The International Classification for Patient Safety

General description

1 Rationale, goals, general description and products

The development of the ICPS will follow the rationale that has guided the work on the conceptual framework by the International drafting group. The appropriate use of modern technologies of proven value, in a perspective of phased development, will support the development as follows:

- the ICPS will be developed as a user-friendly, yet scientifically sound classification compliant with the legacy classifications of the WHO family of international classifications.
- As such, it will obey the fundamental rule of classifications that the sister categories contained therein, at whatever the level of granularity, both inherit the defining characteristics (be it entities or associated relations) from the parent category, and feature additional distinctive categories (entities or associated relations) that distinguish them from their siblings. Furthermore, any set of categories at any one level coming from a same parent must be jointly exhaustive and mutually exclusive (JE-ME principle).
- The ICPS will refer in its composition, structure, and logical underpinning to the broad categories identified by the International drafting group in the agreed conceptual framework as a key to appropriately and purposefully describe a meaningful patient safety universe.
- Mindful of the overall categorial structure emanating from the conceptual framework, it will be developed in as many consistent levels of detailed specificity as may be useful to end users, particularly in the perspective of aggregating data collected from a variety of reporting systems.
- Appropriate use will be made of knowledge engineering techniques in order to firmly ground the emerging classification in the principles of sound information management, exchange on the basis of semantic interoperability, and maintenance while preserving essential stability over time. Related knowledge engineering techniques will also be called upon to ensure localization in different language and culture communities in a manner that will facilitate updates as they become necessary while preventing compromising the logical structure of the classification.
- As a corollary, the ICPS will seek to bridge possible terminology gaps with other Health Information Systems such as those supporting the electronic health records, the case-mix groupers, in a manner that will ensure seamless interoperability in the exchange of information that is both understandable by humans and processable by machines.

2 ICPS Structure

2.1 Outline

The classification of patient safety events will be elaborated with reference to the agreed conceptual framework. The conceptual framework represents the broad categories necessary to fully describe patient safety events and the surrounding circumstances with a view to gaining an accurate view of a patient safety situation at any one point in time, but also gathering detailed information for all relevant parameters that might turn a fortuitous currents of a patient safety event into a learning experience that will inform technical and managerial action for prevention period.

Parameters emanating from the conceptual framework represent either broad categories of information objects or some indication of the relationship between them. Those are general descriptors whose particular instantiations that have been recognised as essential to the full characterisation of any particular event. Categories include "incident types", "contributing factors", "ameliorating actions", etc. Relations include
"has_cause", "has_consequence", "has_contributing_factor", etc. All the descriptors of categories and relations between them constitutes the conceptual framework that presents a particular view and understanding of the patient safety universe by an international group of experts. To convey that vision to prospective end users around the world, and to avoid any misinterpretation that would limit the comparability of data collected with the new instrument, the patient safety universe as seen by the drafting group has been more accurately described in the definitions attached to the category descriptors. Skillfully crafted, the definitions represent the natural language realization of what the experts had in mind when they put the name on the categories and the relations between them.

2.2 Rationale

While such an armamentarium certainly describes as accurately as possible the universe in point, it is insufficient for machine processing. Machine processing capability is a present-day requirement for several reasons:

- the sheer number of entities in any classification soon exceeds the human capacity to encompass its total coverage, a growing range of interactions between the entities and the logical implications of that situation;
- scientific progress implies a frequent revisions of any descriptive instruments including classifications at regular intervals; the absence of IT support would make this task unmanageable;
- the multiple uses for which any particular instrument may be called upon induce domesticity to further describe different views of the same universe description; this requires use of multiple hierarchies and a variety of logical operators that will adequately represent a complex perception of the universe but also prevent uncontrolled adjustments that would so compromise the integrity of the conceptual framework;
- finally similar instrumentation could use fully support the consistent production of natural language representations of the classification in multiple languages, thus preserving the integrity of the logical construct.

The full description of the conceptual framework, including the broad categories and their relations, will be referred to as the domain ontology. The domain ontology will be represented through use of description logic languages. The basic paradigm for the desired functionality will be OWL, more specifically, its newer version OWL2.

3 Categorial structure

Classifying objects means organizing their universe in groups and subgroups according to certain characteristics, in order to make their totality easier to grasp and the relations between them more obvious. As a reductionist representation of that universe, criteria must be adopted that govern the aggregation into groups.

In the traditional view of a classification, a number of characteristics of the objects that are meaningful for the intended use of the classification are selected as relevant. Others, although an integral part of the object description, will be ignored as irrelevant for the intended use of the classification.

The overall arrangement of the classification also relies on some implicit relations between the classes and the objects in them.

In a domain populated by fairly well known objects, it is useful to analyse (possibly multiple) definitions of the objects in order to identify commonalities that could support some grouping for an intended use. It implies that all members of any given group will have at least such selected characteristics in common. They will also have other particular characteristics not shared by others that will help differentiate members of a same class. This situation is typical, for instance, of a classification of butterflies, of automotive parts, or of medical procedures.

Where different classifications of the same objects have been produced independently, the intended uses
may have been described with different perspectives or at various levels of specificity. The resulting selection of characteristics may therefore be different. Harmonizing the independently developed classifications may take some time. A useful compromise may be initially limited to the higher-level structure, to which individual classifications may be mapped. This approach is generically supported by ISO/CEN standards and has been successfully applied to particular domains.1

3.1 Rationale for ICPS application

The ICPS work has been realized from a top-down perspective, namely the elaboration by domain experts of a conceptual framework capturing the place and role of the objects populating it as well as meaningful relations between them for the stated purpose of the project, i.e. "to enable categorization of patient safety information using standardized sets of concepts with agreed definitions, preferred terms, and the relationships between them based on an explicit domain ontology. It is designed to facilitate the description, comparison, measurement, monitoring, analysis and interpretation of information to improve patient care, and for epidemiological and health policy planning purposes."

The benefit of using the categorial structure in various application domains is explicitly described in the standard itself:

"- facilitate the construction of new terminological systems in a regular form which will increase their coherence and expressiveness;
- facilitate maintenance of terminological systems;
- increase consistency and coherence of existing terminological systems;
- allow systematic cross-references between items of different types of terminological systems;
- facilitate convergence among terminological systems;
- make explicit the overlap between different health care domains terminological systems;
- provide elements for negotiation about integration of different terminological systems into information systems between the respective developers;
- enable the systematic evaluation of terminological systems".2

On that basis, it is envisaged to combine the high-level structuring benefits of the categorial structure approach and the more granular ontological analytical processes of instances populating the classes. The proposals on formalism development are informed by that dual-headed approach that should combine the immediate benefits of the former and the more robust expansion derived from the latter.

4 ICPS as a WHOFIC member

In line with the WHO policy to facilitate the elaboration of health information standards of international significance and interest, cooperation between Member States and scientific institutions has resulted in much progress towards bringing closer together legacy classifications such as the International Classification of Diseases (ICD), the International Classification of Functioning, Disability and Health, as well as special adaptations for particular purposes. The latter include the International Classification of External Causes of Injury (ICECI).

The close interaction of the ICPS with the above mentioned legacy instruments will be informed by a detailed comparison of their similarities and differences.

Furthermore, rapid development of ontology-based formalisms has been recognized as indispensible to make various clinical terminologies operational in highly interoperable information systems such as electronic health records (EHR). This has lead to collaborative activities with the owners of front line clinical terminologies in the

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2 CEN prEN12264:2005, Health informatics - Categorial structures for systems of concepts
elaboration of a robust terminology base for the ICD revision.

The vision underpinning the ICPS is of the same nature. Not only is it been advisable to ensure its compatibility with the ICD as its most obviously interacting information system, particularly with respect to ICD Chapter XX on External causes of injury, but also to seek optimum convergence, where appropriate, with clinical terminology systems like SNOMED-CT, among others.

On those premises, the work plan has adopted similar technical solutions as those presiding over the modernization of other classifications in the Family of International Classifications. In addition, experts contributing to both projects should ensure full compatibility.

5 ICPS in multiple languages

Once the domain ontology has been fully specified, a fully consistent natural language generation will be implemented to ensure faithful transmission of the content of the domain ontology into the respective application languages. For this purpose, a terminological layer localization in various language spheres (ontological lexicalization) will be implemented. A first stage will be achieved by coupling the domain ontology meta-model with a Linguistic Information Repository (LIR). LIR is a generic tool that is amenable to semantic description logic processing. Priority languages will include English, French, Spanish (in line with the linguistic evaluation meetings of the conceptual framework last November in Paris and Madrid, respectively), then German (Spanish and German are languages in which extensive experiments have been conducted). Portuguese would also be added as feasible to engage the lusophone countries in South America and Africa. LIR is fully compatible with more sophisticated tools such as LingInfo in a later phase of development if field application so require.

6 ICPS partnership

- National Patient Safety Agency (NPSA), United Kingdom
- Australian Patient Safety Foundation, Australia
- Ontology Engineering Group, Universidad Politécnica de Madrid, Spain
- Département de Santé Publique et Information Médicale, Université of Saint Etienne, France.
- Stanford Medical Informatics, Stanford University, United States of America.
- Technical University Delft, The Netherlands