Metaphrase: Achieving Formalized EMR Problem Lists from Informal Input

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The nature of healthcare is changing, and with these changes come new information needs. Many Electronic Medical Record (EMR) systems are appearing which require authoritative names for diseases, therapies, procedures, symptoms and indications. Driving this requirement for authoritative names in the EMR are a variety of institutional needs and reimbursement imperatives. For example, only if every instance of a disease is correctly coded in the EMR will accurate outcomes analysis be possible.

There are a limited number of ways to have clinical concepts coded authoritatively in the EMR:

(1) We can require caregivers to record only authoritative names.

(2) We can allow caregivers to record concepts idiosyncratically, then later perform human chart review to code authoritatively.

(3) We can allow caregivers to record idiosyncratically, then have these names recoded immediately by professional coders.

(4) We can allow caregivers to record idiosyncratically, but have an interactive system that immediately suggests to the caregiver authoritative names for the named concept, and allow the caregiver to select the authoritative name that best fits the concept being expressed.

(5) We can allow caregivers to record idiosyncratically, then have these names coded by an artificial intelligence system that "understands" the clinical domain.

Method (1) is too restrictive for caregivers, (2) is problematic because the caregivers are not involved, and (3) is not cost-effective in most healthcare enterprises. Method (5), while attractive, is still impractical. However, since the development of the Unified Medical Language System® (UMLS®), it has gradually become possible to achieve method (4). It is now possible by careful engineering to suggest to caregivers, at the point of care, authoritative terms that seem to match or at least be closely related to an idiosyncratic term the caregiver has recorded. If the caregiver types in *mad cow disease*, it is possible to return a short list of names for that concept, specifically its names in several different naming systems such as SNOMED or MeSH. Such a system allows the caregiver to a) enter terms that are easy to recall, and then b) recognize a suitable formal term from a focused list of suggestions. This 'enter an approximate term, then recognize the exact term' approach may be an approach that fits very well with human cognitive processing.

Lexical Technology has developed an Application Program Interface (API) module called *Metaphrase*™, which is a UMLS-based middleware component. Metaphrase helps convert the informal language natural to a caregiver into terms from the formal vocabularies in its database, which includes the 1997 UMLS Metathesaurus®, and 10,000 problems from the Mayo Clinic and Harvard Beth Israel Hospital.* The 1997 Metathesaurus contains more than 750,000 term occurrences, including all of 1997 MeSH, 1996 ICD-9-CM, 1996 CPT-4, SNOMED 3.1, DSM-IV, and over 30 other clinical vocabularies.

Metaphrase can perform word completion on a word fragment, term completion on multi-word terms, and it will correct common spelling errors. It can also do simple composition using a shallow information model built on the UMLS Semantic Network. A prototype of Metaphrase was tested at the Mayo Clinic's Usability Lab in December, 1996, and later versions will be deployed as part of the Mayo Clinic and Beth Israel EMRs by the end of 1997.

In the local EMR, providers at the point of care might enter *mad cow disease* on a patient's problem list; Metaphrase will return not only the authoritative term *bovine spongiform encephalopathy*, but also a navigable semantic neighborhood of related terms. The same provider might wish to maneuver in the semantic neighborhood to find the parent concept (e.g. *prion diseases*), examine siblings, or perhaps navigate to find an even better term, *Creutzfeld-Jakob disease*, the human correlate to mad cow disease. These and other Metaphrase behaviors will be viewed during a demonstration.

Some of the potential benefits that Metaphrase offers as an embeddable component within an EMR system are: better alert triggering, selectable indications, more accurate reimbursement, patient aggregation, guideline prompting, best-practice identification, and quality assessment. Because Metaphrase will help to provide a richer and more useable EMR system across an entire enterprise healthcare network, it may become the first widely used reusable point-of-care software component.

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