e-Health – For Continuity of Care
C. Lovis et al. (Eds.)

doi:10.3233/978-1-61499-432-9-181

Information Model for Learning Nursing Terminology

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Abstract. Standardized terminologies are introduced in healthcare with the intention of improving information quality, which is important for enhancing the quality of healthcare itself. The International Classification for Nursing Practice (ICNP®) is a unified language system that presents an ontology for nursing terminology; it is meant for documentation of nursing diagnoses, nursing interventions and patient outcomes. This paper presents an information model and an application for teaching nursing students how to use ICNP to assist in the planning of nursing care. The model is an integration of ICNP and our catalog ontology, patient journal ontology, and ontology defining task sets. The application for learning nursing terminology offers descriptions of patient situations and then prompts the student to supply nursing statements for diagnoses, goals and interventions. The nursing statements may be selected from catalogues containing premade solutions based on ICNP, or they may be constructed directly by selecting terms from ICNP.

Keywords. Healthcare terminology, International Classification of Nursing Practice ®, Nursing Education, OWL, UML.

1. Introduction

Correct and professional use of nursing terminology in nursing documentation is critical for nurses to communicate their impact on patient care. The nursing terminology used in this project is described in The International Classification for Nursing Practice (ICNP®), which is expressed in the Web Ontology Language (OWL) [1]. ICNP is meant to improve communication among nurses and between nurses and other health care professionals; enable comparison of nursing data across clinical populations, healthcare settings, geographic areas and time; and stimulate nursing research through links to data available in health information systems [2]. ICNP consists of more than 3000 terminology terms. Some are specific nursing terms, and others are more general terms meant for composing nursing statements. A nursing statement may be composed in advance, i.e., a pre-coordinated statement, or it may be composed on the fly at the edge of care, i.e., a post-coordinated statement. The 2013 version of ICNP contains 783 pre-coordinated diagnosis and outcome statements and 809 pre-coordinated intervention statements [3].

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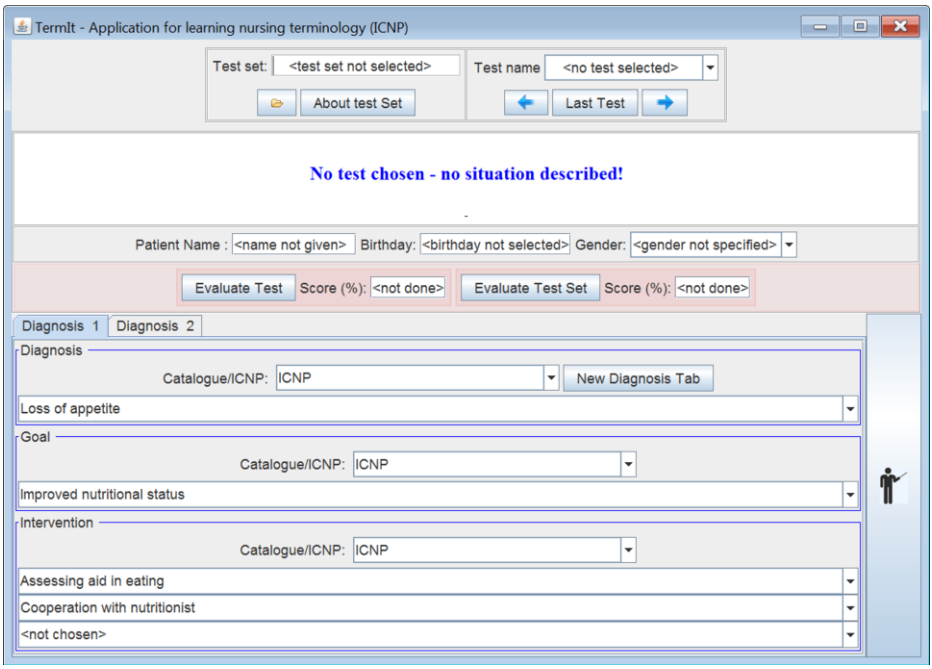

Figure 1. Screenshot of TermIt, an application for learning nursing terminology.

The main purpose of the project is to develop an application for teaching nursing students how to use ICNP to assist in the planning of nursing care. Conceptually, the application is a nursing care planning system tailored as a pedagogical tool for teaching the terminology. In other words, based on the description of a patient situation, the student is to propose diagnosis, goal and intervention statements. The proposed statements will then be evaluated in comparison to teacher-provided statements.

The use of care plans is based on the use of the nursing process [4]. The process model chosen for the application contains three steps: Diagnosis, goal and intervention. ICNP has been used with the following steps: Diagnosis, intervention and outcome. Viewing goal statements as equivalent to outcome statements allows our chosen process model to integrate well with ICNP.

Research and development projects involving ICNP have worldwide participation but are focused mainly on practice settings [3]. There is limited evidence regarding the effectiveness of teaching strategy on nursing care planning, and the absence of quality nursing documentation is an on-going problem [5]. To our knowledge, no application for teaching ICNP to nursing students has been developed. Studies have shown that in addition to providing a framework for navigation, the 7-axis model has been used successfully by applications to guide data entry and support data analysis. However, the trend has been toward the use of pre-coordinated concepts [3]. Subsets of pre-coordinated concepts, perhaps as found in ICNP catalogues, may be used to support data entry and analysis within specific contexts. Note that ICNP catalogues do not equate to ICNP subsets, as they may contain additional information such as organizing categories and even concepts drawn from other terminologies [3]. Our application will allow students to select terms and statements directly from ICNP or

from catalogues with premade statements. Our information model is presented in the following figures. Figure 2(a) gives an overview of the involved ontologies.

2. Methods

OWL is an ontology language with formally defined meaning [1] based on Description Logic [6]. Choosing OWL as our representational language allows us to integrate easily with ICNP and other OWL ontologies. The strong inference support available will allow us to analyze relationships between diagnosis, treatment and outcome by examining patient journals. In regard to the learning application, inference may be used to find which tests are difficult, etc.

The application is being implemented in Java. The programming interface to the ontology is Apache Jena™. The Jena framework is meant for building Semantic Web [7] applications and it offers a collection of tools and Java libraries [8]. Jena also supports SPARQL Protocol and RDF Query Language (SPARQL) [9], which may be used to insert, change and query data. UML was used for defining the application as well as presenting the models. We chose to present the models in UML instead of a visual language meant to express OWL because we are accustomed to the concrete syntax of UML and also because it provides a relatively compact presentation.

3. Results and Discussion

In our approach, a nursing care plan may have several time ordered cycles, which again are composed of cyclic steps. The cyclic steps can be of type Diagnosis, etc. A portion of this is shown in Figure 2(b). The type of test we support is closely tied to our nursing process model. A test contains a description of a situation in the form of either text or HTML (not shown in figure 2(b)); the task of the student is then to specify a diagnosis, goal, and intervention by writing or selecting from either ICNP or catalogues. Possible solutions and their associated scores (e.g., 100% correct) are defined by a teacher, and these are used to grade student-proposed statements. A nursing statement is seen as a phrase that may be composed of text or sub-phrases (see Figure 2(c)); a phrase may be found in ICNP, and that phrase may then reference the corresponding concept in ICNP as well (Phenomenon is superclass to all classes in ICNP). Some text may not be found in ICNP and consequently have no reference to ICNP; in the future, other

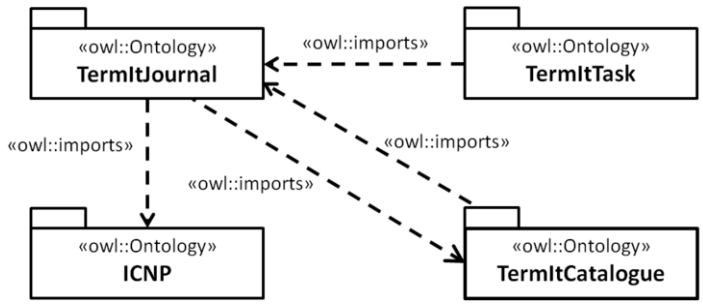

Figure 2. a)

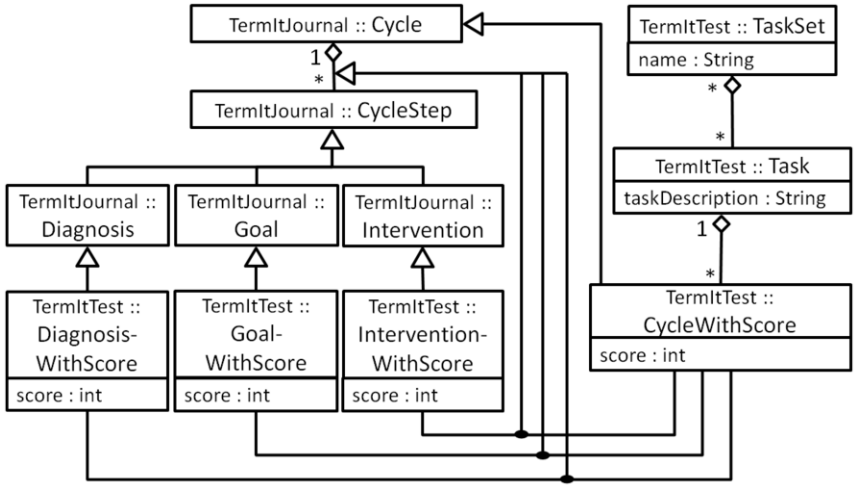

Figure 2. b)

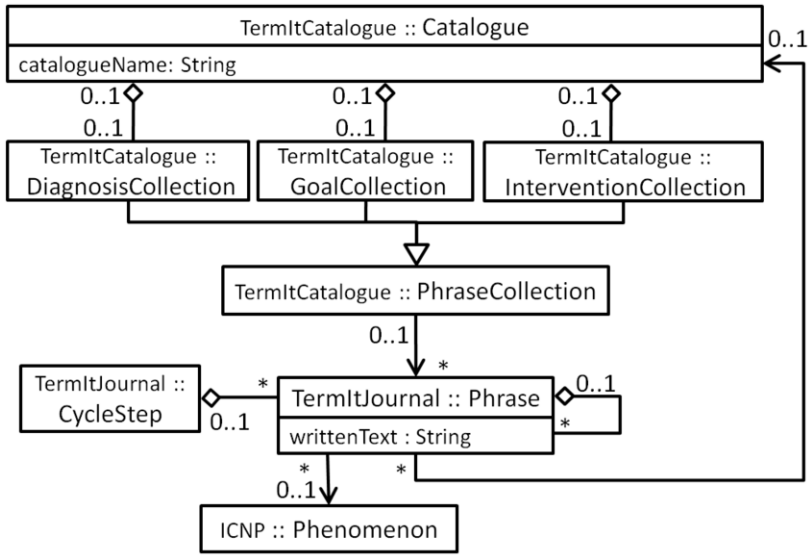

Figure 2. (c)

Figure 2. (a, b, c) Integrating the ontologies (simplified).

terminologies (ontologies) may also be referenced. A catalogue contains pre-coordinated diagnosis statements [10, 11], etc. The terms of such a statement may be found in ICNP and referenced (see Figure 2(c)).

A pedagogical application with ICNP integration may ensure that nursing students learn to observe in a more analytical way and better document those observations. The model presented enables nursing students to use the elements in the nursing process as a structure for nursing documentation. Further research should focus on developing

evidence-based ICNP terminology subsets for nursing education, development and testing applications; however, it is also important to explore the nursing record quality and how it may have been affected by introducing standardized terminology.

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