TOWARDS AN ADVERSE EVENT REPORTING ONTOLOGY

INTERNATIONAL CONFERENCE ON BIOMEDICAL ONTOLOGY
REPRESENTING ADVERSE EVENTS WORKSHOP
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Importance of adverse event reporting (AE reporting)

- Important to decrease morbidity and mortality
- Safety alerts, recalls, prescription revisions, SOPs revisions…
- A shared, standard reporting system for AE would improve patient safety

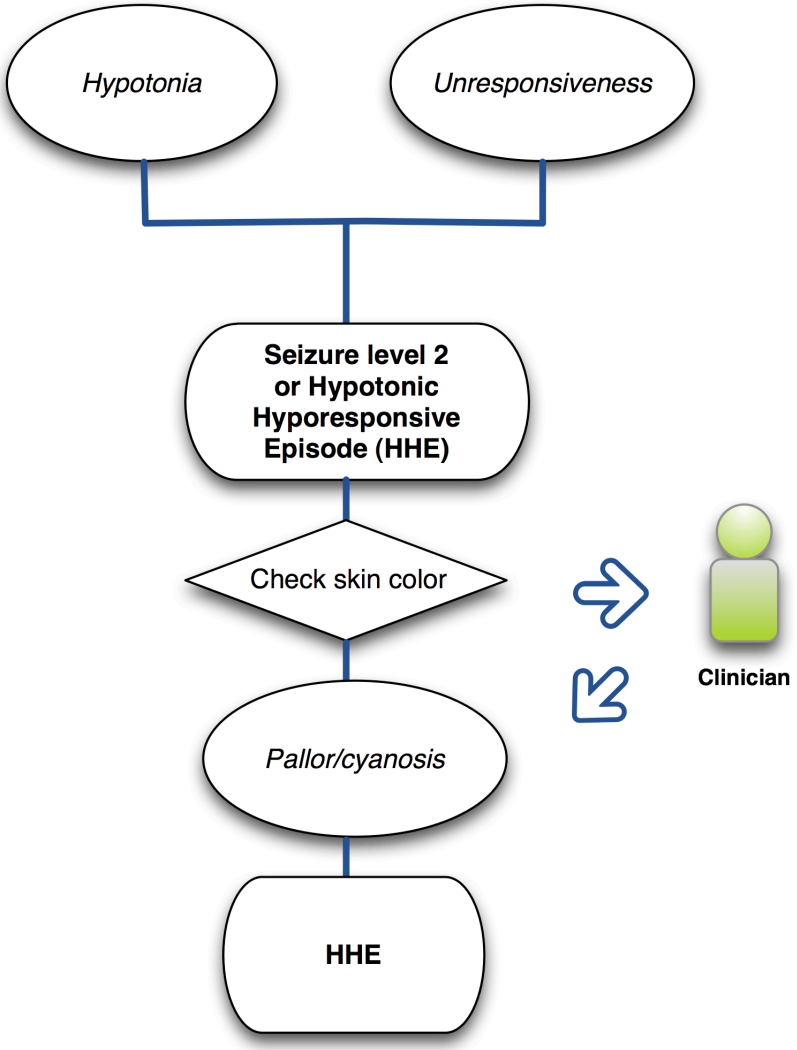
PCIRN mission

- PCIRN: Public Health Agency Canada/Canadian Institutes of Health Research Influenza Research Network
- Canadian national network of key influenza vaccine researchers.
- Develops and tests methodologies/methods related to the evaluation of pandemic influenza vaccines as they pertain to safety, immunogenicity and effectiveness, and program implementation and evaluation.
- http://www.pcirn.ca/

PCIRN AE reporting: current problem

- Forms use Medical Dictionary of Regulatory Activities (MedDRA) at best
  - No definitions
  - Ambiguous terms
- But often only “description” text input field offered to record result of diagnosis
- PCIRN wants a tool to help confirm that the diagnosis follows the guidelines, and the ability to perform more complex queries on reports

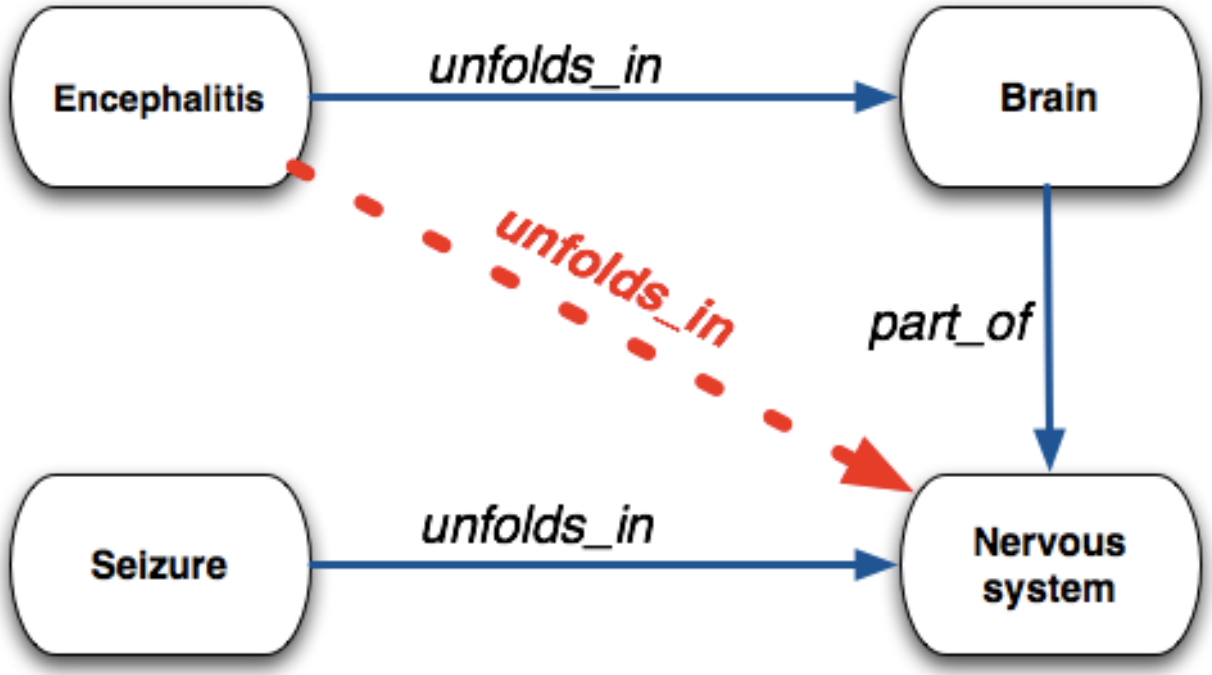
A diagnosis confirmation tool



- Given diagnosis, retrieves appropriate parts of guidelines and prompts for additional information needed to reach diagnosis according to them
- Example: Clinician records *Seizure level 2*. System prompts for associated symptoms. Clinician records *hypotonia* and *unresponsiveness*. System asks about skin color to help clinician make final determination of *Seizure level 2* or *Hypotonic-Hyporesponsive Episode* (HHE)

Enabling more complex queries

- Current system can't ask for AE reports related to nervous system
- By making relations explicit and adding general knowledge we can infer new things
- Computer can infer link such as "Encephalitis unfolds_in Nervous system"



A 3 step approach to improving adverse event reporting

① Use standard definitions for terms used in AE reporting
- Ensure that *AE Following Immunization* (AEFI) is reported in accordance to a PCIRN selected guideline
- Specify evidence that confirms AEFI diagnosis

② Convert the guideline into a computer manipulable form
- Use automatic reasoning to support diagnosis confirmation and enhance query results

③ Make diagnosis confirmation tool part of reporting workflow
- Enable annotation at data entry time by clinicians

① Standard definitions: the Brighton artifacts

- Brighton collaboration provides diagnosis guidelines to help standardize reporting
  - Built by 300 contributors from patient care, public health, scientific, pharmaceutical, regulatory and professional organizations

    Bonhoeffer et al. Vaccine, 2002.
  - Good applicability, sensitivity, and specificity

    Kohl et al. Vaccine, 2007.
  - Performs well against other standards

    Erlewyn-Lajeunesse et al. Drug safety, 2010.
  - Adopted by PHAC and used within PCIRN

    Gagnon et al., Journal of allergy and clinical immunology, 2010.

② Build an OWL ontology to represent the guidelines

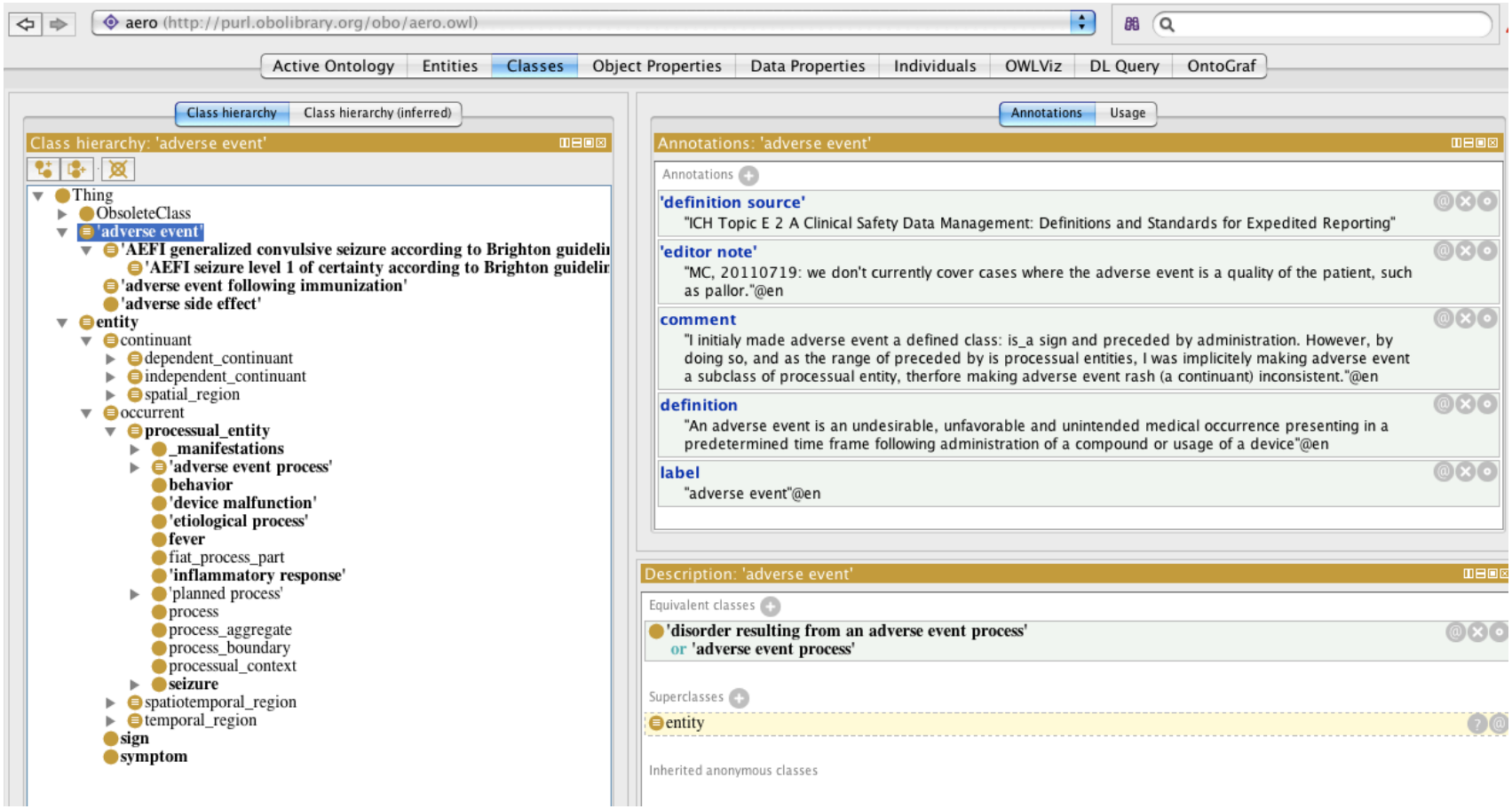
- Domain is modeled using an ontology
- Each entity is defined textually
  - Human readable definition, label
- Each entity is defined logically
  - Relations to other entities

③ Implement in reporting systems: Dacima EDC (commercial system)

- Assist in confirming a reported clinical entity (e.g., seizure)
  - Diagnosis support at data entry time
- Prompt for disambiguating information to narrow diagnosis
- Enable interoperability and advanced querying of AE reports
- Current status: discussion with Dacima about implementing these improvements to their Electronic Data Capture system (Daciforms)

The Adverse Event Reporting Ontology - AERO

AERO is an OWL ontology that represents the Brighton guidelines



AERO – elements and issues

- What is an adverse event?
- Processes and continuants
- Adverse event report
- Use of guidelines: case definitions

Adverse event definition

- An adverse event is an undesirable, unfavorable and unintended medical occurrence presenting in a predetermined time frame following administration of a compound or usage of a device
  - No causality assessment
  - Compliant with U.S. Food and Drug Administration (FDA) and International Conference on Harmonization guideline (ICH E2A)

AERO:adverse event

- Occurrents:
  - motor manifestations, seizures, inflammatory responses…
- Continuants:
  - sensorineural deafness reported after measles, mumps, and rubella immunization, rash…
- Logical definition:
  - 'disorder resulting from an adverse event process' or 'adverse event process'

AERO:adverse event report

- Subclass of IAO: report
- In most cases, an adverse event *is_about* an adverse event
- Medical device reporting: also reports about device malfunction
- Logical definition:
  - 'is about' some ('adverse event' or 'device malfunction')

Call for contributions

- Help develop the prototype
  - Ontological issues to solve
  - Describe severity, expectedness
  - Add more AEFIs
  - Cover drugs and device related AEs
- Review AERO. AERO is available at http://purl.obolibrary.org/obo/aero

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