An Empiric Analysis of Omaha System Targets

K. Monsen[1]; G. Melton-Meaux[2,4]; J. Timm[3]; B. Westra[1,4]; M. Kerr[1]; N. Raman[4]; O. Farri[4]; C. Hart[1]; K. Martin[5]

[1]University of Minnesota School of Nursing; [2]University of Minnesota Medical School; [3]Washington County Minnesota Department of Public Health and Environment; [4]University Of Minnesota Institute for Health Informatics; [5]Martin Associates

Summary

Interface terminologies used in electronic health records must be re-evaluated and revised to reflect current health care practice and knowledge. To enable future revisions of the Omaha System Intervention Scheme, investigators evaluated formal semantic structure of target terms and concept duplication of problem and target terms. Using linguistic principles and qualitative analysis, five themes were found. A multidimensional formal semantic structure for the intervention target term was proposed. Concept duplication was examined for 16 problem-target matches. Clinical data enabled assessment of the validity of a proposed formal semantic structure and concept duplication. Recommendations are suggested for future development of the Omaha System Intervention Scheme.

Correspondence to:

Karen A. Monsen, PhD, RN
Assistant Professor
University Of Minnesota School of Nursing
5–160 Weaver-Densford Hall
Minneapolis, MN 55455
Email: mons0122@umn.edu
Phone: 612–624–0490
Fax: 612–625–7091

1. Background

A goal of health informatics is meaningful use of clinical data, including structured data generated through documentation [1–3]. The capture of meaningful clinical data depends on the integration of interface terminologies within electronic health record (EHR) systems [4]. Interface terminologies are defined as "unique vehicles for supporting efficient and accurate interaction between healthcare providers and computer-based clinical applications" [5 (p. 65)]. Nursing has led in the development of interface terminologies since the 1970's, with the intent of encoding clinical narrative into structured form [4]. Because data generated by interface terminologies give voice to health care practice and outcomes, it is essential to clearly articulate the conceptual structure of each terminology as a basis for knowledge discovery [4, 6]. The American Nurses Association [6] established a formal recognition process for such terminologies in 1992. Currently, eight interface terminologies are recognized. Of these, four can be used to describe interventions for community-based care: Nursing Intervention Classification (NIC) [7], International Classification for Nursing Practice (ICNP) [8], Clinical Care Classification (CCC) [9], and the Omaha System [10]. It is beyond the scope of this article to describe all interface terminologies. However, there are many similarities between interface terminologies; thus this study may serve as an exemplar for refining and revising other terminologies. The overall purpose of this project was to identify the formal semantic structure of Omaha System target (Phase I), and to analyze free text data associated with Omaha System target 'other' (Phase II), in order to inform the use and future development of the Omaha System Intervention Scheme. Other defined terms in the Intervention Scheme had strong semantic structures (i.e., problem = topic, category = verb) and thus were not addressed in this study. The purpose of this paper is to describe our findings from Phase I. Findings from Phase II are reported separately [11].

1.1 Evaluation Model

Due to the dynamic nature of the health care environment, terms used to describe health care services and client health needs are constantly changing. Therefore, interface terminologies must be re-evaluated and revised. Rosenbloom and colleagues proposed an evaluation model to evaluate an interface terminology's functional utility. Parameters in the evaluation model include concept accuracy, term expressivity, semantic consistency, assertional knowledge adequacy, formal semantic structure, and human readability [5]. Formal semantic structure is defined as "Explicitly describing the relationships among concepts in a terminology" [5 (p. 69)]. In a formal semantic structure, relationships among concepts in a terminology must be specified to support algorithmic data storage, inferencing, subsumption, classification, management and analysis. Evaluation of formal semantic structures may reveal gaps in the description of the relationships between concepts [5]. When such gaps exist, concepts may be represented at more than one level in a terminology, or there may be multiple ways to use the terminology to represent a single concept. However, concept duplication may reduce the accuracy of information retrieval with terminologies [12].

1.2 The Omaha System

The Omaha System [10] is an interface terminology that is recognized by the American Nurses Association [6], and is used widely in community-based EHR systems. It has 3 components: the Problem Classification Scheme (domains, modifiers, and signs/symptoms), the Problem Rating Scale for Outcomes (knowledge, behavior, and status), and the Intervention Scheme (categories, targets, and care description). The Problem Classification Scheme is a comprehensive, holistic health assessment instrument that defines 42 health concepts (problems). A concept map depicting the formal semantic structure of the Omaha System has been developed and is available on-line and in ▶ Figure 1 (http://omahasystemmn.org/documents/2009_Omaha_System_concept_map.pdf). This concept map depicts the centrality of the problem concept to the 3 inter-related components of the Omaha System.

 The focus of this study is the Intervention Scheme. Interventions in the Omaha System consist of four linked terms: problem + category + target + care description. The category term specifies the action of the intervention. In the Omaha System, there are four actions that can be used to address any

of the 42 problems: teaching, guidance, and counseling; treatments and procedures; case management; and surveillance. The target term consists of an alphabetical list of defined terms that further describe the intervention content. Targets are defined as "unique objects of practitioner actions or activities that serve to further describe interventions" [10 (p. 466)]. The care description term is not defined and can be customized to provide highly granular intervention details for any program, population, or practice [10].

Omaha System interventions provide highly granular descriptions of care. There are 12,600 possible combinations of problem, category, and target terms, each of which can be further customized using the care description. These interventions have been successfully employed to discover new health care knowledge using complex statistical models and data mining methods [13–15].

Concept duplication is considered a threat to the validity of a structured interface terminology [5]. In an early edition of the Omaha System, 2 concepts (nutrition, substance use) were exactly duplicated as terms at the problem and target levels [16]. When the Omaha System was revised in 2005, this concept duplication was addressed by altering target terms (dietary management, substance use cessation); eliminating the exact duplication while maintaining congruence with the original Omaha System targets in the 2005 revision [10]. These and other similarities between the current problem and target terms demonstrate the need for further examination of potential concept duplication between these 2 levels of the Intervention Scheme.

The purpose of this paper is to clarify of 2 aspects of Omaha System terminology structure, formal semantic structure and concept duplication, as an essential first steps that will support further analysis of interface terminology structure and function. Additional studies based on this analysis are planned, and will include analysis of free text associated with structured documentation to identify terminology gaps and propose improvements that will support data and practice quality [11, 17].

2. Objectives

The objectives of this study were to
1. identify a formal semantic structure underlying Omaha System target terms,
2. assess the validity of the formal semantic structure identified in Objective 1, and
3. examine problem and target terms for concept duplication.

3. Methods

This study is the first phase of a study that will evaluate free text data accompanying structured Omaha System intervention terms to inform future revision of target terms. Approval was obtained from the University of Minnesota Institutional Review Board and the participating agency directors.

3.1 Sample

Clinical EHR data from a public health agency and a skilled homecare, skilled hospice, and palliative care agency were used in the study. The term "home care" is used henceforth to include home care, hospice, and palliative care. The data were generated during a 2 year period (October 2006-October 2008) for 1,079 clients in the maternal-child cohort (270,487 interventions) and 2,309 clients in the home care cohort (723,422 interventions) for a total sample of 993,909 interventions.

3.2 Procedures for Data Collection

Data were abstracted from the 2 agencies by the software vendor, CareFacts™ Information Systems. Variables included a fictitious client identifier, visit date, problem, category, target, care description, and a text note to include further granularity associated with the data. The data were generated by practitioners who documented client assessments and clinical interventions during the course of routine care. Practitioners were aware that documentation data could be utilized in program evaluation and research, but were blind to client selection criteria and analysis methodologies.

3.3 Method for identifying the formal semantic structure.

A systematic semantic analysis of targets was conducted based on linguistic principles [18]. Then, the authors categorized the target terms into themes, based on the linguistic definitions (subject and object complements, direct objects, and indirect objects) and corresponding definitions of the Omaha System target terms. Finally, these themes were organized in a concept map to depict the formal semantic structure of target terms.

3.4 Method validating the formal semantic structure

The formal semantic structure was validated using intervention data using descriptive analysis separately for the home care and maternal-child cohorts. Results were interpreted qualitatively to assess the validity of the attributes and themes.

3.5 Method for evaluating concept duplication

Problem and target term matches were identified by reviewing the names and definitions of problem and target terms. Frequencies of matches by problem were assessed using descriptive statistics for all interventions in the combined data set.

4. Results

4.1 Formal Semantic Structure

The first objective of the study was to identify the formal semantic structure underlying Omaha System target terms. The analysis was conducted from a linguistic perspective. The context of the target term is an intervention. Semantically, an intervention is a verbal phrase that describes a practitioner's action to address a health need or topic with a client [18]. The implied subject or "I" of the sentence is always the practitioner who documents the sentence or intervention. The problem is always the topic of the sentence. The category is always the verb of the sentence. It is the action taken by the practitioner to address the topic. The implied direct object or receiver of the action is always the client. The target and care description terms are the dependent clause, always related to the topic and verb of the sentence. Thus, all Omaha System interventions are written in the following form (italicized words are implied):

> "I addressed **Problem** with Client by doing **Category**,
> furthermore, **Target-Care description**."

An example of an Omaha System intervention for changing an ostomy appliance is as follows: "Bowel care – Treatments and procedures – ostomy care – change appliance bag", expressed in a complete sentence as "I addressed **Bowel function** with client by doing **treatments and procedures** for ostomy care, **changing the appliance bag**".

The Omaha System concept map depicts the multidimensional structures of the Problem Classification Scheme Domains and Problem Rating Scale for Outcomes. The Intervention Scheme is depicted a series of one-dimensional concepts at four levels: problem, category, target, and care description. Targets are defined as 75 "unique objects of practitioner actions or activities that serve to further describe interventions" [10 (p. 466)]. Linguistically, the target is analogous to the "object" as a part of speech, defined as "a word or group of words which receives the action of a verb or that completes the description or statement being made about the subject" [18]. There are four types of objects: direct objects, indirect objects, subject complements, and object complements. Direct objects are defined as "a word or group of words that follow transitive verbs, and name the receiver of the action. *EX: I threw **the baseball**"* [18]. Targets such as such as education, other community services, and transportation are used as direct objects. An intervention using a target as a direct object is Health care supervision – Case management – transportation – options (schedule ride to appointment). In-

direct objects are defined as "a noun or pronoun that come before or behind a direct object, and tells to whom or for whom or what the action is done. *EX: I gave the ball **to Jack**.*" [18]. Targets such as mobility/transfers, signs/symptoms mental/emotional, and signs/symptoms physical are used as indirect objects. An intervention using a target as an indirect object is Mental health – Surveillance – signs/symptoms mental/emotional – suicidal tendencies. Subject complements are defined as objects that "follow a linking verb and describe or complete the meaning of the subject. These can be nouns *(I am the **manager**)*, or adjectives *(I am **so stupid**!)*" [18]. Targets such as nutritionist care, social work/counseling care, and recreational therapy care are used as subject complements. An intervention using a target as a subject complement is Nutrition – Case management – nutritionist care – schedule/provide services. Finally, object complements are defined as "a word or group of words that describes or completes a direct object's meaning. These can also be nouns or adjectives. *EX: Love makes the world **a happier place**. Yes, I am calling you **ridiculous**".* [18]. Targets such as coping skills, substance use cessation, and wellness are used as object complements. An intervention using a target as an object complement is Mental health – Surveillance – coping skills – adequate/appropriate. The Omaha System provides definitions for targets, but the definitions do not specify the type of object intended for each target. Thus, targets may be used as diverse objects, depending on how they are used in the intervention sentence. For example, exercises can relate to a client's physical activity (direct object) or a practitioner's services for the client (indirect object).

The qualitative analysis of target terms revealed 5 broad themes grouped by care attributes and client attributes. Two themes were care attributes (type of care, n = 25) and type of practitioner (n=11) often used in interventions as subject complements. Three themes were client attributes (client skills (n = 11), client needs (n = 17), and client environment (n = 12), often used in interventions as indirect or direct objects (▶ Table 1). Based on definitions of related terms within the Omaha System glossary [10] we assigned definitions to the 5 themes. Type of care was defined as a specific health care or social service provided to clients. Type of practitioner was defined as a particular group of professionals who provide health care and/or social services to clients. Client skills were defined as the capacity of an individual, family, or community to perform particular health care or self care functions. Client needs were defined as particular conditions that affect any aspect of the client's wellbeing. Client environment was defined as material resources and physical surroundings of the client. A concept map was created based on the proposed semantic structure depicting the 2 attributes and 5 themes (▶ Fig. 2).

4.2 Validation of the Formal Semantic Structure

The second objective of the study was to assess the validity of formal semantic structure using existing Omaha System intervention data. The most frequent targets and differences between results by the 2 cohorts are shown in ▶ Table 2. Targets used in home care interventions were split evenly between care attributes (49.7%) and client attributes (50.3%). Targets used in maternal-child interventions were primarily client attributes (76.5%). Examples of interventions that illustrate the definitions of the attributes and themes are provided in ▶ Table 3.

4.3 Concept Duplication

The third objective of the study was to examine concept duplication. Review of term names and definitions found 16 matches of problem and target terms that represented very similar concepts. Use of matched terms in interventions varied by problem (mean = 22.9%; range = 0.8% to 82.5%). Concept duplication occurred in 10.1% of all interventions in the combine home care and maternal-child data set (▶ Table 4).

5. Discussion

In this study, the investigators evaluated 2 aspects of functional utility (formal semantic structure and concept duplication) for Omaha System target terms.

5.1 Proposed Semantic Structure for Target Terms.

Semantic analysis of target terms revealed the complex nature of the target term. Similar to the **object** part of speech, targets can be used to describe both care attributes (usually direct objects, subject complements, or object complements) and client attributes (usually indirect objects). Therefore, it is preferable to re-define targets in a multi-dimensional semantic structure. A new definition of the target term is proposed, building on the original definition:

> A unique object of practitioner actions or activities that
> serves to further describe interventions, including practice
> attributes (type of care and type of practitioner) and client
> attributes (skills, needs, and environment).

The proposed definition may support adaptation of target terms to meet the changing health care environment while maintaining the robust structure of the Intervention Scheme. For example, the *type of practitioner* theme could be used as a sub-heading for practitioners currently included, such as *practitioner-nursing, practitioner-social worker,* and *practitioner-physical therapy.* Thus, any type of practitioner not currently included could be systematically specified (e.g. midwife, acupuncturist, hospitalist). Using the terms *practitioner-medical* and *practitioner-dental* resolves issues in current targets such as *medical/dental care* in which 2 types of practitioners are included within one term.

The *type of care* theme could be used as a sub-heading for care related to problems currently included in the Problem Classification Scheme, as with current targets *care-bowel*, *care-family planning*, and *care-skin*. Thus, care for any problem could be systematically added. Current targets specifying care by specific practitioners (e.g. nutritionist care) should be included within the *type of practitioner* theme (e.g. practitioner-nutritionist), instead of the *type of care* theme.

The *client skills* theme could be used as a sub-heading for targets currently naming skills, such as *skills-caretaking/parenting*, *skills-coping*, and *skills-stress management*. The *client needs* theme could be used as a sub-heading for targets currently naming needs, such as *needs-transportation*, *needs-anger management*, and *needs-support system.* The *client environment* theme could be used as a sub-heading for targets currently naming an attribute of the client environment or context, such as *environment-safety*, *environment-finances*, and *environment-daycare/respite.*

The authors reached consensus on the best fit of the target terms within the attributes and themes, but acknowledge that overlap exists and that the targets may be applicable across themes, depending on the client situation. For example, many interventions are intended to assess client skill levels and to teach skills to clients. Expanding this theme using other existing target terms such as *skills-medication administration* and *skills-wellness* would greatly increase the precision of data collection regarding such interventions. Similar to the *client skills* theme, the *client needs* theme could be expanded using other existing target terms, such as *needs-supplies* and *needs-medication set up*; and the *client environment* theme could be similarly expanded using terms such as *environment-employment* and *environment infection-precautions*. Use of sub-headings with existing target terms will aid in practitioner understanding of intervention descriptions; and improve the analysis and interpretation of intervention data.

5.2 Validity of Formal Semantic Structure.

Face validity of the attributes and themes was assessed empirically for community care of 2 cohorts receiving home care services and maternal-child services. Each of the 5 themes was represented in the data for both cohorts, with content for each cohort supporting the face validity of the formal semantic structure for different types of clients. For example, common targets in the most frequent problem-target matches for the home care cohort (Table 1) were related to the *type of care* theme (medication action/side effects, medication administration, medication coordination/ordering, medication set-up, spiritual care) and *client needs* theme (mobility/transfers, signs/symptoms-mental/emotional, signs/symptoms-physical). Common targets for the maternal-child cohort were related to the *type of care* theme (family planning care), *client skills* theme (caretaking/parenting skills), the *client needs* theme (education, feeding procedures, stimulation/nurturance, substance use cessation)

and the *client environment* theme (finances, home). Common targets for both cohorts were *client skills* theme (coping skills), *type of care* theme (medical/dental care), and the *client environment* theme (safety).

Distribution of targets was split equally between care attributes and client attributes in targets for the home care interventions, while more client attributes than care attributes were found in maternal-child interventions. This pattern may indicate that the formal semantic structure may help to discriminate between types of health care practice because it may enable more granular analysis of workforce attributes (type of practitioner and type of care themes).

5.3 Concept Duplication.

Concept duplication was found for 16 matched problem and target terms, indicating that there are 16 target terms that represent significant aspects of major health concepts also represented at the problem level (▶Table 3). The purpose of the target term is to further specify intervention content [10]. When problem and target terms match, intervention content description is not further specified. In this study, concept duplication occurred in 10.1% of total interventions, substantively limiting precision of intervention data representation. These findings suggest that to improve data capture, matched problem and target terms should not be used in the same intervention. Instead, care should be taken to use the most descriptive terms available for each intervention. For the problems with very high incidence of matched terms, further study is needed to determine if additional target terms may be necessary to improve intervention description. As described above, use of the proposed sub-headings will increase intervention precision.

Ideally in a classification system or taxonomy, no concept duplication should occur. However, concept duplication at the problem and target levels in the multi-level structure of the Intervention Scheme is very useful for 2 reasons. First, in real life, health problems are rarely independent. For example, surveillance of shortness of breath for a client with congestive heart failure is related to both the Respiration problem and the Circulation problem. With duplicate concepts at the problem and target levels as described above, surveillance of respirations for a congestive heart failure client with shortness of breath could be captured with one intervention (*Circulation-surveillance-care-respiration-shortness of breath*). Second, such concept duplication improves documentation efficiency, enabling data capture related to one priority problem instead of 2 problems. This reduces documentation work load, as it is more cumbersome to document interventions for several different problems than for fewer priority problems. These findings suggest that it may be beneficial to allow for continued and/or expanded use of problem concepts at the target level within the Intervention Scheme, as described for the *type of care* theme, above.

5.5 Recommendations

Based on the findings of this study, suggested recommendations for future Omaha System target revisions are:
1. To improve the semantic structure of the Omaha System, revisions of the Intervention Scheme targets should be guided by the proposed formal semantic structure.
2. To maximize flexibility and efficiency of documentation, it may be beneficial to enable use of major concepts at multiple levels of the Intervention Scheme (problem and target).
3. To maximize usefulness, target terms should be applicable across many problems.
4. To maintain know-ability of the Omaha System, the number of targets should not be greatly increased. However, it may be possible to expand targets in a knowable fashion by using sub-heading conventions based on the proposed formal semantic structure.

6. Conclusions

Interface terminologies must be stable to support data integrity and practice quality, and flexible to reflect changes in the dynamic health care environment. To prepare for future revisions of the Omaha System Intervention Scheme, target terms were examined for formal semantic structure and

concept duplication. Using linguistic principles and qualitative analysis revealed 5 themes: type of care, type of practitioner, client skills, client needs, and client environment. These themes are the basis of a proposed multi-dimensional semantic structure to be used for future revisions of the Intervention Scheme. Concept duplication analysis revealed 16 matches of problem and target terms with similar or overlapping names and definitions. The qualitative analyses were validated empirically using large intervention data sets from community care settings. These results will be used in future studies of free text associated with Omaha System target terms [11]. Recommendations to guide future Intervention Scheme revisions were suggested. The methods and findings of this study may be generalizable to other interface terminologies.

Clinical Relevance Statement

Practitioner success using electronic health records depends on the interface terminology used to describe care. Thus it is essential to critically analyze the interface terminology and suggest evidence-based improvements. The formal semantic structure and recommendations of this study are based on data from practice, and provide a meaningful method for incorporating practical improvements in future Omaha System revisions.

Human Subjects

No human subjects were involved in the preparation of this manuscript. University of Minnesota Institutional Review Board approval was obtained for use of de-identified clinical data.

Conflicts of Interest

The authors are informatics specialists with expertise in use of the Omaha System in education and research. All authors declare no conflict of interest in the preparation of this manuscript. The content is solely the responsibility of the authors and does not necessarily represent the official views of the authors' employers.

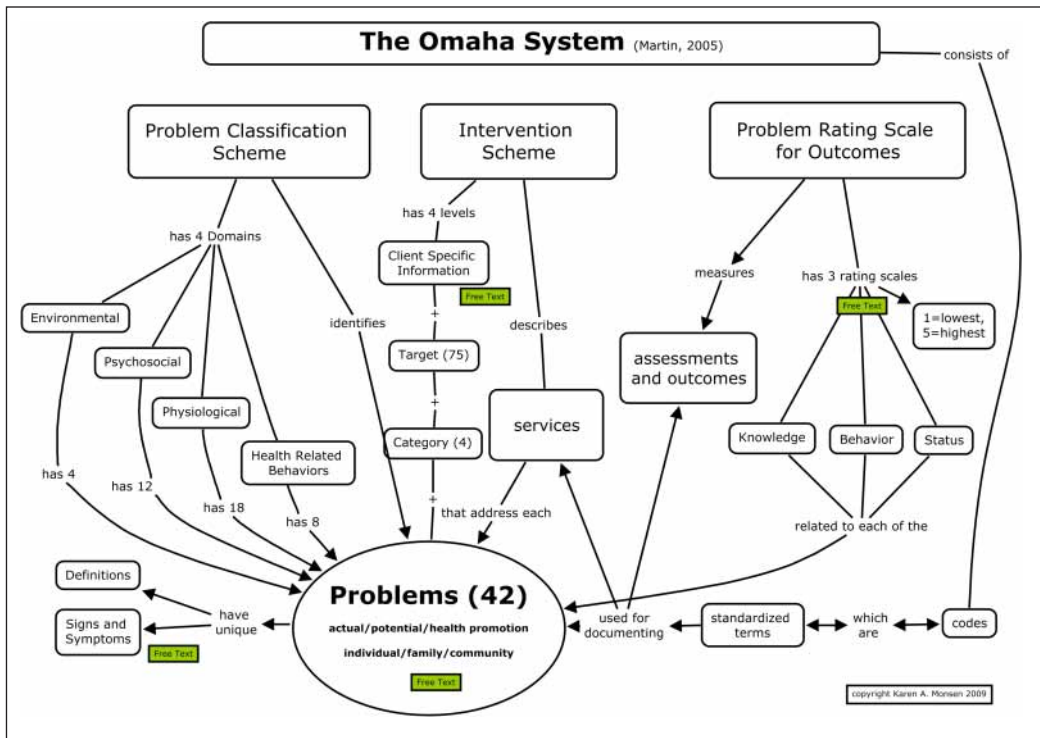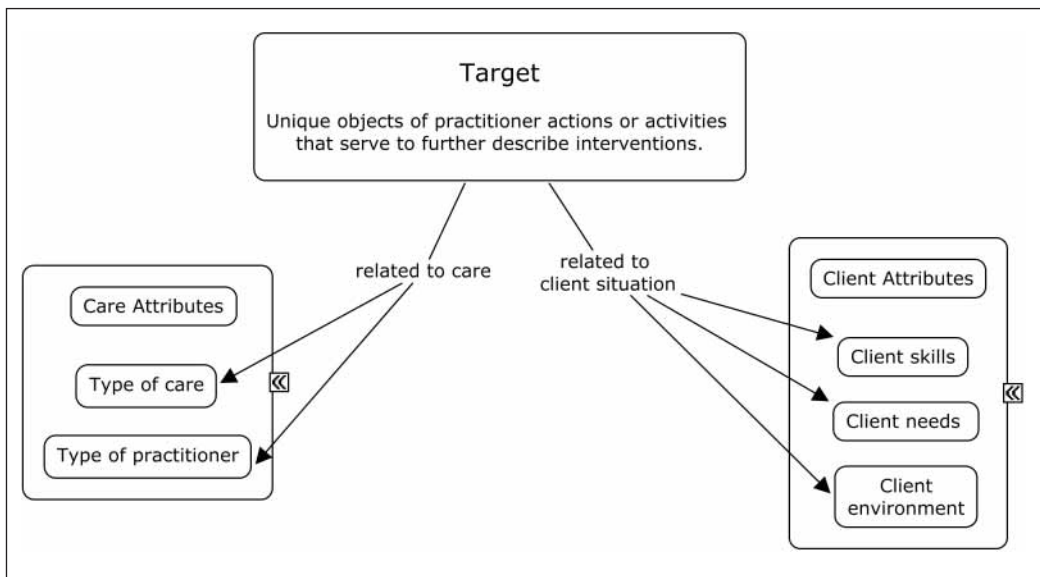## Acknowledgments

Figure 1 Omaha System concept map

Figure 2 Proposed formal semantic structure for Omaha System targets

Table 1 Omaha System target terms by theme in the proposed formal semantic structure

Practice Attributes		Client Attributes		
Type of practitioner	**Type of care**	**Client Skills**	**Client Needs**	**Client Environment**
community outreach worker services	bladder care	behavior modification	anatomy/physiology	day care/respite
interpreter/translator services	bowel care	caretaking/parenting skills	anger management	durable medical equipment
medical/dental care	cardiac care	communication	bonding/attachment	environment
nursing care	cast care	coping skills	discipline	finances
nutritionist care	continuity of care	dietary management	education	home
occupational therapy care	dressing change/wound care	exercises	employment	homemaking/housekeeping
paraprofessional/aide care	end-of-life care	feeding procedures	genetics	interaction
physical therapy care	family planning care	relaxation/breathing techniques	laboratory findings	legal system
recreational therapy care	gait training	stimulation/nurturance	mobility/transfers	other community resources
respiratory therapy care	growth/development care	stress management	personal hygiene	safety
social work/counseling care	ostomy care		rest/sleep	supplies
	respiratory care		signs/symptoms-mental/emotional	support group
	screening procedures		signs/symptoms-physical	
	sickness/injury care		substance use cessation	
	skin care		support system	
	speech and language pathology care		transportation	
	spiritual care		wellness	
	infection precautions			
	medication action/side effects			
	medication administration			
	medication coordination/ordering			
	medication prescription			
	medication set-up			
	positioning			
	specimen collection			

Table 2 Most frequent targets with related problem for home Ccare and maternal-child cohorts

Cohort	Target	Problem	Frequency	Percent
Home Care n = 768581				
	signs/symptoms-physical	Pain	74801	9.73
	medication administration	Medication regimen	63623	8.28
	medication action/side effects	Medication regimen	49121	6.39
	spiritual care	Spirituality	33647	4.38
	medication coordination/ordering	Medication regimen	27907	3.63
	medication set-up	Medication regimen	21970	2.86
	signs/symptoms-mental/emotional	Grief	20778	2.70
	safety	Neuro-musculo-skeletal function	14492	1.89
	medical/dental care	Pain	13701	1.78
	mobility/transfers	Neuro-musculo-skeletal function	12433	1.62
	coping skills	Grief	10889	1.42
			343362	44.67
Maternal-child = 270615				
	finances	Income	19345	7.15
	caretaking/parenting skills	Caretaking/parenting	15890	5.87
	feeding procedures	Caretaking/parenting	8390	3.10
	family planning care	Family planning	7633	2.82
	stimulation/nurturance	Caretaking/parenting	5993	2.21
	home	Residence	5951	2.20
	education	Income	5879	2.17
	safety	Caretaking/parenting	5605	2.07
	medical/dental care	Caretaking/parenting	5500	2.03
	coping skills	Caretaking/parenting	5429	2.01
	substance use cessation	Substance use	4986	1.84
			90601	33.48

Table 3 Examples of interventions illustrating the proposed formal semantic structure for Omaha System targets

Practice Attributes			
Type of Care	Medication Regimen	CM	Medication Coordination/Ordering
	Medication Regimen	TP	Medication Prescription
	Medication Regimen	TP	Medication Set-Up
	Skin	TGC	Positioning
	Nutrition	TP	Specimen Collection
	Circulation	TGC	Cardiac Care
	Growth and Development	S	Growth/Development Care
	Skin	S	Dressing Change/Wound Care
	Respiration	TGC	Respiratory Care
	Speech and Language	CM	Speech And Language Pathology Care
	Medication Regimen	CM	Behavior Modification
	Neuro-Musculo-Skeletal Function	TP	Exercises
Type of Practitioner	Neuro-Musculo-Skeletal Function	CM	Physical Therapy Care
	Health Care Supervision	TP	Medical/Dental Care
	Personal Care	TP	Paraprofessional/Aide Care
	Caretaking/Parenting	S	Nursing Care
	Grief	CM	Social Work/Counseling Care
Client Attributes			
Client Skills	Grief	TGC	Coping Skills
	Nutrition	TGC	Dietary Management
	Caretaking/Parenting	TGC	Stimulation/Nurturance
	Grief	S	Coping Skills
	Interpersonal Relations	S	Stress Management
Client Needs	Caretaking/Parenting	TGC	Bonding/Attachment
	Mental Health	S	Anger Management
	Neuro-Musculo-Skeletal Function	TGC	Education
	Mental Health	TGC	Rest/Sleep
	Genito-Urinary Function	CM	Transportation
Client Environment	Medication Regimen	CM	Finances
	Caretaking/Parenting	S	Day Care/Respite
	Caretaking/Parenting	S	Safety
	Skin	CM	Durable Medical Equipment
	Communication with Community Resources	CM	Legal System

TGC = Teaching, guidance, and counseling; TP = Treatments and procedures, CM = Case management, S = Surveillance

Table 4 Concept duplication

Problem-target match		Number of interventions		Percent of interventions
Problem	**Target**	**Total for the problem**	**For the problem-target match**	**By problem for problem-target match**
Caretaking/parenting	caretaking/parenting skills	127,825	5,645	4.4
Skin	skin care	73,762	596	0.8
Spirituality	spiritual care	40,767	33,647	82.5
Growth and development	growth/development care	34,937	4011	11.5
Nutrition	dietary management	28,632	11,409	39.8
Income	finances	28,324	19,427	68.6
Respiration	respiratory care	20,635	1,338	6.5
Circulation	circulatory care	20,022	1,498	7.5
Substance use	substance use cessation	16,268	5,328	32.8
Bowel function	bowel care	13,998	227	1.6
Family planning	family planning care	12,300	8,367	68.0
Residence	home	9,564	5,993	62.7
Urinary function	bladder care	5,830	1,306	22.4
Personal hygiene	personal care	4,730	1,219	25.8
Speech and language	speech and language pathology care	342	64	18.7
Sleep and rest patterns	rest/sleep	51	19	37.3
Total		437,987	100,094	22.9
Percent of all interventions (n = 993,909)		44.1	10.1	

References

1. Markle Connecting for Health Collaborative. Achieving the health IT objectives of ARRA: A framework for "Meaningful Use" and "Certified or Qualified" EHR [Internet]. 2009. [Cited 2010 Dec 30] Available from: http://markle.org/downloadable_assets/20090430_meaningful_use.pdf
2. Martin KS, Monsen KA, Bowles KH. The Omaha System and meaningful use: Applications for practice, education, and research. Comput Inform Nurs 2011; 29: 52–58.
3. Blumenthal D. Launching HITECH. N Engl J Med 2010; 362(5): 382–385.
4. Westra BL, Delaney CW, Konicek D, Keenan G. Nursing standards to support the electronic health record. Nurs Outlook 2008; 56(5): 258–266.
5. Rosenbloom ST, Miller RA, Johnson KB, Elkin PL, Brown SH. A model for evaluating interface terminologies. J Am Med Inform Assoc 2008; 15(1): 65–76.
6. American Nurses Association. ANA recognized terminologies and data element sets. [Cited 2010 Dec 30] Available from: http://www.nursingworld.org/npii/terminologies.htm.
7. McCloskey JC, Bulechek GM. Nursing Interventions Classification (NIC). 4th Ed. St. Louis: Mosby; 2007.
8. International Classification for Nursing Practice (ICNP) 2011. Available from: http://www.icn.ch/pillar sprograms/international-classification-for-nursing-practicer/
9. Saba V. Clinical Care Classification (CCC) System Manual: A Guide to Nursing Documentation. New York:Springer; 2006.
10. Martin, KS. The Omaha System: A key to practice, documentation, and information management. Reprinted 2nd ed. Omaha, NE: Health Connections Press; 2005.
11. Farri O, Monsen KA, Westra BL, Melton, G. Analysis of free text with Omaha System Targets in Community-Based Care to Inform Practice and Terminology Development. Applied Clinical Informatics 2011; 2: 304–316.
12. Rosenbloom ST, Miller RA, Johnson KB, Elkin PL, Brown SH. Interface terminologies: Facilitating direct entry of clinical data into electronic health record systems. J Am Med Inform Assoc 2006; 13(3): 277–288.
13. Monsen KA, Westra BL, Yu F, Ramadoss VK, Kerr MJ. Intervention data management for effectiveness research: Comparing inductive and deductive approaches. Res Nurs Health 2009; 32(6): 647–656.
14. Monsen KA, Banerjee A, Das P. Discovering client and intervention patterns in home visiting data. West J Nurs Res 2010; 83: 1031–1054.
15. Monsen KA, Westra BL, Oancea SC, Yu F, Kerr MJ. Comparing approaches for linking home care interventions and hospitalization outcomes for frail and non-frail elderly clients. Res Nurs Health 2011; 34: 160–168.
16. Martin KS, Scheet NJ. The Omaha System: Applications for community health nursing. Philadelphia: WB Saunders; 1992.
17. Melton GB, Westra BL, Raman N, Monsen KA, Kerr MJ, Hart CH, Solomon DA, Timm JE. Informing standard development and understanding user needs with Omaha System signs and symptoms text entries in community-based care settings. AMIA Annu Symp Proc 2010: 512–516.
18. Powerwrite. Understanding parts of speech and sentences. [Cited 2010 Dec 30] Available from: http://fac web.furman.edu/~moakes/Powerwrite/partspeech.htm