Best Practices for Problem Lists in an EHR

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Problem lists can be a healthcare organization's best friend or worst nightmare. Electronic record systems can extend the benefits or compound the issues. The same forces that make problem lists valuable for patient care and secondary data uses can also create barriers to clinical efficiency.

This practice brief explores the use and maintenance of problem lists in health records with a special focus on how electronic environments support additional functionality for sharing information and supporting continuity of care.

What Is a Problem List?

Computer-based hospital information systems emerged in the late 1960s. At that time they were primarily used for collecting and routing orders and accessing laboratory test results. These early systems collected clinical information, but their major purpose was to capture charges to comply with reimbursement requirements, not assist physicians with delivering patient care.

Dr. Lawrence Weed introduced the problem-oriented medical record more than 40 years ago.[1] It was a new concept for health record keeping that reflected the physician's logical thinking for delivering patient care. Weed suggested that the primary organization of the medical record should be by medical problem and that all diagnostic and therapeutic plans be linked to a specific problem.

Historically, the information retrieved from a patient-physician relationship centered on what is termed the "problem list." In many settings the problem list has evolved into a virtual table of contents in an EHR presenting a holistic view of the patient. In the problem-oriented medical record model all data associated with the patient can be linked to a list of problems.[2]

A variety of authoritative sources offer problem list definitions (see appendix A [...]. For the sake of this practice brief, a problem list is defined as a compilation of clinically relevant physical and diagnostic concerns, procedures, and psychosocial and cultural issues that may affect the health status and care of patients. This information should identify the date of occurrence or discovery and resolution, if known.

Safe and efficient patient care relies on a clinical workflow that assesses problems, documents interventions, and evaluates the effects of treatment. The problem list is expected to support these activities in an effective and concise fashion. Technology offers the opportunity to achieve this goal while retaining information across the healthcare continuum and reducing redundant processes.

Problem List Challenges

There is no shortage of challenges when implementing and maintaining a problem list in the EHR. However, multiple resources are available to provide solutions for success. (A resource list of additional research and guidance is available in appendix C online.) The following issues and barriers to the effective use of problem lists within EHR systems are consistent throughout literature review and informal anecdotal information.

Time and Effort

The amount of time and resources required to document and maintain a problem list presents a substantial barrier. Studies dating back to 1996 cite concerns with the speed of entry and limited physician acceptance of electronic healthcare

documentation systems.[3] Clinicians frequently complain that a system requires too many clicks to get to the problem list and that using the documentation system takes too much effort and cuts into patient time.

The amount of human resources required to create and maintain the patient problem list is often significant. Healthcare providers and organizations should plan ahead to include the number of hours required to support this feature in clinical and administrative workflows in EHR systems.

Search Functionality for Providers

Physicians who are accustomed to writing down their diagnosis on paper problem lists in some cases are now required to electronically search through thousands of options to retrieve the specific diagnosis needed to accurately describe the patient's disease process. This frustrating process may lead to incorrect or nonspecific data in a patient's medical record due to inefficient search capability.

For example, a physician may see a patient for an acute sore throat and type "sore throat" into the search field. The system retrieves 54 options, including everything from acute gangrenous pharyngitis to streptococcal sore throat. The physician may try to limit the search to include only phrases that link to ICD-9-CM codes but still retrieves more than 33 options. EHR search functionality varies widely, and the retrieval and storage of problems remains an issue.

In another example, a physician sees a child with otitis media and types "otitis media" into the search field. The system retrieves 106 options, including acute allergic mucoid otitis media and tubotymphanic otitis media of the right ear. Once again, when the physician limits the search to diagnoses linked to an equivalent ICD-9-CM code, the system retrieves 99 options.

These inefficiencies can be remedied by placing a common list of acute illnesses into a favorites list. These lists can be populated by each physician personally or at an administrative level. However, users must still consider issues surrounding misspellings, acronyms, and abbreviations. Healthcare organizations must balance the ability for physicians to choose the diagnosis with the most specificity while still completing documentation in a timely manner.

Multiple Uses and Needs

The problem list serves a variety of uses for clinicians and nonclinicians in diverse healthcare settings. It can provide a succinct view of a patient's health status and therefore must be used and maintained to meet different needs. A primary care physician is concerned with chronic and acute conditions. A specialty provider may focus only on a subset of problems relevant to that area of medicine. An emergency provider may address only the critical acute presenting problems. Other clinicians may use the problem list for tracking conditions that should be addressed for specific care delivery goals.

Coding professionals use the problem list to confirm or clarify documentation found in other parts of the health record. To address billing needs, the problem list may be used as a source of diagnostic information. Problem list entries may be linked or integrated with other parts of the EHR to minimize duplication and improve documentation. Key information about a patient (e.g., drug-seeking behavior or other pertinent facts affecting care or treatment) may be added to the problem list as a means of communication to all providers, since the problem list is intended for review at every patient encounter.

Although problem lists have typically been used as a source of information for clinical care, in an electronic environment this section of the record is considered a source for secondary data use including quality measurement initiatives and research. Disparate needs present challenges when creating and maintaining the problem list.

Specialty and emergency providers may address and update only problems relevant to a single episode of care, placing accountability and maintenance of the problem list on the primary care provider. Clinicians may not always specify problems at the diagnostic level necessary for accurate billing, yet problems may be used as the basis for diagnosis codes on claims to communicate reason for care and justification of medical necessity.

Including psychosocial, cultural, and other key information about the patient may lengthen the problem list and compromise its utility as a quick reference about the patient's overall health condition.

Administrative Maintenance

Administrative management issues surrounding an EHR problem list must be resolved during the mass customization of a data entry platform. The primary challenge is to provide tools that balance patient care with the taxonomy of data standardization. The flexibility required by a variety of clinicians to document complex, patient-oriented care is at odds with the structure required by a standardized set of terminology describing discrete conditions, events, and measurable outcomes.

Multiple coding schemes can satisfy some administrative issues so that secondary data use cases are satisfied. Encoded results can be cross-referenced with frequently used entries placed at the front of the look-up table, resulting in faster identification of acceptable entries. The choices presented by the variety of clinical settings and their array of problems and diagnoses require that administrators work with application developers and clinical users to develop the cross-references needed to increase the relevance of returned entries to populate the list.

Incomplete problem entry selection with unspecified or vague results when linked to codes for reporting presents additional issues without an application-based solution. Personnel resources are often committed to conduct quality reviews of patient information, providing an opportunity to educate users in all departments, increase overall data quality, and review workflow to leverage the value of the EHR.

As the number of problem list entries increases, so do the data integrity risks, which can jeopardize the potential patient safety benefits of an EHR. Strict review of workflow and a shift in responsibilities from clinicians to order-receiving departments can ensure the problem list is updated through direct edits by personnel from the laboratory or pharmacy or automated import from these systems.

The most costly administrative issue is the lack of software application interoperability in list management. Custom application interfaces are required for data exchange between disparate systems. Legacy databases further increase the complexity and cost of EHR implementation. Competing developers may limit the interactivity of systems, increasing the cost of adopting new systems.

Cross-mapping entries speeds identification of an entry and identifies synonyms for intended entries, but the work involved may delay adoption of new systems. Additional work is often required when a new system is implemented due to the lack of standardized data dictionaries and cross-mapping guidelines. Local review of technical requirements prior to implementation limits delays and minimizes expense, though it increases the costs associated with technical reviews.

An independent technical review by qualified IT staff must be part of the assessment where complex EHR systems are used. Quality of care and patient safety are affected by software interoperability conflicts. Dual purpose software applications satisfying patient care requirements in addition to providing a source for billing codes should not limit the ability of the clinician to document clinical care appropriately.

Clinical Management Maintenance

A significant barrier facing the clinical end user is problem list clutter. Without careful management, the shared problem list accumulates multiple diagnoses and symptoms that may or may not be accurate to the patient's true condition. Eventually, the list may become useless due to length and inaccuracy, and often the list is either appended to or displayed with each patient encounter. If the list is filled with inaccuracies, the clinical documentation is viewed as suspect and becomes a potential liability.

There are multiple clutter sources. First, many of the items on the problem list are symptoms and health factors that are not condition-specific. These symptom diagnoses may equate to a specific ICD-9-CM code but may not be important problems for the long-term management of the patient. An example would be dysuria. This diagnosis is important for the purpose of ordering diagnostic evaluation, but it is an improper entry to the patient's active (long-term) problem list after the condition has been resolved with treatment.

Other entries contributing to the clutter barrier are acute care diagnoses. These are important for the purpose of diagnostic evaluation and clinical management of a patient's condition at that particular encounter; however, they don't belong on the active (long-term) problem list.
Continuing the above example, acute cystitis would be a patient problem identified following the evaluation of dysuria. Linking this problem or diagnosis to a clinical encounter is important; however, acute cystitis is by definition a self-limited problem,

unlikely to require multiple encounters for resolution. If promoted to the active problem list, the problem becomes clutter when the patient presents months later with a different chief complaint.

ICD-9-CM V codes are used in problem list search engines but rarely belong on an active problem list. The supplementary classification from ICD-9-CM is for classification of factors influencing health status and contact with health services. Though a patient may present to the office for screening for malignant disease of the cervix, adding this diagnosis to the active problem list is of little clinical utility, despite being critical to the encounter for the purpose of ordering and billing.

On the other hand, problems affecting health status expressed as problems linked to V codes add important clinical facts to the record. Examples include the V44 category for artificial opening status and V42 category for organ transplant status or problems linked to codes similar to V60.4, No other household member able to render care.

As providers in different specialties add diagnoses to a patient's list, multiple diagnostic statements describing a single condition will be entered into the same problem list. An example might include "diabetes mellitus" versus "type II diabetes mellitus." As more specific diagnoses are added, the less specific entries remain in the list, adding length but not clinical or administrative detail.

The accumulation of entries that fail to define the patient's current condition concisely frequently occurs in systems where the problem list is expressed using ICD-9-CM descriptions (a classification approach), but it is not limited to this code set. Use of a clinical terminology standard or controlled vocabulary for problem list expression is a contributing factor to the success of a well-designed problem list.[4]

Health Language and Terminology Standards

An effective problem list should provide a clear, descriptive summary of a patient's health history. To accomplish this, the problem list must use a terminology that provides sufficient detail. Ideally, it allows the transfer of this information across healthcare systems and within the various portions of the EHR. Codification of problem lists enables interoperability and data mining for other purposes, such as quality of care measurement and administrative use, including claims submission for reimbursement.

A number of terminologies and classification systems have features that facilitate their use in problem lists. (Appendix B provides a list of these candidate terminologies, along with information pertaining to ownership, content, and means of distribution.) Some of these candidates, such as ICD-9-CM, are more familiar to clinicians and therefore are often viewed as the first choice. However, a classification system is not the best choice for a number of reasons.

ICD-9-CM codes often lack the granularity necessary to fully describe a health condition. For a complex condition such as muscular dystrophy, ICD-9 offers very limited codes. Specific types of muscular dystrophy, including Erb's, Gower's, and Duchenne's, all fall under ICD-9-CM code 359.1, Hereditary progressive muscular dystrophy.

In contrast, SNOMED CT offers unique codes for each of these conditions. A clinician might be puzzled to see the ICD-9-CM description "Foreign body in the larynx" on a problem list when the condition they are looking for is "Aspiration." Other terminologies, such as SNOMED CT, offer more detailed, descriptive codes for these conditions. UMLS, which incorporates both ICD-9-CM and SNOMED, may seem like the perfect compromise. Unfortunately, it is too large and unwieldy to function effectively for problem list use.

Of the candidate terminologies reviewed, SNOMED CT has the best mix of features and benefits for problem list use.[5] SNOMED CT is the recommended clinical terminology standard for documenting clinical care for the problem list by Consolidated Healthcare Informatics (CHI) initiative and the National Committee on Vital and Health Statistics (NCVHS), and it is now endorsed by the Healthcare Information Technology Standards Panel.[6-8] SNOMED CT was developed for use in the healthcare system and selected based on its overall comprehensive clinical domain coverage, reference information, and demonstrated good update and maintenance practices.

In addition, CHI and NCVHS also recommend that healthcare organizations implement accurate cross mappings between clinical vocabularies such as SNOMED CT and the HIPAA code sets, including ICD-9-CM, to satisfy administrative purposes. This includes external reporting or data aggregation for measuring quality of care, monitoring resource utilization, or processing of claims for reimbursement.[9]

SNOMED CT is readily available, frequently updated, and currently being used successfully in many organizations. It provides a comprehensive, detailed listing of more than 300,000 concepts and 900,000 descriptions (compared to only about 13,000 codes in ICD-9-CM). Although the comprehensive nature of SNOMED CT makes it attractive for problem list use, it may be necessary to limit searches to the clinical findings hierarchy when adding a new item to a problem list. This would prevent clinicians from having to search through an overwhelming list of search results. Subsets of SNOMED concepts are useful for problem list development.[10]

EHR Functionality and Data Standards for Problem Lists

Problem list functionality in EHR systems must be designed to improve care, data quality, and timeliness, and it must support interoperable exchange of problem list content. Health Level Seven's EHR System Functional Model recognizes the need to create and maintain problem lists in function DC.1.4.3. Conformance criteria for this function identify EHR system functionality needed to manage electronic problem lists over time, supporting the documentation of current and historical problems and tracking the changing character of these problems and their priority.

In addition, the Certification Commission for Healthcare Information Technology defines EHR system requirements in both its ambulatory and inpatient functionality criteria that address the need to create and maintain patient-specific problem lists. Ambulatory care software products certified in 2006 and 2007 have been required to meet nine criteria addressing the management of problems lists. Current inpatient functionality requirements related to problem lists will not be part of product certification testing until 2009 or later.

The Continuity of Care Record standard developed by ASTM includes a data segment for problem lists. The Continuity of Care Document standard from Health Level Seven applies the organization's clinical document architecture messaging standard required for portability and interoperability to the ASTM data content requirements. These standards facilitate transfer of essential data from one EHR system to another wherever care is delivered.

Best Practices for Managing Problem Lists

Problem lists require standard approaches to managing data quality. The best practice is to avoid entering bad data, then to audit and remove any bad data found. Clinicians must be committed to entering only appropriate, supported diagnoses and patient problems and able to accept the careful removal of unnecessary or irrelevant data and resolved problems. Best practice considerations for problem lists are organized in table form in appendix D, also available online.

Organizations realize the benefits of improved quality care and patient safety when the EHR can cross-reference problems and treatment factors such as allergies and medication use in an active list and support clinical decisions. Potentially harmful clinical decisions and treatment plans can be avoided, or an interaction with a resolved problem may be signaled and identified for correction if the list is inaccurate or out of date.

Workflow solutions can address accuracy, especially when the patient or caregiver is involved in the process. The waiting patient can be part of his or her care by reviewing the problem list, which enables support staff to remove resolved problems from the list pending physician confirmation during the encounter.

Care should be taken when removing active problems identified by another provider when problem lists are shared between organizations or physicians. The patient may be able to provide enough information to support removing an entry. If unable to collaborate with other providers to verify accuracy, it is advisable to leave a problem on the list. Diagnostic and problem statements are critical for the appropriate documentation of a specific encounter, even if not important for long-term care.

EHRs should provide a means to enter diagnostic statement entries linked to specific encounters without promotion to the active problem list. EHR design considerations include the capability to separate acute problems from chronic ones or the functionality to set a date for automatic resolution of the two. An "inactive" problem location, separate from the active list, can retain these interim issues. For example, it is important to document a transient diagnosis (problem) of hypokalemia and subsequent treatment with potassium, but it may not be necessary to add it to a long-term care list.

A Shared Problem List

The EHR is truly a shared and interdisciplinary record-more so than any previous incarnation of patient health record keeping. This presents new challenges for management of shared problem lists, and benefiting from new opportunities for quality enhancement requires carefully considered organizational guidelines.

A concise list is necessary to enhance readability and usability. Problem list accuracy is of paramount importance in order to take full advantage of safety measures, document encounters precisely, and maximize informatics opportunity. All users in the organization must contribute to list maintenance to realize improvements in healthcare delivery promised by EHRs. The organization is responsible for providing guidelines for problem list creation and maintenance to achieve this goal.

The use of an electronic problem list is a change predicated on patient safety and improved patient care. It may help control costs, and it has the potential to increase efficiency, depending on how it is used. The benefits realized from the use of this tool rely on the dedication of professionals to change for the benefit of the patients they serve.

Notes

1. Weed, Lawrence L. "Medical Records that Guide and Teach." *New England Journal of Medicine* 278, no. 11 (1968): 593–600.

2. Salmon, P., et al. "Taking the Problem Oriented Medical Record Forward." *AMIA Annual Fall Symposium* (1996): 463–67.

3. Institute of Medicine. *The Computer-Based Patient Record: An Essential Technology for Health Care.* Washington, DC: National Academy Press, 1997.

4. Salmon, P., et al. "Taking the Problem Oriented Medical Record Forward."

5. Campbell, J.R. "Strategies for Problem List Implementation in a Complex Clinical Enterprise." *Proceedings/AMIA Annual Symposium* (1998): 285–89.

6. Elkin, P.L., et al. "Evaluation of the Content Coverage of SNOMED CT: Ability of SNOMED Clinical Terms to Represent Clinical Problem Lists." *Mayo Clinic Proceedings* 81 no. 6 (2006): 741–48.

7. Department of Health and Human Services, Office of the National Coordinator for Health Information Technology. "Federal Initiatives." Available online at www.hhs.gov/healthit/chiinitiative.html.

8. National Committee on Vital and Health Statistics. Letter to Secretary Thompson. November 3, 2003. Available online at www.ncvhs.hhs.gov/031105lt3.pdf.

9. Healthcare Information Technology Standards Panel. Available online at www.ansi.org/hitsp.

10. Tang, P.C., et al. "Comparison of Methodologies for Calculating Quality Measures Based on Administrative Data versus Clinical Data from an Electronic Health Record System: Implications for Performance Measures." *Journal of the American Medical Informatics Association* 14, no. 1 (2007): 10–15.

Appendixes

Appendix A: Definitions of Problem Lists from Authoritative Sources

Dr. Weed's Problem-Oriented Medical Record

Dr. Weed is considered a pioneer for innovation in HIM for advancing a problem-oriented medical record approach. In his approach, each medical record should have a complete list of all the patient's problems, including both clearly established diagnoses and all other unexplained findings that are not yet clear manifestations of a specific diagnosis, such as abnormal physical findings or symptoms. When the data warrant, these findings can be crystallized into a specific diagnosis. The problem list is not static in its composition, but is a dynamic table of contents of the patient's chart, which can be updated at any time.

Inherent in the problem-oriented approach to data organization is the necessity for completeness in the formulation of the problem list and careful analysis and follow-through on each problem as revealed in the titled progress notes, requiring that the proper data be collected and that the conclusions drawn from this data are logical and relevant.

Weed, Lawrence L. "Medical Records That Guide and Teach." *New England Journal of Medicine* 278, no 11 (1968): 593–600.

ASTM Internationals's Standard Practice for Content and Structure of the Electronic Health Record (EHR) (E1384-02a)

7. The Overall Structure of the Electronic Health Record

7.9 Segment 5, Problem List:
7.9.1 This includes specified clinical problems, a diagnosis summary and stressor exposure, an ongoing list of clinically significant health status events and factors, resolved and unresolved, in a patient's life. This list should contain all past and existing diagnoses, pathophysiological states, potentially significant abnormal physical signs and laboratory findings, disabilities, and unusual conditions. Other factors such as social problems, psychiatric problems, risk factors, allergies, reactions to drugs or foods, behavioral problems or other health alerts may be included. The problem list is to be amended as more precise definitions of the problems become available. Controlled vocabulary for problem lists may be contained in a problem list directory master table.

7.9.2 This segment contains a master list of all of a patient's problems or diagnoses. It may be referenced, as noted in 7.18.2 in presenting the diagnostic summary beginning each encounter/episode. All problems or diagnoses initially recorded in a specific encounter/episode will also be entered in this master list.

7.9.3 Whenever possible, identification of risk factors (health alerts) that should be known prior to implementing any health services should be included in this section. They can be considered to be instances of a special type of patient problem and include allergies, contagious conditions, and adverse reaction to specified treatments.

The full standard is available for purchase including the E2369-05 standard with Continuity of Care attributes and data object descriptions at http://www.astm.org.

The Joint Commission's Standard IM.6.40
For patients receiving continuing ambulatory care services, the medical record contains a summary list(s) of significant diagnoses, procedures, drug allergies, and medications.

Elements of Performance for IM.6.40

1. The summary list(s) is initiated for the patient by the third visit and maintained thereafter.
2. The summary list(s) contains the following information:
    - Known significant medical diagnoses and conditions
    - Known significant operative and invasive procedures
    - Known adverse and allergic drug reactions
    - Known long-term medications, including current medications, over-the-counter drugs, and herbal preparations
3. The summary list(s) is quickly and easily available for practitioners to access needed information.

Available online at http://www.jointcommission.org/.

Federal Health Architecture, Consolidated Health Informatics Problem List
Diagnosis/problem list is broadly defined as a series of brief statements that catalog a patient's medical, nursing, dental, social, preventative, and psychiatric events and issues that are relevant to that patient's health care (e.g. signs, symptoms, and defined conditions).

Available online at http://www.hhs.gov/healthit/chiinitiative.html.

Health Level Seven Electronic Health Record System Functional Model, Release 1, Chapter 3: Direct Care Functions, February 2007

Function DC.1.4.3 (Manage Problem List)
Description: A problem list may include, but is not limited to chronic conditions, diagnoses, or symptoms, functional limitations, visit or stay-specific conditions, diagnoses, or symptoms.

Problem lists are managed over time, whether over the course of a visit or stay or the life of a patient, allowing documentation of historical information and tracking the changing character of problem(s) and their priority. The source (e.g. the provider, the system ID, or the patient) of the updates should be documented. In addition all pertinent dates are stored. All pertinent dates are stored, including date noted or diagnosed, dates of any changes in problem specification or prioritization, and date of resolution. This might include time stamps, where useful and appropriate.

The entire problem history for any problem in the list is viewable.

Health Level Seven's Personal Health Record System Functional Model, Release 1 for public comment, Chapter 3: Personal Health Functions, August 2007

Function PH.2.5.1 (Manage Problem Lists)
Problems are a core feature of the medical record that provides structure and direct management. A problem may be a definitive diagnosis but may also be a symptom complex, a working hypothesis, or anything else that bothers the account holder. What is defined and included as a problem is arbitrary, although there may be institutional guidelines. The account holder, along with their medical advisor such as their PCP, may wish to establish their own guidelines regarding who can add or change problems on the primary list.

Individual providers may not agree with some of the diagnoses listed as problems and would want to maintain their own list version. The account holder may add problem definitions authored themselves or from non-traditional providers that have no correlate in allopathic medicine. Problems can be further characterized as acute, chronic, resolved, historic, and recurrent.

Example: Problem list items may include: chronic conditions, diagnoses, allergies, or symptoms, both past and present, as well as functional status and all pertinent dates, including date of onset, diagnosis, changes and resolution.

Available online at http://www.hl7.org/ehr/.

Appendix B: Candidate Terminologies for Encoding Problem Lists

Codification of problem lists enables interoperability and data mining for other purposes, such as quality of care measurement and administrative use, including claims submission for reimbursement.

SNOMED CT
Description: SNOMED-CT is a comprehensive, multilingual, controlled clinical reference terminology, with comprehensive coverage of diseases, clinical findings, etiologies, procedures, living organisms, and outcomes used for recording clinical data. It provides a common language that enables a consistent way of capturing, sharing, and aggregating health data across specialties and sites of care.
Content: A relational, concept-based system with more than 300,000 unique concepts and more than 900,000 descriptions. SNOMED CT may include multiple descriptions for each concept. Concepts are organized by defined relationships.
Uses: Focused on clinical data retrieval. Designed to index, store, and retrieve information about a patient in an electronic health record. Helps ensure comparability of data records by multiple practitioners. Provides a common language that enables a consistent way of capturing, sharing, and aggregating health data across specialties and sites of care.
Classification versus Terminology: Comprehensive clinical terminology
Ownership: Acquired in April 2007 by the International Health Terminology Standards Organization (IHTSDO). IHTSDO is responsible for ongoing maintenance, development, quality assurance, and distribution of SNOMED CT. The College of American Pathologists (CAP) will continue to support SDO operations under contract and to provide SNOMED-related products and services as a licensee of the terminology.

Updated: Twice a year in January and July (for English versions)
Proprietary versus Nonproprietary: SNOMED CT is a copyrighted work of the College of American Pathologists (CAP). CAP and the National Library of Medicine (NLM) entered into an agreement to provide SNOMED CT at no charge to those who execute a license agreement.
Means of Distribution: In addition to access to SNOMED CT within the UMLS Metathesaurus, UMLS licensees also have free access to SNOMED CT in its native file formats, the documentation of these files, and a growing set of subsets and mapping files. MetamorphoSys, free Java software, is distributed with the UMLS to assist users in producing subsets of the Metathesaurus. Effective May 15, 2007, UMLS licensees may obtain the English and Spanish editions of SNOMED CT in their native file formats from the UMLS Knowledge Sources Server.
Comments: SNOMED-CT is a comprehensive, multilingual, controlled clinical reference terminology, with comprehensive coverage of diseases, clinical findings, etiologies, procedures, living organisms, and outcomes used for recording clinical data. It provides a common language that enables a consistent way of capturing, sharing, and aggregating health data across specialties and sites of care.
Sources of Information: SNOMED Clinical Terms, Coordination of SNOMED-CT and ICD-10: Getting the Most out of Electronic Health Record Systems

LOINC
Description: The Logical Observation Identifiers Names and Codes (LOINC) database facilitates the exchange and pooling of results such as blood hemoglobin, serum potassium, or vital signs for clinical care, outcomes management, and research.
Content: LOINC is a comprised of more than 45,000 terms made up of laboratory, microbiology, toxicology, EKG, vital signs, hemodynamics, obstetric ultrasound, cardiac echocardiography, radiology, selected survey instruments and other clinical observations.
Uses: LOINC has been identified by CHI to be the standard terminology for the identification of laboratory results, as well as for the representation of patient assessment instruments, questions, and answers. It has also been proposed as the HIPAA standard for the communication of claims attachments.
Classification versus Terminology: Terminology
Ownership: Regenstrief Institute, Inc.
Updated: Two or three times a year. No set schedule, although the organization strives to finalize versions in June and December each year.
Proprietary versus Nonproprietary: The LOINC database is free of charge.
Means of Distribution: The LOINC database can be downloaded from Regenstrief's Web site. LOINC is available as a Microsoft Access (.mdb) database file and a tab-delimited text file (.txt).
Sources of Information: www.regenstrief.org/medinformatics/loinc/

ICD-9-CM
Description: ICD-9-CM consists of three sections: a tabular list containing a numerical list of disease code numbers, an alphabetic index to the diseases, and a list for surgical, diagnostic, and therapeutic procedures.
Content: ICD-9-CM is comprised of more than13,000 numeric or alphanumeric codes and descriptions for diagnoses, and more than 4,000 numeric codes and descriptions for procedures. The hard copy edition or .pdf format of ICD-9-CM also contains more than100,000 diseases, signs or symptoms as part of the index.
Uses: The International Classification of Diseases (ICD) is the classification used to code and classify mortality data from death certificates. The International Classification of Diseases, Clinical Modification (ICD-9-CM) is used to code and classify morbidity data from the inpatient and outpatient records, physician offices, and most National Center for Health Statistics (NCHS) surveys.
Classification versus Terminology: Classification
Ownership: The World Health Center for International Classification of Diseases, ninth edition, National Center for Health Statistics for Clinical Modifications specific to the United States.
Updated: Once a year with fiscal year starting October 1. Errata and changes are submitted quarterly if needed.
Proprietary versus Nonproprietary: Nonproprietary, although copyrighted by the World Health Organization. **Means of Distribution:** CD ROM database formats can be obtained directly from NCHS. There are also numerous vendors and distributors who distribute ICD-9-CM via hard copy or database format. Increasingly, there are Internet sites that provide subscriptions to the ICD-9-CM content with supporting resources.

Sources of Information: www.cdc.gov/nchs/icd9.htm, Coordination of SNOMED-CT and ICD-10: Getting the Most out of Electronic Health Record Systems

ICD-10-CM

Description: ICD-10-CM represents a significant improvement over ICD-9-CM and ICD-10. Specific improvements include: the addition of information relevant to ambulatory and managed care encounters; expanded injury codes; the creation of combination diagnosis/symptom codes to reduce the number of codes needed to fully describe a condition; the addition of sixth and seventh characters; incorporation of common fourth and fifth digit subclassifications; laterality; and greater specificity in code assignment. The new structure will allow further expansion than was possible with ICD-9-CM.

Content: The proposed ICD-10-CM diagnoses volume contains more than 120,000 alphanumeric codes and descriptions. ICD-10-PCS has more than 90,000 alphanumeric codes and descriptions for procedures.

Uses: ICD-10 (unmodified) is currently used to classify death certificates within the United States. It is anticipated that ICD-10-CM will perform the same and probably enhanced functions as ICD-9-CM.

Classification versus Terminology: Classification

Ownership: The World Health Center for International Classification of Diseases, tenth edition edition, National Center for Health Statistics for Clinical Modifications specific to the United States.

Updated: Unknown at this time. The expectation is that at minimum an annual update will occur as it has with ICD-9-CM.

Proprietary versus Nonproprietary: Copyright held by the World Health Organization for ICD-10. For use in the US nonproprietary is expected (same as ICD-9-CM).

Means of Distribution: CD ROM database formats can be obtained directly from NCHS or the code sets may be downloaded from the NCHS Web site.

Comments: It is anticipated that ICD-10-CM will be adopted to replace ICD-9-CM at some time in the near future. Plans for adoption require congressional ratification.

Sources of Information: www.cdc.gov/nchs/icd9.htm, Coordination of SNOMED-CT and ICD-10: Getting the Most out of Electronic Health Record Systems

CPT

Description: The American Medication Association (AMA) states that the codes and descriptions provide a mechanism for the reporting of medical services and procedures performed by physicians.

Content: CPT is comprised of more than 8,900 terms and codes. The codes are listed under three categories. Category I codes and descriptors make up the majority of CPT identifying services and procedures that are in common use within the medical community. Category II codes and descriptors are for use in reporting performance measurements. Category III codes and descriptors are used to report emerging technology.

Uses: Current Procedural Terminology has been adopted by HIPAA as the coding standard for the reporting of physician services. It is also an integral part of the reporting of outpatient hospital surgical procedures.

Classification versus Terminology: Classification system

Ownership: American Medical Association (AMA)

Updated: CPT is updated semi-annually with the primary release in the fall for implementation on January 1 of each year. An interim release is provided in the spring for implementation on July 1.

Proprietary versus Nonproprietary: Proprietary system requiring a license for use.

Means of Distribution: Hard copy and database formats can be purchased directly from the AMA. There are also numerous vendors and distributors who have been authorized to distribute CPT via hard copy or database format.

Comments: CPT is maintained by an editorial board through the AMA and supported by an advisory panel comprised of members appointed by the national medical specialty societies affiliated with the AMA.

Sources of Information: www.ama-assn.org/ama/pub/category/3113.html

MEDCIN

Description: MEDCIN is an EMR engine allowing rapid entry, retrieval, and correlation of relevant clinical information at the point of care. Each data element is a unique phrase of clinical content, presented in a hierarchical format. Additional information regarding relevant value ranges, units, laterality, and cross-references to external code sets allow for organization and interpretation of the data by the end user.

Content: Several tables consisting of 250,000 clinical data elements in a hierarchical format that can be accessed through Intelligent Prompting in order to display the clinically relevant terms.

Uses: Built to assist with problem-oriented flow sheets, alerts, and automated evaluation and management calculation
Classification versus Terminology: Knowledgebase of clinical terms and phrases.
Ownership: Medicomp Systems, Inc
Updated: Twice a year
Proprietary versus Nonproprietary: Proprietary systems requiring a license for use.
Means of Distribution: CDs are sent to licensed users.
Comments: MEDCI is distributed with a software development kit to assist with implementation of the front end.
Source of Information: www.medicomp.com

MeSH
Description: Preferred list of terms used by the National Library of Medicine to catalogue books and library materials and to index articles for inclusion in health-related databases, including MEDLINE. MeSH descriptors are arranged in both an alphabetic and a hierarchical structure. There are 22,997 descriptors in MeSH. The most general level of the hierarchical structure contains very broad headings such as “Anatomy” or “Mental Disorders.”
Content: Consists of sets of terms naming descriptors in a hierarchical structure that permits searching at various levels of specificity.
Uses: Used by NLM for indexing articles from 4,800 of the world’s leading biomedical journals for the MEDLINE/PubMED database. Also used for the NLM-produced database that includes cataloging of books, documents, and audiovisuals by the library.
Classification versus Terminology: Terminology
Ownership: National Library of Medicine
Updated: Continually updates by subject specialists. The vocabulary is also published in print each January
Proprietary versus Nonproprietary: Nonproprietary. The MeSH Web site is the central access point for more information
Means of Distribution: MeSH, in machine-readable form, is provided at no charge via electronic means. The MeSH Web site, http://www.nlm.nih.gov/mesh, is the central access point for additional information and for obtaining MeSH in electronic form. The vocabulary is also published in print each January.
Comments: MeSH can be a difficult tool to use, and initially users may have problems in locating appropriate subject headings. MeSH requires a certain amount of knowledge before it can be used productively. MeSH prefers clinical terms such as neoplasm as opposed to more common terms like cancer or tumor. Also, some compound terms are not listed in natural word order. For example, juvenile rheumatoid arthritis is listed under arthritis, juvenile, rheumatoid.
Source of Information: http://www.nlm.nih.gov/mesh/

UMLS
Description: Consists of three knowledge sources: the Metathesaurus (vocabulary database), the Semantic Network (categorization and relationships of and between the vocabulary terms), and the SPECIALIST Lexicon (information to assist with natural language processing). The MetamorphoSys is a tool used to assist in installation and customization of the knowledge sources.
Content: Several of the data sources contained within the UMLS include MeSH, CPT, ICD-9-CM, LOINC, and SNOMED CT.
Uses: The multipurpose UMLS databases and software tools are meant to facilitate the development of the interoperability of computer systems in the many different aspects of the healthcare information.
Classification versus Terminology: Vocabulary database of more than 130 terminologies and classification systems
Ownership: The Unified Medical Language System is owned and maintained by the National Library of Medicine.
Updated: Three to four times a year.
Proprietary versus Nonproprietary: More than130 terminologies and classification systems within the UMLS are proprietary, many of which are proprietary and require separate license agreements for use. However, access to all of the UMLS knowledge sources is free, but requires a license agreement with the NLM.
Means of Distribution: Through Web site distribution or DVD obtained through the NLM.
Comments: Through Web site distribution or DVD obtained through the NLM.
Source of Information: www.nlm.nih.fob/research/umls/about_umls.html

Clinical Care Classification
Description: Terminology that identifies the discrete data elements of nursing practice. Standardized framework and coding

structure of diagnoses interventions, and outcomes for assessing, documenting, and classifying care in all healthcare settings. Used to track and measure patient/client care holistically over time, across settings, population groups, and geographic locations.
Content: 182 nursing diagnostic coded concepts; 792 nursing interventions and action-coded concepts (198 interventions and 4 action qualifiers-assess/monitor, direct care/perform, teach/instruct. manage/refer); 546 nursing outcomes (182 diagnoses and three expected and actual outcome qualifiers-improve, stabilize, or deteriorate); 21 care components classifies, codes and links terminologies.
Uses: It is used to document nursing care in the electronic health record computer-based patient record, and personal health record systems. It serves as a language for nursing and other healthcare providers such as physical, occupational, and speech therapists, medical social workers, etc. It is used for document integrated patient care processes to classify and track clinical care, develop evidence-based practice models, analyze patient profiles and populations, and predict care needs, resources, and costs.
Classification versus Terminology: Classification
Ownership: Developed and maintained by Virginia K. Saba and colleagues from the University of Georgetown.
Updated: No information available.
Proprietary versus Nonproprietary: Version 2.0 is free and granted upon permission and available at www.sabacare.com
Means of Distribution: Through Web site distribution of tables. A manual is also available for $45.
Comments: On January 22, 2007 the CCC was accepted by the Department of Health and Human Services as a named standard within the Healthcare Information Technology Standards Panel (HITSP) Interoperability Specification for Electronic Health Records, Biosurveillance and Consumer Empowerment. The CCC system is recognized as the terminology of choice for documenting the essence of patient care in the EHR systems. It meets all the features of a concept-oriented terminology and has been formally accepted by the various standards organizations. It has been incorporated into LOINC and UMLS and is a separate subset of SNOMED CT (for a separate fee through CAP).
Source of Information: www.sabacare.com

Appendix C: Resource List for Additional Research and Guidance

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Appendix D: Best Practice Considerations for Problem Lists

Issue/Barrier	Best Practice Considerations
Time and effort	There are a variety of approaches available to ensure efficient use of the electronic problem list. Physician acceptance of the process is important. Detailed policies and procedures aid in the use of the problem list and minimize time and effort. Consistent training and education is also key.
Training/education	Training for an EHR system implementation often is limited to the use of the product rather than use of the inquiry fields, which are critical for creating problem list entries. Training must include how to perform optimal searches for problem entries suitable for sharing with others and secondary data use. Physicians tend to have questions directly related to coding guidelines. Trainers should be well versed in these guidelines.
ICD-9-CM–based searching	Although ICD-9-CM may work well for charge capture in an electronic environment, a classification system where clinical conditions are classified into categories is not the best solution for documentation on the problem list.

Consistency in choosing the correct or most specific problem	Policies and procedures for clinical staff using the problem list are needed to ensure that the most specific diagnosis or problem statement is chosen. Linking to a classification system or other terminology is optimized when the expression of the condition or problem is as specific as the circumstances allow.
Primary care, specialty, and emergency providers have varying needs for conditions on the problem list	Policies and guidelines for problem list use in organizations with more than one medical specialty are helpful. Accountability for maintaining a complete problem list should be assigned to the primary care physician. This is sometimes referred to as the “medical home” for patients using healthcare services from more than one provider. It is plausible that a sharable problem list system would provide a mechanism for specialty physicians to recommend additions to the complete problem list to the primary care provider for a comprehensive health profile in one place. Removal of problems from the list would occur at the discretion of the primary care physician in consultation with the patient or authorized caregiver.
Billing needs may utilize the problem list for diagnostic	Due to challenges with specifying the entries on the problem list, best practice is to use the problem list for reference of the diagnostic statements and clinical conditions rather than the single source of information use for claims submission documentation for encoding required for healthcare payment or reimbursement.
Physician acceptance of structured coding is resisted	SNOMED CT and ICD-9-CM coding schemes can be cross-referenced with frequently used entries lifted to the front of the table, resulting in faster lookups
Varying clinical settings use varied diagnoses and workflow	Multiple lookup schemes or subsets of problem list entry choices should be developed consistent with the clinical workflow best suited for patient care needs and optimal data capture.
Lookup speed is critical to user acceptance	Clinician involvement in developing cross references, problem look-up process, and search optimization increases more relevant returns on entries and better results for specificity in expression of problems.
Incomplete entries or “free text entries” for unlisted problems are not coded	Organizations should provide personnel resources committed to the review of uncoded or inaccurate/incomplete entries. This position (often someone with HIM training) should be empowered to add choices or encode the free text entry using the appropriate coding schema to build a dynamic system that easily adapts as needed. An approval process for adding new entries should be established to ensure data quality and control.
Review of unlisted codes is frequent or ongoing	Plan for an ongoing review of problem list entries not linked to controlled vocabulary. Resource distribution within HIM in an EHR environment may result in changes from filing to code review and quality improvement activities related to problem list maintenance.
Multiple entries risk data integrity concerns	Order-receiving departments such as laboratory and pharmacy may update the problem list directly, either through direct edit or automated input. This best practice allows for data capture at the source of physician order to capture the condition requiring the test or therapy provided.
Interactivity with computerized physician order entry systems is limited by application integration issues	Technical review of CPOE systems with problem lists can limit risk of interactivity issues. Best practice is for careful consideration of exchange of data between the systems and what the process is for data validation and use.
Clinicians resist changes in work flow	System benefits of a well-designed and managed problem list outweighs the costs. Coded entries support research and information retrieval; improved patient safety limits liability; automating entries from laboratory and pharmacy improve regulatory compliance; patient satisfaction ratings improve with information sharing across providers with a useful list of problems suitable for inclusion in personal health records and continuing care

No universally adopted standard exists for problem lists content, use, or linkage to a clinical terminology or other clinical code set	Best practice requires that the work unit or task force responsible for problem list technical framework and use defines standards that will be used across the enterprise with an eye towards national or international standard that enable data sharing.
No defined cross mapping guidelines exists	Cross mapping of problems to clinical data standards has been done by individual institutions but to date has not been adopted by IT developers. Best practice is to review any recognized guidelines appropriate to the organization's workflow and data needs. Include companies that provide interface terminologies that translate problem text phrases into clinical data standards for secondary use including billing, patient-friendly terms, and other specialized needs.
There is poor industry implementation of SNOMED CT guidelines	Organizations who have adopted SNOMED CT as a standard terminology should advocate for guideline development that would enable reliable health information exchange. Adoption of a reference terminology is a useful step toward interoperability but if everyone uses the system differently the benefit may not be realized.
V code diagnosis	V code diagnoses rarely are necessary in the active problem list for lack of a better code. Pregnancy (v22.2) is an example of this exception for the duration of the pregnancy. Organizations need to provide guidelines for their users of these rules and exceptions.
Multiple accurate diagnosis describing the same condition	The problem list should be examined and corrected for accuracy at every patient encounter. In the process of clinical evaluation of the problem list, those repetitive diagnoses that describe the same condition should be identified. The more accurate diagnosis should be retained and the less accurate diagnosis removed.
Symptom type diagnosis	Problems that are primarily symptoms should rarely be promoted to the active problem list. Occasionally, a symptom should be included as an active problem while a disease-specific diagnosis is being determined. In this case, multiple encounters will be required in order to arrive at the diagnosis. Pelvic pain is an example of such a problem. In the case of these subacute symptom problems, treating providers should be careful to resolve the symptom from the active problem list when treatment is concluded or when a more accurate diagnosis is identified.
Acute condition diagnosis	An alternative is to set a date at which time such a condition will drop off the active problem list automatically. Subacute problems that will require several encounters before resolution are appropriate to include. Upon resolution, the provider will need to determine if the problem should be completely resolved to an inactive list or transferred to the past medical history section of the problem list.
Implementation from paper to electronic problem list	Make a decision and form a plan of action of how to proceed. Options to consider are: 1. While still in paper record, updating and correcting the paper problem list will ensure that it is entered correctly into the electronic problem list. 2. Prepopulation of data into the electronic problem list can take place during the training period. 3. Prepopulation can be done at time of service while using the paper problem list to enter the electronic problem list 4. Whose responsibility is it to ensure that the correct data elements are added and to move, correct, and amend discrepancies? 5. How can we best use the computable problems as a decision support tool?

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