

Medical Terminology

Ken Baclawski
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Preface

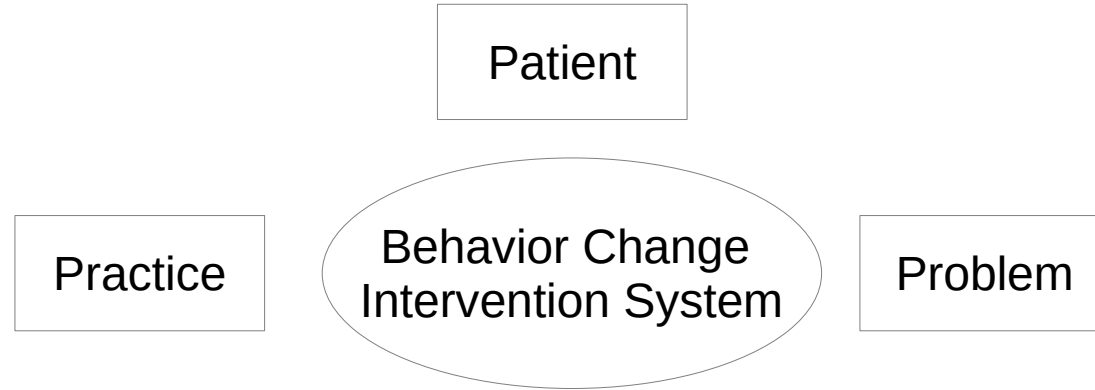
- Managing terminology is a formidable problem
 - Very large, complex vocabularies
 - Even closely related specialties can disagree
 - Clinicians can fail to communicate correctly
 - This can result in inappropriate medical treatment or worse
 - New terminology is continually being introduced
 - Existing terminology changes its meaning
- Much of the work on terminology implicitly assumes that vocabulary is static.
- However, recent efforts have developed tools and techniques that support dynamic terminology and ontologies.



Health Counseling

- NIH project (2007-2009) for ontology based behavior change
- Developed an automated system for counseling subjects to adopt healthy habits
 - Such systems were not new, but they were costly, inflexible and limited
 - Ontologies help to more easily develop a system specific to the patient, practice and problem to be addressed.
- The workflow proceeds as follows:
 - The counseling practice develops their theory as a concept ontology by using ontology modules.
 - The ontology modules have associated task models.
 - The task models are used to produce a customized dialog-based health behavior change intervention system.
- The concept ontology and intervention systems are dynamic.

Health Counseling



- The practice creates its psychological theory and can dynamically modify it
- The intervention system is dynamically tailored to the patient
- The intervention system can be repurposed to address a different problem



Zoonosis

- NIH project (2008-2012) for predicting and tracking zoonotic diseases
- Requires integration of reports from many regions
 - Terminology is a formidable problem
 - Reports can be in different languages.
 - Names for species and geographic regions are ambiguous and changing
 - Names for diseases and descriptions of symptoms are ambiguous, changing and inconsistent
- Epidemics and pandemics add even more complexity



Smart Medical Word Processor

- Different clinicians complain that they do not fully understand each other.
 - They use the same terms and they might even agree on their meanings to some degree, but sentences using the terms can have significantly different meanings.
- An architecture and workflow was proposed for this problem in 2012.
 - The interface would be a word processor with enhanced spelling and grammar checkers.
 - A clinician could introduce new terms and even new syntax as long as they explain it.
 - The word processor would submit the new terms and syntax to the community.
 - If the community agrees, then the submitting clinician gets credit.
 - It would dynamically generate ontologies and ontology mappings as well as terms and syntax.
- Unfortunately, the technology of the time was not adequate.
 - Spelling and grammar checkers used statistical techniques, not natural language parsers.
 - This might still be the case.

Ontology Summit

A person stands on the peak of a mountain, arms raised in triumph. The background features a vast mountain range under a cloudy sky, with a large lake visible in the distance. The overall scene is one of achievement and natural beauty.

- An annual virtual conference bringing together prominent individuals on a particular theme
 - Each summit publishes a communiqué
 - Some summits publish additional articles or a special issue of a journal
- Recent summits:
 - 2019 Explanations
 - 2020 Knowledge Graphs
 - 2021 Ontology Generation and Harmonization
 - 2022 Pandemics and Other Disasters
 - 2023 Helping scientific researchers make better use of ontologies

Ontology Summit 2023



- Companies and communities are actively dealing with the problem of harmonizing dynamic biomedical terminology.
 - **OBO Foundry** builds and maintains ontologies related to the life sciences. Starting with the Gene Ontology, GO and the Foundational Model of Anatomy, and the OBO Foundry now has over 100 ontologies.
 - **Core Ontology for Biology and Biomedicine (COB)** integrates key parts of a large range of OBO projects into a single, small ontology.
 - **ROBOT**: A command line tool to automate ontology workflows

Ontology Summit 2023



- Still more:
 - **Ontology Access Kit (OAK)** is a Python library for ontology access.
 - **Ontology Development Kit (ODK)** provides continuous integration and FAIR release management for modular ontologies.
 - **OBO Dashboards** monitor ontology standardization and community activity.
 - **Ubergraph** is a SPARQL endpoint with many OBO ontologies loaded and pre-reasoned with simple triples materialized.
 - **Wikidata** is the all-purpose knowledge graph of the Wikimedia Foundation.
 - **Schema.org** (next week)



Some Purposes of Ontologies

- FAIR principles for (meta)data
 - Findable
 - Accessible
 - Interoperable (meta)data
 - Reusable (meta)data
- Pandemics and other disasters
 - Prediction
 - Monitoring
 - Mitigation
 - Management
 - Recovery
- Tool Reuse
- Decision making
- Situation Awareness
- Domain understanding
- Policies and regulation
- Explanation
- Root cause analysis
- Fairness (non-discrimination)
- Validation
- Self-awareness
- Inference
 - Logical
 - Probabilistic
- Collaboration