Representing Nursing Assessment Data with the ICNP

Hyeoneui Kim\textsuperscript{a}, Patricia Dykes\textsuperscript{b}, Denise Goldsmith\textsuperscript{c}, Qing Zeng-Treitler PhD\textsuperscript{a}
\textsuperscript{a}Decision Systems Group, Brigham and Women’s Hospital, Boston, MA.
\textsuperscript{b}Clinical Informatics Research and Development, Partners HealthCare, Wellesley, MA.
\textsuperscript{c}Center for Nursing Excellence, Brigham and Women’s Hospital, Boston, MA

Abstract
Patient assessment provides the basis for identifying patient problems sensitive to nursing care and aligning nursing interventions to promote positive patient outcomes. We mapped the key concepts and attribute relations extracted from a set of initial patient assessment items to the International Classification for Nursing Practice (ICNP). Although we found the coverage of the ICNP not yet complete, we believe that the ICNP does have the potential to represent the nursing assessment data.

Background and Significance
Detailed representational model of assessment data is critical for data quality as well as documentation consistency. Fairly rich terminology sets and representational guidelines are available for nursing diagnoses, interventions, and outcomes data. However, few such resources exist for nursing assessment, although nursing assessment is the foundation of the iterative cycles of nursing process and source of fine-grained reusable data. This study aimed to: 1) identify the key attributes and attribute relations necessary to unambiguously represent a limited set of nursing assessment items and 2) evaluate the International Classification for Nursing ICNP (http://www.icn.ch/icnp.htm) for its adequacy to cover the identified concepts and attribute relations.

Methods
We manually parsed 132 core nursing assessment items into key concepts and attribute relations. These core assessment items have been identified as the minimum items needed to plan nursing care for patients regardless of where a patient is admitted across the healthcare system, by a group of nurses of the Partners HealthCare affiliated institutions.

For example, an item “do you have any problems or symptoms that prevent you from eating? – a possible answer: swallowing difficulty” was parsed as below

\begin{verbatim}
Eating
<hasJudgedState> (compromised)
<hasCause> (swallowing difficulty)
\end{verbatim}

The key concepts (e.g., eating, swallowing difficulty, compromised) and the attribute relations (e.g., hasCause, hasJudgedState) were then mapped to the ICNP. We referred to the ICNP in Protégé-OWL format because the attribute relations are explicitly represented only in this format.

Results
We have extracted 223 unique key concepts and 33 attribute relations from the 132 assessment items. About 35% (77) of the key concepts were found exact matches in the ICNP, and 15.70% (35) were correctly represented by coordinating multiple concepts using the attribute relations. The remaining 111 concepts were not fully represented with the ICNP but most of them fit into the existing ICNP structure. About 58% (19) of the identified attribute relations were covered by the ICNP and we have identified 14 new relations to cover the additional attribute relations. Several concepts and attribute relations significant in nursing assessment but unmapped to the ICNP are presented below as examples.

<table>
<thead>
<tr>
<th>Concepts</th>
<th>Attribute Relations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feeling safe</td>
<td>hasCause</td>
</tr>
<tr>
<td>Drowsy</td>
<td>hasObservedState_color</td>
</tr>
<tr>
<td>Language spoken</td>
<td>hasObservedState_odor</td>
</tr>
<tr>
<td>Radiating pain,</td>
<td>hasObservedState_texture</td>
</tr>
<tr>
<td>Rectal pressure</td>
<td>hasAmount</td>
</tr>
<tr>
<td>Reading, Writing</td>
<td></td>
</tr>
</tbody>
</table>

Discussion and Conclusion
The ICNP lacks many detailed concepts and attribute relations. Its logic based structure and the scope of the domain coverage, however, are comprehensive and flexible enough to incorporate new concepts and relations. Therefore the ICNP has the potential as representational underpinnings for nursing assessment data.

We will further evaluate the newly identified attribute relations and concepts for their appropriateness of the ICNP inclusion. For example, “hasFrequency” and “hasAmount” may be better represented via an information model of nursing assessment rather than the ICNP terminology model. In addition, we will expand the scope of our future study to include the nursing assessment data documented in nursing records as well as those listed in nursing literature.