

Consolidated Health Informatics
Standards Adoption Recommendation
Anatomy/Physiology

Index

1. **Part I – Sub-team & Domain Scope Identification** – basic information defining the team and the scope of its investigation.
2. **Part II – Standards Adoption Recommendation** – team-based advice on standard(s) to adopt.
3. **Part III – Adoption & Deployment Information** – supporting information gathered to assist with deployment of the standard (may be partial).

Summary

Domain: Anatomy and Physiology

Standards Adoption Recommendation (Anatomy only):

Systematized Nomenclature of Medicine Clinical Terms[®] (SNOMED CT[®])
National Cancer Institute's (NCI) Thesaurus

SCOPE

Anatomy: To describe anatomical locations for clinical, surgical, pathological and research purposes.

Physiology: To describe or infer human physiology at least at the organ system, cellular, and biochemical levels

RECOMMENDATION

No standard is being recommended for Physiology.

SNOMED CT[®] and the NCI Thesaurus is recommended for Anatomy. It is not realistic to limit or change the anatomy component of current widely used clinical terminologies to adopted standards. Continued use with the required level of semantic understanding will require certified mappings. Hence, mapping is an essential requirement of the anatomy domain. It is the workgroup's recommendation that these mappings be developed, maintained, validated and distributed through the UMLS[®].

OWNERSHIP

SNOMED CT[®] is a copyrighted work of the College of American Pathologists (CAP). The CAP and the National Library of Medicine (NLM) entered into an agreement to provide SNOMED CT[®] core content via the UMLS[®] at no charge to those who execute a license agreement. This agreement is for healthcare applications and uses within the US and any application of use of SNOMED CT[®] by any US government facility or office, whether permanent or temporary, wherever located.

Maintained and published by the National Institutes of Health/National Cancer Institute, the NCI Thesaurus contains the working terminology used in a growing number of NCI data systems. It covers vocabulary for clinical care, translational and basic research, and public information and administrative activities

APPROVALS AND ACCREDITATIONS

The CAP is an ANSI Standards Development Organization. The SNOMED CT[®] Healthcare Terminology Structure is ANSI approved.

ACQUISITION AND COST

SNOMED CT[®] will be available from the National Library of Medicine's (NLM) Unified Medical Language System[®] (UMLS[®]) Metathesaurus[®] at no charge to anyone in the US who agrees to the license terms. This no-charge feature has been supported by HHS (NLM, NIH/OD, CDC, ASPE, AHRQ, CMS, FDA, HIS, SAMSHA, HRSA), DoD and VA.

Health care entities can also choose to purchase SNOMED CT[®] as a stand-alone terminology directly from SNOMED[®] International at (<http://www.snomed.org>)

The NCI Thesaurus is covered by an open content license. The license allows free distribution and modification of the NCI Thesaurus content.

REVISION HISTORY

DATE	VERSION	COMMENT
11/14/2003	Public Document	Final Recommendation
2/24/2006	1.1	AHRQ reference added

Part I – Team & Domain Scope Identification

Target Vocabulary Domain

Common name used to describe the clinical/medical domain or messaging standard requirement that has been examined.

Anatomy/Physiology

Describe the specific purpose/primary use of this standard in the federal health care sector (100 words or less)

Anatomy

Used to describe anatomical locations for the following purposes:

- Clinical
 - Site of a procedure such as:
 - Source of culture specimen
 - Surgical site
 - Location of blood pressure, temperature, other measurement
 - Etc.
 - Location of an observation such as:
 - Site of fracture
 - Site of injury
 - Etc.
- Surgical:
 - Precise anatomical structure involved in procedure
- Pathology:
 - Detailed gross description of item observed
 - Cellular description of item observed
- Research:
 - Uses many clinical terms
 - Subcellular components

and having the following requirements:

- Is-a hierarchy
- Part-of hierarchy
- Laterality
- Synonyms
- Virtual locators (Concepts added to the terminology that may not physically exist but are added for representational purposes. An example might be liver as a physical object that is the concept used when referring to the entire liver and liver structure when describing the relationships of the various parts of the liver such as left lobe. SNOMED CT[®] uses concepts similar to those just described.)

- Modifiers of basic terms such as “necrotic”
- Compatibility with animal models

Physiology

Used to describe or infer human physiology at least at the organ system, cellular, and biochemical levels. Physiology terminology includes tests that are used to infer the physiological state at any of the levels noted. Terminology that infers cellular physiology by direct inspection of cells is also included. The terminology must include concepts for both normal and abnormal physiology.

Sub-domains Identify/dissect the domain into sub-domains, if any. For each, indicate if standards recommendations are or are not included in the scope of this recommendation.

Domain/Sub-domain	In-Scope (Y/N)
Anatomical location of a procedure	Y
Anatomical location of an injury	Y
Anatomical description of specimen	Y
Subcellular anatomy	Y
<i>Physiology of patient</i>	N
Measured or inferred physiology of organ or organ system	Y
Measured or inferred physiology of cell	Y
Morphology	Y

Information Exchange Requirements (IERS) Using the table at appendix A, list the IERS involved when using this vocabulary.

Care Management Information
Customer Risk Factors
Referral Information
Body of Health Services Knowledge
Tailored Education Materials
Case Management Information
Cost Accounting Information
Population Member Health Data
Population Risk Reduction Plan
Improvement Strategy
Clinical Guidelines
Customer Approved Care Plan
Customer Health Care Information

Team Members *Team members' names and agency names with phone numbers.*

Name	Agency/Department
Steven J Steindel, PhD (Team lead)	CDC/HHS
Sherrí de Coronado	NIH/NCI/HHS
Lionelle Wells MD	VA
Ross Barner MD	DoD/AFIP
Daniel Pollock MD	CDC/HHS
Kathy Johnson Ph.D.	NASA

Work Period *Dates work began/ended.*

Start	End
6/16/03	9/3/03

Part II – Standards Adoption Recommendation

Recommendation *Identify the solution recommended*

Anatomy:

SNOMED CT®:

SNOMED CT® codes, when available (anticipated April 2004) within the US as Category 0 codes in National Library of Medicine (NLM) Unified Medical Language System® (UMLS®) Metathesaurus®, were found to adequately cover the domain of anatomy. Where codes do not exist, an adequate mechanism exists to add new codes in a timely fashion.

The specific locations in the SNOMED CT® hierarchy that form the basis of our recommendation are:

Body structure:acquired body structure

Body structure:acquired body structure:post-surgical anatomy

Body structure:anatomical concepts:combined site

Body structure:anatomical concepts:physical anatomical entity:anatomical spatial entity

Body structure:anatomical concepts:physical anatomical entity:anatomical structure

Body structure:anatomical concepts:physical surface topography

Body structure:morphologically altered structure

For modifier terms not pre-coordinated above:

Qualifier Value:Additonal Values

Qualifier Value:Modifer and/or Qualifier

We recommend the sending of both SNOMED® and UMLS® codes when available, but the sending of a SNOMED® code alone is essentially equivalent to sending a UMLS® code because of the UMLS® mapping.

Note: Category 0 UMLS® Codes have no license restrictions on their use beyond the minimal restrictions provided by the National Library of Medicine on UMLS®. They can be used and distributed without further license fees. It is anticipated that SNOMED CT® will be available from the UMLS® in April 2004.

The Workgroup determined the need for a simpler anatomy terminology for general practitioner use in a clinical setting. This work should be coordinated through the NLM as it seeks to enhance the usability of SNOMED CT®.

NCI Thesaurus:

To support its research programs and international based clinical trials, the National Cancer Institute is revising the anatomy component of it's widely use Thesaurus (<http://www.nci.nih.gov/cancerinfo/terminologyresources>). This work extends present anatomy terminologies into subcelluar structures that are required for research and is primarily recommended for that purpose. Additionally, the remaining terminology appears well ordered and complete. The public release of

the NCI Anatomy terminology in the NCI Thesaurus is anticipated in May 2004. The two terminologies, SNOMED CT[®] and the NCI Thesaurus can relate through mapping (see below).

Physiology

The Workgroup could not identify an acceptable terminology that covered cellular physiology. The VA NDF-RT medication physiologic effect axis is too narrowly focused toward drug physiology to be of general applicability. It is, however, the closest terminology we found that addresses this subject.

Under our broader definition of Clinical Physiology we reviewed the clinical terms in LOINC[®] and the appropriate hierarchies within SNOMED CT[®]. We found that both terminologies had significant weaknesses that prevent a recommendation at this time. These are reviewed in the Gaps section of this report.

We recommend that CHI review this area in 12 – 18 months for progress and potential recommendation.

Ownership Structure *Describe who “owns” the standard, how it is managed and controlled.*

SNOMED CT[®]:

Recently, the National Library of Medicine (NLM) enacted an agreement with the College of American Pathologists (CAP) for the distribution of SNOMED CT[®] that effectively makes it a perpetual Category 0 codeset in the Unified Medical Language System[®] (UMLS[®]) for use in the United States. The CAP owns SNOMED[®] and maintains both the content and structure of the terminology. (see www.snomed.org for more information.)

UMLS[®] is maintained by the NLM and is available at no charge to those who execute a license agreement. They have an extensive internal and contracted group that maintains content. (see www.nlm.nih.gov/research/umls/ for more information.)

Terminology found in both the UMLS[®] and SNOMED[®] extends beyond the domain of anatomy. It is only the domain of anatomy to which this recommendation applies. The specific domains are enumerated above.

NCI Thesaurus:

Maintained and published by the National Institutes of Health/National Cancer Institute, this thesaurus contains the working terminology used in a growing number of NCI data systems. It covers vocabulary for clinical care, translational and basic research, and public information and administrative activities. The NCI Thesaurus provides definitions, synonyms, and other information on more than 7000 cancers and related diseases, 5500 single agents and combination therapies, and a wide range of other cancer-related topics.

Summary Basis for Recommendation *Summarize the team's basis for making the recommendation (300 words or less).*

SNOMED CT[®]:

Relative completeness of the terminology, free access through the federal license and clinical orientation form the basis of this recommendation.

NCI Thesaurus:

Extension into subcellular structures for research, free availability and lack of international distribution restrictions for clinical trials and research form the basis of this recommendation.

Conditional Recommendation *If this is a conditional recommendation, describe conditions upon which the recommendation is predicated.*

No conditions placed on recommendation. Gaps identified and noted in the "Gaps" section of this report.

Approvals & Accreditations

Indicate the status of various accreditations and approvals:

Approvals & Accreditations	Yes/Approved	Applied	Not Approved

Options Considered *Inventory solution options considered and summarize the basis for not recommending the alternative(s). SNOMED must be specifically discussed.*

Medical Subject Headings[®] (MeSH[®]) [see www.nlm.nih.gov/mesh/meshhome.html]

While this was reviewed it was found that it was neither simple enough to recommend as a general terminology nor complex enough for a complete table. This does not imply it was found to be lacking for its intended purpose, literature retrieval.

NCI Anatomical Terminology

SNOMED CT[®]

Logical Observation Identifiers Names and Codes (LOINC[®]) - Clinical

Foundational Model of Anatomy (University of Washington)

This work in progress from the University of Washington was reviewed by the Workgroup. It was found to be a very complete, well structured anatomy terminology that was optimized for the spatial representation of anatomical structures and not clinical concepts. For this reason it does not form part of our recommendation, though mapping will allow connections, when made generally available to the recommended terminologies.

Health Level 7[®]

<i>Veterans Administration NDF-RT Medication Physiologic Effect Axis</i>
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Current Deployment

Summarize the degree of market penetration today; i.e., where is this solution installed today?

SNOMED CT®:

What number of or percentage of relevant vendors have adopted the standard?

The table represents results regarding vendor intent. Reliable information on the actual use of SNOMED CT® or earlier versions of SNOMED® is not available. Hence, inferences regarding actual current use should not be made.

Enterprise-wide Computerized Patient Record Systems:

Vendor	% Market	Use SNOMED
Siemens	17	Yes
McKesson	16	Yes
Meditech	13	Yes
Cerner	10	Yes
IDX	6	Yes
Eclipsys	5	Yes
Epic	3	Yes
Per-Se	2	No
HC Mgmt	6	No
Achieve	4	No
Other	14	No

64% of the Computerized Patient Record Vendors are currently developing systems using SNOMED®

Laboratory Computerized Systems:

Vender	% Market	Use SNOMED
Meditech	26	Yes
Misys	20	Yes
Cerner	19	Yes
McKesson	11	Yes
Siemens	4	Yes
Soft	4	Yes
Dynamic	1	Yes
CPSI	2	No
Outsource	1	No
Keane	1	No
Other	11	No

85% of the LIS Vendors are currently developing systems using SNOMED®

What number or percentage of healthcare institutions have adopted the standard?

Unknown. Number not available through CAP.

What number or percentage of federal agencies have adopted the standard?

A subset of the current version of SNOMED[®], SNOMED II[®] created in 1972, is used extensively in the VA for coding of anatomical pathology reports. This coding, however, is limited to only the Final Diagnosis portion of the Anatomical Pathology report. Successful use of coding for Anatomical Pathology reports will require extension to other report sections and standardization of those sections.

DoD currently uses SNOMED II[®] in a fashion similar to the VA for coding of anatomical pathology information.

Is the standard used in other countries?

SNOMED CT[®] as a whole is the national standard in the UK. SNOMED II[®] is widely implemented for anatomical pathology coding in many countries.

Are there other relevant indicators of market acceptance?

The federal government spent almost two years negotiation a license so that the terminology could be more widely implemented without fiscal barriers.

NCI Thesaurus:

NCI Thesaurus is a primary leg of the bioinformatics infrastructure for a number of NCI research initiatives including NCI Intramural and Extramurally supported Clinical Trials, the Cancer Models Database, Gene Expression Data Portal, Cancer Image Database, and other clinical and research science databases. It is also used by the NCI portal website, Cancer.gov, Physician Data Query System (PDQ), and to supply standard terminology for coding grants, program management, reporting, and clinical trial data elements through the Cancer Data Standards Repository (caDSR), a metadata repository that is also part of the core bioinformatics infrastructure. NCI management has recommended that all new RFAs for initiatives that include activities with a vocabulary component interact with the NCI Enterprise Vocabulary Services and caDSR to determine whether they can use NCI Thesaurus directly or via caDSR. The cancer diagnosis vocabulary portion of the NCI Thesaurus has been extensively reviewed, and is being considered for adoption by Sloan Kettering and other major cancer centers. The vocabulary is made available to NCI applications through the caCORE infrastructure, and through a programming API to a proprietary terminology server. The vocabulary itself is available publicly on the web as a stand-alone source or as part of the NCI Metathesaurus, also through an open source license in flat, XML and OWL files formats.

Part III – Adoption & Deployment Information

Provide all information gathered in the course of making the recommendation that may assist with adoption of the standard in the federal health care sector. This information will support the work of an implementation team.

Existing Need & Use Environment

Measure the need for this standard and the extent of existing exchange among federal users. Provide information regarding federal departments and agencies use or non-use of this health information in paper or electronic form, summarize their primary reason for using the information, and indicate if they exchange the information internally or externally with other federal or non-federal entities.

- Column A: Agency or Department Identity (name)
 Column B: Use data in this domain today? (Y or N)
 Column C: Is use of data a core mission requirement? (Y or N)
 Column D: Exchange with others in federal sector now? (Y or N)
 Column E: Currently exchange paper or electronic (P, E, B (both), N/Ap)
 Column F: Name of paper/electronic vocabulary, if any (name)
 Column G: Basis/purposes for data use (research, patient care, benefits)

Department/Agency	B	C	D	E	F	G
Department of Veterans Affairs						
Department of Defense						
HHS Office of the Secretary						
Administration for Children and Families (ACF)						
Administration on Aging (AOA)						
Agency for Healthcare Research and Quality (AHRQ)						
Agency for Toxic Substances and Disease Registry (ATSDR)						
Centers for Disease Control and Prevention (CDC)						
Centers for Medicare and Medicaid						

Department/Agency	B	C	D	E	F	G
Services (CMS)						
Food and Drug Administration (FDA)						
Health Resources and Services Administration (HRSA)						
Indian Health Service (IHS)						
National Institutes of Health (NIH)						
Substance Abuse and Mental Health Services Administration (SAMHSA)						
Social Security Administration						
Department of Agriculture						
State Department						
US Agency for International Development						
Justice Department						
Treasury Department						
Department of Education						
General Services Administration						
Environmental Protection Agency						
Department of Housing & Urban Development						
Department of Transportation						
Homeland Security						

Number of Terms

Quantify the number of vocabulary terms, range of terms or other order of magnitude.

Anatomy terminologies generally have on the order of 3 – 5,000 concepts. Synonyms can

expand the number of terms by a factor of 10.

How often are terms updated?

Anatomy is generally stable and the need for updates, outside of the research areas, is limited. Update schedules for the terminologies in general is given below.

Range of Coverage

Within the recommended vocabulary, what portions of the standard are complete and can be implemented now? (300 words or less)

The range of coverage for SNOMED CT[®] and corresponding UMLS[®] Category 0 terms appears adequate for use now, containing approximately the number of terms and synonyms noted above, for expressing general descriptive clinical and anatomical concepts. No large gaps in coverage in this area were noted. It is noted; however, that the coverage is weak in the subcellular structures required for research, hence the augmentation with the NCI Thesaurus.

SNOMED II[®], but not SNOMED CT[®], has been implemented widely, but not universally, for anatomical pathology reporting. Use in other areas can only be considered as prototype.

Non-human codes exist. While the original terminology was developed with veterinary input the maintenance of those codes is weak.

The range of coverage for a simplified anatomy terminology for general medicine needs is currently limited (see Gaps).

Acquisition: *How are the data sets/codes acquired and use licensed?*

UMLS[®] is available at no charge to anyone who agrees to the license terms. UMLS[®] license terms allow use for all patient record uses and messaging. An in-principal agreement has been reached that provides, in the US, SNOMED[®] as one of the Category 0 codesets essentially allowing free distribution and use in the US.

Cost

What is the direct cost to obtain permission to use the data sets/codes? (licensure, acquisition, other external data sets required, training and education, updates and maintenance, etc.)

With the current federal agreement, SNOMED CT[®] has no acquisition cost. We have no knowledge of the cost of implementing SNOMED[®] as a source terminology from UMLS[®] but it is our understanding that it will be able to be extracted easily and then implemented as is the current stand-alone version.. Successful implementation of the current version of SNOMED[®] requires knowledge of the file and data structure that can be obtained from extensive provided documentation or training courses, offered for a fee, on-site or at the CAP offices on a regular basis. Similarly, full use of the hierarchies and relationships in SNOMED[®] also require extensive training, education and in many cases extensive software changes. The United Kingdom has been working with CAP for 3+ years on implementation, Kaiser Permanente in US has for 5+ years, and various other prototype sites exist. To our knowledge, none have successfully used all features of SNOMED CT[®]. Hence, no estimates on cost in this area can be offered.

SNOMED[®] has been successfully implemented in many sites simply as a source of code values. The cost for this type of implementation is basically the mapping of current results to the appropriate SNOMED[®] codes. If result mapping is not possible and conversion to SNOMED[®] codes requires natural language processing, the cost is much higher and success is limited.

The NCI Thesaurus is covered by an open content license. The license allows free distribution and modification of the NCI Thesaurus content. Modification of NCI Thesaurus, including development of extensions, may be made using either Protégé available from Stanford University (<http://protege.stanford.edu/>) or DTS/TDE terminology development/distribution environment available from Apelon, Inc (www.apelon.com). Developers of extensions are encouraged to share their extensions. Through a central website (<http://ncicb.nci.nih.gov/core>) a User Guide provides functional description and suggested uses of the NCI Thesaurus content. Technical support through the Help Desk is available by phone and email. There is also a list serve specific to the NCI Thesaurus and other NCI terminology services as a whole.

Systems Requirements

Is the standard associated with or limited to a specific hardware or software technology or other protocol?

No

Guidance: *What public domain and implementation and user guides, implementation tools or other assistance is available and are they approved by the SDO?*

An extensive set of education material is provided as well as training courses for SNOMED CT[®]. Information and current draft documents can be found at www.snomed.org. Training and educational material is more limited for UMLS[®]. See <http://umlsinfo.nlm.nih.gov>, and look under documentation & learning resources.

Effective with caCORE release 2.0 which is scheduled for release Oct 3, 2003, the NCI Thesaurus will be available as a component of the caCORE (<http://ncicb.nci.nih.gov/core>). (*Update April 04: caCORE version 2.0, was released on October 31, 2003. Version 2.0.1, a bug-fix update, was released on December 19, 2003.*) The caCORE Technical Guide will detail the description logic structure of the NCI Thesaurus, various formats in which the vocabulary data are available for download, the APIs that NCI provides to the servers on which the NCI Thesaurus are hosted for public access, and examples of the software that uses the APIs to retrieve NCI Thesaurus content from the NCI public servers. In addition the NCI CaCORE User Guide will provide functional description and suggested uses of the NCI Thesaurus content. Technical support through the caCORE Help Desk is available by phone and email. There are also list serves for the vocabulary as well as for the caCORE as a whole.

The Workgroup notes that the implementation of any coding system for any purpose within an institution is complex and actual guidance is outside the scope of this report and may be outside the scope of the terminology provider.

Is a conformance standard specified? Are conformance tools available?

SNOMED CT[®] has none. Discussion is under way regarding conformance-testing tools for use in the United Kingdom and subsequent use in the US, but they are at least one to two years away.

NCI Thesaurus currently does not specify a conformance standard. They do provide programming tools from the above website to add in implementation and provide conformance.

Maintenance: *How do you coordinate inclusion and maintenance with the standards developer/owners?*

SNOMED CT[®]:

What is the process for adding new capabilities or fixes?

SNOMED[®] has a defined process for requesting additions through standard communication channels (phone, fax, e-mail) and is developing an extensive web entry

process that is now in test. A formal editorial board exists to recommend and review more extensive changes. UMLS[®] relies on the changes in the underlying terminologies to express changes and is governed by their processes. (Note: mapping to other vocabularies is revised periodically during regular updates by UMLS[®] staff and editors.)

Both SNOMED[®] and UMLS[®] retire but not remove concepts that require changes. Minor changes that do not change meaning, such as spelling corrections, are allowed without retiring the concept.

What is the average time between versions?

SNOMED[®] – six months. UMLS[®] – 3 months. It is noted that first release of SNOMED CT[®] in the UMLS[®] is anticipated in April 2004 using the July 2003 version. It is hoped that future release cycles of the two products will not have a six-month gap.

What methods or tools are used to expedite the standards development cycle?

None formally. SNOMED[®] does respond quickly if emergency codes are needed in a new area, such as bioterrorism support codes. The codes, however, are not published until the next release, generally six months or less.

How are local extensions, beyond the scope of the standard, supported if at all?

Both SNOMED[®] and UMLS[®] formally support terminology subsets and local extensions. SNOMED[®] uses subsets to create subspecialty and language variants of the terminology. A local extension policy is still under development. UMLS[®] supports subsets and local versions of the terminology and provides a tool to form these versions.

NCI Thesaurus:

What is the process for adding new capabilities or fixes?

Requests for change to the NCI Thesaurus content and software may be made on line at ncicb@pop.nci.nih.gov.

What is the average time between versions?

Monthly

What methods or tools are used to expedite the standards development cycle?

None formally. Note that a monthly frequency limits the need for non-routine additions.

How are local extensions, beyond the scope of the standard, supported if at all?

The NCI Thesaurus is published in three formats: ACSII tab-delimited flat files, XML and OWL. The XML format is compatible with the proprietary Apelon TDE/DTS suite of tools (www.apelon.com). The OWL format is compatible with open source Protégé suite of tools and with the OWL plug-in (<http://protege.stanford.edu/plugins/owl/>). The NCI Thesaurus is covered by an open content license. The license allows free distribution and

modification of the NCI Thesaurus content. Modification of NCI Thesaurus, including development of extensions, may be made using either Protégé or DTS/TDE. Developers of extensions are encouraged to share their extensions.

Customization: *Describe known implementations that have been achieved without user customization, if any.*

None known.

If user customization is needed or desirable, how is this achieved? (e.g. optional fields, interface engines, etc.)

Customization is general for these products and involves subsets, extensions and mapping tables. Mappings may involve interface engines or be connected to natural language processing software.

Mapping Requirements

Describe the extent to which user agencies will likely need to perform mapping from internal codes to this standard.

The workgroup has concluded that mapping is an essential component of the Anatomy recommendation. We have determined that synonymy is very strong across anatomy terminologies but that the placement of a similar concept within the terminology and the relationship to other concepts is highly use-dependent. For example the Foundational Model is designed for applications that require very detailed structural and spatial anatomic information, SNOMED CT[®] is designed for information retrieval across the various hierarchies, and NCI Thesaurus anatomy is optimized for the description of various types of tumors.

In addition to anatomy specific terminologies, many clinical use terminologies also have an anatomy component. For example, the Abbreviated Injury Scale used by ED physicians to describe a traumatic injury contains anatomy components. It is not realistic to limit or change these widely used terminologies to adopted standards. Continued use with the required level of semantic understanding will require certified mappings.

The Workgroup notes that while a high degree of synonymy exists within real anatomical structures, some anatomy terminologies have introduced virtual anatomical structures that do not physically exist but are used to link related anatomical subparts. Mapping of these virtual structures may require interpretation that requires consensus validation. (An example of this is the SNOMED[®] concept of the liver structure which is used to link the parts of the liver, such as right liver lobe, into a liver as an anatomical organ. In addition SNOMED[®] has the concept the liver to be used when one is referring to the entire physical organ.)

Mapping is an essential requirement of the anatomy domain. It is the workgroup's

recommendation that these mappings be developed, maintained, validated and distributed through the UMLS®.

Identify the tools available to user agencies to automate or otherwise simplify mapping from existing codes to this standard.

None are currently available. The high degree of synonymy across the anatomy terminologies might make the development of automated mapping tools feasible. The existing software tools used by NLM for the UMLS® give one a good start at mapping anatomy terminologies using lexical and norm matching. The result is generally a subset of terms that require review and some manual mappings. The workgroup recommends that the NLM undertake a study regarding effort involved.

Compatibility

Identify the extent of off-the-shelf conformity with other standards and requirements:

Conformity with other Standards	Yes (100%)	No (0%)	Yes with exception

Implementation Timeframe

Estimate the number of months required to deploy this standard; identify unique considerations that will impact deployment schedules.

For the coding of new data, assuming limited complexity for mapping and limited use of natural language processing, implementation of the anatomy portions of SNOMED® and NCI Thesaurus is estimated at less than three months in most facilities, size dependent.

The Workgroup notes that the above does not address the problem of existing, uncoded data, or data coded with non-standard terminology. Those who wish to study past and present data using standard coded terminology will need to develop their own mapping or other translation systems to achieve acceptable common codes. The cost and complexity of these systems will likely be higher than those using new data. While this is not a direct objective of CHI, the Workgroup felt the need to make Council aware of this issue.

If some data sets/code sets are under development, what are the projected dates of completion/deployment?

-NA-

Gaps

Anatomy:

Identify the gaps in data, vocabulary or interoperability.

The Workgroup has determined that a stand-alone, limited clinically oriented terminology for anatomy that relates to the more complex ones is required from the perspective of a general practitioner in the clinical environment. Lack of a limited terminology in this area could limit use and acceptance by clinicians within electronic medical record systems. It is recommended that this work be coordinated in the next phase of CHI through the NLM as it seeks to enhance the usability of SNOMED CT®.

A major use of coded anatomy terminology today is by Cancer Registries. The standard there is the ICD-O classification system provided by the World Health Organization. Currently, by agreement, the morphology axis of that classification and the legacy codes used in SNOMED® are the same. With the change in SNOMED® to the SCID as the primary identifier, it is unclear that that relationship will continue into the future. The increasing shift of SNOMED® codes versus those in ICD-O will require good agreement on mapping to maintain interoperability. ICD-O is not currently included in UMLS® but could be with permission from WHO. It is however included in NCI Metathesaurus for non-commercial use, with mapping done to UMLS®.

The Workgroup also notes that many anatomy concepts require the post-coordination of modifier terms to anatomical concepts. At present, a common, understandable way of post-coordinating terms does not exist. An example of an anatomical term that will require post-coordination rules to be understood is “Status post colonoscopy and polypectomy adenomatous polyp 1.5 cm at 10 cm in sigmoid colon, benign.” Until rules are developed for post-coordination, full use of an anatomy terminology will be limited. This gap has already been noted to the National Committee of Vital and Health Statistics as part of their investigations into Patient Medical Record Information terminologies.

Physiology

Cellular physiology is a basic medical concept that is not widely used at the clinical level and has diverse requirements at the research level. It is not surprising that a terminology was not found to meet this need. We note the potential need for terminology at this level to serve as a reference terminology that would link other terminologies that use physiology concepts. We recommend that the NLM investigate funding such a development, perhaps using the VA NDF-RT medication physiologic effect axis as a basis.

Clinical physiology, which we defined as the identification of tests and their results to infer the underlying cellular physiology, is an area that requires good terminology. We observed that both candidates, SNOMED CT® and Clinical LOINC® approached this area differently. We also felt that the approaches did not fully meet the needs of the area from

a content or organization viewpoint.

Clinical physiology terms are found in SNOMED CT[®] in the Observable Entity (physiology test names) and Finding (physiology test results) hierarchies. Under Observable Entity:Function;Physiological Functions and Activities are found many of the tests we are considering, such as EKG. In this section we find only one instance of EKG and it is described as “EKG wave, interval AND/OR segment.” No EKG specific lead indications are given. A set of terms for ECG leads is found deep in the Physical Object hierarchy as a device and these are listed only as “anterior lead,” “anterolateral lead,” “chest lead,” “inferior lead,” inferolateral lead,” and “limb lead.” A review of Test Finding:ECG waveform reveals a set of concepts that appear adequate for physiology test results. (Note the mix of abbreviation: ECG and EKG. This mix is how it exists in SNOMED CT[®] and is used deliberately in this report for emphasis.)

Clinical LOINC[®] takes a different approach to the enumeration of tests used to infer cellular physiology which is similar to that used for laboratory tests. Again using the EKG as an example, Clinical LOINC[®] has three major categories for concepts: EKG.ATOM which contains general descriptive terms (e.g.: EKG IMPRESSION, VENDOR MODEL NUMBER, STUDY DURATION); EKG.IMP (Impression) which contains general observation concepts (e.g.: CONDUCTION, HYPERTROPHY, MYOCARDIAL ISCHEMIA); and EKG.MEAS (Measurement) which contains numerous specific designations for EKG leads and result names associated with them. The list appears exhaustive and should meet the needs of modern EKG reporting in the form of (name:value) pairs, similar to that used for laboratory results, where the results might come from the SNOMED CT[®] Findings axis noted above. The problem with Clinical LOINC[®] is that coverage is spotty. After coupling the concepts found in CARD.US (Cardiac Ultrasound), the coverage of concepts for inferring cardiac physiology seems adequate. No concepts, however, are found for neurological tests indicating limited overall body system coverage. It is this limited coverage and the present lack of use of Clinical LOINC[®] that prevents a recommendation at this time. We do note that it is expected that Clinical LOINC[®] will play a major role in the HIPAA Claims Attachment transaction and urge Regenstrief Institute, the maintainers of LOINC[®], to develop a systematic path toward more complete coverage.

General:

The Workgroup would like to note that while the high degree of synonymy allowed us to interchange anatomy concepts freely, we did observe difficulty in navigating the SNOMED CT[®] hierarchies to find anatomically related terms. In part this is due to the mixed use of is-a and part-of relationships. The SNOMED[®] Clue browser is designed to navigate an “is-a” hierarchy and hides the “part-of” relationships. We also note above the diverse locations we found in that hierarchy for physiology function concepts, both tests and findings. Furthermore we note that the organization issue noted in the CHI recommendation to use Laboratory LOINC[®] applies also to Clinical LOINC[®]. (We do note that the Regenstrief Institute is addressing the issue.) Finally, we note that successful organization is use dependant and interpretation guidelines might be in order.

The Workgroup also notes that our definition for Clinical Physiology should be validated as this forms our basis for looking at SNOMED CT[®] and Clinical LOINC[®].

Finally, the Workgroup noted that a critical look needs to be taken regarding Clinical LOINC[®] with regard to utility, content, extension and overlap with SNOMED CT[®].

We ask that CHI Council approach the NCVHS about investigating the three areas noted in this General area by the hearing process.

Obstacles

What obstacles, if any, have slowed penetration of this standard? (technical, financial, and/or cultural)?

Anatomical pathology use of SNOMED II[®] is widespread. While natural language processing systems (encoders) are readily available, they are not widely or successfully used. Most SNOMED[®] coding is done by hand and limited to just portions of the anatomical pathology report, principally the final diagnosis. Cancer Registries have been reluctant to use clinical code systems, such as SNOMED II[®], and rely on the classification system provide by WHO, ICD-O. Acceptance of the clinical terminology by the Cancer Registries would aid in acceptance and use.

Appendix A**Information Exchange Requirements (IERs)**

Information Exchange Requirement	Description of IER
Beneficiary Financial / Demographic Data	Beneficiary financial and demographic data used to support enrollment and eligibility into a Health Insurance Program.
Beneficiary Inquiry Information	Information relating to the inquiries made by beneficiaries as they relate to their interaction with the health organization.
Beneficiary Tracking Information	Information relating to the physical movement or potential movement of patients, beneficiaries, or active duty personnel due to changes in level of care or deployment, etc.
Body of Health Services Knowledge	Federal, state, professional association, or local policies and guidance regarding health services or any other health care information accessible to health care providers through research, journals, medical texts, on-line health care data bases, consultations, and provider expertise. This may include: (1) utilization management standards that monitor health care services and resources used in the delivery of health care to a customer; (2) case management guidelines; (3) clinical protocols based on forensic requirements; (4) clinical pathway guidelines; (5) uniform patient placement criteria, which are used to determine the level of risk for a customer and the level of mental disorders (6) standards set by health care oversight bodies such as the Joint Commission for Accreditation of Health Care Organizations (JCAHO) and Health Plan Employer Data and Information Set (HEDIS); (7) credentialing criteria; (8) privacy act standards; (9) Freedom of Information Act guidelines; and (10) the estimated time needed to perform health care procedures and services.
Care Management Information	Specific clinical information used to record and identify the stratification of Beneficiaries as they are assigned to varying levels of care.
Case Management Information	Specific clinical information used to record and manage the occurrences of high-risk level assignments of patients in the health delivery organization..
Clinical Guidelines	Treatment, screening, and clinical management guidelines used by clinicians in the decision-making processes for providing care and treatment of the beneficiary/patient.

Cost Accounting Information	All clinical and financial data collected for use in the calculation and assignment of costs in the health organization .
Customer Approved Care Plan	The plan of care (or set of intervention options) mutually selected by the provider and the customer (or responsible person).
Customer Demographic Data	Facts about the beneficiary population such as address, phone number, occupation, sex, age, race, mother's maiden name and SSN, father's name, and unit to which Service members are assigned
Customer Health Care Information	All information about customer health data, customer care information, and customer demographic data, and customer insurance information. Selected information is provided to both external and internal customers contingent upon confidentiality restrictions. Information provided includes immunization certifications and reports, birth information, and customer medical and dental readiness status
Customer Risk Factors	Factors in the environment or chemical, psychological, physiological, or genetic elements thought to predispose an individual to the development of a disease or injury. Includes occupational and lifestyle risk factors and risk of acquiring a disease due to travel to certain regions.
Encounter (Administrative) Data	Administrative and Financial data that is collected on patients as they move through the healthcare continuum. This information is largely used for administrative and financial activities such as reporting and billing.
Improvement Strategy	Approach for advancing or changing for the better the business rules or business functions of the health organization. Includes strategies for improving health organization employee performance (including training requirements), utilization management, workplace safety, and customer satisfaction.
Labor Productivity Information	Financial and clinical (acuity, etc.) data used to calculate and measure labor productivity of the workforce supporting the health organization.
health organization Direction	Goals, objectives, strategies, policies, plans, programs, and projects that control and direct health organization business function, including (1) direction derived from DoD policy and guidance and laws and regulations; and (2) health promotion programs.
Patient Satisfaction Information	Survey data gathered from beneficiaries that receive services from providers that the health organization wishes to use to measure satisfaction.

Patient Schedule	Scheduled procedure type, location, and date of service information related to scheduled interactions with the patient.
Population Member Health Data	Facts about the current and historical health conditions of the members of an organization. (Individuals' health data are grouped by the employing organization, with the expectation that the organization's operations pose similar health risks to all the organization's members.)
Population Risk Reduction Plan	Sets of actions proposed to an organization commander for his/her selection to reduce the effect of health risks on the organization's mission effectiveness and member health status. The proposed actions include: (1) resources required to carry out the actions, (2) expected mission impact, and (3) member's health status with and without the actions.
Provider Demographics	Specific demographic information relating to both internal and external providers associated with the health organization including location, credentialing, services, ratings, etc.
Provider Metrics	Key indicators that are used to measure performance of providers (internal and external) associated with the health organization.
Referral Information	Specific clinical and financial information necessary to refer beneficiaries to the appropriate services and level of care.
Resource Availability	The accessibility of all people, equipment, supplies, facilities, and automated systems needed to execute business activities.
Tailored Education Information	Approved TRICARE program education information / materials customized for distribution to existing beneficiaries to provide information on their selected health plan. Can also include risk factors, diseases, individual health care instructions, and driving instructions.