ICD9 Code Assistant: A Prototype
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Abstract: At The Ohio State University Medical Center (OSUMC) patient reports are available in real time along with other clinical and financial data in the OSUMC Information Warehouse (IW). Using the UMLS Meta Thesaurus we have leveraged the IW to develop a tool that can assist the medical record coders as well as administrators, physicians and researchers to quickly identify clinical concepts and their associated ICD-9 codes.

Introduction: Much of the clinical data in healthcare organizations are embedded in free text reports. These reports comprise the patient’s medical record which is used to assign ICD-9 diagnosis codes. These coded data are used in many ways from generating a patient bill to research and quality assurance activities.

To recover the costs of the services provided during the inpatient stay or outpatient encounter, the documentation in the medical record is reviewed for diagnoses to which ICD-9 diagnosis codes are assigned by medical record coding specialists. This coded information, is sent to the Central Business Office for billing.

The coding process, requires the medical record coding specialist to sift through physician progress notes and related physician documentation, and text reports to assign these codes. This requires careful evaluation of all types of documentation since failure to identify codes (under coding) can result in loss of revenue; conversely, assigning codes that are not relevant (over coding) can result in overpayment which is a compliance issue.

The prototype tool we have developed can be used by medical record coders to quickly translate text information into ICD-9 diagnosis codes, thus expediting the coding process and improving the coding accuracy.

Methodology: The tool allows a user to apply various search criteria to retrieve medical record information for coding purposes through a WEB interface.

The underlying infrastructure:
- UMLs: We have integrated UMLS Meta Thesaurus, MetaMap [1,2] into the IW. In order to provide ICD-9 codes from the free-text we have included the dictionaries for ICD-9-CM (International Classification of Diseases, Ninth Revision, Clinical Modification: ICD-9-CM). This allows us to identify relevant concepts in the text reports as well as the associated ICD9 codes
- Text index: In the process of loading the reports text indexes are created. These indexes are used for keyword searches or UMLS Meta Thesaurus expanded concept searches to retrieve medical records for coding.

Functionality
1) Search Criteria: Patients can be searched in a number of ways:
   - Date of Discharge
   - Medical Record Number
   - Keywords: Users can select medical records by making keyword searches on specific report types such as pathology or radiology reports. Keyword searches can be expanded into conceptual searches using the UMLS Meta Thesaurus.
   - Length of Stay: Patients can be searched by length of stay (e.g., search for patients with lengths of stay > 60 days) to identify patients whose medical records should be prioritized for coding.
2) Code Extraction and Historical Data Display: Once users finalize their search, they may drill down on an individual patient to retrieve and visualize past history.
   - Historical Data Display: Users can review ICD9 codes from previous encounters to assist in the coding process and to ensure the completeness of the chart. Any discrepancies between previously documented diagnosis and the current review of the chart provides user an opportunity to make further inquiries to resolve the inconsistencies.
   - Code Extraction: Users may choose to analyze any of the available report types. With the aid of Metathesaurus all possible codes extracted from the text are listed. In addition, the interface provides simple negation detection allowing user to omit results from sentences containing words like “no evidence of”, or “not likely” etc.

Conclusions: The web based tool provides an intuitive and user friendly interface enabling on demand extraction of ICD-9 codes from free-text reports to expedite the coding as well as the billing process. This should help reduce instances of under- or over-coding. It also provides a quick mechanism to spot check the accuracy and quality of coding.

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References:
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