic that provide new contours for the knowledge base. Beyond the resilient core lies a rich panoply of emergent vocabulary. The vocabulary of the pandemic itself becomes part of the knowledge base of the home care nurse. The rise of an emotional layer beyond the core vocabulary of NIB reveals the contours of the social impact of the pandemic as vocabulary concerning the very human psychological and social impacts enter the knowledge base with terms forming a credo of moral fiber, hope, dedication and determination.

1.0 Introduction: Health care, nursing information behavior and COVID-19

Health care, always a core human priority, assumed epic proportions in 2020 as the COVID-19 coronavirus pandemic swept the globe, crossing all social, geographic, economic and political lines. A key component of care at every phase of the pandemic has been home care nursing. Home care nurses tend to long-term survival of millions and keeping these nurses at work despite the pandemic was of critical importance. Understanding the knowledge base of home care nursing and analyzing the impact of the pandemic on that knowledge base presented an important challenge to knowledge organization (KO).

A virtual domain analysis clinic (DAC)(Smiraglia 2019) was constructed around the focus of nursing information behavior (NIB). According to Pajarillo's unique and innovative 2005 synthesis of the nursing process with information behavior, NIB is a conceptual framework comprising a set of nursing behaviors used to transform data into information and knowledge. Pajarillo's theory concerning the "nub of NIB"—uncovering, discovery, and recovery—can be used to explain the behaviors in NIB such as assessment, problem identification, planning, interventions, and evaluation (Pajarillo 2020, 64). An

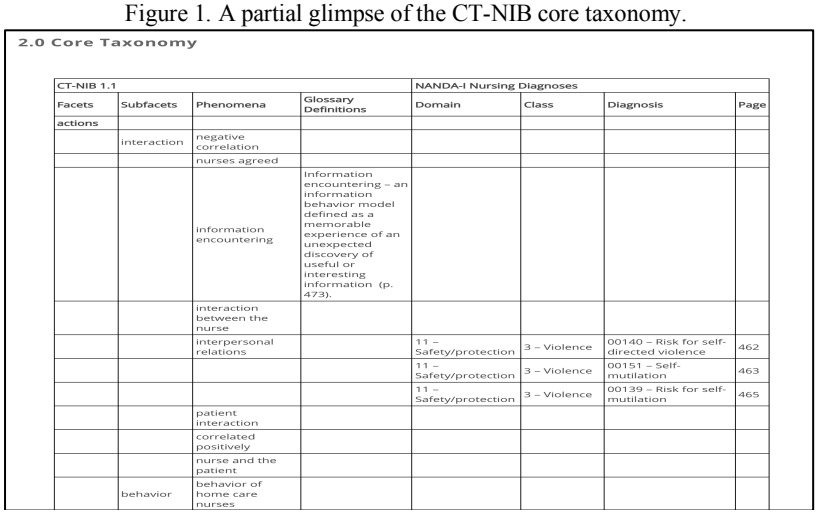
important question for research was the extent to which the ontological base underlying the nub of NIB might be the subject of conceptual evolution during the pandemic. The clinic began by using domain analytical techniques to extract a NIB taxonomy from a key text; the taxonomy was then mapped to an international nursing classification and published online where it could be available for scholarship. As the pandemic evolved the DAC employed ethnographic techniques to discover ways in which the knowledge base represented by the pandemic was affected over time. This short paper is a preliminary report of these findings.

2.0 Background

2.1 The construction of the taxonomy

The first objective of this research was to establish the knowledge base of NIB by generating a taxonomy. Ontology extraction using standard domain analytical tools (Smiraglia 2015) was used to mine text from Pajarillo's 2005 dissertation (Milonas, Zherebchevsky and Smiraglia 2020), which remains the most exhaustive treatment of the nursing process from the point of view of information behavior. Provalis ProSuite was used to generate frequency distributions of terms and phrases, which were then cleaned and sorted into a list of "phenomena." Co-word analysis using Wordstat produced three-dimensional visualizations of the co-occurrence of these terms and phrases. Analysis of these visualizations revealed regions of possible facets and sub-facets, including: home-care nurses, nursing process, geographic health, information tools and resources, information searching behavior, family-related information leads and drivers, community resources, and professional experience. The cleansing of analysis results generated a final list of knowledge units (the phenomena). A comparison of the knowledge units to the dissertation's glossary identified a total of 122 core terms. Analysis of the 122 core terms revealed six facets (actions, care, resources, agents, processes and place) and seventeen sub-facets. Terms defined in the Pajarillo (2005) glossary are accompanied by those definitions. Figures 1 and 2 show segments of the faceted CT-NIB (Core Taxonomy-Nursing Information Behavior 1.1) itself and the accompanying alphabetical index of phenomena, respectively.

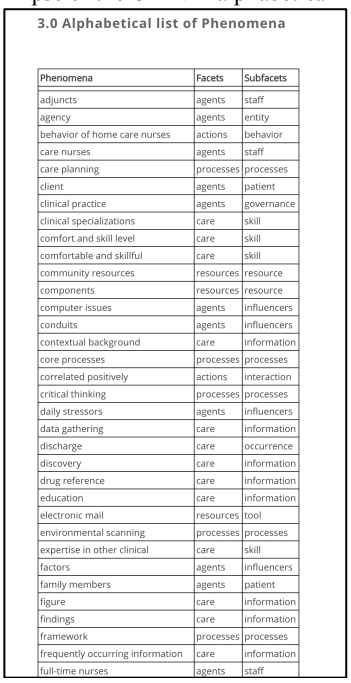
Figure 1. A partial glimpse of the CT-NIB core taxonomy.



2.0 Core Taxonomy

CT-NIB 1.1				NANDA-I Nursing Diagnoses			
Facets	Subfacets	Phenomena	Glossary Definitions	Domain	Class	Diagnosis	Page
actions							
	interaction	negative correlation					
		nurses agreed					
		information encountering	Information encountering – an information behavior model defined as a memorable experience of an unexpected discovery of useful or interesting information (p. 473).				
		interaction between the nurse					
		interpersonal relations		11 – Safety/protection	3 – Violence	00140 – Risk for self-directed violence	462
				11 – Safety/protection	3 – Violence	00151 – Self-mutilation	463
				11 – Safety/protection	3 – Violence	00139 – Risk for self-mutilation	465
		patient interaction					
		correlated positively					
		nurse and the patient					
	behavior	behavior of home care nurses					

Figure 2. A partial glimpse of the CT-NIB alphabetical index of phenomena.



3.0 Alphabetical list of Phenomena

Phenomena	Facets	Subfacets
adjuncts	agents	staff
agency	agents	entity
behavior of home care nurses	actions	behavior
care nurses	agents	staff
care planning	processes	processes
client	agents	patient
clinical practice	agents	governance
clinical specializations	care	skill
comfort and skill level	care	skill
comfortable and skillful	care	skill
community resources	resources	resource
components	resources	resource
computer issues	agents	influencers
conduits	agents	influencers
contextual background	care	information
core processes	processes	processes
correlated positively	actions	interaction
critical thinking	processes	processes
daily stressors	agents	influencers
data gathering	care	information
discharge	care	occurrence
discovery	care	information
drug reference	care	information
education	care	information
electronic mail	resources	tool
environmental scanning	processes	processes
expertise in other clinical	care	skill
factors	agents	influencers
family members	agents	patient
figure	care	information
findings	care	information
framework	processes	processes
frequently occurring information	care	information
full-time nurses	agents	staff

An occurrence analysis of the 122 NIB terms in the NANDA International Nursing Diagnoses and Classification (NANDA-I) identified the presence of 20 of the 122 NIB terms in 12 of the 13 NANDA-I domains providing both a means of interoperability and a measure of external validity. The CT-NIB provides a core taxonomy for research and identifies challenges faced by home healthcare nursing during the pandemic. The taxonomy and NANDA-I mappings are maintained online at https://knoworg.org/a-core-taxonomy-of-nursing-information-behavior-ct-nib-version-1-1/ .

2.2 Video interviews and NIB in the Pandemic

To test and validate our taxonomy we wanted to hear the voices of home care nurses. We knew any intrusion at this time would be unethical, so we turned to videos describing the work of home care nurses during a pandemic. In particular we turned to newscasts and interviews of home care nurses. This gave us the voices not only of the nurses themselves, but also of the entirety of the social milieu in which they were operating, while it freed us from the ethical problem of interfering with health care. We considered this approach to be a first step toward Cognitive Work Analysis of home care nursing in the pandemic. Essentially it constituted a form of quasi-ethnography.

Using somewhat dissimilar approaches for the purpose of methodological triangulation, including differently worded queries three researchers used the Google search engine and YouTube to identify relevant interviews and presentations. Specifically, we searched using the following sets of queries:

Milonas: home care, nursing and COVID
Zherebchevsky: home care nurse, You Tube videos
Pajarillo: COVID, visiting nurses

The result sets overlapped substantially. After merging and deduplicating, the final list included 45 videos. A transcript of each audiovisual resource was either downloaded or generated. These transcripts were then analyzed using co-word analysis and two independent rounds of open coding.

2.2.1 Co-word Analysis

Co-word analysis was performed on the corpus of transcripts to identify the keywords and phrases. Keywords with a frequency of occurrence of greater than 28 (representing at least 0.8% of the total vocabulary, the top tier of a Bradford-like distribution) were compiled. Multidimensional scaling (MDS) was employed to analyze the co-occurrence of the keywords. The resulting hierarchical clustering was visualized using a dendrogram. The relative proximity of keywords within the dendrogram's clusters was illustrated in a three-dimensional plot, which as in the analysis above gave us a visual overview of the knowledge domain. Terms occurring in this analysis were mapped to the CT-NIB taxonomy. Twenty terms mapped to phenomena in the five CT-NIB facets: action, care,

resources, agents and processes. Among terms that did not map, were “COVID,” “COVID-positive,” “mask,” “PPE,” “protective equipment” and “frontlines.” Figures 3 and 4 show a three-dimensional MDS plots of the most frequently occurring keywords and multi-word phrases respectively.

Figure 3. MDS plot of frequently occurring keywords in the first round of open coding.

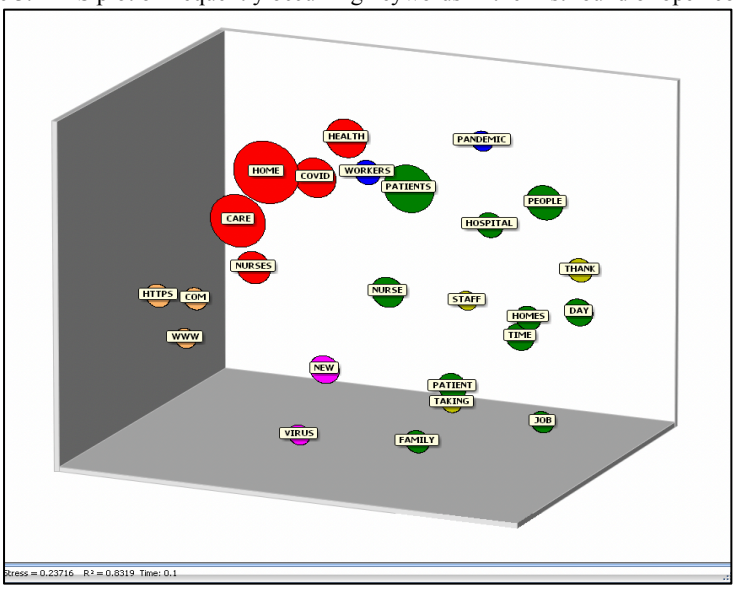
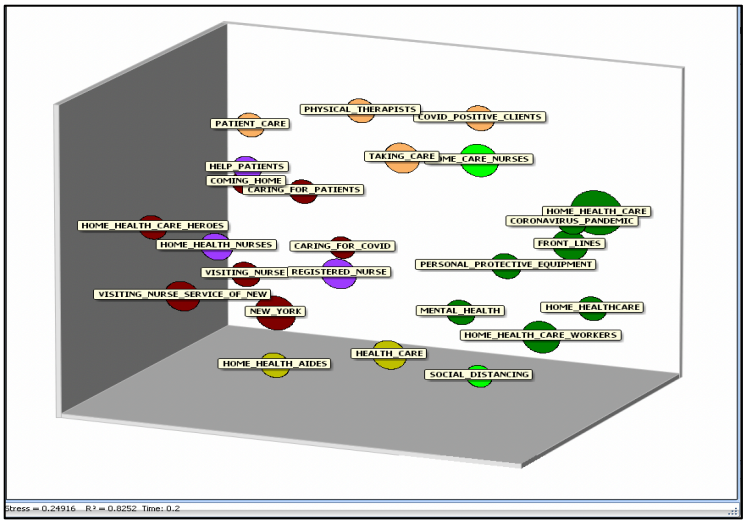


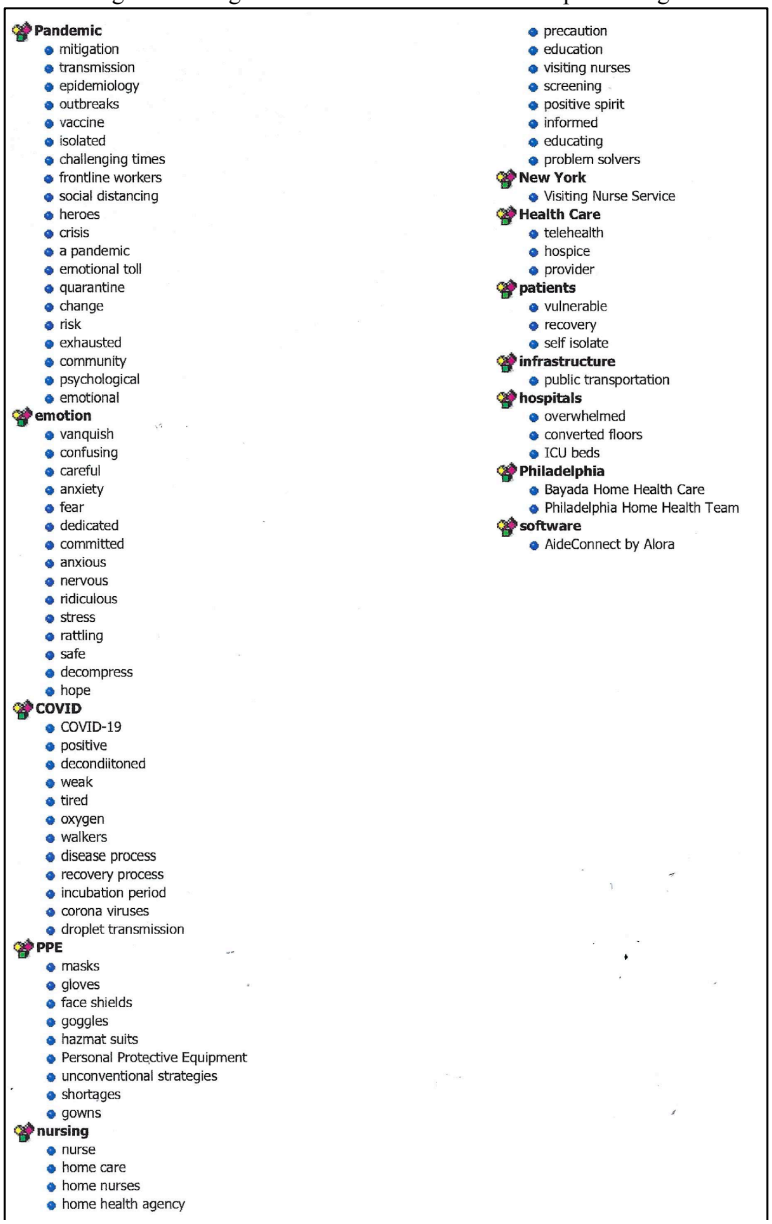
Figure 4. MDS plot of frequently occurring phrases in the first round of open coding.



2.2.2 Open coding

The first round was conducted using QDAMiner™ and WordStat™ text analytics tools developed by Provalis Research. Using QDAMiner™ terms were designated as codes and assigned to broad categories for analysis. Figure 5 shows the categorical clusters of open coding from the first round.

Figure 5. Categorized terms from first round of open coding.



The second round of open coding by a different member of the team was conducted using the transcripts in Microsoft Word®. A set of spreadsheets were compiled to compare and analyze the concepts identified in the corpus of video transcripts. 407 codes were identified of which 90 occurred more than once. Table 1 shows the 47 codes that occurred three or more times in the coding.

Table 1. Most frequently occurring terms in the second round of open coding.

pandemic	14
home	13
patients	12
communities	10
safe	10
nurses	9
hospice	8
hospital	8
healthcare	7
home care	6
PPE	6
protective equipment	6
rewarding	6
virus	6
care	5
coronavirus	5
doctors	5
registered nurse	5
clinicians	4
COVID	4
Covid 19	4
family	4
fearful	4
gloves	4

home health	4
Home Health Care	4
nursing homes	4
precautions	4
coronavirus pandemic	3
discharged	3
disease	3
education	3
emotionally	3
families	3
front line	3
help	3
home care workers	3
home visits	3
Homecare	3
masks	3
nurse	3
quarantined	3
risk	3
sick	3
surgical masks	3
symptoms	3
visiting nurses	3

These two rounds of open coding signaled the emergence of new concepts and thematic clusters relative to COVID-19. Through the identification and analysis of such knowledge units, the discipline of knowledge organization can facilitate the development of knowledge in nursing.

3.0 Current Results

Whereas taxonomy as a KO application reveals an empirical knowledge base derived from quantitative analysis of concepts in use and their co-occurrence, the present study is an attempt to move qualitatively into the experience of the pandemic through narrative analysis. At present, we have completed two rounds of open coding, each performed by a different member of the team. As a result, we have two sets of mappings of "codes" or meaningful concepts identified in the context of the interviews with active home care nurses. The codes naturally form "axes" around which narrative analysis can be constructed eventually to provide powerful explanation. Preliminary narrative analysis revealed two prominent themes: the care given (Care facet) and those who administer and/or received care (Agents facet). Terms and phrases in the co-word analysis mapped to 5 out of the 6 CT-NIB facets: 1) action, 2) care, 3) resources, 4) agents and 5) place. Displayed evidence of time suggested the future formation of a Time facet as well as additional sub-facets: 1) protection, 2) illness, and 3) family/significant others, for the existing Care facet

3.1 Two contexts

Preliminary results of the open coding in effect identify a set of potential axes, as well as two clearly emerging contexts. The interviews we compiled all stem from news organizations seeking to document the story of home care nursing in the pandemic. Two overlapping contexts play a critical role. The first is the context of home care nursing in general taking place against the shifting backdrop of COVID-19. For example, while nurses continue to visit their long-term clients as before, the pandemic has generated a context of fear and a sense of crisis among both the nurses and their clients. Thus, the use of personal protective equipment or PPE plays two roles. On the one hand it is to protect the nurses as they go about their work, but on the other it is also to protect the clients whose homes are being visited on a regular basis. The second context, of course, is that of home care of patients who have or have recovered from COVID-19.

3.2 Some potential axes

To date this research has revealed the strength of the CT-NIB taxonomy with regard to the core NIB elements. Nursing and nurses continue to be effective informed problem solvers and care givers at a very high professional level. Of course, two obvious axes that emerge are the vocabulary of COVID-19 itself, and the complex vocabulary of PPE. Two emergent axes are vivid in the narrative of those interviewed. One is that around the notion of "pandemic"—mitigation, transmission and epidemiology of course, but also crisis and quarantine, sheltering, social distancing, and the very important identification of home care nurses as frontline workers and healthcare heroes. Another is a panoply of "emotion"—vivid invocations of concepts such as ambiguity, anxiety, fear, rattling, confusing and stress, but also the very noble concepts of hope, vanquish, dedication, commitment, determination, important work, community support and moral fiber.

4.0 Conclusion

The knowledge base of NIB is resilient. The taxonomy of the domain originally drawn from research and mapped to a classification of practice is sustainably efficacious throughout this project. The analysis of video transcripts reveals ethnographic contexts emerging over the course of the pandemic that provide new contours for the knowledge base. We have clear pictures of the work of the home care nurse as it remains unchanged with regard to care for long term clients despite mitigation measures required by the pandemic.

But we also have a clear picture of the new reality of home care of pandemic patients of COVID-19. Beyond the resilient core lies a rich panoply of emergent vocabulary. The vocabulary of the pandemic itself becomes part of the knowledge base of the home care nurse. In effect, the pandemic visibly influences the elements of the nub of NIB—uncovering, discovery, and recovery—as heroic frontline efforts to mitigate infuse the knowledge base of the home care nurse. Finally, the rise of an emotional layer beyond the core vocabulary of NIB reveals the contours of the social impact of the pandemic as vocabulary concerning the very human psychological and social impacts enter the knowledge base with terms forming a credo of moral fiber, hope, dedication and determination.

Next steps in the project will include axial analysis, further in-person interviews of home care nurses. Continued updating of the CT-NIB taxonomy will also take place to incorporate the terminology emerging from the pandemic.

References

Milonas, Elizabeth, Sergey Zherebchevsky and Richard P. Smiraglia. 2020. "CT-NIB Taxonomy for Nursing Information Behavior: KO in the Pandemic." *IKOS Bulletin* 2: 13-16.

Pajarillo, Edmund J.Y. 2005. "Contextual Perspectives of Information for Home Care Nurses: Towards a Framework of Nursing Information Behavior (NIB)." PhD diss., Long Island University

Pajarillo, Edmund J.Y. 2020. "Knowledge Discovery and Development as an Ongoing Process in the use of Data and Information by Nurses to Deliver Safe and Quality Care." *IKOS Bulletin* 2: 59-64.

Smiraglia, Richard P. 2015. *Domain Analysis for Knowledge Organization: Tools for Ontology Extaction.* Chandos Information Professional Series. Waltham, MA: Chandos.

Smiraglia, Richard P. 2019. The IKOS Domain Analysis Clinic: Toward Critical Problem Solving. *IKOS Bulletin* 1: 5.

Smiraglia, Richard P., Edmund J.Y. Pajarillo, Elizabeth Milonas and Sergey Zherebchevsky. 2020. "Home Health Care Nursing in the Pandemic: Preliminary Analysis of Video Interviews." *IKOS Bulletin* 2: 52-55.