

# Building a Hospital Incident Reporting Ontology (HIRO) in the Web Ontology Language (OWL) using the JCAHO Patient Safety Event Taxonomy (PSET)

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## Abstract

A Hospital Incident Reporting Ontology (HIRO) is being developed in Protégé-OWL to demonstrate feasibility and clinical value of using an ontology to combine, compare, and analyze data from across many public and private reporting systems collecting adverse events and near misses for patient safety. The HIRO is based on the JCAHO Patient Safety Event Taxonomy (PSET) and de-identified hospital incident reports.

## Introduction

Because incident reporting systems present their data and results in various formats, accurate data comparisons cannot be readily made. The PSET is valuable because it provides a common standardized terminology for different event data collected from dissimilar reporting systems. The HIRO is intended to be used to facilitate data-mining, knowledge sharing, and cooperative problem-solving for adverse events and near misses respecting patient safety in hospitals. The HIRO will be structured specifically to reconcile differences in terminology and classification among disparate incident reports, by applying description logic, equating synonyms, and mapping to existing data interchange standards. The reuse of terminology standards will promote the interoperability of the patient safety data across different systems.

## Method

Protégé version 3.0 (base system and optional plug-ins) was downloaded from <http://protege.stanford.edu/download.html>. OWL, the ontology language standard, has been endorsed by the World Wide Web Consortium (W3C). Protégé's OWL plug-ins provides support for editing ontologies. Racer is a description logic (DL) reasoner that can be accessed via a Protégé-OWL API that enables inferences to be made about classes in OWL-DL, a standard based on description logic. Racer can be applied to an ontology to ensure taxonomic structural integrity and class consistency.

## Results

The PSET was brought into Protégé 3.0 to provide the basis for. **Class\_Name and Preferred\_Name:** A

human-friendly machine-readable OWL-compliant Class\_Name was created from each term and the original term is now an attribute Preferred\_Name. Another attribute Recommended\_PREFERRED\_Name exists in some cases, to be adopted for clear semantic expression. **PSET\_Definition:** The definition from the PSET of a term with a source. **Hierarchies:** The structure and concepts in the PSET constitute the framework for the HIRO. A true IS-A relationship is maintained throughout each hierarchy. One top node Domain exempted, 4 other top nodes were made disjoint, disallowing the same Class\_Name to be multiple-treed. **PSET\_Category:** The category of each PSET term is indicated. **PSET\_ID:** Each PSET Number was converted into a 7-digit serial number to be used as a unique identifier. **Synonym:** Synonym may include lexical variants such as plural form, word order, British spellings, lay terms, scientific terms, etc. **ICD-9\_Code and DSM-IV\_ID:** Mapping from a PSET term to one in ICD-9 or DSM-IV. **Properties:** Three inheritable relationships identified within the PSET (prevent, lead\_to, affect) will be used in modeling the top level classes.

## Conclusions

Additional classes, attributes, and properties to be obtained from de-identified individual incident reports by Natural Language Processing and manual curating will be incorporated into the HIRO for editing/modeling. The HIRO will function as a front-end controlled vocabulary to guide data input concerning adverse events. The computability of the data will generate new knowledge, yielding evidence for future directions in research and intervention. On a larger scale, if incorporated into a broad reporting system, the HIRO could assist health care organizations, researchers, accrediting bodies, and funding agencies by serving as a large scale source of aggregated information regarding variables associated with patient safety, adverse events, etc.

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