FINAL TASK REPORT (Task 2)

Unified Medical Language System (UMLS) Project
Contract No. NO1-LM-6-3522

Principal Investigators:

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Collaborative Effort

University of Pittsburgh
University of Utah
Carnegie Mellon University

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Title:

Initial Phase in Developing Representations for Mapping Medical Knowledge: INTERNIST-I/QMR, HELP, and MeSH

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Executive Summary. Under Task 2, our efforts have been focused on two important, initial activities associated with the longer-term goal of developing a uniform representation system for medical concepts, viz., (1) the identification of the medical concepts that are required to express unit findings in the INTERNIST-l/QMR and HELP systems; and (2) the identification of semantic classes appropriate to the expression of individual medical concepts, including findings.

Our efforts under (1) were focused by the practical goal of developing a system for tlir automatic mapping of expressions between INTERNIST-l/QMR and HELP. In collaboration with our colleagues at the University of Utah, we have completed a thorough study of tin- expressions in INTERNIST-l/QMR and HELP that represent findings in the sub-domain of pulmonary diagnoses. Based on this study, we have created a uniform, frame-representation schema to serve as the basis of translation of concepts between the two systems. This lias enabled us to identify, further, the critical semantic fields that requires special treatment (or calibration) when attempting to translate qualitative expressions. In addition, we have succeeded in producing a number of utilities for the editing and maintenance of our growing knowledge base. Our report on these activities is presented in Part I, prepared principally by Fred E. Masarie.

Our efforts under (2) were designed to establish the semantic basis for the generalizations that we discovered in our study of the INTERNIST-l/QMR and HELP systems. Mindful of tin· need to develop a representation schema that is generic to the domain of biomedicine and not merely specific to the applications in two systems (iNTERNIST-l/QMR and HELP). \\< undertook to identify a semantic classification for basic medical concepts (as they appear^! in either INTERNIST-l/QMR or HELP) and a frame-based representation schema appropriair to generic clinical manifestations. This work was more theoretical than our work under (1 !. but we plan a test of the power of the representation system for processing expression of findings in natural language. Our report on these activities in presented in Part II, prepared principally by David A. Evans.

In sum, we feel we have taken an important step toward the goal of producing semantically coherent, frame-based representations for concepts in diagnostic medicine, both by identifying the pragmatic and implicit constraints that provide a context for the interpretation of medical observations and also by identifying the semantic features that form tli< basis of an explicit classification of medical concepts.

Contents

List of Figures

Part I

Mapping Medical Knowledge Representations between INTERNIST-I/QMR and HELP

1. Summary of Accomplishments

Our major accomplishment during the task period involved development and refinement of a conceptual model for mapping between large controlled medical vocabularies. The model involved the creation of an intermediate representation scheme which could serve as the vehicle for mapping between controlled vocabularies. This intermediate level representation scheme would center on medical diagnostic concepts such as *Chest Pain* or *Dyspnea* and explicitly and comprehensively encode information relevant to the concept. We developed a working protot3*pe system, the UMLS Frame Editor, as a vehicle for testing our hypothetical model. The system allows information from a given controlled vocabulary term to be captured in a frame which serves as a standardized template for comparing two controlled vocabulary terms.

2. Approach

2.1. Target Vocabularies

Our target vocabularies for our task included three large controlled medical vocabularies—Quick Medical Reference (QMR) manifestation names; HELP PTXT dictionary; and. the Medical Subject Headings (MeSH). We focused on the terms in each vocabulary which described clinical manifestations of pulmonary diseases.

Each vocabulary is organized differently. The QMR manifestation names consist of non-parsed text strings which are represented internally as a single unique number. They are often a noun phrase with multiple modifiers. Several examples of QMR manifestation name are included in Figure 1.

The HELP PTXT dictionary is a compendium of terminology which can be used to encode patient information into electronic hospital records for the HELP hospital information system. The HELP system has been developed over the past 15 years at the LDS Hospital in Salt Lake City. The dictionary is primarily hierarchically organized. Terms are represented internally as eight (8) byte code which represents both simple semantic and syntactic informal iou about the term. HELP PTXT terms tend to be more atomic than QMR manifestations since

Figure 1: QMR Manifestation Names

```
CIGARETTE SMOKING HX
CHEST PAIN SUBSTERNAL BURNING
RALES LOCALIZED
CHOLESTEROL SERUM INCREASED
ABDOMEN XRAY COLON DISTENTION WITH GAS
PROLACTIN SERUM GTR THAN 100 NG PER ML
```

they can be concatenated in the patient record. A part of the PTXT dictionary is included as Figure 2.

The Medical Subject Heading (MeSH) vocabulary has evolved at the National Library of Medicine (NLM) as a controlled keyword vocabulary for indexing biomedical articles. In general, the MeSH vocabulary does not contain the depth of coverage as the other two vocabularies in the study domain. MeSH terms tend to be quite atomic like DYSPNEA or CHEST PAIN.

2.2. Conceptual Model

A generic medical concept frame is a computerized data structure which attempts to capture in a comprehensive manner all the potential attributes of a diagnostic medical concept. For example, if abdominal pain is the medical concept, its potential attributes might include the site of the pain, the severity of pain, exacerbating factors, etc. Concept frames consist of a heading (key concept) and a series of slots (potential attributes). Therefore, a slot can be thought of as one attribute of the key medical concept. Generic frames provide a template for describing specific medical terms in a standardized manner. A frame which represents a specific instance of the general concept is an instantiated frame. For example, ureteral dilatation would be a specific instance of the general medical concept, ureteral diameter. Instantiation is the process of assigning values to slots in a generic frame to produce a specific frame.

Values of slots within a generic frame are referred to as *items*. *Items* in turn are lists of possible specific slot values. For example, the *item* name *Type Of Aphasia* is a list containing the following elements:

```
Exactly One Of
Expressive
Receptive
Global
```

Figure 2: Part of PTXT Dictionary

```
7   1  11   1   1   0   0   0     COUGH
7   1  11   2   1   1   0   0         CONSTANT
7   1  11   2   1   2   0   0         PAROXYSMAL
7   1  11   2   1   3   0   0         MILD
7   1  11   2   1   4   0   0         MODERATE
7   1  11   2   1   5   0   0         SEVERE
7   1  11   2   1   6   0   0         WORSE LYING DOWN
7   1  11   2   1   7   0   0         WORSE SITTING UP
7   1  11   2   1   8   0   0         NOT POSITIONALLY RELATED
7   1  11   2   1   9   0   0         NON-PRODUCTIVE
7   1  11   2   1  10   0   0         SPUTUM PRODUCTION
7   1  11   3   1  10   1   0             MINIMAL AMOUNT
7   1  11   3   1  10   2   0             MODERATE AMOUNT
7   1  11   3   1  10   3   0             COPIOUS AMOUNT
7   1  11   3   1  10   4   0             WHITE
```

The first element of an item list is referred to as the "item list header" and encodes special information about the relationship among the remaining elements. Examples of list headers include: *Opposite Extremes* (for the list—present absent); *Exactly One Of* (for the list—exacerbated-by relieved-by); and, *Progression Deviation* (for the list—mild moderate severe). List headers are used both in structuring the acquisition of information for an instantiated frame and for assessing the degree of match between instantiated frames (described below).

The generic frames have an explicit structure which organizes the attributes permitted to modify the head concept. This structure is essential for comparing information between instantiated frames. There are five (5) main slots in a generic frame. These are shown in Figure 3.

The concept frame names are determined based on the ability of the name to convey some clinically important concept. For this reason PAIN alone is not chosen as a medical concept name but rather the specific type of pain such as *Abdominal Pain, Chest Pain, or Joint Pain.* Frame names may be a single word or contain multiple words such as:

Figure 3: Generic Frame Structure

Status
Subcategory
Site Descriptor
Method(s)
Qualifier(s)

Body Temperature
Abdominal Pain
Corticosteroids 17 OH
Sodium
Sputum Identification Of Pathogenic Bacteria
Adrenal Mass

The Status slot in a generic frame contains information about the Status descriptor and Normal Status (see Figure 1). Status descriptors encode how medically knowledgeable individuals might characterize the status of the concept.

Examples include:

- for *Jaundice,* the status descriptor would be present/absent
- for *Facial Appearance,* normal/abnormal
- for *Blood Culture,* positive/negative
- **for *Toxic Substance Exposure,* true/false**
- for *Urobilinogen,* one of: absent/decreased/normal/increased
- **for *Age, Temperature,* or *Hematocrit*: a numerical value**

The normal status of the clinical abnormality would depend on the concept; in other words, *Jaundice* would be absent, *Facial Appearance* would be normal, *Blood Culture* would be negative, etc.

The next slots in a generic concept frame are the site descriptor and subcategory. These slots allow knowledge base developers to identify for each concept a class of modifiers which have special significance. The site and subcategory slots might be thought of as high level qualifiers. They become more important in assessing degree of match as described below.

Examples of these items (with their elements) include:

Subcategory

Breath Sound Quality
Exactly One Of
Rhonchi
Rales
Wheeze
Egophony
Amphoric

Site

Site Of Pulmonary Auscultation
Exactly One Of
Apex
Base
Anterior Lung Field
Posterior Lung Field
Lateral

The next generic frame slot (see Figure 3) is the method(s) or technique(s) by which the clinical abnormality can be determined. There can be several entries in the method slot for a given concept, since often there are multiple methods for determining the same abnormality. Methods include the process of obtaining historical information about the patient, patient examination, and a variety of laboratory tests and procedures. Examples of methods include:

- Abdominal Computerized Tomography
- Lymph Node Palpation
- Lumbar Puncture
- Pulmonary Spirometry

The allowable entries in the method slot are in fact compound lists (Figure 4).

The first element in the list is the method name as described above. Reliabilities indicate the ability of the method to determine accurately the status of the finding relative to other methods for determining the *same* finding range from 1-5.

If there are several methods for determining a quantitative clinical concept *and* if the numerical result is dependent on the method employed, then the method list also includes a numerical entry. A numerical entry is defined by its units (e.g., mg/dl), the normal value (or range), and expected physiological range of values (see Fig 4). For example, for the clinical concept *Serum Alkaline Phosphatase*, there are several techniques (e.g., Bodansky.

Figure 4: Compound Method List

```
Method Name
Reliability

Numerical Entry
  Units
  Normal Value (Range)
  Physiological Range
```

King-Armstrong) by which this enzyme can be measured in the blood. Furthermore, each technique includes different units and a different normal range.

The last major slot is the qualifier slot. Qualifiers indicate allowable optional ways to modify the main medical concept. Examples of qualifiers (with their elements) include:

```
Severity
  Progressive Deviation
  Mild
  Moderate
  Severe

Chest Pain Quality
  Exactly One Of
  Burning
  Stabbing
  Sharp
  Dull Aching
```

An example of the generic frame for *Chest Pain* is included in Figure 5.

Generic frames provide the template for describing controlled vocabulary terms such as *Chest Pain Substernal Burning* or *Sharp Or Stabbing Chest Pain* in a standardized format. This process is referred to as building instantiated frames. The process involves identifying which portion of the information in the generic frame is applicable to a given controlled vocabulary term. Builders of instantiated frames are only allowed to use **items** which are part of generic frames. Figure 6 shows an example of an instantiated frame.

Figure 5: Sample Generic Frame

Chest Pain

Status: Present or Absent.
Normal: Absent

Site: Chest Topographic Site

Subcategory: Nil

Method: Cardiopulmonary Symptom

Qualifiers:
Chest Pain Quality
Severity
Chest Pain Radiation
Qualitative Time Duration
Quantitative Time Duration
Influencing Factors
Chest Pain Associated Conditions

Figure 6: Sample Instantiated Frame

Chest Pain Substernal Relieved By Antacids (QMR)

Concept Name: Chest Pain
Status: Present
Site: Substernal
Method: Cardiopulmonary Symptom
Qualifiers:
Influencing Factor: Relieved by Antacids

2.3. QMRVIEW Program

A microcomputer program, QMRVIEW, was developed which allows users to examine subsets of the INTERNIST-l/QMR manifestation and disease vocabularies. These INTERNIST-i/QMR vocabularies have previously been organized in separate hierarchies. The QMRVIEW program allows the the user to identify any node in either hierarchy to create a logical set of terms. For example, since the manifestation hierarchy contains a higher level node '•OCCUPATION HISTORY", a person using QMRVIEW could quickly create a set of diseases which explain manifestations under that node in the hierarchy. A QMR user previously had difficulty determining which occupational diseases are currently profiled in the INTERNIST-i/QMR knowledge base, since the diseases were organized by organ system and thus, the occupational diseases were not grouped under a specific node in the hierarchy.

2.4. The Frame Editor

A large portion of the six month period was spent developing a frame editor and necessary data structures in PASCAL to allow us to begin building the concept frames (generic frames) and the frames which represent specific controlled vocabulary terms (instantiated frames). The Frame Editor is written in Turbo Pascal and runs on an IBM PC-XT or PC-AT with 512 K RAM. The data base includes a vocabulary developed for the generic frames which currently includes over 1800 concept names, 1600 item names, and 350 method names. In addition, the data base includes over 15,000 HELP PTXT nodes and the DXPLAIN manifestation name vocabulary. The entire database require approximately 3 megabytes of hard disk space.

The Frame Editor also includes a series of mapping routines which allow the system to compare controlled vocabulary terms. Once a test set of instantiated frames had been built for the concept *Chest Pain,* we developed algorithms which compare specific instances of medical terms as encoded in a frame. The routines assess the degree of match from three perspectives: COARSE (Differences in Scope); FINE (Semantic Differences); and. COMPOSITE (Aggregations of more atomic terms into complex phrases). Figure 7 includes examples of the different perspectives.

In order to capture the subtle (and sometimes not so subtle) semantic differences between elements in an item lists, we employed the concept of distance mapping between these vocabulary terms. A distance map is simply a 2x2 table with the x- and y-axes representing the elements in an item list. The entries in the table are integers between 100 and -100 where 100 indicates that the pair of elements are an exact match and -100 indicates that they are opposites as shown in Figure 8.

Distance maps are created automatically for each item list using default assumptions encoded in the item list header. System developers can also hand edit distance maps to capture semantic relationships between such terms as *Sharp* and *Knife-Like.* A sample

Figure 7: DilFerent Mapping Perspectives

Examples of COARSE mapping include the relationship between:

(QMR) Chest Pain Substernal Relieved By Antacid
(HELP) Chest Pain Substernal

Examples of FINE mapping include the relationship between:

(QMR) Chest Pain Substernal Knife-Like Or Tearing
(HELP) Sharp Or Stabbing Chest Pain

(QMR) Chest Pain Substernal Unrelieved By Nitroglycerin
(HELP) Chest Pain Relieved By Nitroglycerin

Examples of COMPOSITE mapping include a single term from one vocabulary mapping to several terms in another:

(QMR) Chest Pain Substernal Relieved By Nitroglycerin
(HELP) Chest Pain Substernal
Chest Pain Relieved By Nitroglycerin

Figure 8: Scoring Scheme

100	Exact match
50	Very close match
25	Close match
0	Unrelated
-5	Difference in scope
-25	Mild conflict
-50	Moderate conflict
-100	Opposites

Figure 9: Sample Distance Map for *Chest Pain Quality*

	1	2	3	4	5	6	7
1:	1						
2:	-50	1					
3:	-50	-50	1				
4:	-50	-50	-50	1			
5:	-50	-50	-50	50	1		
6:	-50	-50	-50	50	50	1	
7:	-50	25	-50	-50	-50	-50	1

where
1 : Burning
2 : Crushing
3 : Dull Aching
4 : Knife Like Or Tearing
5 : Sharp
6 : Stabbing
7 : Squeezing Or Contracting

distance map is included as Figure 9.

Routines were developed which allowed system users to ask which terms in a target vocabulary (e.g., HELP) matched a specific term in a source vocabulary (e.g., QMR). Scoring algorithms were developed empirically and remain to be vigorously tested as our data base increases in size and complexity. A complete script of one such match is included in Figure 10.

The scores in front of each target vocabulary term reflect its "degree of match" with the source term (refer to Figure 10). A score which is a multiple of 100 is considered an exact match. Target terms are penalized by -5 points if they are more *or* less specific than the source term for a given descriptor. Target terms which address the same descriptor as the source term are given a score which reflects the level of conflict or match with the source term. Information for this part of the scoring comes from the distance maps.

2.5. Data Base Development

We did not originally anticipate progressing to the development of a running prototype during the first six months of the contract. Due to the time involved in developing a prototype system, data base development was not as great as anticipated. Thirty (30) generic frames

Figure 10: Sample Match

```
Mapping from QMR to HELP
Chest Pain Lateral Sharp
Potential Matches

95 Chest Pain, Left-sided
95 Chest Pain, Right-sided
95 Sharp Or Stabbing Chest Pain
90 Pleuritic Chest Pain (with Breathing)
90 Pleuritic Chest Pain (with Coughing)

The follow pair(s) together are an exact match for the Source term

   Chest Pain, Left-sided
   Sharp Or Stabbing Chest Pain

   Chest Pain, Right-sided
   Sharp Or Stabbing Chest Pain

               Mapping from QMR to HELP
               Chest Pain Lateral Sharp
Composite Scores
  95 Chest Pain, Left-sided
  95 Chest Pain, Right-sided
  95 Sharp Or Stabbing Chest Pain
  90 Pleuritic Chest Pain (with Breathing)
  90 Pleuritic Chest Pain (with Coughing)
  -5 Chest Pain, Substernal
 -10 Chest Pain, Painful To Palpation
 -10 Current Chest Pain
 -10 Recent Chest Pain
 -15 Acute Chest Pain
 -15 Chest Pain Lasts == Minutes
 -15 Chest Pain Relieved By Rest
 -15 Chest Pain Relieved By Tng After == Minutes
 -15 Chest Pain With Dyspnea
 -15 Chest Pain, Accompanied By Faintness
 -15 Chest Pain, Induced Or Increased By Bending
 -15 Chest Pain, Interferes With Sleep
 -15 Chest Pain, Made Worse By Eating
 -15 Chest Pain, Radiates To Back
 -15 Chest Pain, Radiates To Shoulder, Arm, Or Neck
```

were built in the pulmonary disease domain. A hard copy of these are included as Appendix A. In addition, the corresponding QMR and HELP PTXT terms were mapped into instantiated frames.

2.6. Strategies for Mapping Entire Vocabularies

Building generic frames is a time consuming process. It involves significant medical expertise to capture clinically relevant information in the concept template. This process is facilitated by past experience and thus developers become more proficient and consistent with time. Once generic frames have been built then they can be distributed to distant sites (e.g., UTAH, National Library of Medicine) to be instantiated. The developers of the generic frames refer to the target vocabularies for reference. However, invariably, controlled vocabulary terms will arise which can not be captured by existing generic frames. Thus, the process of instantiating frames will provide feedback to generic frame developers.

3. Problems Encountered

3.1. Data Base Development Work

As mentioned above, the majority of time spent on the current task involved developing the tools to construct the proposed data structures. We went further in developing the prototype system than the initial task description envisioned at a cost of mapping fewer actual terms. Consequently, data base development has been limited to a much smaller subset than originally anticipated. We anticipate that data base development efficiency will increase non-linearly as we begin to develop a "library" of items that can be used in multiple generic frame definitions.

4. Recommendations

4.1. Hierarchical Organization of Concepts

Medical information can be classified along multiple axes including etiological, anatomical, procedural, etc. These classification schemes are basically organized hierarchically. Our initial approach to codifying medical information was somewhat different in that we used functional criteria (clinical manifestations of disease) for the identification of medical "concepts". The basis for this approach rests in the assumption that most clinical utterances contain at least one central concept which serves as a focus. Due to this multiaxial perspective, we have embedded a considerable amount of redundant information in our frames since neither the concepts themselves nor their subcomponents (items and methods) are hierarchically organized. In addition, the lack of an anatomical hierarchy forces us to explicitly represent all anatomical sites and handle relational information with distance maps. The creation of an anatomical hierarchy would enhance and simplify the process of frame-building. And finally, a methods hierarchy must be developed which will allow more default reasoning by the system with regards to the presence or absence of available information.

We recognize the need to develop a conceptual suprastructure for our generic frames. The organization of concepts into a hierarchical structure and the creation of higher level conceptual frames will be an area for further investigation. Our initial attempts at establishing the basis of a hierachical classification schema for concepts in INTERNIST-l/QMR and HELP is described in Part II of this report.

4.2. Continued Data Base Development

We believe that a significant amount of insight can be gained by careful examination and decomposition of existing medical terminology into a frame-based structure. Thus, we recommend that further support for this genre of work involve adequate resources to perform

the necessary data base development.

Part II

Developing a Semantic Basis for Clinical Findings in INTERNIST-I/QMR and HELP

1. Summary of Accomplishments

Based on an analysis of expressions of findings and the use of concepts in INTERNIST-l/QMR and HELP, we have developed a semantically-coherent, candidate classification schema for more general concepts in diagnostic medicine. The several results of our initial efforts include (1) a detailed preliminary classification of *basic* medical concepts in the domain; (2) the identification of *concept clusters* that recur in expressions of findings; and (3) a partial analysis and hierarchical classification of *manifestations,* or findings, as composed by basic medical concepts and concept clusters. This last work promises to provide a uniform semantic characterization of findings-level concepts and should serve as the basis for interpreting natural-language expressions of findings in diagnostic medicine.

2. Approach

2.1. Background Considerations

We interpret the UMLS effort as having the long-term goal of establishing a coherent, uniform basis for the representation of medical concepts, to facilitate the comparison, identification, and use of concepts whether they be expressed in natural language or in specialized expert systems and databases. Designing appropriate representation schemata involves many considerations, including the need to maintain generality of representation; the need to insure semantic coherence (allowing, for example, more complex representations to be composed of more basic ones, etc.); and the need to preserve flexibility in perspective (as when we want to adjust knowledge-granularity for different applications, etc.) Thus, though we must begin our efforts by analyzing the structure of expressions that we encounter in highly specialized systems, such as INTERNIST-l/QMR and HELP, we must also attempt to extract the general principles that will permit us, in time, to move beyond the problem of mapping controlled vocabularies to the problem of interpreting natural language as it appears, for example, in the biomedical literature and in hospital records.

In our work, it is natural to begin with the study of controlled vocabularies and well-defined contexts. INTERNIST-l/QMR and HELP provide especially useful examples of well-developed knowledge bases built upon standardized expressions. The two systems, taken

together, cover a large portion of clinical medicine—*diagnosis* and *management* of diseases. The systems rely on the ability to represent complex phenomena (such as a disease) as a collection of simpler clinical observations—manifestations and laboratory data. These observations, in turn, are composed of basic concepts that provide the relevant details of the observation—for example, the *body-fluid* being analyzed; the *substance* discovered; the *amount* present; etc.

In Part I, we report the progress we have made in pursuing our initial hypothesis that we could develop a frame-based representation schema to facilitate the mapping between the controlled vocabularies in INTERNIST-I/QMR and HELP. This has given us a pragmatic goal in the analysis of medical concepts. We decompose an expression in INTERNIST-I/QMR, for example, and attempt to identify the components of the expression that may designate concepts that have a role to play in the composition of expressions in, for example, HELP. Just those components (concepts) that appear in one or the other system must be considered; and our representations must account for the way in which the components can combine to produce well-formed, canonical expressions. This work has given us a great deal of information about the structure of the expressions in the two systems and has been enormously important in moving us toward the goal of merging the knowledge bases of INTERNIST-I/QMR and HELP. But because the representations we have produced are specific to controlled vocabularies and standardized expressions, they cannot be used directly as the basis of a more general representation schema for medical concepts.

To take the step toward generality, we must address a number of issues. Essentially, what we attempt to capture by decomposing well-formed expressions are the semantic relations that are important in building medical concepts. We want to make those relationships as explicit as possible. How should we do that? Another issue involves the problem of the organization of the network of associations that we make explicit. At the very least, we would argue, it is important to classify concepts to insure uniform semantic treatment. But if we go down the road of classification one step we immediately confront the problem of efficiency and the problem of inheritance. Any moderately-large, frame-based system must manage information efficiently and distinguish the general constellations of features that define broader classes from the more detailed constellations of features the individuate specific concepts. This involves, at least, one step more beyond the simple classification of concepts: the identification of classes within classes of concepts.

As a final background consideration, we should point out that our goal in this work is to provide a *functional-semantic* classification of concepts to capture the usage of terms and expressions in the domain of diagnostic medicine. One consequence is that we need not consider all the semantic detail that would be required to distinguish a term if we were developing a classification for unrestricted language. For example, the term *sharp* will not be analyzed as having use in describing the quality of a knife edge or the acuity of someone's mind; rather, it will be roughly classified as a *sense-quality*, appropriate as a qualifier in the description of a symptom such as pain. Another consequence is that the classification need not reflect general medical practice in organizing the presentation of concepts—for we are not interested in reproducing the standard structure of medical *behavior*, merely in capturing

the use of terms as they appear in well-formed expressions in the domain. For example, in organizing manifestations, it is not necessary to build a taxonomy around the standard review of systems; rather, around semantically similar concepts that may be found in many different 'systems,' such as *tenderness* or *pain.* Thus, both the granularity of classification and the apparent taxonomy can appear to be inappropriate without affecting the actual utility of the classification schema. This feature of the enterprise is a general characteristic of the semantic analysis of sublanguages. (Cf. [Sager & Friedman (In Press)] and [Grishman & Kittredge 1986].)

It is not possible, in the scope of this report, to justify fully every design decision that was taken in developing representations for medical concepts or to discuss every generalization that was discovered and incorporated in the structure of frames. In that sense, this report must be regarded as incomplete. However, the discussion in the following sections is intended to demonstrate both the style of the work as well as the details of the results.

2.2. BX-, CX-, and MX-Level Frames

The work we have done represents a first attempt to classify concepts, to identify clusters of classes in more complex constellations of concepts, and to distinguish more general clusters of classes from more specific ones. We have also attempted to construct a hierarchy of generic manifestations based on our classifications. This has led us to identify three levels of complexity in concept organization, which we have called [a]BX" (for basic-level concepts), "CX" (for clusters of concepts that represent well-formed diagnostic units), and "MX" (for complex clusters of concepts that play the role of well-formed findings, as defined by the standards of the INTERNIST-l/QMR knowledge base). Each level is potentially hierarchically organized; and each is grounded in the BX-level semantic classifications.

Before describing these levels in greater detail, it might be useful to consider a concrete example. For illustration, consider the representation of the INTERNIST-l/QMR finding *lymph node aspirate acid fast bacteria by stain* as it might be given in a semantically-coherent, frame-based system. Clearly, many concepts combine to compose this expression; but some are more related to one another than to others. For example, *lymph* and *node* combine to identify a body structure; *lymph* and *acid* combine to identify nothing. In fact, we see the finding as involving, at a minimum, some notion of a body site or structure *(lymph node).* some notion of a pathological factor *(acid fast bacteria),* and some notion of laboratory technique *(aspirate* and *by stain).*

Some of the combinations are so standardized in diagnostic medicine that we would label then as basic, atomic concepts. A candidate here would be *acid-fast-bacteria,* which, for our purposes, could be given the BX-classification *Bacterium.* In a frame-based system, we could build the structure as follows:

BX-Frame:
Head: acid-fast-bacteria

```
Class:    Bacterium
```

Other combinations may be more complex. For example, *lymph* could be treated as a basic term, classified as *Body-fluid; node,* as a basic term, classified as *Body-structure.* Their combination has a special role to play, of course, in giving the site or source of the material whose analysis is reported in the laboratory finding. But the combination of *Body-fluid* and *Body-structure* is quite common among INTERNIST-l/QMR findings, always playing the role of source or body site. So we can propose an intermediate-level representation, a CX frame, as the appropriate structure to capture this concept-complex:

```
CX-Frame:
Head:       Body-Site-CX
Object-1:   BX-Frame:
            Head:     lymph
            Class:    Body-Fluid
Object-2:   BX-Frame:
            Head:     node
            Class:    Body-Structure
```

Following this strategy, we could represent the finding itself in terms of the various complex and basic frames that compose it, according to the role of the information they contribute to the finding. Schematically, and eliminating some sub-frame-structure detail, we could give the complete finding as follows:

```
MX-Frame:
Head:     Lab-Source-Observation-MX
Method:   Lab-Tecimique-CX:
             Lab-Exam-Tech-BX:    stain
             Lab-Extract-Tech-BX: aspirate
Source:   Body-Site-CX:
             Body-Fluid-BX:       lymph
             Body-Structure-BX:   node
Result:   Path-Factor-CX:
             Pathologic-Agent-CX:
               Bacterium-BX:      acid-fast-bacteria
```

Essentially, the complex concept—the finding—is decomposed into clusters of more-individuated concepts, and these, in turn, are expressed as basic, atomic concepts. The specific pragmatic roles each cluster plays in the complete finding are given by the slot-types, here, *method, source,* and *result.* How these are to be further interpreted, of course, may depend upon particular applications.

To recapitulate, then, in schematic form, we have the following principal taxonomies:

- BX gives classes of atomic concepts;
- CX gives clusters of associated concepts; and
- MX gives generic manifestations.

The inter-relations of the three taxonomies can be summaried as follows:

- MX is composed of CX and BX;
- CX is composed of BX only

We have assumed that any actual knowledge base embedding these taxonomies would be frame-based, hierarchically-structured, and tangled. We therefore assume design considerations such as those articulated in [Woods 1975], [Brachman 1979], and [Levesque & Brachman 1985]. Our special interest in building representations appropriate for both controlled vocabularies and natural language has led us to use frames that have the following generic structure:

```
Frame:   (representing a concept)
Head:    (giving the term/label of the concept)
Slot-1:  (identifying one or more semantic roles
          or fields appropriate to the individuation
          of the concept)
...
Slot-n:
```

For a complex frame, such as would be appropriate for a clinical finding, we have the following:

```
MX-Frame:
Head:       <expression>
Slot-1:     <CX-Frame> or <BX-Frame>
...
Slot-j:     <CX-Frame> or <BX-Frame>
```

For intermediate-level concepts, we have the following:

```
CX-Frame:
Head:       <expression>
Slot-1:     <BX-Frame>
...
Slot-m:     <BX-Frame>
```

Finally, for primitive, or basic-level concepts, we have:

BX-Frame:
Head: **<BX-term>**
Class: **<BX-Class>**

The general point is that more complex concepts will depend on less complex ones; and all concepts will ultimately be expressed in basic-level terms. In this way, we guarantee semantic well-formedness of complex concepts and maximize the possibility of capturing generalizations about the structure of important concept types. (Further arguments for this type of approach can be found in [Carbonell, *et al.* 1986] and [Carbonell &; Thomason 1986].)

2.3. Comparative Contexts—INTERNlST-l/QMR and HELP

We have assumed that it is possible to identify uniform concepts in the domain of diagnostic medicine. One might well ask whether such an assumption is justified. Based on our study of the findings-level expressions in INTERNIST-l/QMR and HELP, we would answer that it is. Independently, the architects of both systems have volunteered characterizations of clinically significant observations. When we compare them, we discover that there is remarkable agreement on what information needs to be expressed; a disagreement only in style, especially granularity, of expression.[1] Consider just the expressions in the two systems designed to capture information associated with the symptom *chest pain,* as given in Figures 11 and 12.

It is apparent that INTERNIST-l/QMR expressions are not identical to HELP expressions in form. HELP expressions have less information per expression than INTERNIST-l/QMR expressions; and some individual terms are different. For example, INTERNIST-l/QMR uses the term *knife-like* to qualify pain sensation; HELP does not. But it is also clear that there are no significant differences in the kinds of pain that each system recognizes—there are no 'medical sensation-archana' that one system, but not the other, possesses.

Can we make generalizations about the conceptual basis of *chest-pain* manifestations by comparing the two systems? We can when we begin to identify the roles that various terms play in both sets of expressions. If we consider the individual terms used across the expressions, as given in Figure 13, for example, the terms *abdomen, apical, arm, back, chest, girdle, lateral, left-sided, neck, right-sided, shoulder, substernal,* and *upper* seem to designate body locations—body regions or body parts. The terms *aching, acute, burning, contracting, crushing, dull, knife-like, pleuritic, severe, sharp, squeezing, stabbing,* and *tearing* seem to give pain-sensation qualities. And the terms *bending, breathing, cough, eating, leaning, morning, nocturnal, rest, sitting-up, sleep, swallowing,* and *sweating* all seem to designate circumstances—actions or states—the patient may be in at the time of the chest pain.

[1]In fact, there are gaps in the two knowledge bases, in part because of the different tasks the systems were designed to perform—diagnosis and management, respectively. One finds relatively more detail in signs and symptoms in INTERNIST-I/QMR, relatively more detail in laboratory data in HELP.

Figure 11: QMR Expressions for *chest pain*

```
CHEST PAIN APICAL STABBING
CHEST PAIN GIRDLE DISTRIBUTION
CHEST PAIN LATERAL DULL ACHING
CHEST PAIN LATERAL EXACERBATION WITH BREATHING
CHEST PAIN LATERAL SHARP
CHEST PAIN LATERAL SHARP RECURRENT ATTACK <S> HX
CHEST PAIN SUBSTERNAL AT REST
CHEST PAIN SUBSTERNAL BURNING
CHEST PAIN SUBSTERNAL CRUSHING
CHEST PAIN SUBSTERNAL EXACERBATION WITH BREATHING
CHEST PAIN SUBSTERNAL EXACERBATION WITH COUGH
CHEST PAIN SUBSTERNAL EXACERBATION WITH SWALLOWING
CHEST PAIN SUBSTERNAL EXERTIONAL
CHEST PAIN SUBSTERNAL KNIFE LIKE OR TEARING
CHEST PAIN SUBSTERNAL LASTING 20 MINUTE <S> OR GTR
CHEST PAIN SUBSTERNAL LASTING LESS THAN 20 MINUTE <S>
CHEST PAIN SUBSTERNAL MIGRATING TO BACK OR ABDOMEN
CHEST PAIN SUBSTERNAL PAROXYSMAL INCREASING IN DURATION AND/OR SEVERITY
  RECENT
CHEST PAIN SUBSTERNAL RADIATING TO BACK
CHEST PAIN SUBSTERNAL RADIATING TO NECK AND/OR UPPER EXTREMITY <IES>
CHEST PAIN SUBSTERNAL RECURRENT NOCTURNAL OR MORNING ONLY
CHEST PAIN SUBSTERNAL RELIEVED BY ANTACID
CHEST PAIN SUBSTERNAL RELIEVED BY LEANING FORWARD
CHEST PAIN SUBSTERNAL RELEIVED BY NITROGLYCERIN
CHEST PAIN SUBSTERNAL SEVERE
CHEST PAIN SUBSTERNAL SEVERITY MAXIMAL AT ONSET
CHEST PAIN SUBSTERNAL UNRELIEVED BY NITROGLYCERIN
```

Figure 12: HELP Expressions for *chest pain*

```
RECENT CHEST PAIN
RECURRING EPISODES OF CHEST PAIN
CURRENT CHEST PAIN
SHARP OR STABBING CHEST PAIN
BURNING CHEST PAIN
CHEST PAIN, SQUEEZING/CONTRACTING
ACUTE CHEST PAIN
CHEST PAIN, RIGHT-SIDED
CHEST PAIN, LEFT-SIDED
CHEST PAIN, SUBSTERNAL
CHEST PAIN, RADIATES TO SHOULDER, ARM
CHEST PAIN, RADIATES TO BACK
CHEST PAIN, INTERFERES WITH SLEEP
EXERTIONAL CHEST PAIN
CHEST PAIN RELIEVED BY REST
PLEURITIC CHEST PAIN (WITH BREATHING)
PLEURITIC CHEST PAIN (WITH COUGHING)
CHEST PAIN, MADE WORSE BY EATING
CHEST PAIN, INDUCED OR INCREASED BY BENDING
CHEST PAIN, WORSE SUPINE
CHEST PAIN, RELIEVED BY MILK OR ANTACID
CHEST PAIN, RELIEVED BY NITROGLYCERINE
CHEST PAIN, RELIEVED BY SITTING UP/LEANING
CHEST PAIN, WITH NAUSEA
CHEST PAIN, WITH SWEATING
CHEST PAIN, ACCOMPANIED BY FAINTNESS
CHEST PAIN, PAINFUL TO PALPATION
CHEST PAIN WITH DYSPNEA
CHEST PAIN LASTS == MINUTES
CHEST PAIN RELIEVED BY TNG AFTER « MINUTES
```

Figure 13: Terms in INTERNIST-I/QMR and HELP *Oiest Pain* Expressions

ABDOMEN
ACCOMPANIED
ACHING
ACUTE
AFTER
ANTACID
APICAL
ARM
AT
ATTACK
BACK
BENDING
BREATHING
BURNING
CHEST
CONTRACTING
COUGH
COUGHING
CRUSHING
CURRENT
DISTRIBUTION
DULL
DURATION
DYSPNEA
EATING
EPISODES
EXACERBATION
EXERTIONAL
EXTREMITY
FAINTNESS
FORWARD
GIRDLE
GTR
HX
IN
INCREASED
INCREASING
INDUCED
INTERFERES
KNIFE-LIKE
LASTING
LASTS
LATERAL
LEANING
LEFT-SIDED
LESS
MADE
MAXIMAL
MIGRATING
MILK
MINUTE
MINUTES
MORNING
NAUSEA
NECK
NITROGLYCERIN
NITROGLYCERINE
NOCTURNAL
OF
ONLY
ONSET
OR
PAIN
PAINFUL
PALPATION
PAROXYSMAL
PLEURITIC
RADIATES
RADIATING
RECENT
RECURRENT
RECURRING
RELEIVED
REST
RIGHT-SIDED
SEVERE
SEVERITY
SHARP
SHOULDER
SITTING-UP
SLEEP
SQUEEZING
STABBING
SUBSTERNAL
SUPINE
SWALLOWING
SWEATING
TEARING
THAN
TNG
TO
UNRELIEVED
UPPER
WITH
WORSE

By completing the comparative classification, it is possible to generalize about the structure of the expressions in the two systems, as well. All the terms seem to play a role in only one of a small number of clusters of concepts: they are part of the cluster that gives **(A) a *located-pain* (as in *chest pain substernal);* (B) a *time-course* (as in *lasting 20 minutes);* (C) a *sensation-pattern* (as in *maximal at onset);* (D) a *sensation-quality* (as in *knife-like)]*** and (E) a patient circumstance (as in *with swallowing).* Using just these clusters, one can induce a "grammar" for *chest-pain* findings in INTERNIST-l/QMR and HELP. Schematically, this could be given as follows:

- QMR-*chest-pain-MX* =» A plus any of B, C, D, E
- HELP-*chest-pain-MX* => A plus only one of B, C, D, E

In this fashion, then, one can begin to establish both the basic classifications of terms that will be important in composing findings and also the constellations of concepts that will be useful in providing their gross structure. Unfortunately, because of limited time and limited access to the HELP knowledge base, it was possible in this task period to attempt only a limited contrastive study of the HELP and INTERNIST-l/QMR sets of findings. However, the principles of concept classification and concept clustering that emerged from this work formed the basis of the extensive analysis of INTERNIST-l/QMR findings that was completed. The following sections focus, in particular, on that work.

2.4. Isolation of Basic Concepts

Based on the identification and use of atomic concepts in INTERNIST-l/QMR findings, we were able to develop a comprehensive, though still preliminary, classification schema for basic concepts. The complete classification schema is reproduced in Appendix B; and our current list of terms, given by basic class, is included in Appendix D. The following discussion will focus on selected aspects of the schema.

The basic division in the classification schema is between *concrete* objects and *abstract* ones. The concrete objects will be appropriately used in roles requiring *location* or *agency* or *instrumentality,* for example. The abstract objects will include many kinds of states, actions, and processes, but also classes appropriate to relations, linguistic objects, and meta-language. The top portion of the hierarchy is reproduced in Figure 14.

Each of the terminal categories shown in the top portion of the BX hierarchy is further subcategorized, giving the classification schema, at present, a depth of approximately seven classification levels. At this degree of granularity, generalizations in the use of concepts in generic expressions of findings can be captured. In future work, the fineness of classification can be expected to increase by 1-3 levels as the distinctions among semantic fields discovered in the development of the controlled-vocabulary frames, reported in Part I, are added to the BX hierarchy.

Figure 14: Top Portion of the Basic-Concept (BX) Classification Schema

```
BX-Thing
        physical-thing
                living-thing
                        organism
                non-living-thing
                        body-thing
                        place
                        substance
                        instrument
                        pathological-factor
        abstract-thing
                meta-term
                marker
                        relation
                        grammar
                                grammatical-marker
                                morphological-item
                                        bound-morpheme
                                        free-morpheme
                                                lexical-item
                                                phrasal-lexical-item
                medical-procedure
                circumstance
                        patient-circumstance
                        physiological-circumstance
                action/event
                experience
                        pathological-experience
                        behavior
                measure-theoretic-thing
                        measure
                        unit
                        quality
                        relative-index
```

Figure 15: Classification of *Body-Thing*

```
BODY-THING
        body-entity
                body-structure
                        macro-body-structure (e.g., joint, orifice)
                        micro-body-structure (e.g., cell)
                body-part
                        macro-body-part (e.g., kidney, arm, head)
                        micro-body-part (e.g., loop-of-henle)
                body-substance
                        body-fluid (e.g., blood, serum, urine)
                        body-chemical
                                generic-body-chemical (e.g., hormone)
                                specific-body-chemical  (e.g., insulin)
        body-region
                topological-body-region
                        macro-body-region (e.g., abdomen, chest)
                        micro-body-region (e.g., extranuclear)
                relative-body-region (e.g., quadrant)
```

As an example of more detailed classification, consider the distinctions we have made in categorizing *Body-Thing*, as shown in Figure 15. One could say a great deal about the 'things' of the body, of course, but as the concepts are actually used in INTERNIST-I/QMR, it is not important to capture exhaustive detail. The principle distinction is between concepts that denote *entities*, which can be the objects of procedures such as laboratory or physical examinations, and *regions*, which identify the locations of entities and other phenomena. Findings also manifest implicit distinctions depending on whether the body 'thing' involved is large or small—large enough to be seen without instruments or under minor magnification: or small enough to require microscopic examination.

Other important distinctions under *Body-Thing* involve the division among *structures*, *parts*, and *substances*. Findings contain clusters of concepts designed to designate *sources* of information—locations, physical parts, fluids, etc. *Structures*, *parts*, and *substances* can combine to indicate sources. For example, a structure and a part, together, can designate the *structure-within-the-part* that is intended, provided there is a potential *contains*-relation between the part and the structure; a structure and a substance, together, can designate the *substance-from-the-part*, provided there is a potential *contains*-relation between the part and the substance; and so on. This points out the need for additional relational information among concepts—such as *contains*—that goes beyond the 'is-a' classification in the BX-

Figure 16: Classification of *Medical-Procedure*

```
MEDICAL-PROCEDURE
        diagnostic-procedure
                extraction-procedure
                        tissue-extraction (e.g., scraping)
                        fluid-extraction (e.g., paracentesis)
                lab-assay-procedure
                        substance-technique (e.g., latex-agglutination)
                        tissue-technique (e.g., staining)
                imaging
                        indirect-imaging (e.g., sonography, x-ray)
                        direct-imaging (e.g., endoscopy)
                monitoring-procedure (e.g., ekg, eeg)
                physical-exam (e.g., palpation)
                test-of-dynamic-function (e.g., cardiac-stress-test)
        therapeutic-procedure
                drug-administration-procedure (e.g., innoculation)
                surgical-procedure (e.g., amputation)
                physical-therapeutic-procedure (e.g., exercise-therapy)
```

hierarchy. For unrestricted natural-language processing, having such relational information is essential; for identifying candidate findings in INTERNIST-l/QMR and HELP, it is not, because expressions in those systems have exploited the relevant relations implicitly: When a body *part* and *substance* co-occur in a well-formed INTERXIST-l/QMR finding, they do have the *contains* relation—we need only establish the presence of a *part-* or *substance-term.*

Another interesting branch of the BX-hierarchy classifies concepts associated with medical procedures, as given in Figure 16. The principal distinction is between *diagnostic* and *therapeutic* procedures, though, in terms of conceptual complexity in INTERNIST-l/QMR findings, the *diagnostic-procedure* sub-class is much more significant. It makes further distinctions that derive from the type of laboratory procedure associated with the term, with consequences for the semantic type of the *object* of the procedure. For example, *direct-imaging-procedures* will take objects that are *macro-*—structures or parts—etc. The semantic implications of the BX-class *medical-procedure* are discussed further in the following sections of this report.

In sum, the BX-classification schema provides a functional-semantic basis for the categorization of terms as they are used in expressions of diagnostic findings, especially as given in INTERNIST-l/QMR. Because the findings in INTERNIST-l/QMR are typically more complex than those in HELP, the BX schema can serve as a functional-semantic basis for HELP expressions, as well. Additional work will involve the expansion of the classification to all HELP

Figure 17: Composition of *Observation-Technique-CX*

```
<OBSERVATION-TECHNIQUE-CX> ==>

    either <LAB-OBSERVATION-TECHNIQUE-CX> or <PHYSICAL-EXAM-TECHNIQUE-CX>

<LAB-OBSERVATION-TECHNIQUE-CX>  «>  (hierarchically ordered:)

    <LAB-EXAM-TECHNIQUE-CX>   (example, "stain")
    <LAB-PREP-TECHNIQUE-CX>   (example, "culture")
    <LAB-OBTAIN-TECHNIQUE-CX> (example, "biopsy")

    <LAB-VIEW-TECHNIQUE-CX>   (example, "arteriography" or "-oscopy")

    and

    <LAB-OBSERVATION-TECHNIQUE-CONSTRAINTS-CX>
```

terms and the development of finer subcategories to accommodate the specialized semantic classes discovered in building QMR-HELP controlled-vocabulary frames.

2.5. Identification of Complex Concepts

It is clear that many basic-level classes of concepts can combine to yield functionally important complex concepts. In our examination of the INTERNIST-l/QMR set of findings, we discovered approximately one dozen recurrent clusters that have pragmatically significant roles to play in the composition of findings. We give the complex clusters in schematic frame form in Appendix C. The following discussion focuses on three of the most important **clusters, those characterizing *laboratory-methods, sources,* and *results.***

Not surprisingly, almost every finding in INTERNIST-I/QMR that involves an *observation* has an associated method, often indicated explicitly. It is the method that provides the broadest context in which to assess the clinical significance of the observation; and it is the method that constrains the possible source and result. For example, *bronchoscopy* in a finding will potentially constrain the source to be the bronchial passage or material contained therein; and will constrain the result to be focused on a gross body structure, typically.

In fact, we find a class of clusters appropriate to methods in observation-based findings, which we call *Observation-Technique-CX.* As shown in Figure 17, there are two further. broad sub-divisions, essentially distinguishing laboratory- from physical-examination-based classes of methods.

The constellation of concepts under *Lab-Observation-Technique-CX* is by far the most interesting and complex of CX-level structures. As the schematization indicates, there are two parts to a *Lab-Observation-Technique-CX*. The first is a hierarchy of lab-technique types (each potentially complex); the second is a collection of constraints (usually implicit) that derive from the information in the first. To focus discussion, consider the following findings in INTERNIST-I/QMR.

```
BRONCHOSCOPY ENDOBRONCHIAL MASS
BRONCHOSCOPY TRACHEA NARROWING

BRONCHOSCOPY ENDOBRONCHIAL BIOPSY MALIGNANT NEOPLASM
COLONOSCOPY BIOPSY MUCOSAL ULCERATION AND INFLAMMATION

BRONCHOSCOPY BRONCHIAL WASHING <S> CULTURE CANDIDA
COLONOSCOPY BIOPSY CULTURE MYCOBACTERIUM TUBERCULOSIS
```

As noted previously, when the only laboratory technique mentioned in a finding involves endoscopy, the balance of information (giving a source of material and a result) must be compatible with the implicit constraints on the procedure. In the case of the first two findings above, the source must be a bronchial region and the focus of the result must be at the level of *macro-body-part* or *macro-body-structure*. When a second laboratory technique is mentioned, as in the second pair of findings, the focus (but not the source) shifts to a 'result-granularity' that is appropriate to the second technique. In the case of the example, *biopsy* causes the focus to shift from gross structures to 'micro' ones. When a third laboratory technique is mentioned, as in the third pair of examples, the focus (but not the source) shifts again. Here, *culture* causes the focus to be a pathogen. The generalization is that when more than one laboratory technique is mentioned, the source must be compatible with the first, the focus with the last.

In fact, it is not string-ordering that determines 'first' and 'last' in these cases but an implicit epistemological ordering of techniques. One ordering is temporal: Endoscopy precedes biopsy; biopsy precedes culturing; culturing precedes staining. Another ordering affects the focus: Endoscopy facilitates *viewing* of materials; biopsy facilitates *obtaining* materials; culture facilitates *growing* materials; staining facilitates *examining* materials. This suggests the hierarchy of technique types that we record in the *Lab-Observation-Technique-Cx* complex. The 'highest-ordered' technique mentioned in a finding imposes constraints on the focus of the technique; the lowest-ordered technique imposes constraints on the source. The specific constraints are collected in the frame designated *Lab-Observation-Technique-Constraints-Cx*.

Another important complex, *Body-Site-CX* gives information about the *source* of materials. As shown in Figure 18, it contains basic-level concepts of the class *Body-Region*, *Body-Part*, or *Body-Structure* and any other *Body-Thing* that can be contained by them. Some examples of the *Body-Site-CX* are the following:

```
ARM <S> MUSCLE <S> ATROPHY BILATERAL
```

Figure 18: Composition of *Body-Site-CX*

<BODY-SITE-CX> ==> <B0DY-REGI0N>, <B0DY-PART>, or <BODY-STRUCTURE>
with contained elements

Figure 19: Composition of Complexes Giving *Result*

<EVALUATED-ATTRIBUTE-CX>
Focus: restricted to be of BX type <EVALUATED-ATTRIBUTE>
Value: restricted to be of type <VALUE-CX>

<VALUE-CX>
Measure: restricted to be of type <MEASURE-CX>
Context: restricted to be of type <??>

<MEASURE-CX>
...

<PATHQLOGICAL-FACTOR-CX>
Focus: restricted to be of BX type <PATH0L0GICAL-FACT0R>
Quality:
Context:

BRAIN COMPUTERIZED TOMOGRAPHY LATERAL VENTRICLE <S> ENLARGED
HEART ECHOCARDIOGRAPHY VALVE LEAFLET <S> IRREGULAR THICKENING <S>

Here, the *Body-Site-CX* is composed of, respectively, *arm* and *muscle; brain* and *ventricle;* and *heart, valve,* and *leaflet* String-syntax notwithstanding, we can identify the complex by the semantic types of the terms in the findings. In fact, in most INTERNIST-l/QMR findings, the *Body-Site-CX* is instantiated by a single term.

Finally, many observation-reporting findings (and all *Lab-Souce-Observation* findings) have a cluster giving the result of the observation, focusing either on the significant pathological factor or on the value of a clinically significant parameter that is being evaluated. As shown in Figure 19, these result-reporting complexes have CX-level frames as part of their internal structure.

Our analysis of the fine structure of *results* is not completed, but a large number[2] of laboratory and physical examination findings report results that can be captured in the 'simpler' **versions of either *Evaluated-Attribute-CX* or *Pathological-Factor-CX* frames—requiring no** more than a focus and value or quality. Typical examples are the following:

ASCITIC FLUID ACID FAST BACTERIA BY STAIN
AMMONIA BLOOD INCREASED
BLOOD CULTURE YERSINIA PESTIS
BREAST <S> MASS <ES> BILATERAL

In these cases, the result is simply the pathological factor, e.g., *acid-fast-bacteria, yersinia-pestis,* or *mass]* or the default attribute, *amount* (of ammonia), with value *increased.*

In general, in our initial work, we discovered many implicit semantic relations that can be captured directly in the generic, semantically-grounded frames of our approach. A key element of longer-term success will be our description of the CX-level clusters and their roles in MX-level structures.

2.6. Composition of Manifestations

There was insufficient time during the task period to develop a comprehensive classification of INTERNIST-I/QMR findings. However, we were able to establish a generic-frame schema for all laboratory and history findings and for selected signs and symptoms. Our preliminary (and incomplete) classification of findings is given in Figure 20.

As discussed in Section 2.2 of this part of our report, the MX level represents a degree of complexity greater than the preceding levels of concept organization, CX and BX, which it includes. In the upper portion of the MX-hierarchy (given in Figure 20), the important generalizations concern both the generic structure of the MX-frame appropriate to a particular MX-class and also the classes of CX-level clusters that may instantiate roles in the generic structures. In the lower portions of the hierarchy (not yet developed in this framework), the special co-occurence constraints on BX-level concepts, the identification of appropriate default interpretations, and the recording, explicitly, of implicit constraints on concept formation become the appropriate research issues. Indeed, it is at this point that the efforts in developing frames for the controlled vocabularies of INTERNIST-l/QMR and HELP merge with the more theoretical work of designing semantically-grounded frames.

It is premature to speculate on the details of the lower-MX-level frames, but it is possible to describe some of the generalizations we have discovered in constructing the upper-MX-level frames. As a concrete example of the semantic characteristics of MX-level frames, then, consider the class of laboratory findings. Laboratory findings are sub-classes of *Observation-*

[2] **A good estimate might be 75%.**

Figure 20: Classification of Findings

```
MX-THING
        REPORT-MX
                PATIENT-HX-MX
                        PATIENT-DEMOGRAPHIC-HX-MX
                        PATIENT-SOCIAL-HX-MX
                        PATIENT-MEDICAL-HX-MX
                PATIENT-SYMPTOM-MX
                        <to be developed...>
        OBSERVATION-MX
                PHYSICIAN-OBSERVATION-MX
                        <to be developed...>
                LAB-SOURCE-OBSERVATION-MX
                        LAB-ASSAY-MX
                        LAB-IMAGING-MX
                                LAB-DIRECT-IMAGING-MX
                                LAB-INDIRECT-IMAGING-MX
                        LAB-INSTRUMENT-MX
                                LAB-MONITORING-MX
                                LAB-TEST-MX
```

MXj which, in turn, is distinguished from the *ReporUMX* class of findings.[3] All *Observation-MX* findings have the following generic structure, with restrictions as specified:

OBSERVATION-MX:
Method: restricted to be of type <OBSERVATION-TECHNIQUE-CX>
Source: restricted to be of type <BODY-SITE-CX>
Focus: restricted to be a sub-constituent of <BODY-SITE-CX>
or <BODY-STATE-CX> or <PATHOLOGICAL-FACTOR-BX>
Result: restricted to be of type <PATHOLOGICAL-FACTOR-CX>
or <EVALUATED-ATTRIBUTE-CX>

The complex cluster, *Observation-Technique-CX* includes clusters that are appropriate to physical examinations as well as the *Lab-Observation-Technique-CX*described in the previous section.

For laboratory findings, the generic frame is inherited directly, with exceptions as noted:

LAB-SQURCE-OBSERVATION-MX:
Method: restricted to be of type <LAB-OBSERVATION-TECHNIQUE-CX>
Source:, Focus:, and Result: as in OBSERVATION-MX

LAB-ASSAY-MX:
Method:, Source:, Focus:, and Result: as in OBSERVATION-MX

LAB-IMAGING-MX:
Method: restricted to be <LAB-VIEW-TECHNIQUE-CX>
Source:, Focus:, and Result: as in OBSERVATION-MX

Among the slots *(Method:, Source:, Object:, Result:),* constraints propagate downward. The *method* constrains the *source]* the *method* and *source* co-constrain the *focus;* and *method, source,* and *focus* co-constrain the *result* Thus, the interpretation of a finding such as

LYMPH NODE ASPIRATE CULTURE YERSINIA PESTIS

proceeds, by first identifying the terms of semantic classes appropriate to the *method,* then the *source,* then the *focus,* and finally the *result.* Schematically, an instantiated frame for this finding might be given as follows:

MX-Frame

[3]This principal division of *observations* from *reports* reflects not only the reliability of the findings under each branch but also the generic-frame structure. *Report-MX* frames, in general, do not have a *result* role within them.

```
Head:      Lab-Source-Observation-MX
Method:    Lab-Observation-Technique-CX:
               Lab-Prep-Technique-CX:
                   Tissue-Technique-BX:    culture
               Lab-Obtain-Technique-CX:
                   Fluid-Extraction-BX:    aspirate
Source:    Body-Site-CX:
               Body-Structure:             node
               Body-Fluid:                 lymph
Focus:     Pathological-Factor-BX:         yersinia-pestis
Result:    Pathological-Factor-CX:
               Pathological-Factor-BX:     yersinia-pestis
```

Clearly, many details involving inheritance of values, the determination of defaults, and the effect of co-constraints on the instantiation of slot-values need to be made explicit before the practical implications of this initial work can be evaluated. However, our first steps toward developing a framework for semantically-grounded representations of findings have demonstrated that much of the semantic structure inherent in expressions in INTERNIST-i/QMR—and by inclusion, HELP—can be captured through generalizations realized at three principal levels of complexity. This result provides a basis for future efforts directed at the longer-term goal of developing generic knowledge-representation formalisms for the domain of biomedicine.

3. Problems Encountered

There were several problems that impeded progress on the development of semantically-grounded frames. Briefly, they were (1) insufficient time and manpower, (2) the absense of an implementation for the testing of hypotheses, and (3) limited access to HELP.

3.1. Insufficient Time and Manpower

Because of the need to focus our team efforts on the immediate problem of mapping expressions between INTERNIST-l/QMR and HELP, resources which otherwise might have supported more work on developing semantically-grounded frames had to be diverted from this work. Most of the work in analyzing the structure of findings and developing classifications and representations was done by one person, working part-time. Future development should provide for additional collaborators in this effort.

3.2. No Opportunity to Implement Ideas

The development of large-scale, knowledge-representation systems is extremely difficult without the proofing of ideas that comes naturally with computational implementations. Unfortunately, at the initiation of this task, there was no practical application to focus our efforts. This problem has been circumvented, somewhat, by the use of some of the design decisions deriving from this work in the construction of the MedSORT-II Project knowledge base and its extensions in natural-language processing experiments. Future efforts should be tied to specific implementations.

3.3. Limited Access to HELP

The work to-date has been especially facilitated by ready access to the INTERNIST-l/QMR knowledge base, largely because of the QMR system itself, but also because of the many PC-based utilities that have been developed in the QMR effort, which give users many different perspectives on the implicit semantic structure of the knowledge base. Similar utilities exist for the HELP system, but they were not available to us at Carnegie Mellon and the University of Pittsburgh because we do not have in our laboratories equipment compatible with that used by our Utah colleagues.

4. Recommendations

Several obvious recommendations follow from the discussion of problems in the previous section: the purchase of complementary equipment for the Pittsburgh and Utah teams and the devotion of additional effort to a continuation of this task.

4.1. Additional Equipment Resources

To gain better access to HELP, the Pittsburgh teams need equipment compatible with Utah.[4] At a minimum, this would involve purchasing two MacIntosh systems and peripherals.

4.2. Task-5 (Autumn) Effort

Over the next six months, work on both aspects of the effort we report here—the development of strategies for mapping controlled vocabularies and the development of semantically-grounded, generic frameworks—will continue under UMLS Task 4. However, as was the case under Task 3, it is still premature to plan a joint effort to unify our approaches, so our work will proceed in parallel tracks. We recommend an Autumn effort, perhaps under a "Task 5," to integrate Part-I and Part-II work.

[4]The Utah team has recently acquired equipment permitting them to use QMR and QMR-related utilites.

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A Generic BVames for Mapping between INTERNIST-I/QMR and HELP Expressions Approriate to the Sub-Domain of *Pulmonary Diseases*

UMLS DIAGNOSTIC CONCEPT FRAME EDITOR


```
Abdominal Bruit
     Generic Frame:
         Allowable Status: Presence Or Absence
     Normal Status: Absent
         Site: Abdominal Topographical Site
     Method(s)
         Name: Abdomen Auscultation
             Reliability: 4
     Qualifier(s)
         Timing Within Cardiac Cycle

Abdominal Lymph Node Size
     Generic Frame:
         Allowable Status: Direction Of Change
     Normal Status: Normal
         Site: Abdominal Lymph Node Site
     Method(s)
         Name: Abdomen Computerized Tomography
             Reliability: 4
         Name: Abdominal Lymphangiography
             Reliability: 5
         Name: Abdomen Ultrasonography
             Reliability: 4

Abdominal Mass Palpable
     Generic Frame:
         Allowable Status: Presence Or Absence
     Normal Status: Absent
         Site: Abdominal Topographical Site
     Method(s)
         Name: Abdomen Palpation
             Reliability: 3
```

```
Abdominal Tenderness
     Generic Frame:
         Allowable Status: Presence Or Absence
     Normal Status: Absent
         Site: Abdominal Topographical Site
     Method(s)
         Name: Abdomen Palpation
             Reliability: 4
     Qualifier(s)
         Rebound Tenderness
         Involuntary Guarding Localized

Adrenal Mass Lesion
     Generic Frame:
         Allowable Status: Presence Or Absence
     Normal Status: Absent
         Site: Laterality
     Method(s)
         Name: Abdomen Computerized Tomography
             Reliability: 4
         Name: Abdomen Ultrasonography
             Reliability: 3
         Name: Renal Arteriography
             Reliability: 4
         Name: Abdomen Venography
             Reliability: 3

Alopecia
     Generic Frame:
         Allowable Status: Presence Or Absence
     Normal Status: Absent
         Site: Alopecia Site
     Method(s)
         Name: Skin Observation
             Reliability: 4
     Qualifier(s)
         Type Of Alopecia
```

Alveolar Hall Antigen Antibody Deposit
Generic Frame:
Allowable Status: Presence Or Absence
Normal Status: Absent
Subcategory: Antigen Antibody Deposit Distribution
Method(s)
Name: Open Lung Biopsy
Reliability: 4

Aortic Knob Size
Generic Frame:
Allowable Status: Direction Of Change
Normal Status: Normal
Method(s)
Name: Chest Plain Film
Reliability: 3
Name: Thoracic Aortography
Reliability: 4
Name: Chest Computerized Tomography
Reliability: 5
Name: Chest Xray Tomography
Reliability: 4
Name: Heart Fluoroscopy
Reliability: 4

Breast Palpable Mass Or Induration
Generic Frame:
Allowable Status: Presence Or Absence
Normal Status: Absent
Site: Site Within Breast
Method(s)
Name: Breast Observation
Reliability: 3
Qualifier(s)
Laterality
Time Duration Quantitative

Breath Sound Character
Generic Frame:
Allowable Status: Normal Or Abnormal
Normal Status: Normal
Subcategory: Breath Sound Quality
Site: Site Of Pulmonary Auscultation
Method(s)
Name: Pulmonary Auscultation
Reliability: 4
Qualifier(s)
Pattern Of Occurrence
Timing Within Breathing Cycle
Influence On Breath Sound

Breath Sound Expiratory Phase Duration
Generic Frame:
Allowable Status: Direction Of Change
Normal Status: Normal
Site: Site Of Pulmonary Auscultation
Method(s)
Name: Pulmonary Auscultation
Reliability: 4

Breath Sound Intensity
Generic Frame:
Allowable Status: Direction Of Change
Normal Status: Normal
Site: Site Of Pulmonary Auscultation
Method(s)
Name: Pulmonary Auscultation
Reliability: 4

Breathing Accessory Muscle Use
Generic Frame:
Allowable Status: Presence Or Absence
Normal Status: Absent
Method(s)
Name: Chest Inspection
Reliability: 3

```
Breathing Intercostal Retraction
     Generic Frame:
         Allowable Status: Presence Or Absence
     Normal Status: Absent
     Method(s)
         Name: Chest Inspection
             Reliability: 4
     Qualifier(s)
         Timing Within Breathing Cycle

Breathing Pattern
     Generic Frame:
         Allowable Status: Normal Or Abnormal
     Normal Status: Normal
         Subcategory: Type Of Breathing Pattern
     Method(s)
         Name: Chest Inspection
             Reliability: 4

Bronchial Diameter
     Generic Frame:
         Allowable Status: Direction Of Change
     Normal Status: Normal
         Site: Site Within Bronchus
     Method(s)
         Name: Bronchogram
             Reliability: 4
         Name: Chest Computerized Tomography
             Reliability: 4
         Name: Bronchoscopy
             Reliability: 4
```

```
Chest Pain
     Generic Frame:
         Allowable Status: Presence Or Absence
     Normal Status: Absent
         Site: Chest Topographical Site
     Method(s)
         Name: Cardiopulmonary Symptom
             Reliability: 4
     Qualifier(s)
         Severity
         Chest Pain Quality
         Chest Pain Radiation
         Pattern Of Occurrence
         Time Duration Qualitative
         Time Duration Quantitative
         Influence On Chest Pain
         Chest Pain Associated Condition

Cigarette Smoking
     Generic Frame:
         Allowable Status: True Or False
     Normal Status: False
     Method(s)
         Name: Substance Abuse History
             Reliability: 4
     Qualifier(s)
         Time Duration Quantitative
         Number Of Pack/day

Clubbing
     Generic Frame:
         Allowable Status: Presence Or Absence
     Normal Status: Absent
     Method(s)
         Name: Hand Inspection
             Reliability: 3
         Name: Foot Inspection
             Reliability: 3
     Qualifier(s)
         Clubbing Distribution
```

Coccidioidin Skin Test
    Generic Frame:
        Allowable Status: Positive Or Negative
    Normal Status: Negative
    Method(s)
        Name: Skin Test
            Reliability: 4

Coma
    Generic Frame:
        Allowable Status: Presence Or Absence
    Normal Status: Absent
    Method(s)
        Name: Neurologic Exam
            Reliability: 3
    Qualifier(s)
        Glascow Coma Score
        Number

Contagious Disease Exposure
    Generic Frame:
        Allowable Status: True Or False
    Normal Status: False
        Subcategory: Contagious Disease Name
    Method(s)
        Name: Patient History
            Reliability: 4

Cough
    Generic Frame:
        Allowable Status: Presence Or Absence
    Normal Status: Absent
    Method(s)
        Name: Cardiopulmonary Observation
            Reliability: 4
    Qualifier(s)
        Pattern Of Occurrence
        Influence On Cough
        Time Duration Qualitative
        Time Duration Quantitative
        Cough Associated Condition

Dyspnea
    Generic Frame:
        Allowable Status: Presence Or Absence
    Normal Status: Absent
    Method(s)
        Name: Cardiopulmonary Observation
            Reliability: 4
    Qualifier(s)
        Pattern Of Occurrence
        Time Duration Qualitative
        Time Duration Quantitative
        Influence On Dyspnea
        Dyspnea Associated Condition

Ear Pain
    Generic Frame:
        Allowable Status: Presence Or Absence
    Normal Status: Absent
    Method(s)
        Name: Patient History
            Reliability: 4
    Qualifier(s)
        Laterality

Heart Murmur
    Generic Frame:
        Allowable Status: Presence Or Absence
    Normal Status: Absent
        Subcategory: Timing Within Cardiac Cycle
        Site: Site Of Cardiac Auscultation
    Method(s)
        Name: Cardiac Auscultation
            Reliability: 4
    Qualifier(s)
        Heart Murmur Radiation
        Heart Murmur Quality
        Timing Within Systole Or Diastole
        Influence On Heart Murmur

Immobilization History
    Generic Frame:
        Allowable Status: True Or False
    Normal Status: False
    Method(s)
        Name: Patient History
            Reliability: 4
    Qualifier(s)
        Relative Timing

Iridocyclitis
    Generic Frame:
        Allowable Status: Presence Or Absence
    Normal Status: Absent
    Method(s)
        Name: Eye Inspection
            Reliability: 3
        Name: Eye Slit Lamp Examination
            Reliability: 4
    Qualifier(s)
        Laterality

Kidney Mass Lesion
    Generic Frame:
        Allowable Status: Presence Or Absence
    Normal Status: Absent
        Site: Site Within Kidney
    Method(s)
        Name: Kidney Ultrasonography
            Reliability: 4
        Name: Abdomen Computerized Tomography
            Reliability: 4
        Name: Renal Arteriography
            Reliability: 4
        Name: Intravenous Pyelography
            Reliability: 4

Kveim Test

- Generic Frame:
  - Allowable Status: Positive Or Negative
- Normal Status: Negative
- Method(s)
  - Name: Skin Test
    - Reliability: 4

Kyphoscoliosis

- Generic Frame:
  - Allowable Status: Presence Or Absence
- Normal Status: Absent
  - Site: Site Within Vertebral Column
- Method(s)
  - Name: Thoracic Spine Xray
    - Reliability: 4
  - Name: Spine Inspection
    - Reliability: 4
- Qualifier(s)
  - Severity

Kyphosis

- Generic Frame:
  - Allowable Status: Presence Or Absence
- Normal Status: Absent
  - Site: Site Within Vertebral Column
- Method(s)
  - Name: Thoracic Spine Xray
    - Reliability: 4
  - Name: Spine Inspection
    - Reliability: 4

```
Lacrimal Gland Size
     Generic Frame:
         Allowable Status: Direction Of Change
     Normal Status: Normal
     Method(s)
         Name: Orbital Inspection
             Reliability: 4

Larynx Tissue Granuloma
     Generic Frame:
         Allowable Status: Presence Or Absence
     Normal Status: Absent
         Subcategory: Type Of Granuloma
     Method(s)
         Name: Larynx Biopsy
             Reliability: 4

Larynx Tissue Identification Of Bacteria
     Generic Frame:
         Allowable Status: Presence Or Absence
     Normal Status: Absent
         Subcategory: Larynx Bacteria Species
     Method(s)
         Name: Larynx Biopsy
             Reliability: 4

Le Test
     Generic Frame:
         Allowable Status: Positive Or Negative
     Normal Status: Negative
     Method(s)
         Name: Blood Test
             Reliability: 4
```

Reaginic Allergy History
Generic Frame:
Allowable Status: Presence Or Absence
Normal Status: Absent
Method(s)
Name: Patient History
Reliability: 3
Name: Skin Allergy Panel
Reliability: 4

Sodium Blood
Generic Frame:
Allowable Status: Numerical Value
Normal and Physiologic Ranges:
Between 135 and 145 Between 100 and 180 Meq/1
Method(s)
Name: Serum Electrolyte
Reliability: 5

Sputum Identification Of Pathogenic Bacteria
Generic Frame:
Allowable Status: Presence Or Absence
Normal Status: Absent
Subcategory: Sputum Bacterial Species
Method(s)
Name: Sputum Culture
Reliability: 4
Name: Direct Fluorescent Antibody Test
Reliability: 4
Name: Sputum Gram Stain
Reliability: 4
Name: Sputum Acid Fast Stain
Reliability: 4

Sputum Identification Of Fungus
    Generic Frame:
        Allowable Status: Presence Or Absence
    Normal Status: Absent
        Subcategory: Sputum Fungal Species
    Method(s)
        Name: Sputum Fungal Stain
            Reliability: 3
        Name: Sputum Fungus Culture
            Reliability: 4

Sputum Identification Of Protozoa
    Generic Frame:
        Allowable Status: Presence Or Absence
    Normal Status: Absent
        Subcategory: Sputum Protozoal Species
    Method(s)
        Name: Sputum Smear
            Reliability: 4

Sputum Production
    Generic Frame:
        Allowable Status: Presence Or Absence
    Normal Status: Absent
        Subcategory: Sputum Gross Appearance
    Method(s)
        Name: Cardiopulmonary Observation
            Reliability: 4
    Qualifier(s)
        Sputum Amount

Subcutaneous Nodule
    Generic Frame:
        Allowable Status: Presence Or Absence
    Normal Status: Absent
        Site: Site Of Skin Abnormality
    Method(s)
        Name: Skin Observation
            Reliability: 4

B Hierarchical Classification of *Basic* Medical Concepts (BX)

The top portion of the hierarchy, BX-Thing:

```
BX-Thing
        physical-thing
                living-thing
                        organism
                non-living-thing
                        body-thing
                        place
                        substance
                        instrument
                        pathological-factor
        abstract-thing
                meta-term
                marker
                        relation
                        grammar
                                grammatical-marker
                                morphological-item
                                        bound-morpheme
                                        free-morpheme
                                                lexical-item
                                                phrasal-lexical-item
                medical-procedure
                circumstance
                        patient-circumstance
                        physiological-circumstance
                action/event
                experience
                        pathological-experience
                        behavior
                measure-theoretic-thing
                        measure
                        unit
                        quality
                        relative-index
```

The rest of the hierarchy, BX-Thing:

```
BODY-THING
        body-entity
                body-structure
                        macro-body-structure (e.g., joint, orifice)
                        micro-body-structure (e.g., cell)
                body-part
                        macro-body-paxt (e.g., kidney, arm, head)
                        micro-body-part (e.g., loop-of-henle)
                body-substance
                        body-fluid (e.g., blood, serum, urine)
                        body-chemical
                                generic-body-chemical (e.g., hormone)
                                specific-body-chemical  (e.g., insulin)
        body-region
                topological-body-region
                        macro-body-region (e.g., abdomen, chest)
                        micro-body-region (e.g., extranuclear)
                relative-body-region (e.g., quadrant)

PLACE
        relative-place (e.g., mountain, stream)
        absolute-place (e.g., the Orient, Arizona)

PATIENT-CIRCUMSTANCE
        background-context
                        social-status (e.g., divorced, married, homosexual)
                        demographics (e.g., male, female, Caucasian)
                        occupational-status (e.g., dockworker)
        condition-context (e.g., at-rest, recumbent)

PATHOLOGICAL-FACTOR
        pathological-structure
                histologic-pathological-structure (e.g., megaloblast)
                gross-pathological-structure (e.g., lesion, laceration)
        pathological-state (e.g., necrosis, inflanimation, fibrosis)
                disease (e.g., diabetes-mellitus)
        pathological-action/process (e.g., hemorrhage, vomiting)
        pathological-substance (e.g.,-pus, heterophile)
        pathological-detected-sign (e.g., Kerley-B-lines, cast)
        pathological-body-part (e.g., target-cell)
        pathological-etiological-factor (e.g., neoplasm, toxin, infection)
```

PATIENT-EXPERIENCE
    patient-physical-sensation (e.g., pain, tingling)
    patient-mental-state (e.g., confusion, hallucination)

MEDICAL-PROCEDURE
    diagnostic-procedure
        extraction-procedure
            tissue-extraction (e.g., scraping)
            fluid-extraction (e.g., paracentesis)
        lab-assay-procedure
            substance-technique (e.g., latex-agglutination)
            tissue-technique (e.g., staining)
        imaging
            indirect-imaging (e.g., sonography, x-ray)
            direct-imaging (e.g., endoscopy)
        monitoring-procedure (e.g., ekg, eeg)
        physical-exam (e.g., palpation)
        test-of-dynamic-function (e.g., cardiac-stress-test)
    therapeutic-procedure
        drug-administration-procedure (e.g., innoculation)
        surgical-procedure (e.g., amputation)
        physical-therapeutic-procedure (e.g., exercise-therapy)

SUBSTANCE
    drug-substance (e.g., dexamethasone, pentagastrin)
    general-substance
        food-substance (e.g., meat)
        non-food-substance (e.g., asbestos, coal)
    lab-procedure-substance (e.g., coccidiodin, dexamethasone)

PHYSIOLOGICAL-CIRCUMSTANCE
    physiological-state (e.g., awake)
    physiological-action/process (e.g., bleeding)
    physiological-event (e.g., extravasation)

INSTRUMENT
    medical-instrument
        diagnostic-instrument (e.g., microscope)
        therapeutic-instrument (e.g., prosthesis)
    general-instrument (e.g., cane)

ORGANISM
    micro-organism
        fungus (e.g., phycomycetes)

protozoa (e.g., Balantidium-coli)
bacterium (e.g., streptococcus)
virus (e.g., hepatitis-virus)
macro-organism (e.g., dog)

QUALITY
sense-quality (e.g., dry)
physical-quality
shape-configuration (e.g., round, bulging)
color (e.g., red)
texture/state (e.g., rough)
evaluated-attribute (e.g., size, age, pressure)
pattern-quality (e.g., radiating)
sound (e.g., amphoric)

MEASURE
relative-measure
temporal-relative-measure (e.g., abrupt, recent)
atemporal-relative-measure (e.g., abnormal, hot)
numeric-measure
range (e.g., 50-to-300)
ratio (e.g., 140/80)
individual-number (e.g., 1, 25.96)

UNIT
temporal-unit (e.g., hour, second)
atemporal-unit (e.g., ml, lb)

GRAMMATICAL-MARKER
quantifier (e.g., some, no, non)
conjunction (e.g., and, or, and/or)
preposition (e.g., for, to)

BEHAVIOR
pathological-behavior (e.g., crying-spells)
normal-behavior (e.g, talking)

ACTION/EVENT (e.g., fall)

RELATIVE-INDEX
relative-temporal-index (e.g., March, onset, yesterday)
relative-atemporal-index (e.g., peak, left, right, front)

META-TERM (e.g., body, bacterium, pathology) - all previous class names

C Concept Clusters Appropriate to Medical Diagnosis (CX)

```
<EVALUATED-ATTRIBUTE-CX>
        Focus:  restricted to be of BX type <EVALUATED-ATTRIBUTE>
        Value:  restricted to be of type <VALUE-CX>

<VALUE-CX>
        Measure:  restricted to be of type <MEASURE-CX>
        Context:  restricted to be of type <??>

<MEASURE-CX>
        ...

<PATHOLOGICAL-FACTOR-CX>
        Focus:  restricted to be of BX type <PATH0L0GICAL-FACT0R>
        Quality:

        Context:

<PHYSIOLOGICAL-STATUS-CX>  »=>  <BODY-CHEMICAL> in <BODY-FLUID>

<PATHOGEN-CX>  ==>  <PATHOGENS> and their parts and morphology
                 --
<BODY-STATE-CX>  -->  condition of <B0DY-PART> or <BODY-STRUCTURE>
                --
<BODY-SITE-CX>  —>  <B0DY-REGI0N>, <B0DY-PART>, or <BODY-STRUCTURE>

                    with contained elements

<PHYSICAL-QUALITY-CX>  ==>

<OBSERVATION-TECHNIQUE-CX>

    either <LAB-OBSERVATION-TECHNIQUE-CX> or <PHYSICAL-EXAM-TECHNIQUE-CX>

<LAB-OBSERVATION-TECHNIQUE-CX>  ==>    (hierarchically ordered:)
    <LAB-EXAM-TECHNIQUE-CX>    (example, "stain")
    <LAB-PREP-TECHNIQUE-CX>    (example, "culture")
    <LAB-OBTAIN-TECHNIQUE-CX>  (example, "biopsy")
    <LAB-VIEW-TECHNIQUE-CX>    (example, "arteriography" or "-oscopy")

    and

    <LAB-OBSERVATION-TECHNIQUE-CONSTRAINTS-CX>
```

D Basic Concepts by BX-Class

*** ABSOLUTE-PLACE ***

MEDITERRANEAN
MISSISSIPPI
OHIO
SEMITROPICAL
TROPICAL
US

*** ACTION/EVENT ***

ABSORPTION
ADMINISTRATION
ASSOCIATION
ATTEMPT
AUGMENTATION
AUGMENTED
BITE
BURN
BURST
CHANGE
CHANGING -
CLOSING
CONSUMPTIÓN
CONTACT
CONTAINING
[illegible]
CORRECTION
COUGH
DEATH
DELAY
DIAGNOSIS
DIGESTED
DIP
DISPOSAL
DISTURBANCE
DOCM
DRAINING
EJECTION
ELICITED
EPIDEMIC
EVOKED
EXACERBATION
EXPANSION
EXPOSURE
EXTENDING
FAILURE
FASTING
FINDING
FLUTTER
FORMATION
GAG
GRASP
IDENTIFICATION
IMMERSION
IMPROVEMENT
INCLUDING

INDICATE
INDUCED
INFLUENCE
INHALATION
INJURY
INSERTION
INTAKE
ISOLATED
ISSUING
JERK
KNOWN
LABELLED
IAUGHTNG
LIFT
LOSS
MOTION
OBTAINED
OCCURRING
OVERRIDING
PRECIPITATED
FRECIPITATION
PROTRUDE
PROTRUSION
PUCKERING
PURSUIT
REGENERATED
RELIEVED
REMISSION
RETENTION
SIGHING
SPELL
STIMULATION
STIMULI
STIMULUS
SUPPRESS
SUPPRESSION
THOUGHT
TOUCH
TRANSIT
TRANSMITTED
TRAVEL
UNRELIEVED
USAGE
USE
USED
USING
VIBRATION
VIEW

*** ATEfffORAL-REIATTVE-MEASURE ***

ABNORMAL
ABSENT
A3UNDANT
ACID
ACUTE
ALKALINE
ATYPICAL
CHRONIC

OOLD
COMPLETE
DECREASE
DECREASED
DEEP
DEFICIT
DENSE
DOUBLE
DULL
EFFECTIVE
EQUALLY
EXACT
EXCESSIVE
FINE
FIRST
FORCEFUL
FOURTH
GENERALIZED
GREATER
HALF
HOT
IMPAIRED
IMPROVEMENT
INADEQUATE
INCREASE
INCREASED .
INCREASING
INCREMENTAL
INTIMATE
IRREGULAR
LACK
LACKING
LARGE
LENGTHENED
LONG
LOOSE
LOW
LOWER
MASSIVE
MAXIMAL
MAXIMUM
MICROSCOPIC
MIDDLE
MILD
MINIMAL
MINOR
MODERATE
MORE
MULTIPLE
NEGATIVE
NEGLIGIBLE
NORMAL
NUMEROUS
PARADOXIC
PIECEMEAL
POOR
POSITIVE
PREDOMINANT
PRESENT
PRIKARY

PRODUCTIVE
PROFUSE
CPANHTAXIVE
SECOND
SECONDARY
SEVERE
SHALLOW
SHORT
SIGNIFICANT
SINGLE
SLIGHT
SMALL
SUBACUTE
SYSTEMIC
TALL
THIRD
TRIPLE.
UNEQUAL
UNRELIEVED
WELL
WORSE

*** ATEMPORALrUNTT ***

CM
UBSKEE
DL
GM
GRAM
L
IB
LITER
MCG
MEQ
VG
MICROUNTT
ML
MM
W
NG
NMDL
PCG
PS
PH
U

*** BACKGRDUND-OONTEXT ***

ENVIRONMENT
ENVIRONMEWIAL
FAMILY-HISTORY
HX
PAST-DIAQ*DSIS

*** BACTERIUM ***

ACID-FAST-BACTERIA

ACnNCMTCES
AERO-ENAS
AERCMONAS-HYERDPHILIA
ANAERDBIC-STOEFTOOOOCUS
BACILLI
BACTEROIDES
BOIULTNUM
BRXELLA
CAMFYLDBACIER<TEJUNI
CHLMttDJA
CHUttttDIft-GROUP
CITROBACIER
CTOSIRIDIUM
CLOSTRIDIUM-BOTULINUM
CIDSIRIDIUM-DIpnCILE
CLOSTRIDIUM-SORDELLII
CLOSTRIDIUM-TETANI
CX)OCI
CTOOOBACILLr
DIPEDOOOCI
E-COLI
D^TIEROEACTER
ENIZROODOCUS
FRANCISEIIA-TOIARENSIS
FUSOBACIERIUM
HEMOFHIIDS
KLEBSIELlA
LEGICMELLA
IZSTERIA-fCNOCTIOGENES
MUUnPLZ-BACIERIAIr-SPECIES
MKDBACIERIUM
MYCOBACTERIUM-TUBERCULOSIS
KYODPLASMA
NEISSERIA
NEISSERIA-GONORRHEA
NEISSERIA-MENDJGITIDIS
NOCARDIA
PASIEURELLA-MtlLIDCICA
PNEUMOOXCUS
PROTEUS
PSEUDOMCNAS
R-RICKETISII
RICKETISIAL
RICKEnSIAL-SPECIES
RICKETTSII
ROD
SAIMONELIA
SAIMONELLA-IYPHI
SPIROOiErE
STAPHYIDOCXXUS
STAPHYIIXXXXJJS-AUREUS
SIAPHYIi3COOCUS-EPIDERMIDIS
SIREPTOaXXUS
STREPIDCXXCUS-BOVIS
STREPIOOCXXUS-FBCALIS
STREPIOOOOCUS-PyOGENES
SIREFTOOOCCUS-VIRIEftNS
TREPC^Et-JA
TREPCNDA-EAIUDUM
H.TAREt.'SIS

YERSINIA._____
YERSIOTA-PESTTS

*** BEHAVIOR ***

CRYING
LAUGHING
SIGHING
USAGE
USE

*** BODY-CHEMICAL ***

LIGHT-CHAIN

*** BODY-FIDID ***

Ascrnc-FiuiD
BILE
BLOOD
CSF
LYMPH
MUCH*
MUCUS
PLASMA
PLEURAL-FLUID
SEMEN
SEFUM
SJUIUM
SWEAT
URINE
WATER

*** BODY-REGION ***

DISTRIBUTION
SOMATIC

*** BODY-SUBSTANCE ***

BREATH
COLLOID
FAT
FECES
GAS
MARROW
PIGMENT
RBC-SEDIMEOT
SECRETION

*** COLOR ***

BLACK
BLUE

BULJISH
EROWN
CLEAR
DARK
FLUORESCENT
GREEN
OPALESCENT
PINK
PURPLE
RED
RUDDY
STRAW-COLORED
WHITE
YELLOW

*** OCNDITION-OCNIEXr ***

ACTIVE
AT-REST
AWAKENING
BENDING
CONGENITAL
DEPENDENT
LEANING
RECUMBENCY
RESTING
RETIRING
SITTING-UP
SQUATTING
STANDING
STRESS
SUPINE
WHEN-EYE-OPEN

*** CONJUNCTION ***

AND
AND/OR
IN-ADDITION
OR
THAN
WHEN
WITHOUT

*** DEMOGRAPHICS ***

AMERICAN
AMERICAN-INDIAN
ARABIC
ASHKENAZI-JEW
ETHNIC-BACKGROUND
EUROPEAN
FEMALE
FILIPINO
JEW
KALE
MARRIAGE

MEXICAN
NEGRO
NORTHERN
ORIENTAL
RACE
RESIDENCE
SEX

*** DIAGNOSTIC-PROCEDURE ***

ACID-INFUSION-TEST
BATTERY
CONFIRMATION
HYDROGEN-BREATH-TEST
SCHILLING-TEST
SCHIRMER-TEST
SERIES
SLIT-LAMP-EXAM

*** DIRECT-IMAGING ***

AORTOGRAPHY
BRONCHOSCOPY
COLONOSCOPY
CULDOSCOPY
CYSTOSCOPY
ENDOSCOPY
ESOPHAGOSCOPY
LAPAROSCOPY
LARYNGOSCOPY
PERITONEOSCOPY
SIGMOIDOSCOPY

*** DISEASE ***

ABDOMINAL-ACTINOMYCOSIS
ABDOMINAL-ANGINA
ABDOMINAL-AORTIC-ANEURYSM
ACHALASIA
ACQUIRED-COAGULOPATHY
ACROMEGALIC-ARTHROPATHY
ACROMEGALY
ACUTE-OBSTRUCTIVE-NEPHROPATHY
ADDISONS-DISEASE
ADRENAL-APOPLEXY
ADRENAL-CORTICAL-HYPERFUNCTION
ADRENAL-CORTICAL-HYPOFUNCTION
ADRENAL-DISEASE
ADRENAL-MEDULLARY-HYPERFUNCTION
AFFECTIVE-REACTION
AIDS-MENINGOENCEPHALITIS
ALCOHOL-INDUCED-HYPOGLYCEMIA
ALCOHOLIC-HEPATITIS
ALDOSTERONISM
ALLERGIC-GRANULOMATOSIS
ALVEOLAR-HYPOVENTILATION-SYNDROME
ALZHEIMERS-DISEASE

AMEBIC-OOLTITS
AMEBIC-IIVER-ABSCESS
AMEBIC-MENINOOQICEFHALrnS
AlttlOIDOSIS-SYSTEMIC
AH*0TI»H£[C-IATERAIr-SCHLEROSIS
ANADSESIC-NEFHROPAIHY
ANERDGEK-INDUCED-JAUNDICE
ANEMIA
A1«INA.-PECTORIS
ANGINA-VARIANT
ANGIODYSPIASIA
ANGIOIimWBEASTIC-LSMEHADENOPATHY
ANKYLOSING-SPONDYLITIS
ANQRDOA-NERVOSA
ANTERIOR-PITUITARY-DISEASE
ANXIETY-NEUROSIS
AORTIC-DISEASE
AORTIC-DISSECTION
AORnC-OCCULBION
AORTIC-OUTFLOW-OBSTRUCTION
AORnC-REGURSrrATION
AORnC-VALVE-DISEASE
AOKnC-VALVUIAR-SIENOSIS
APIASTIC-ANEMIA
APPENDICITIS
ARTERIAL-DISEASE
ARTERIOIAR-NEfHRDSCIERDSIS
ARrERIOSCIZRDTIC-HEARr-DISEASE
ARTERICSOZKOTIC-KEriNOPAriK
ARTHRITIS
ASCENDI3«XHOIANGrTIS
ASCTTES
ASEPTIC-MENINGITIS
ASPERC-IIIDSIS
ASPIRATION-PNEUMONIA
ATELECTASIS
ATHEROMATOUS-EMBDLISM
A3RIAL-MXXOMA.
ATRIAL-SEPTAL-DEFECT
ATYPICAL-MYCOBACTERIAL-INFECTION
AUTOIMMUNE-HEMDIXTIC-ANEMIA
AUTONOMIC-NEUROPATHY
BACTERIAL-MENINGITIS
BACTERIAL-INEUhKNIA
BACTERIM^KHEUMATIC-SWDHCME
BEHCETS-DISEASE
BENIGN-RHEUMATIC-STATE
BILIARY-CIRRHOSIS
BIASTOMYCOSIS
BONE-DISEASE
BOTULISM
BRAIN-ABSCESS
BRONCHIAL-ASTHMA
BRONCHIECrASIS
BIOJC^OIAR-ALV'EOIAR-CEIIH^RCINOKA
BRONCHITIS
BRONCTOGEN^C-CARCINCMA
BRUCELLOSIS
BUBOtCIC-PIAGUE
CAKPiTOBACTER-nrrERITIS

CARB0NH3IOXIDE-NARO0SIS
CARCINOID-SYNDRCKE
CARCTNCMA
CARDIAC-CIFRHCSIS
CARDIAC-FAILURE
CARDIAC-NEOPLASM
CARDIACVEAMPONADE
CARDIOGINIC-SHOCK
CARDICMYOPAIHY
CARDIOVASCULAR-DISEASE
CARPAL-TUNNEL-SYNDROME
CAT-SCRATCH-DISEASE
CAT-SCRATCH-MENINGOENCEPHALITIS
CATATONIA
CELEAC-SFTOE
CENflRAIH^ERVOUS-SYSTEMHDISEASE
CENTRAL-NERVOUS-SYSTEM-NEOPLASM
CERAMIDE-TOIHEXCSICe-LrPOIDOSIS
CS^EBRAL-ARTERY-THRCMBDSIS
CEREBRAL-EMBOLISM
(SKEBRAIHttlARIA
CEREBRAL-^EOPIASM
CEREBRAL-THROMBOTIC-THROMBOCYTOPENIC-PURPURA
CEREBROSIDE-LIPOIDOSIS
CERVICOFACIAL-ACTINOMYCOSIS
CHILDHOOD-DERMATOMYOSITIS
CHILDHOOD-POLYMYOSITIS
CHOLANGIOCARCTNCKA.
CHOLECYSTTTIS
CHOLEDOCHOLTIHIASIS
CHDLELTIHIASIS
CHOLESTASIS
CHOLESTATIC-INFECTION
CHOREA
CHRISTMAS-DISEASE
CHRONIC-OBSTRUCTIVE-NEPHROPAIHY
CHYLOUS-ASCTTES
OOAGULDPAIHY
COCCIDIOIDCtKCCSIS
COGNITIVE-REACTION
CONC3ENITAL-HEARr-DISEASE
CONGENITAL-HEPATIC-FIBRCSIS
CONNECTIVE-TISSUE-DISEASE
CONSTRICTT\7E-PERICARDITIS
(XiRll(XSTEROID-HXPERSECRETION
CRANIAL-ARTERrnS
CRANIOPHARYNGIOKA
CRESCENDO-ANGINA
CREST-SYNDRCME
CROHNS-DISEASE
CRYOIMMUNOGLOBULINEMIC-SYNDROME
O«0PATHIC-AUT0IMMUNE--HEM0LYTIC-ANEMIA
CRYPICaXJCALrKENINGITTS
a^YPTOCOCCOSIS
a^STAL-ASSCCIATED-ARTHRTITS
C3WSTALIKE-ARTHRITIS
CUSHINGS-SYITOROME
CUTANEOUS-ATYPICAL-MYCOBACTERIAL-INFECTION
CUIAKEOUS-T-rn.IrLYMPHCMA
CYSnC-FISROSIS

CYSTITIS
CYTOMEGALOVIRUS-INFECTION
CYTOMEGALOVIRUS-MONONUCLEOSIS
CYTOMEGALOVIRUS-PNEUMONIA
DB3?EASED-RENAI/-FUNCTIGN
DBGENERATIVE-PHEUMATIC-DISEASE
CEMYEUNATING-DISEASE
DEPRESSION
DERMATOMYOSITIS
DIABEIES-INSIPIDUS
DIABEIES-INSIPIDUS-NEFHRDGENIC
DIABETES-MEHITOS
DIABETIC-KETCACIDOSIS
DIABETIC^EFHROPAIHY
DIABEnC-RETINOPAlIff
DISCJOID-UJHJS-ERyiHEMAIOSUS
DISEASE-INVOLVDIG-PIAIELEIS
DISEASE^FKINIRAL-NERVDUS-SYSTEM
DISSEMINATED-GRANULOMATOUS-DISEASE
DISSEMINATED-INTRAVASCULAR-COAGULATION
DIVERnCULTITS
DRUG-HYPERSENSITIVITY
DUBIN-JOHNSON-SYNDROME
BCIDPIC-ACIH-SYNEEOE
ECIDPIC-FREa^NCY '
EMPVIMA -
DKEFHALTTIS
ENDOCARDITIS
INDCMEJIKECSIS
ENIEROPAIHIC-ARIHRmS
BosiNOPHnic-FAScirns
EOSINOPHILIC-GASTROENTERITIS
B0SIN0PHILIC-INEUM3NIA
EPIDURAI^HEMATCMA
EPILEPSY
ERYIHEMA-NODCSUM
ERYIHROCifTOSIS
ERYTHROLEUKEMIA
ESOPKAGEAL-CANDIDIASIS
ESOPHAGEAL-DISEASE
ESOPHAGEAL-SPASM
ESIROGIN-INIXJCED-JAUNDICE
EXn^OORPUSaJIAR-HEMOLVTIC-ANEMIA
EJORAPYRAJirCftL-DISEASE
EXUnATTVE-ASCTIES
FAMIUJJj-MEDITEKHANEAN-FrVER
FAMHIAL-PSEUDOGOUT
FAScirris
FATIY-LIVER
FEL3YS-SYNIP0ME
FOCAIr-HEPATIC-PARENCHYMALr-DISEASE
FUNCnCWAIr-DYSPEPSIA
FUNGAL-MENINGITIS
FUNGAL-PNEUMONIA
FONGAL-RHEUKATIC-SYNERME
GAILBIAKER-DISEASE
GANGUON-CTST
GASTRIC-CARCBOA
GASTRIC-I2MPHCMA
GASTRIC-NEOPLASM

GASTRITIS-GIANr-HYPEKIHDPHIC
GASTHXUODENAI/-DISEASE
GASTODDUOC^IAL-PERPORATICN
GASTROENTERITIS
GASTODINrESTINAL-AMYIOIDOSIS
GASTTODTIESTINAIr^AROOIDCSIS
GIANT-CELL-ARIERITTS
GILBERTS-SYNERCME
GLCMERLJLAR-DISEASE
GLOMEFULONEPHRITTS
GIDCAGONCMA
GONOCOCCAL-ARIHRITIS
GONOCOCCEMIA
OXOPASTOHE-SYNERCME
GO7T
GCUIY-ARIHRrnS
GOUTY-NEPHROPATHY
GRAM-NEGATIVE-COCCI-RHEUMATIC-SYNDROME
GRAM-NEGATIVE-PNEUManA
GRAM-NEGATIVE-ROD-RHEUMATIC-SYNDROME
GRAM-POSITTVE-COCCI -SYNDROME
GRAM-POSmVE-PNEUMDNIA
GRANUIDCYIDPENIA
GRANUICMATOUS-ARTERITIS
GJW^UIfl^IOJS-HEPATIC-DISEASE
GRANUI£f^TOUS-UJNG-DISEASE
GRANUICMATOUS^IENINGITIS
GUILLAIN-BftRRE-SYNEEOE
GXNBOOLDGICAL-DISEASE
GYNDX»IDGICAL-NEDPIASM
HEW>ANT>-NiCK-INFECnON
HEAT-EXHMJSTION
HEAT-STROKE
HEMANGIOSARCOMA
HEMATOKGIC-DISEASE
HEMIPLBGIA-OR-HEMIPAPESIS
HEMDBIIZA
HEMOCHROMATOSIS
HEMOLYnC-ANEMIA
HEMOPHUJA-A
HEMDPHUZC-ARIHRmS
HEMOTOQRAX
HENOCH-SOKWIEIN-PURPURA
HENOCH-SCHCMJEIN-SYNERCME
HEPATIC-AMiTIDIDOSIS
HEPATIC-ARTERIAL-DISEASE
HEPATIC-ARTERY-ANEURYSM
HEPATIC-EgUTFT.TOSIS
HEPATIC-C33JGESTION
KEPATIC-E^CZPHALDPATHy
HEPATTC-FIEROSIS
HEPATIC-PC)CAL-lJODAIr-I«PERPIASIA
HEPATIC-HD-ONGIOMA
HEPATIC-mSTOPIASMOSIS
HEPATIC-IZPTOSPIRCSIS
HEPATIC-MILIARY-TUBERCULOSIS
HEPATIC-NEOPLASM
HEPATIC-h»IXilAR-P33ENERATIVT-HYPERPLASIA
HEPATIC-PARENaKKAL-DISEASE
HEPATIC-SAROOIDOSIS

HEPATIC-VASCULAR-DISEASE
HEPATIC-VASCULITIS
HEPATIC-VEIN-OBSTRUCTION
HEPATIC-WILSONS-DISEASE
HEPATITIS
HEPATOCELLULAR-ADENOMA
HEPATOCELLULAR-CARCINOMA
HEPATOCELLULAR-INFECTION
HEPATOSPLENIC-LYMPHOMA
HEREDITARY-HEMORRHAGIC-TELANGIECTASIA
HEREDITARY-HYPERBILIRUBINEMIA
HEREDITARY-NEPHRITIS
HERPES-ZOSTER
HISTOPLASMA-MENINGITIS
HISTOPLASMOSIS
HODGKINS-DISEASE
HOOKWORM-DISEASE
HUNTINGTON-DISEASE
HYDRONEPHROSIS
HYPERPARATHYROIDISM
HYPERSENSITIVITY-ANGIITIS
HYPERTENSIVE-ENCEPHALOPATHY
HYPERTENSIVE-HEART-DISEASE
HYPERTENSIVE-RETINOPATHY
HYPERTHYROIDISM
HYPERTROPHIC-OSTEOARTHROPATHY
HYPERTROPHIC-SUBAORTIC-STENOSIS
HYPERVISCOSITY-SYNDROME
HYPOCOMPLEMENTEMIC-VASCULITIS
HYPOGLYCEMIA
HYPOKALEMIC-NEPHROPATHY
HYPOPARATHYROIDISM
HYPOPROLIFERATIVE-ANEMIA
HYPOTHYROIDISM
HYPOVOLEMIC-SHOCK
IGA-NEPHROPATHY
ILEOCECAL-TUBERCULOSIS
IMMUNE-DEFICIENCY-SYNDROME-ACQUIRED
IMMUNE-HEPATOCELLUAR-DISEASE
INFECTIOUS-ARTHRITIS
INFECTIOUS-LYMPHADENOPATHY
INFECTIOUS-MONONUCLEOSIS
INFECTIOUS-RHEUMATIC-DISEASE
INFILTRATIVE-PARENCHYMAL-HEPATIC-DISEASE
INFLAMMATORY-MUSCLE-DISEASE
INFLAMMATORY-RHEUMATIC-DISEASE
INFLUENZA
INFLUENZA-PNEUMONIA
INHALATION-PNEUMONIA
INHERITED-COAGULOPATHY
INSULINOMA
INTERSTITIAL-LUNG-DISEASE
INTESTINAL-INFESTATION
INTRACEREBRAL-HEMATOMA
INTRACORPUSCULAR-HEMOLYTIC-ANEMIA
INTRAHEPATIC-CHOLESTASIS
INTRAPERITONEAL-ABSCESS
IRON-DEFICIENCY-ANEMIA
ISCHEMIC-HEART-DISEASE
JOINT-DISEASE

JUVENILE-ARIHRrnS
KftKASAKI-DISEASE
KIOiEif-AND-URINAFY-TRACr-DISEASE
KLEBSIELIA-INEUM3NIA
LACIDSE-INrOLERANCE
IARGE-BCWEL-OBSTRyCITCN
IARGE-DUCT-OBSITOCTICN
LEAD-ENCEPHALOPATHY
IZAD-NEFHROPAIHY-OiRONIC
I£N>-POISCNING
IEFT-VE27IKrOJIAR-EAIUJRE
I^CIO^EIIA-MENINGOENCEPHAIITIS
LBGIONELLCSIS
Ldtw-rtATOUS-LEFROSY
LEPRDSY
IEPIOSPIRAL-MENINGinS
IEPTOSpiRDSIS-SYSTEiaC
LEUKEMIA
IEUKEMIA-HAIRY-CZIi
LINEAR-SCLERODERMA
LTPOIDCSIS
LISIERIA-MENINGITIS
UVER-ABSCESS
LOCALIZED-DISEASE-OF-CENTRAL-NERVOUS-SYSTEM
LOCALIZED-GRANULOMATOUS-LUNG-DISEASE
LOCALIZED-INFLAMMATION-OF-LARGE-INTESTINE
IOCAIIZED-IDNG-DISEASE
LOCALIZED-PULMONARY-CONSOLIDATION
KCALIZED-SCLEfJXEIMA
LUNG-DISEASE
mroS-CEREBRITTS
LUPUS-ERYTHEMATOSUS
nJTOS-ERXTHEMATOSUS-SYSTEMIC
LUPUS-NEPHRITIS
IXME-MOHRITIS
LQE-DISEASE
LYME-MENINGOENCEPHALITIS
LYMPHOMATOID-GRANULOMATOSIS
LYMfflOPROLIFERAnVE-DISEASE
MACHDNOEftlH^RRHOSIS
MMABSORPTIC^
MAIARIA
MALIGNANT-RHEUMATIC-STATE
MALLDRY^WEISS-SYNERCME
jaNIC-DEPRESSIVE-DISEASE
MEDULLARY-CYSTIC-KIDNEY
MEIULLARY-SPCX^GE-KIIlsTY
MEGMDBLASnC-ANEKIA
MEMBRANOUS-GLOMERULOPATHY
MENINGEAL-DISEASE
KENINGEAL-NBOPLASM
MENINGICKA
MENINGOCXXXAIr-ARIHRITIS
MENINGOCOCCAL-MENINGITIS
KENINGOOOCCEMIA
METABOLIC-DISEASE
KEU3OLIC-RKEUKATIC-DISEASE
hJICRCX^OEALr-CIRRHOSIS
MIGRAINE
MINERALOCORTICOID-HYPERSECRETION

MITRAL-REGURGITATION
MITRAL-STENOSIS
MITRAL-VALVE-DISEASE
MITRAL-VALVE-OBSTRUCTION
MITRAL-VALVE-PROLAPSE
MIXED-CONNECTIVE-TISSUE-DISEASE
MIXED-CRYOGLOBULINEMIA
MORPHEA
MULTIPLE-SCLEROSIS
MYASTHENIA-GRAVIS
MYCOBACTERIAL-RHEUMATIC-SYNDROME
MYCOPLASMA-PNEUMONIA
MYELOID-METAPLASIA
MYELOPHTHISIC-ANEMIA
MYELOPROLIFERATIVE-DISEASE
MYOCARDIAL-DISEASE
MYOCARDIAL-INFARCTION
MYOCARDITIS
NARCOLEPSY
NECROTIZING-VASCULITIS
NEOPLASM
NEOPLASTIC-PULMONARY-DISEASE
NEPHRITIS
NEPHROLITHIASIS
NEPHROTIC-SYNDROME
NEUROLOGIC-DISEASE
NEUROTIC-REACTION
OBESITY
OBSESSIVE-COMPULSIVE-NEUROSIS
OBSTRUCTIVE-LUNG-DISEASE
OBSTRUCTIVE-NEPHROPATHY
OLIGOARTICULAR-PSORIATIC-ARTHRITIS
OSTEITIS-DEFORMANS
OSTEOARTHRITIS
OSTEOCHONDROMATOSIS
OSTEOMALACIA
OSTEOPOROSIS
OVERLAP-SYNDROME
PANCREATIC-CHOLERA
PANCREATIC-DISEASE
PANCREATIC-PSEUDOCYST
PANCREATITIS
PARALYSIS-AGITANS
PARAPARESIS
PARAPLEGIA
PARASITIC-RHEUMATIC-SYNDROME
PARATHYROID-DISEASE
PARATHYROID-HYPERFUNCTION
PARATHYROID-HYPOFUNCTION
PAROXYSMAL-NOCTURNAL-HEMOGLOBINURIA
PATENT-DUCTUS-ARTERIOSUS
PELIOSIS-HEPATIS
PELVIC-ACTINOMYCOSIS
PELVIC-INFECTION
PELVIC-INFLAMMATORY-DISEASE
PEPTIC-ULCER
PERICARDIAL-DISEASE
PERICARDIAL-EFFUSION
PERICARDIAL-INFECTION
PERICARDITIS

EERICHOIANGITIS
PERIPHERAL-NERVOUS-SYSTEM-DISEASE
PERIPHERAI/-NEURDPA1HY
PERIPHERALrOSTEQftRIHRriTS
FEKEFHERAIrVASCUIARHDISEASE
HMP0BIAL-SINUSOIEAIH5IIAEATI0M
PERITONEAL-DISEASE
PERTICNEAL-NEOPLASM
PERITONITIS
PEFNICICUS-ANEMIA
PHBOCHRCMXYKMA
PHLEGMASIA-CERULEA-DOLENS
FHDBIC-NEURDSIS
PnUITftPY-CUSHINGS-SYNCRCME
Pl'lUl'IARY-DISEASE
PITUITARY-HYPOTHYROIDISM
PLAGUE-MENINGITIS
PIASUE-PNEIMDNIA
PIASMAH31L-DYSCRASIA
PLASMA-CELL-MYELOMA
PIEURAL-DISEASE
PLEURAL-EFFUSICN
PLEURAL-MALIGNANT-MESOTHELIOMA
PNEUMOOCXXAIHffiNINGITIS
PNEUMOCOCCAL-PNEUMONIA
PNEUMOOONIOSIS
PNEUMOCiTSnS-PNIOCNIA
H^EUMONIA
FNELJMOIHORAX
POLiARIERmS^ODCSA
POLYARTICULAR-PSORIATIC-ARTHRITIS
POIXCXSTIC-LIVER-DISEASE
POLYCiTSnC-RENAL-DISEftSE
POI^CYIHEMIA-VERA
POLYMALGIA-RHEUMATICA
POLXMXALGIA-RHEUhSATICA
POLYMYOSITIS
PORPHYRIA
PCKEAL-HYPERTENSION
PORTAL-VEIN-OBSTRUCTION
POSTEJ^IOR-Pl'lUrJARY-DISEASE
PREQ^NSY-TOXEMIA
PRERENALr-AZOTEMIA
PRESINUSOIEAL-PORTAL-HYPiKi'iNSICW
PROGRESSIV'E-SYSTEMIC-SCLEROSIS
PROLACITNCMA
PROTEIN-LOSING-ENTEROPATHY
PROTOZCAN-PKEUMCWIA
PSEUDOGOUT
PSEUDCHYPOPARATHYRDIDISM
PSEUDOKEMESyiNOUS-OOLrriS
PSEUDOPSEUIXHYPOPARAIHYROIDISM
PSITIACX3SIS
PSCJRIASIS
PSORIATIC-AKIHRrnS
PSYCHIATRIC-DISEASE
PULMONARY-ABSCESS
FUUO^ARY-ALVEOLAR-PHOTEI>JCJSIS
PUI>ENARY-ANTHRACOSIS
PULhKKARY-ASBESTOSIS

KJLMONARY-ASPERGILLOSIS
PULMONARY-ATYPICAL-MYCOBACTERIAL-INFECTION
HJUdKARY-CANDIDIASIS
KJIMDNftRY-OONGESTICN
EUIMQNARY-CSYPIOO0O00SIS
RJDBNARY-DISEASE
EUIM3NARY-EMB0LIC-DISEASE
TOIMONARY-EMBOLISM
HJUENARY-EMFHYSEMA
FUIMDNMW-HISTIOCnOSIS
EUIMDNARY-HYPERTENSICN
FUIM3NARY-INFARCTICN
RJUCNAPY-INIERSTITIAL-FIBRDSIS
PULMONARY-LYMPHOMA
PULMONARY-MALIGNANT-NEOPLASM
PUDCNARY-NOCARDIOSIS
HJIMDNARY-THRCMBOEMBOLISM
IUUJONARY-VASCUIAR-DISEASE
PULMONARY-VENO-OCCLUSIVE-DISEASE
roiMONIC-OUTFTJDW-OBS'IHJCriCN
PULMONIC-VALVULAR-STENOSIS
PiTELCNEEHRITIS
PiTIDRIC-OBSTFUCTICW
JYOGENIC-LTVER-ABSCESS
PXROGENIC-SHOCK
RAYNAUDS-DISEASE
REELUX-ESOHaGmS
REGIONAL-VASCULITIS
RETTER•S-SYNDRCME
RETIERS-DISEASE
REIAPSING-PANNICUIinS
RELAPSING-PDLYCHONEKrriS
RENAL-AMYLOIDOSIS
RENAL-ARIZRY-STENOSIS
RENAL-CELL-CARCINOMA
HENAL-CYSnC-DISEASE
RENAD-FAILURE
RENAL-INFARCTION
RENALrXNTERSnTIAL-DISEASE
RENAL-INTERSTITIAL-SARCOIDOSIS
RENAL-IZPTOSPrSOSIS
RENAL-NEOPIASM
RENAL-THROMBOTIC-THROMBOCYTOPENIC-PURPURA
RENW>TUBSROJIOSIS
RENJ^Lr-IÜrULAR-ACIDOSIS
RENAIrTOBUIAR-DISEASE
RENAL-VASCUIAR-DISEftSE
RENALr-XTiSaJLITIS
RENAL-VEIN-THROMBOSIS
RESIRICNVE-PERICARDIAIR-DISEASE
RETHJOPAIHY
PHEUKATIC-AKTHRrnS
RHEUMATIC-CARDITIS
RHEUMATIC-DISEASE
RHEUKATOID-ARTHRITIS
RHDWCEREERAIrMUCDRMyCOSIS
RICKETTSIAL-MENINGOENCEPHALITIS
ROCKY-MOUNTAIN-SPOTTED-FEVER
RUPTURED-MITRAL-CHORDAE-TENDINEAE
RUPTURED-MITRAL-PAPILLARY-MUSCLE

SALT-LOSING-NEPHRITIS
SAROOIDOSIS
SCHATZKES-RING
SCHISTOSCMIASIS
SCHEZOCynC-HEMDLniC-ANEMIA
SCHIZOPHRENIA
SCLERODERMA
SOZROSING-CHOIANGinS
SCURVY
SELIAR-TUMOR
SERDNBGATIVE-ARIHRrnS
SERONEGATIVE-RHEUMATOID-ARIHRITIS
SEROPC6rrTVE-RHEUMATOID-ARIHRrriS
SEBUM-SICKNESS
SHOCK
SICKLE-CELL-ANEMIA
SIDEK3BIASTIC-ANEMIA-ACQUIRED
SINUSITIS
SINUSOIDAL-OR-POSISINUSOIDAL-PORTAL-HYPERTENSION
SJOGRENS-SYNTKCME
SKIN-DISEASE
SMAIl^BCWEL-OBSiroCITCN
SMALL-INTESTINAL-LYMPHOMA
SMALI^INrESTINAL-NBOPIASM
Sa-RTIZATICN-DISC^DER
SHCNGCMyELIN.-LIPOIDOSIS
SPINAL-COHD-DISEASE
SPINAIXDRD-NEOPLASM
SPINAL-CQRD-TOMOR
SPINAL-OSIBQARIHRrTIS
SPIROCHAEIM/-MENINGrriS
SPIROCHETAL-RHEUMATIC-SYNDROME
SPIZNIC-DISEASE
SPLENIC-INFARCTICN
SPONDYLARIHRrnS
SPONGIPOR4-ENCEPHALOPA3HY
STAPHyLOCOCCAL-PNEUJCNIA
STAPHYIDCXXC3d>SCARLET-EEVER
STREPIOCOCCUS-PYOGENES-PNEUM2NIA
STRICOTREHDF-BILE-CUCT
STRUCTORAL-DISORDER-OF-CARDIAC-FLDW
SUBARACHNOID-HEMORHHAGE
SUBDURAL-HEMATCMA
SUBFKRENIC-ABSCESS
SUPERIOR-^ffiSD'JrERIC-ARrERSf-IliSUFFTCIENaf
SUPERIOR-MESENTERIC-VEIN-THROMBOSIS
SYDENKA!«!S-CHOREA
SYNOVTU^L-SARCOMA
SYPHILIS-SECaCARY
SYPHILITIC-CIRRHOSIS
SYPHILITIC-MENINGITIS
SYRINGOMYELIA
SYSTEMIC-BACIE^IAL-INFECTION
SYSTH<C[C-DISEASE
SYSTEXIC-FUNGAL-INFEXrnON
SYSTEiaC-INTECTION
SYSTEMIC-INFESTATION
SYST2<IC-UJPUS-ERYTHEMATOSIJS
SYSTE^aC^«Ct)B^CTERIAL-INFECTION
SYSTE<IC-ONSEr-JU\'ENILE-ARTHRrnS

SYSmaC-POISCNING
SYSHMIC-HOTOZQM^INEEJCTICN
SYSTEMIC-RICJCBnSIAIr-INEEJCTION
SYSTEMIC-SCLEROSIS
SYSTEMIC-SPIKCICHEIM^INFEXniCN
SYSTEMIC-VIRAL-INFEJCTICN
TAKAYASUS-AF3ERITTS
TETANUS
THORACIC-ACTINOMYCOSIS
THORACIC-ECHINCWXJCOSIS
IHRCMBOCyiHEMIA-IDIOPAaHIC
THRCMBOCYIOPENIC-PtJRPURA
THRCMBOPHLEBrnS
THROMBOTIC-THROMBOCYTOPENIC-PURPURA
THYROID-ANAPLASTIC-CARCINOMA
UttROID-DISEASE
THYRDID-HyPEPfUNCnCK
U&KOID-HVrPORJNCTION
THYROID-MEDULLARY-CARCINOMA
THYROID-NEOPLASM
THYROID-PAPILLARY-CARCINOMA
THXROIDITIS
UKRDTOXIC-HEARr-DISEASE
UKROTOXIC-STQRM
TOXEMIA-OF-PREGNANCY
TOXIC-CHOLESTATIC-DISEASE
TOXIC-HEPAIDCELIUIAR--DISEASE
TOXOPLASMA-MENINGOENCEPHALITIS
TOXOPLASMOSIS

TRANSVERSE-MYELITIS
TE^CHINEIIAHffiNINGOENCEESALITIS
TRICHINOSIS
TRICUSPID-REGURGnATICN
TRICUSPID-STENOSIS
TUBERCUIDID-IEFROSY
TUBERCUIDSIS
TUBERCULOUS-LYMPHADENITIS
TUBERCULOUS-MENINGITIS
TUBERCULOUS-PERICARDITIS
TUBERCULOUS-PERITONITIS
TUBEKCUIOUS-PIZURISY
TUBULAR-NECROSIS
TULAREMIA
TUIAREMIA-KENINGnTS
TYPHOID-FEVER
ULCERATn-E-COLITIS
URINARy-TRACr-INFECTION
VASOUIAR-DISEASE
VASCUUTTS
VENOUS-DISEASE
VEWTRiaJIAR-ANEURYSM
VHTO^CUIAR-SEPTAIr-DEFECT
VERTEBRAL-BASILAR-ARTERY-INSUFFICIENCY
VIRAL-PNEUMONIA
VIRAL-RHEUMATIC-SYNDROME
VTIAKIN'-DEFICIEIJCY-DISEASE
VON-WILLE3RANDS-DISEASE
WALDENSTROMS-MACROGLOBULINEMIA
WEBER-CHRISTIAN-DISEASE

KEGENER[1]S-GRANUKMATOSIS
WHIPPIE' S-DISEASE
ZOIIINGER-ELLISON-SYNCRCME

*** ER^AMNISTRATICN-PROCEDURE ***

DfUNIZATION
INOCCUIATICN
IV
VACCINATION

*** EHUG-SUBSTftNCE ***

ACETAMINOPHEN
AMTNOGLYODSIEe
AMINOPXRINE
MffL-NTIRTIE
ANAI£ESIC
ANERDGEN
ANTACID
ANTIOQAGUIANT
ASPIRIN
BARBnURATE
ERCMIDE
BSP
CAPTOPRIL
CARBAMAZEPINE
CEHiALDSPORIN
CHI£SRAMPHENIOOL
CHIDROQUINE
CUNEAMYCIN
CLCMIffKEJJE
C3OLCHIC3NE
OONIKACEPTIVE
CYCLDSERINE
DEXAMETHASONE
DIURETIC
DOCA
EDROPH^IUM
ERGOWVINE-MAIZATE
ERGOT
FENOPROFEN
GOLD-PREPARATICW
HAI0IHANE
HEPARIN
HYDRAIAZDJE
INHIBITOR
IODINE
IPECAC
ISONIA2ID
ISOPROTERENOL
IAXATIVE
LINCa>IYCIN
LITKIUM
KEIHOTREXAIE
hEIHYLDOPA
KEIHi'SERGIDE
METYRAPONE

MONOAMINE-OXIDASE-INHIBITOR
MORPHINE
NALPON
NICOTINE
NTIRDFURANIOIN
NTIROGLYCERIN
PENICHIAMINE
PENICILLIN
PENIAGASTOIN
FHENINDIONE
FHENOTKEAZINE
PHENYLBUTAZCNE
PHENYIEFHRINE
FHENXTOIN
PRDBENECID
PROCAINAMIDE
PYRAZINAMIDE
PYRIMETHAMINE
QUINIDINE
QUININE
RADIOIODINE
STEROID
SUIPONAMUS
TENSHXW
TETRACYCLINE
THIAZIDE
1HICIURACIL
THOROTRAST
TNG
TOLBUTAMIDE
TRIAMTERENE
Ti!RAMINE
VASOH^ESSIN
VDTCRISTINE

*** mOKXSICAIrEACiaR ***

BOIULINUM-TOXIN

*** EVAUJATED-ATTRIBUTE ***

A-WAVE
ABILITY
ABSTRACT-THINKING
ACIDITY
ACTIVITY
ACUITY
ADHESIVENESS
AFFECT
AGE
ALFHA-RHYTHM
ALTITUDE
AMOUNT
AMPLITUDE
ANGLE
AP-DIAMETER
APPEARANCE
APPEnTE

ARTERIAL-PRESSURE
AURA
AXIS
BINDING
BINDING-CAPACnY
CALIBER
CAPACnY
CARDIAC-SHHOUETTE
CELLULARITY
CHARACTER
CLEARANCE
OCMPATIBILnY
COMPLIANCE
CONCENTRATION
CONSCIOUSNESS
CONTENT
CONTOUR
COUNT
DE!CISION-45AKING-ABILnY
DENSITY
DEPIH
DIAMETEK
DIET
DIFFERENCE
DIFFUSION-CAPACITY
DIRECTION
DISTANCE
DOSE
DURATION
ECHOGENICITY
EKG-VOLTAGE
END-DIASTOLIC-roESSURE
EVOKED-POTENTIAL
FEAIURES
FLEXIBILTIY
FOCI
FORCH>-VrrAL-CAPACITY
FREQUENCY
FREQUENCY-POTENTIAL
GAIT
HABITUS
HEART-IMPULSE
WEIGHT
IDEAS
IMPEDANCE
INDURATION
INSIGHT
INSPIRATORY-DEPTH
INTENSITY
INTER\7vL
JUDGEMENT
IZNGTIH
LEVEL
LIBIDO
LIGHT-TOUCH-SENSATION
LUCENCY
MAGJ^ITUDE
KASS
MCH
MCHC

MCV
MEAN
MENTATION
MORPHOLOGY
MOTOR
MOTOR-ACTIVITY
MOVEMENT
OCCLUSIVE-IMPEDANCE
ODOR
OSMOLALITY
OSMOTIC-FRAGILITY
OUTPUT
OXYGEN-DIFFERENCE
P-WAVE
P2
PALMOMENTAL-REFLEX
PIGMENTATION
POLYPHASIC-POTENTIAL
POSITION
POSTURE
POTENTIAL
PR-INTERVAL
PRESSURE
PRESSURE-GRADIENT
PULSE
Q-WAVES
QRS
QRS-WAVE
QT-INTERVAL
QUANTITY
RANGE-OF-FLEXION
RANGE-OF-MOTION
RANGE-OF-ROTATION
RATE
RBC
REASONING
RELATIVE-COUNT
RESIDUAL-VOLUME
RESISTANCE
RESISTANCE-TO-FLEXION
RESONANCE
RESPONSE
RESTING-PRESSURE
RHYTHM
ROTATION
SANITATION
SATURATION
SENSITIVITY
SEPARATION
SEQUENCE
SEVERITY
SILHOUETTE
SIZE
SPECIES
SPECIFIC-GRAVITY
SPEECH
ST-SEGMENT
STATURE
STRENGTH
T-WAVE

TASTE
TEMPERATURE
TENSION
TEXTURE
THICKNESS
THOUGHT-CONTENT
TIME
TITER
TOLERANCE
TONE
TOTAL
TYPE
UPTAKE
V-WAVE
VALUE
VARIABILITY
VARIATION
VASCULARITY
VELOCITY
VENOUS-PRESSURE
VISCOSITY
VISUAL-FIELD
VISUALIZATION
VITAL-CAPACITY
VOCAL-FREMITUS
VOLTAGE
VOLUME
WAVE
WAVEFORM
WAVES
WBC
WEDGE
WEDGE-PRESSURE
WEIGHT

*** EXTRACTION-PROCEDURE ***

ASPIRATE
ASPIRATION
OBTAINED
WASHING

*** FLUID-EXTRACTION ***

ARTHROCENTESIS
CATHETERIZATION
PARACENTESIS
PERICARDIOCENTESIS
THORACENTESIS

*** FOOD-SUBSTANCE ***

ALCOHOL
ASCORBIC-ACID
BEEF
CALCIUM
COFFEE

COFFEE-GROUND
FISH
FRUITS
IRON
MEAT
MHX
MUSHROOM
ONION
PORK
POTASSIUM
PROTEIN
SODIUM
VEGETABLES
WATER

*** FUNGUS ***

ASPERGILLUS
BLASTCMYCES
CANDIDA
OOCCIDIOIDES
CRYPTOCOCCUS
HISTOPIASMA
MUCOR

*** GENERAIr-INSTRUMENT ***

LAMP

*** GENERAL-SUBSTANCE ***

ACID
CARBON
CARBON-DIOXIDE
ION
LIQUID
MATERIAL
SALT
WATER

*** GENERIC-BODY-CHEMICAL ***

AGGLUTININ
ANTIBODY
ANTIGEN
ANTITOXIN
COMPLEMENT
ENZYME
FACTOR
HETEROPHILE
HORMONE
PEPTIDE
PROTEIN

*** GRAMMATICAL-MARKER ***

BEING
LIKE
OTHER
PER
TIMES

*** GBOSS-PATHOIOGIOVIr-STHLJCTURE ***

ABSCESS
ANEOKYSM
ANGIOKERATCMA
ANGIOMA
BULIA
BULZAE
BURN ^
CALCULI
CALCULUS
CAST
CATARACT
CHOCOLATE-CYST
CLOT
COTOYLCMA-LATUM
ODRKSCREW-VESSEL
CRATER
CYST
DE5CUBnUS-ULCER
DENSITY
DIVERTICUIA
EDEMA
EXOSTOSES
EXOSTOSIS
EASCICUIATION
PASCICUIATICNS
FBCALITH
FIBRCMA
FISTUIA
PDREIQT-BODY
FRACTURE
RMJNCLE
GOITER
GYRATE-LESION
HEMKDQMA
HUMP
HYEftTIDIFORM-^IOLE
INDENTATION
JANEWAY-LESION
KAPOSI-SAROCMA
KNOB
IACERATION
LESION
LESIONS
MACU1E
MALP0R-5ATTON
MARKING
MASS
METAMORIHOSIS
MOLE
NEUROFIBROKA

OSTEOPHYTE
PAHJLE
PETECHIAE
PEACENIAL-FBAQIENr
FNEUMATOCELE
HSXJMA3O00ELE
POLYP
POOL
PROMINENCE
PROTRUSION
PSEUDOFKACIURE
PUSTULE
SARCOMA
SCARS
SCRATCH
SHUNT
SPIEER-ANGIOMA
SPOT
SPUR
STAR
STONE
STRIAE
SWELLING
SYNDESMDPHYTE
TELANGIECIASIA
THROMBUS
TOPHUS
TUMEFACTION
ULCER
VARICES
VARICOSE-VEEN
WEB
WOUND
XANTHOM&

*** HISTOIDGIC-PAraODDGICAL-STRUCIURE ***

ACANTHOCYTE
ANISOCYTE
BLAST
CHARCOT-IEYEOJ-CRYSTAL
DI\'ERTiajnJM
EM90LI
EMBOLUS
GRANULE)
GRANULOMA
HYALINE-MEMBRANE
HYALENE-THRCKBI
HYPHAE
INCUJSION-BODIES
BORANUOEAR-INCLUSION-BODIES
MALIDRY-BODY
MICROANEURYSM
MYCELIA
NUCLEI
OVA
PHIIAKXPHIA-CHRa-JOSa>E
PINGUECUIAE
PIAQUE

PROJECTION
PSAMCMA-BODY
PSEUDCMEMBRANE
ROUIZM3X-P0BMATION
SCmZONT
SENILE-PLAQUE
TANGLES
TOPHI
TUBERCLE

*** INDIRBCr-IMftGING ***

ANGIOCARDIOGRAPHY
ANGIOGRAPHIC
ANGIOGRAPHY
AKTERI0GRAPHY
BARIUM-ENEMA
BftRIUM-MEAL
BftRIUM-SIUEW
BftRIUM-SKALIDW
BRCWCHOGRAM
CHOLANGIOGRAFHY
CHOLBCXSTOGRAIHY
CHOIESCINrnGRAHff
CISTEBNCXSRAHK
COMPUTERIZED-TOMOGRAPHY
OONERAST

ECHOCARDIOGKAHff
ENHANCEMENT
FWORDSCDPt
IffSTEROSALPINQOGRAHK
IVP
IXMEHANGIOGRAIHCC
LYMPHANGIOGRAPHY
MAMMXRAHtt
MYELOGRAM
MXELOGE^AHGC
MifELOGRAHff
NEFHROGRftM
NEEHHOTOMOGRAFHY
PANO^EAIOSRAFHY
PULMONARY-ARTERIOGRAPHY
PYEKXSRAM
PYELDGRAFHY
RADIOGRAFHIC
RADIOISOTOPE-SCAN
SCAN
SIAIDGRAFHY
TCI«iOGRAJHY
ULTRASONOGRAPHY
VENOGRAPHY
XRAY

*** DTOTVIDUAL-Nl^SER ***

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HUNDRED
THOUSAND
TWO

*** INSTRUMENT ***

DEVICE
INSTRUMENTATION

*** IAB-ASSAY-PROCEDURE ***

ANERGY-PANEL -
DftRKTTIIi>EXAMINATION
EIECTROPHOKESIS

*** IAB-PROCEDURE-SUBSTANCE ***

BARIUM
BIASTOMTCTN
BUTTY-COAT
OXJCIDIOIDIN
OOIIDID
E-ANITGEN
EDTA
FHIERATE
FIIJORESCEI^r-ANnBODY
HBCAG
HBEAG
HESAG
HEMATOXYLTN
HISTOPIASMIN
1131
INDIA-INK
INDIUM
INDOCXANINE
ISOTOPE
IVP-DYE
LEPRCMIN
O-ANTIGEI
PAS
PHEOTOLAMINE
PROTAMINE
RADIATION
ROSE-BENGAL
SUDAN
SUDAN-STAIN

TEARDROP
TECHNETIIM-99M
TUBERCULIN
XYLOSE

*** MACRO-BOOT-PART ***

ANKLE
AORTA
AORTIC-VALVE
ARM
ASCENDING-THORACIC-AORTA
ATRIUM
BTT.TARY-TRACT
BOWEL
GRAIN
BREAST
HJTIOCK
CALF
CALVARIUM
CAROTID-SINUS
CAROTID-SIIHON
CECUM
CERVICAL-SPINE
CERVIX
CLITORIS
COLON
CONJUNCTIVA
CORNEA
IXSCENDING-THORACIC-AORrA
DIAPHRAO!
CUODENUM
EAR
EARLOBE
ENDOMETRIUM
EPIDIDYMIS
ESOFKAGUS
EXTERNAL-CAROTID-ARTERY
EYE
EYE-LID
FALLOPIAN-TOBE
FEET
FEMUR
FLANK
FOOT
FOREHEAD
GALLBLADDER
GINGIVA
HAND
HEAD
HEART
HEEL
HEPATTC-ARTERY
HEPATIC-\'EIN
HUMERUS
ILEUM
IKFERIOR-\'ENA-CA\'A
INNOMINATE-ARTERY
INnKCOSTAL-ARTERY

INTERVERTEBRAL-DISC
INTESTINE
IRIS
JAW
KIDNEY
KNEE
LACRIMAIrGLAND
IAM3NA-DURA
LARYNX
LEFT-VENTRICLE
LEG
LEG-VEIN
LIVER
LUMBAR-SPINE
LUNG
MAIN-PUIM3NARY-ARTERY
MAJOR-BILE-DUCT
MANDIBLE
MASSETER
MASTOID
MESENTERIC-VEIN
MTTRAL-VALVE
NECK
NIPPLE
NOSE
OLECRANCN
OPITC-^ISC
OVKPX
PANCREAS
PANO?EAnC-DUCT
PAROTID-DUCT
PAROTID-GLAND
PELVIS
PENIS
PERICARDIUM
PERITONEUM
PHARYNX
PINEAL-BODY
PLACENTA
PLEURA
PORTAL-VEIN
PROSTATE
PUIMONIC-VALVE
PUPIL
RECTUM
RENAL-VEIN
RETINA
RIB-CAGE
SACRDILIAC-JOINT
SCALENUS
SCALP
SCROTUM
SELLA-TURCTCA
SHOULDER
SKCN
SKULL
SMALL-BILE-DUCT
SMALL-INrESTINE
SMALL-TOE
SPKENOID-RIDGS

SPINAL-CANAL
SPINAL-CORD
SPLEEN
SPLENIC-ARTERY
SPLENIC-VEIN
STERNUM
STOMACH
SUBCLAVIAN-ARTERY
SUBMANDIBULAR-GLAND
SUPERFICIAL-ARTERY
SUPERIOR-ARTERY
SUPRASTERNAL-NOTCH
TABLE
TESTIS
THYROID
TONGUE
TRACHEA
TRAPEZIUS
TRICUSPID-VALVE
TRUNK
UMBILICUS
URETER
URETHRA
URINARY-BLADDER
UTERUS
VAGINA
VENA-CAVA
VENTRICULAR-SEPTUM
VERTEBRAL-CANAL
VOCAL-CORD
WRIST

*** MACRO-BODY-REGION ***

ABDOMEN
ABDOMINAL
ACROMIOCLAVICULAR
ADRENAL
ADVENITITIAL
AIRWAY
ALVEOLAR
ANAL
ANO
ANTRAL
AORTIC
APOPHYSEAL
ARTERIAL
ARTERIOLAR
ARTERIOVENOUS
ARTICULAR
ATLANTO-OCCIPITAL
ATRIAL
ATRIOVENTRICULAR
AURICULAR
AXILLARY
BACK
BILIARY
BITEMPORAL
BRACHIAL

BRONCHIAL
HRCNCHOHEPATIC
BULBAR
CALCANEAL
CALYCEAL
CARDIAC
CARDIOPUIMDNARY
CAROTID
CARPOPEDAL
CFT..TAC
CEREBELLAR
CEREBRAL
CERVICAL
CERVIOODORSAL
CHEST
COI0VESICAL
OORNEAL
COROMARY
CCSOICAL
OOSTOCHONERAL
COSTOVERTEBRAL
CRANIAL
CREMASTERIC
CUIANEOUS
DENIAL
DEFMAL
DERMATCMAL
DIAFHRAOftTIC
WODEXkL
ENDOHROCHIAL
ENTERIC
ENTEROCUIANEOUS
ENTEROENTERIC
EWTEROVAGINAL
ENTEROVESICAL
EPICARDIAL
EPIDERMAL
EPIGASTRIUM
ESOPHAGEAL
EXDCRINE
EXTRAHEPATIC
EXTRAIIMINAL
EXTRAMEDULLARY
EXIRAOCUIAR
EXTRAPELVIC
DCIRAPERITONEAL
DCIRARECTAL
EXTRAUTERINE
FACE
FACIAL
FACIES
FEMDRAL
GASTRIC
GASTROCOUC
GASTROINrESTINAL
GIABELLAR
GLUTEAL
GROIN
HEPATIC
HEPATICALLY

HEPATQJUGUIAR
HEPATOSPLENIC
HIATAL
HUAR
HYPOGASTOIUM
ILEAL
ILEOCECAL
ILIAC
ILIOFQERAL
INFUNDIBULAR
INGUINAL
INTERCOSTAL
INIEROSSEOUS
INUPPEDICUIAR
IKTERHiAIANGEAL
INTERSCAHJIAR
INTERVERTEBRAL
INTESTINAL
INIEACEREBRAL
INTRACRANIAL
INTRAHEPATIC
INTRALUMINAL
INTRAMURAL
INTRAPARENCHYMAL
XNIRAPERITCNEAL
INIRAPECIAL
INIRAIHQRACIC
INTRAUTERINE
INIKWASCUIAR
IOTRAVENOUS
INIRAVENIRIOJIAR
JUGUIAR
IACRIMAL
LOBAR
LUMBAR
LUNG-FIELD
LOCSATIC
KALAR
MANDIEUIAR
MEDIASTINAL
MEOJLLARY
MESANGIAL
MESENTERIC
METACARPAL
METACARPOFHALANGEAL
METAIARSAL
METATARSOPHALANGEAL
MITRAL
MX^IH
MUCOSAL
MYOCARDIAL
KASAL
NASOFHARWGEAL
NEUROLOGIC
NODAL
OCULAR
OLFACTORY
OPTIC
ORAL
ORBITAL

OVARIAN
PALATAL
PALM
PALMAR
PANCREATIC
PARA-AORTIC
PARAORTIC
PARASTERNAL
PARATRACHEAL
PARAVERTEBRAL
PARENCHYMA
PARENCHYMAL
PARENTERAL
PAROTID
PATELLAR
PEDAL
PELVIC
PERIANAL
PERIAPICAL
PERIARTICULAR
PERICARDIAL
PERIHILAR
PERINEAL
PERINEUM
PERIODONTAL
PERIORAL
PERIORBITAL
PERIPORTAL
PERIRECTAL
PERITHYROID
PERITONEAL
PERITONSILLAR
PERIUNGUAL
PERIVASCULAR
PINEAL
PLACENTAL
PLANTAR
PLEURAL
POLYARTICULAR
POPLITEAL
PRECORDIAL
PRETIBIAL
PROSTATIC
PUBIC
PULMONARY
PULMONIC
RECTAL
RENAL
RETINAL
RETROBULBAR
RETROPERITONEAL
S1
S2
S3
S4
SACRAL
SACROILIAC
SADDLE-AREA
SCAPULAR
SCROTAL

SELLAR
SEPTAL
SEROSAL
SKELETAL
SKIN-TO-rtJSCLE
SOLE
SPINAL
SPLENIC
STERNAL
STERNCMASTOID
SUBARACHNOID
SUBCHOMERAL
SUBCLAVIAN
SUBCUTANEOUS
SUBDIAPHRAQ4ATIC
SUBEPrTHELIAL
SUEtKALOID
SUH^ANDIBULAR
SUBFERIOSTEAL
SUBS1ERNAL
SUFRAOAViaJLAR
SUFRAPUBIC
SUPRARZXAL
SUPRASELLAR
SUTOASTERNAL
SUFRAVENIRICULAR
SURAL
TEMPORAL
TH4PCRCMANDIBULAR
THD^AR
raoRAcic
1HRQAT
TRACHEAL
TRANSERDNCHIAL
TRANSIRACHEAL
TRANSUREIHRAL
TRUNCAL
ULKAR
IMBILICAL
URETERAL
URETERO
URETERO-PELVIC
UREIHRAL
URINARY
URINARY-IRACT
VAGINAL
VALVULAR
VASCULAR
VENOUS
VENTRICULAR
VERIEBRAL
VESICULAR
VISCERAL
VTIREOUS
VULVAR

*** KACRO-BODY-SIRUCIURE ***

ACHILLES

ALVEOLI
ALVEOLUS
ANNULUS
ANTRUM
ARCH
ARTERY
BILE-DUCT
BLADDER
BONE
BRANCH
BRIDGE
BULB
BURSA
CANAL
CARTILAGE
CAVITY
CHAMBER
COLUMN
COMMUNICATING-CAVITY
CORD
CORTEX
CRYPT
DECIDUA
DIPLOE
DISC
DUCT
EDGE
EXTREMITY
FASCIA
FILM
FINGER
FOLD
FOLDS
FORAMEN
GENTTALLA.
GIRDLE
GLAND
GLOMERULI
HAIR
HAUSTRA
HEART-VALVE
HILUM
HIP
IOTE3KDSTAL-SPACE
JET
JOINT
KNUCKLE
LAMINA
LEAFLET
U P
LOBE
LONG-BONE
LOOP
LUMEN
LYMPH-NODE
LYMPHOID
MARROW
MATRIX
MUCOSA
M0COUS-MEM3RANE

MUSCLE
NAIL
NODE
ORGAN
ORIFICE
OUTLET
PAD
PAPILLA
PAPILIA-OF-VATER
PHALANGES
PHALANX
PROCESSES
RIB
RIDGE
RING
ROOT
RUGAE
SADDLE
SEAM
SEPTUM
SEROSA
SHEATHING
SHELF
SHIN
SINUS
SIPHON
SMXTH-MUSCLE
SOFT-TISSUE
SPACE
SPHINCTER
SPINE
SUTURE
SYMPHYSIS
SYMPHYSIS-PUBIS
SYNOVTUM
TAIL
TEETH
TENDON
THIGH
TISSUE
TOE
TONSIL
TOOTH
TRACT
TUBE
TUFT
TURBINATE
UPPER-RESPIRATORY-TRACT
VALVE
VEIN
VELLUS
VENIKTCLE
VESICLE
VESSEL
VESSELS
KALL

*** MACRO-ORGANISM ***

ANIKAL
ASCARIS
BEE
BIRDS
CAT
DHHYLLOBOTHRIUM
DOG
FISH
HOOMOW
INSECT
IXODES
LARVA
MAMMALS
NEWBORN
OFFSPRING
POISON-IVY
RABBITS
RODENTS
SHELLFISH
SNAKE
TICK

*** MEDICAIr-INSTFDMENT ***

INTRAUIEECCNE-DEVTCE
NEEDLE

*** MEDICALr-FRXEDURE ***

ABOPTICN
ANESTHESIA.
INSUFFLATION

*** META-LANGUAGE ***

ACTION
ASSAY
BACKGROUND
BACTERIA
BACTERIUM
BEHAVIOR
BODIES
BODY
COLOR
CONFIGURATION
DIAGNOSTIC
DIRECT
DISEASE
DRUG
EXAM
EXAMINATION
FLUID
FOOD
FUNGUS
GENERAL
GROSS
IMAGE

IMAGING
IMAGDK3-TEEHNIQUE
MENIAL
OOOJPATICN
OCCUPATIONAL
ORGANISM
PART
PATIENT
PATTERN
PROCEDURE
QUALITY
RATIO
RELATIVE
SENSATION
SHAPE
SHAPED
SIGN
SOUND
SPECIFIC
SUBSTANCE
SURGERY
TEMPORAL
TEST
THERAPY
UNIT
VIRUS

*** MICRO-BODY-PART ***

ASCHOFF-RDKETANSKiT-SINUS
BASOPfflX
CANALIOULUS
CHORIONIC-VILLI
ELLIPTOCYTE
EOSINOPHIL
HELPER
LOOP-OF-HENLE
LYMPHOBIAST
MEJ3AKARYCCYIE
MYELOBIAST
NEURONE
PLATELETS
PROCNCCYTE
PROMYELOCYTE
PSAMMOMA-BODIES
ROKITANSKir-ASCHOFF-SINUS
SCHIZOCYTE
SUPPRESSOR

*** MICRO-BODY-REGION ***

ANGIOCENTRIC
ANGIOINVASIVE
CELLULAR
CENrRILOBULAR
ENDOTHFT.TAL
EPIPHYSEAL
EPITHELIAL

EKYTHROCYTTC
FIBRILLARY
FOLLICUIAR
GERMINAL-CENTER
GLCMERUIAR
HEPATOCELLUIAR
INTERIDEUIAR
INTERSTITIAL
INIRACELLULAR
INIBAEPnHFLTAL
3NIRAIOBUIAR
JUXI3bGL£MEFUIAR
LAMINAR
IEPICMENINGEAL
MICTOVASOJIAR
MTIOCHCtCRIAL
MJSCLJIARIS
NEURQSXC^AL
NEURONAL
NEUIROJHILIC
NUCIZAR
PAPILLARY
RETICUIOENDOTHELIAL
SENSORINEURAL
SINUSOIDAL
SUBfJODSAL

*** MICR>BCCY-S[l]iroC?IURE ***

BASEMENT-ME34BRANE
BLAST
BUNDLE
CAPILLARIES
CAPILLARY
CEI.I.
CHRCMAnN-DOT
CHRCMOSCME
EPITOELIALr-CELL
EPHHELIUM
ERYIHROBIAST
ERYMROID-SERIES
FIBER
FOLLICLE
GANGLIA
GIANT-CELL
HEPATOCYTE
mSTIOCYTE
IMMUNOBIAST
IM-IUNOCYIE
LEUKXYTE
LYMPH-FOLLICLE
LYMPHOCYTE
LYMPHOILVSERIES
MACROPHAGE
MEMBRANE
METAMYELOCYTE
JO^OBIAST
M3N0CYTE
KYELDCYTE

NERVE
NEURON
NEUTROPHIL
NUCLEI
PARIETAL-CELL
PLATELET
RBC
RETICULIN
RETICULOCYTE
ROULEAUX
SINUSOID
TRABECULAE
VACUOLE
VENULE
WBC

*** MICRO-ORGANISM ***

FALCIPARUM
GAMETOCYTE
OVUM

*** MONITORING-PROCEDURE ***

EEG
EKG
ELECTROCARDIOGRAM
EMG
MANOMETRY
PERFUSION-SCAN

*** NON-FOOD-SUBSTANCE ***

AIR
AMMONIA
AMMONIUM-CHLORIDE
ARSENIC
ASBESTOS
BENTONITE
BENZENE
BISULFITE
CADMIUM
CARBON-MONOXIDE
CARBON-TETRACHLORIDE
CAROTENOIDS
CHLORIDE
CHROMIUM
CIGARETTE
COAL
COAL-DUST
COPPER
CRYSTAL
DYE
ETHANOL
GAS
GEL
HEAT

HYEROCARBON
HYDROGEN
HYEROXY
INSECTICIDE
KETCNE
LEAD
MAGNESIUM
MEDIUM
MERCURY
NITROGEN
OXYGEN
PERCHDORATE
PEROXIDASE
PHOSPHORUS
POISON
RADIOISOTOPE
PESIN,
SEDIMENT
SILVER
SUIfUR
SUNIIGHT
TARTRATE
1HALLIUM
TOXIN
UHICASE
KERE-IDOP
WIRING
XYLOSE

*** NORMAL-BEHAVIOR ***

EXERCISE
FASTING
PHYSICAL-EXERCISE
SITTING
SLEEP
SLEEPING
SJOKCNG
KALKLNG

*** COOJPATIONAL-STATOS ***

ANTMAL-HUSBANDRY
BUTCHER
CCNSTRUCTICW-WORKER
DOCK-WORKER
FA5M-WORKER
FISH-CLEANER
GARBAGE-WORKER
hZALIH-WORKER
MSDICAIr-LABORATORY-WORKER
MILrrARY-RECRUIT
MINER
SSWER-WORKER
\TTERIKARIAN

*** ORGANISM ***

ADULT
FEIUS
LARVAE
PARASITE

***** PATHOLDGICAlrACTICtf/PROCESS *****

ABHLJPTIO
ACCUMULATION
AKINETIC
ARRHYTHMIA
ATTACK
BALDING
BLEEDING
BOSSING
ERONCHCRRHEA
CALCIFICATION
CASEATING
CAVITATICN
CLONUS
CQARCTATION
COLIC
CCME5ESSION
CONSTRICTION
DECALCIFICAnON
DEGENERATION
DHRERATION
DESTFUCTION
DILATATION
DIMPLING
DISCHARGE
DISPLACEMENT
DIURESIS
DRAINAGE
DUPLICATION
EFFUSION
EMPROSTHOTCNOS
ENANTHEM
EROSION
EXIRAKEaULLARY-HEMATOPOEISIS
EXTRAVASATION
FESTIKATING
FTERIIIATICN
FLUSHING
FRACTURE
FRAGMENTATION
FUSION
GALLOP
GASTRIC-RETENTICN
GRAND-JJALrSEIZURE
GRIMACING
HALLUCINATICNS
HEMATEMESIS
HEMDPH'SIS
HEMORRHAGE
HICCUP
HICCUPS
HYALTNIZAnCN

HYPERCONCENTRATION
HYPERVENTILATION
INFILTRATE
INFILTRATED
INFILTRATION
INJURY
INTENTION-TREMOR
INVAGINATION
JACKSONIAN-SEIZURE
MENORRHAGIA
MYOCLONIC-JERK
NARROWING
NECROTIZING
NEOVASCULARIZATION
NIGHTMARE
NIGHTMARES
NOTCHING
OBLITERATION
OBSTRUCTED
OBSTRUCTING
OPISTHOTONOS
PALPITATION
PECTORILOQUY
PENETRATING
PERCUSSION
POISONING
PREMATURE-CONTRACTION
PROLAPSE
PROLIFERATION
PUCKERING
PULSATING
REACTION
REFLUX
REGURGITATION
RESORPTION
RETROVERSION
SEIZURE
SHIFT
SPARING
SPASM
SPLITTING
STING
STIPPLING
STORE
SWELLING
SYNCOPE
TACHYCARDIA
TACHYPNEA
TRAUMA
TREMOR
TUMEFACTION
TWITCHING
VOMITING
WHEEZING
WIDENING

*** PATHOLOGICAL-BEHAVIOR ***

ABUSE

AUJUrtOLISM
ANOREXIA
AUTOMATISM
CRAVING
DEPENDENCY
GUARDING
HESITANCY
OVERDOSAGE
OVERUSE
SUICIDE
WITHDRAWAL
WRITHING

*** PA1HDIOGICAL-BODY-PART ***

CARCINCMA-CELL
DRAINING-SINUS
PQAM-CFT.T,
PQMff-HISTIOCYrE
GIANT-CELL
LE-CELL
KEGAIDBIAST
MICROSPHEROCYTE
hKELCMDNOCXTE
NEOPLASTIC-CELL
NOFMDBLAST
PELGER-HUET-l^EUTBDHnL
POIKILOCYTE
REED-SIERNBERG-CELL
RENG-SIDERDBIAST
SICKLE-CELL
SIDEROBIAST
TARGET-CELL
TARGET-RBC

*** PAIHOLCGICAL-DETECIED-SIGN ***

ACIDOPHILIC
AIR-CRESCEOT
ARGYLL-ROBERTSON
ASBESTOS-BODY
AUER-ROD
AV-NICKI2JG
BABINSKI-REF1EX
BASOPHILIC
BIOTS
BLUE-LINE
BRUDZINSKE-SIGN
CHVOSTEK-SIGN
COGWHEEL-RIGIDITY
CONDUCTION-nEEECT
OORRIGAN-PULSE
GOITON-MCOL-SPOT
O?EMASTERIC-REFLEX
CURSCHMANN-SPIRAL
CYANOTIC
DEEP-TEJJDON-REFIEX
DISCOLORATION

DUROZIEZ-SIGN
EOSINOEHILIC
ERUNMEXER-FLASK-DEPORMITY
FLUID-WAVE
FLUORESCENCE
FRICTIOK-RUB
GAG-REFLEX
GIABELLAR-REFLEX
CLOPTTLTO-fiPTKB
GLYODSURIA
GRASP-REFLEX
GROOVE-SIGN
GYNEOCMASTTA
HEART-MURMUR
HEMA3URIA
HEMDGIDBINURIA
HEEAICMEJGAIY
HOFFKAN-SIGN
HCMANS-SIGN
HONEYOCMB-IUNG
HCWELL-JOLUf-BODIES
HTLV-III
KAYSER-FLEISCHER-RING
KERLEY-B-LTNE
KERNIG-SIGN ..
KETONURIA
WJSSMAUL-SIGf
IHERMTTTES-SIGN
UGHIENING-PAIN
MUZARY-DENSnY
MXHAGE-SIGN
MUCOPURULENT
NEUROIiDGIC-SIGN
NEUROLOGICAL-SIGN
OBIURA3QR-SIGN
PADKMEOTAL-REFLEX
PEAU-DQRANGE
POSITIONAL-SHIFT
PRCNATOR-SIGN
PSQAS-SIGN
PULSUS-ALTERNANS
RJLSUS-3ISFERIENS
PULSUS-PARADOXUS
QUINCKE-PULSE
RADIOIDCENC^
RADIOUJCENT
RALES
RAT-TAIL-DEPORKnY
REBOUND
REENESS
ROMBERG-SIGN
ROTH-SPOT
scmzocyiE
SENTINEL-LOOP
SHADOW
SKIP-LESiaJ
STREAK
STKDJG-SIGTJ
SWAN-NTCK-DEPOR'CnY
THUMBPRINTING

TRANSILILMINATION-OPACTrY
TSDUSSEAU-5IGN
VftSCUIAR-MAEKING

*** PATHOLOGICAIz-SrEATE ***

AENORMALTIY
ABSENCE
ACAICULIA
ACANTHOSIS-NIGRICANS
ACNE
ADENOPATHY
ADHESION
AEHNAMIC
AGNOSIA
AGRAPHIA
AL00HOUSM
ALEXIA
ALLERGY
AIDPECIA
AIDPECIA-MDCINOSA
AMENQRRHEA
AMINCACIDURIA
AMNESIA
ANASARCA
ANERGY
ANISOCDR1A
ANKYLDSIS
ANOREXIA
ANOSMIA
ANURIA
APAIHY
APHASIA
APNEA
APRAXIA
ARACHNODACTYLY
ARTERrnS
ASEPTIC-NECRDSIS
ASTEREOG4QSIS
ASTERDdS
ASTHMA
ASTROCYIOSIS
ATAXIC
ATONIC
ATROPHY
AUIQAMPJIATION
AVASCUIAR
AXES-DEVIATION
AZOTEMIA
BAIANTTIS
BILIRUBINURIA
BLENORRHAGICUM
BIZPHAROPTOSIS
BLINDNESS
BLOCK
BLOOD-POOL
BRADYCARDIA
BRACrxKINESIA

BWJiT
BULGE
BULLCUS-MYRINGrriS
BUNDLE-BRANCH-BLOCK
BURS ms
CALCIFIED
CANDIDIASIS
CAPUT-MEOUSAE
CARBUNCLE
CASONI
CATALEPSY
CATAPLEXY
CELLULrnS
CEPHALIZATICN
CHEHOSIS
CHEYNE-STOKES
CHONDROCALCINOSIS
CHORIGRETINTriS
CIAUDICATION
CIAWING
CLUBBED
CLUBBING
COLICKY
COLLAPSE
COLLAPSED
CCMA
OCMPRESSICN ~
COMPULSION
CONFABUIATION
CONGESTION
CONJUNCTIVITIS
CONSTIPATION
CONTRACTURE
CRAMP
CRYPTORCHIDISM
CYANOSIS
DEAFNESS
DECALCIFIED
DECEREBRATE-RIGIDrrY
DECORTICATE-RIGIDITY
DEFECT
EOT.CIT
DEFORMITY
DEHYDRATION
DEHYDRATION-SYNDROME
DELIRIUM
DELUSION
DEMENTIA
DEPLETION
DEPOSIT
DEPOSITION
DERMATITIS
DERMATrnS-HERPETIFORMIS
DESQUAMATION
DESQUW4ATTVE
DETACHMENT
DEVIATION
DIABETIC
DIARRHEA
DIFFICULTY

DIPLOPIA
DISLOCATION
DISORDER
DISCRIENTAnCN
DISPLACED
DISPLACEMENT
DIS'llNi'lON
DISTORTION
DROP
DUPUY1KEN-CONTRACTURE
DYSAKTHRIA
DYSDIApXHOKINESIS
DYSESTHESIA
DYSPUNCTION
DYSGRAPHIA
DYSLEXIA
DYSPAREUNIA
DYSHiAGIA
DYSPHASIA
DYSPHONIA
DYSPNEA
DYSURIA
EARACHE
ECX3KMDSIS
ECHOIALIA
ECIASIA
ECIDPIC '
EDEMA
EDEMATOUS
EHIERS-DANIOS-SYNERCME
EIECrRICAL-AnrERNANS
EI£WGATICN
EMACIATION
EMBOLISM
ENGORGED
ENLARGED
ENLARGEMENT
ENOPHTHALMDS
ENOPTHALMDS
EPIDERMOPHYTOSIS
EPISCLERTTIS
EPISTAXIS
ERYSIPELAS
ERYTHEMA
ERYTHEMA-CKRONICUM->!IGRANS
ERYTHEMA-MARGINATUM
ERYTHEMA-MULTIFORME
ERYTHEt'IA'IOUS
ERYTHRODER!<A
ERYTHRCMEIALGIA
ERYTHROPHAGOCYTOSIS
ESOPHAGinS
EXFOLLATIVE
EXOPHIHAIMDS
EXOSTOSIS
EXPLOSIVE-SPEECH
EXTINCTIO!C-PHENOKEhJCN
FACET-AZOTH'tLA
FIVER
FIBROSIS

FILLING-DEFECT
FLAOCIDnY
FLUTTER
FRAGILITY
FREMTTUS
FRIABILITY
FRIGIDITY
GAIACTORRHEA
GANGRENE
GADCHERS-DISEASE
GAZE
GENU-VALGUM
GHCN-OOMPLEX
GONORRHEA
HEART-BLOCK
HEART-DISEASE
HEART-FAIIIJRE-a*JGESTTVE
HEMIANOPSIA
HEMOLYSIN
HEMDFHILIA
HEEAT1T1S-A
HEPATTTIS-B
HERNIA
KERSUnSM
HOARSENESS ..
HCRNER-SYNDRCME
HYERAMN1OS
HYPERACTIVE
HYPEREMESIS-GRAVIDARUM
HYPEREMIA
HYPERESTHESIA
HYPERKERATOSIS
HYPERKENESIA
HYPERKINETTC
HYPEROSTOSIS
HYPERPIGMENTATION
HYPERPIASIA
HYPERR,TEA
HYPERSENSlTlVriY
HYPERTENSION
HYPERTONIA
HYPERTPOPHIC
HYPERTROPHY
HYPERVT^SCUIARTTY
HYPESTHESIA
HYPOCEUUTAR
HYPOCHROMIC
HYPOGLYCEMIC
HYPOKCESIA
HYPOPIASIA
HYPOTDJSION
HYPOTHERMIA
HYFOTONIA
ICHTHYOSIS
ILUCESS
ILLOGICAL
IMBALANCE
IMMOBILIZATION
IMPACTION
IMPAIR·ENT

IMPETIGO
IMPOTENCE
INABILITY
INCOAGULABLE
INCONTINENCE
INFARCTION
INFECTION
INFECTIOUS
INFERTILITY
INFLAMMATION
INFLAMMATORY
INFUSION
INSOMNIA
INSPISSATED
INTOLERANCE
INTUSSUSCEPTION
INVOLVEMENT
IRIDOCYCLITIS
IRREGULARITY-OF-LUMEN
ISCHEMIA
ISCHEMIC
JAKOB-CREUTZFELDT-DISEASE
JAUNDICE
KAPOSI-SARCOMA
KERATITIS
KERATODERMA
KEPATOPATHY
KERATOSIS
KOILONYCHIA
KURU-PLAQUE
KYPHOSCOLIOSIS
KYPHOSIS
LACK
LACKING
LAG
LAGOPHTHALMOS
LE
LETHARGY
LIPOPROTEINEMIA
LIVEDO-RETICULARIS
LOOSE-ASSOCIATION
LORDOSIS
LYMPHANGITIS
LYMPHOCYTOSIS
LYMPHOMA
MACROCYTIC
MACULAR
MACULOPAPULAR
MALIGNANT
MALNUTRITION
MANIC-DEPRESSIVE
MARFANS-SYNDROME
MEGACOLON
MENINGITIS
MESOTHELIOMA
METAPLASIA
METRORRHAGIA
MILIARIA-RUBRA
MONCKEBERG-SCLEROSIS
MONOPLEGIC

M3RN3NG-STIFFNESS
MOTTLING
MJOOPURULENT
MUMPS
MURMUR
MUTISM
MYALGIA
MXELOFIBROSIS
MTOCLONUS
MYOSITIS
MYRINGITIS
MXXEDBMA
NAUSEA
NECRDBIOSIS-LIPOIDICA
NECRDLYSIS
NECROSIS
NECROTTC
NEOLOGISM
NDDPIASTIC
NEHiRDCALCINOSIS
NEURALGIA
NOCIURIA
NONVISUALIZED
NUCIEATED
NYSTAQ1US
OBLITERATED
OBSESSICN
OBSTIPATION
OBSTTOCTICN
OOdDSION
OLIGCMENORRHEA
OIZGURIA
CMPHALITIS
ONYCHDLYSIS
OPACTIY
OPHnRLMDPIEGIA
CJRTHOPNEA
CRTHOSTATIC-IKPOTENSICN
ORIHOTONOS
OSTEITIS-FIBROSA
OSTEOLHTC
OSTBCKYELrnS
OSTBOSaZROSIS
OSTEOSCLE3?OTIC
uriTiS-MEDIA
OVERBITE
PAIN
PALLOR
PAPILLEDBMA
PAPILLITIS
PARALYSIS
PARESTHESIA
PAROTITIS
PAROXYSMAL
PAS-POSm\'E
PATHOLOGIC
PERIOSTITIS
PERSEVERATION
PERTUSSIS
PEYRONIES-DISEASE

PHARYNGITIS
PHOTOSENsrnvnY
PICA
PUTINS
PLAGUE
PIAIYBASIA
PLETHORA
PLETHORIC
PLEURITIC
PLUGGING
PNEUftTOSIS
PNEUMATOSIS-CYSTOIDES-INTESTINALIS
PNEUMATURIA
PNEUO4EDIASTINUM
POLrCMYELITIS
POItfCYIHEMIA
POIXDIPSIA
POLKJRIA
POVERIY-OF-OONID'IT
PRIAPISM
PROLAPSE
PRQSTATJ.T1S
PRD1EINURIA
PRURITUS
PSEUDOPOLYPOSIS
PSYCHOSIS
PULSATIOIf
PUNCTATE-KERATinS
FURHJRA
HMJLEOT
PYODERMA-GANGRENOSUM
EYOGD^IC
PZURIA
RASH
RAXNAUDS-PHENCMENON
RETARDATICN
RETENTION
RETDJITIS-PIGMENTOSA
RETINTnS-PROLIFERANS
RETROVERSION
RHEUMATIC-PIVER
RHINORRHEA
RIDGING
RIGOR
RUBOR
SCANNING-SPEECH
SCARLET-FZVER
SCINTILLATING-SCOTOMA
scLERrns
SCLERODACTYLY
SCLERCMALACIA
SCLEROSIS
SCOLIOSIS
SEBORRHEA
SEROSANGLT^EOUS
SEROSA!JGUIN0US
SEXUAL-FRIGIDITY
SIALECTASIS
SIALORRHEA
SCMOMBLTJSM

SPASTICITY
SPINA-BIFIDA
SPLENOMEGALY
STENOSIS
STRABISMUS
STRAWBERRY-TONGUE
STRICTURE
STUPOR
SUBLUXATION
SURAL-VASCULITIS
SWELLING
SYNDROME
SYPHILIS
TENDERNESS
TENESMUS
TENOSYNOVITIS
TETANUS-TOXOID
THICKENED
THICKENING
TIGHTNESS
TINNITUS
TOPHUS
TORTUOSITY
TOXIC
TRIGEMINAL-NEURALGIA
TRISMUS
TUFTING
TUMEFACTION
TURNER-SYNDROME
TYMPANITES
ULCERATION
UNCONSCIOUSNESS
UPPER-RESPIRATORY-INFECTION
URETHRITIS
URTICARIA
VAGINITIS
VARIX
VERTIGO
VISUAL-FIELD-DEFECT
VITILIGO
VOLUBLE
WEAKNESS
WIDENING
WILSONS-DISEASE
WOLFF-PARKINSON-WHITE-SYNDROME
XANTHOCHROMIA
XANTHOMATA
XEROSTOMIA

*** PATHOLOGICAL-STRUCTURE ***

COMPLEX
IRREGULARITY
NODULE
PATCH
SPIKE

*** PATHOLOGICAL-SUBSTANCE ***

ALTHArFETOPRDTEIN
AMYIDID
ANA
ANTINUCLEAR-ANTIBODY
BENCE-JONES-PROIEIN
COLD-AGGLUTININ
CRYOFIERINOGEN
CRYOGLOBULIN
CRYOPRECIPITAJE
DISCHARGE
ESCHAR
EXUDAXE
EAT-ERDPLET
FIBRINOGEN-DEGRADATION-PRODUCT
PBOST
GS06S-EDD0D
HEMDGIDBIN-F
HEMOGLOBIN-S
HEMDGIDBD^-SS
REAGINIC
RHEUMATOID-FACTOR
STREPIDIifSIM
SIREPIDLYS3N-0

*** PATIENT-CIRaWSTANCE ***

MENOPAUSE
PREGNANCY
PRIMIGRAVIEA

*** PATIENr-EXEERIENCE ***

SYMPICM

*** PATIEOT-ΔIENrAL-STATE ***

AMNESIA
ANXIOUS
APA3HY
APHASIA
APPREHENSIVE
CATALEPSY
OCMA
COMPULSION
OCNFUSICN
DELIRIUM
DELUSION
DELUSIONS
DEMENTIA
DEPERSONALIZAnON
DEPRESSED
DEREALIZATION
DISORIENTATION
EUPHORIA
EUPHORIC
EXTINCTION-PHDOEJCN

FEAR
FEARFUL
FLTGHT-OF-IDEA
GUILT
HAIZIX3KATICN
HALLUCINATIONS
ILLOGICAL
LETHARGY
LOOSE-ASSOCIATION
LUCID
MANIC-DEPRESSIVE
NBGATTVISTIC
NEOLOGISM
NEOLOGISMS
NEUROSIS
NIGHTMARE
NIGHTMARES
OBSESSION
PARANOIA
PERSEVERATION
PHOBIA
PREO0CUPATI0N-4OTH-CONTENT
PSYCHOSIS
SENILE
STUPOR
SUICIDAL
SYNCOPE
UNCONSCIOUSNESS

*** PATIENT-PHYSICAL-SENSATION ***

ACHING
EARACHE
FAININESS
HEADACHE
HEAT
LIGHTENING-PAIN
PAIN
PALPriATION
PARALYSIS
PARESTHESIA
PRURITUS
RIGOR
SOMNOLENCE
STABBING
STIFFNESS
TIGHTNESS
TINNITUS
TREMOR
TWITCHING
URGENCY
WEAKNESS

*** PATTERN-QUALITY ***

ALTERNANS
ANACROTTC
BILATERAL

BRADYCARDIA
CENTRIFUGAL
CHANGING
CIRCULATORY
CONCENTRIC
CONTINUOUS
CYCLIC
DAILY
DIASTOLIC
DISSEMINATED
EFFERENT
EPISODIC
EXPIRATORY
FLUCTUANT
FLUCTUATING
FREQUENT
HOIOSYSTOLIC
INCREMENTAL
INTERMITTENT
JUNCTIONAL
MEMSTS3UAL
MID-DIASTDLIC
MIDSYSTDLIC
MIGRATING
MIGRATORY
NONMENSTRUAL
PANSYSTOLIC
PARALLEL
PENDUIAR
PERIODIC
PERSISTENT
PISTOL-SHOT
POLARIZED
PRESYSTOLIC
PROGRESSIVE
RADIAL
RADIATING
RECIPROCAL
RECURRENT
REGENERATTVE
REPETTnVE
RESPIRATORY
REVERSED
SACCADIC
SEASONAL
SERIAL
SHIFTDJG
SPLITTING
STEPWISE
STREAKED
SYSTOLIC
THREADY
UNILATERAL
VARIABLE
VARIATION
WING-BEATING

*** PHYSICAL-EXAM ***

INSPECTION
PALPATION
PERCUSSION
Q^ECKENSTEDT-TEST
SUOCUSSION

*** FHYSICAIrQUALriY ***

ACID-EAST
ANTIHOOPHILIC
ANTINUCLEAR.
BIPOLAR
BIREFRINGENT
COLORED
OGMPQiSAIED
CXTOTOXIC
DEPIGMENTED
DHUIED
DUPLICATED
ECCENTRIC
EXPLOSIVE
FILLED
FORCED
FORCEFUL
FROTH*
HEAVY
HXALENE
HYPERLDCENCY
HYPERPIGMENIED
HYPERTONIC
INCOAGULABLE
INDEOTABLE
INDISTINCT
INFECnVE
INSPISSATED
KETOGENIC
LABILE
LK2H[1]
LINING
MARKED
MATURE
MICROSOMAL
MOTILE
MYCOBACTERIAL
NEUTRORHILIC
NONVISUALIZED
OXYPHILIC
PEPTIC
FERCUSSABLE
PHOTIC
PIGMEOTARY
POLYCLONAL
POSITIONAL
PRESSURED
PRIKAGRAVIDA
PROVOCATIVE
PULSATILE
REACTIVE
RESISTANT

RIGIDITY
SALINE
SCMAIDSENSORY
SCN0UX2NT
TENSE
THICK
THIN
THROBBING
TOXIC
TURBID
UNREACnVE
UNTREATED
VA90ACTTVE

*** FHySIQ0>THERAEEUnC-roOCEDURE ***

CRRDIOHJIM3NARY-RESUSCITATION
BMDBILIZATION

*** FHYSIOIOGICAL-ACTION/FHOCESS ***

AGGLUTINATION
BLEEDING .
BREATHING,
BRUIT
CALdFECAnCN
CAVITAI'ICN
CCROUIATICN
CLOT-REIRACriON
CCNEOCnON
CCNIRACnCN
OCNVERGUJCE
CCNVEKTING
DEFECATION
DBGRADAITCN
DUH3SICN
DRAINAGE
EMPTYING
EXCRETTCN
FACTLTIAITON
FILLING
FLEXION
FLOW
FORMATION
GROWIH
HEALING
HEARH4G
HEMATOPOIESIS
IMJULSE
INGESnON
IAOHMATION
KASnCATION
MENARCHE
MENSES
MOVEMENT
MYOGLOBINURIA
OPENING
OX-AGGIUnNATION

PERISTALSIS
PRODUCTION
REFLEX
REM
RESOLUTION
RESPIRATION
RESPIRATORY-MOVEMENT
SECRETION
SLEEPING
SPEECH
SPUTUM-PRODUCTION
SUFFUSION
SUPPRESS
SUPPRESSION
SWALLOWING
SWEATING
THINKING
TRANSMITTED
URINATION
VOICE
WEIGHT-LOSS

*** PHYSIOLDGICMi-EVENT ***

RELAXATION
RETRACTION
SLEEP

*** PHYSIOLOGICAL-STATE ***

CALCIFIED
NULLIPARA-POSTMENOPAUSAL

*** PLACE ***

SITE

*** PREPOSITION ***

AT
BY
FOR
FROM
IN
IOTO
OF
ON
CUT
THROUGH
TO
VIA
WITH
WITHIN

*** PROTOZOA ***

AMEBA
CERCARIA
ECHINOCOCCAL
ENTAMEBA
ENTAMEBA-HISTOLYTICA
LEPTOSPIRA
PNEUMOCYSTIS
SCHISTOSOMA
TOXOPLASMA
TRICHINELLA
TROPHOZOITE

*** QUALITY ***

ABERRANT
ABSTRACT
ACCESSORY
AGGRESSIVE
ARCHITECTURE
AUDITORY
BAREFOOT
BOUND
CANNED
CONFINED
CONSANGUINEOUS
CONSTRICTIVE
CONTAGIOUS
CONTROLLED
CONTROLLING
CONVENTIONAL
DEMONSTRATIVE
DEPLETED
DESTRUCTIVE
DIETARY
DIMORPHIC
DISCRETE
DISCRETELY
EPITHELIOID
EXHIBITIONISTIC
FACTITIOUS
FREE
GRANDEUR
HEALED
HISTRIONIC
ILLICIT
INAPPROPRIATE
INCONGRUOUS
INTRUSIVE
INVASIVE
INVOLUNTARY
LABELED
LEONINE
ORGANIZED
PILL-ROLLING
PLAIN
PLATEAU
PREFERENCE
REFERENCE

REFRACTOR*
RELATED
RELIGIOSITY
RESPONSIVE
RITUALIZED
ROUTINE
SEDUCTIVE
SELF-INDUCED
SEXUAL
SHALtflW
STTLY
SOCIAL
SPASTIC
SUITABLE
suRREPrmous
SYSTEM
THERAPEUTIC
TOXOU3
UNCONTROLLABLE
UNRESPONSIVE
UNUSUAL
VIOLENT
WADDLING
WILD
WORTHLESSNESS

*** QUANTIFIER ***

APPROX
EVERY
NON
NOT
ONLY

*** RANGE ***

0:4
1:008
1:014
1:016
1:018
1:020
1:1000
1:128
1:1280
1:2
1:250
1:2500
1:32
1:5
1:56
1:80
2:5
2:9
5:4
7:3
7:5

*** RATIO ***

CSF/PLASMA
PERCENT
PERCENTAGE
TWO-THIRDS

*** RELATIVE-ATEMPORAL-INDEX ***

ABOVE
ALPHA
AP
APEX
APICAL
ASCENDING
BACK
BELOW
BILATERAL
CAUDAD
CENTRAL
DESCENDING
DISTAL
DOWN
DOWNWARD
ELEVATED
ELEVATION
EXTERNAL
FOCAL
FOCUS
FORWARD
HIGH
HORIZONTAL
IDEAL
INDIRECT
INDISTINCT
INNER
INTERNAL
INTRINSIC
INWARD
IPSI-UNILATERAL
IPSILATERAL
LATERAL
LATERALLY
LEFT
LEFT-SIDED
LOCALIZED
LONGER
NEAR
NORTHERN
OUTWARD
OVER
OVERALL
PROXIMAL
RAISED
RETROGRADE
REVERSIBLE
RIGHT
RIGHT-SIDED

RIGHTWARD
RISE
SHORTENED
SOLITARY
SURROUNDED
TRANSVERSE
UNILATERAL
UPPER
UPWARD
VERTICAL

*** REIA2TVE-B0DY-RBGICN ***

ACRAL
ADNEXA
AENEXAL
ANTERIOR
AREA
ASPECT
BASAL
BASE
BASILAR
BORDER
CENTER
CENTROLOBUIAR
CEPHALAD
COLLATERAL
COMMON
CONTRAIATERAL
DORSAL
EXOGENOUS
EXTENSOR
FRONTAL
HELIX
INFERIOR
INTERNUCLEAR
INTERSPACE
INTTMAL
INTRACAVITARY
JUNCTICN
LONGTIUDINAL
LOWER
IIKENAL
MAIN
MAJOR
MARGIN
MARGINAL
MEDIAL
MEDIAN
MIDLINE
OOCIPITAL
PARIETAL
PERIDUCTAL
PERIFOLLiaJLAR
PEKTGLOMERU1AR
PERILO3ULAR
PERIPHERAL
PERITONSILAR

PERIUMBIUCAL
PERTVENCUS
FERIVEN1RICUIAR
PORTION
POSTERICR
POSTSTENCTIC
QUADRANT
RADIAL
SEGMENT
SIDED
SOMATOSENSQRY
SUFESFICIAL
SUFERICR
SURFACE
TEFMIKAL
TIP
ZOKE

*** PETAITVE-INDEX ***

POST

*** RBLATTVE-MEASURE ***

ABSOLUTE
FREQOTNT
VARIABLE

*** REtAnVE-PIACE ***

(XtMUNTTY
HCME
LOCATION
SOUTHERN
SOUTHWESTERN
VALLEY

*** RELATTVE-TEMPORAL-INDEX ***

AUTUMN
CHILDHOOD
DAILY
DIASTOLE
DIASTOLIC
END
EVENING
EXCEPTIONAL
EXPIRATORY
EXPIRATORY-PHASE
HISTORY
HOLDSYSTOLIC
INSPZE^ATORY
LAST
MENSTRUAL
MID-DIASTOLIC

MIDSYSIDLIC
KBNINS
NIGHT
NOCTURNAL
ONSET
PANSYSTOLIC
PERIPARTUM
PHASE
P06TICTAL
POSTMENOPAUSAL
POSTPARTUM
POSTPRANDIAL
POSTTENTANIC
POSTTEXANIC
PRESYSTOLIC
RESPIRATORY
SEASON
SEASONAL
SPRING
SUMMATION
SUMMER
SYSTOLIC

*** SENSE-QUALITY ***

ACHING
ACUTE
BLAND
BURNING
COLD
CRUSHING
DRY
DULL
DULLNESS
ENHANCED
FETOR
FOUL
FRUITY
GUSTATORY
HARD
HEPATICUS
HCMONYMOUS
HOT
KNIFE-LIKE
LIGHTNING
METALLIC
MOIST
PAINFUL
PAINLESS
PALPABLE
PLEURITIC
REDNESS
SENSORY
SEVERE
SHARP
SOUR
SQEEZING
STABBING
TACTILE

TEARING
TENDER
TORTUOUS
TRAUMATIC
URINJilWJUS
VIBRATORS
VISIBLE
VISUAL
VISUALIZED
VITREOUS
WAKM

*** SHAPE-OONFIGURATION ***

ACICUIAR
AMEBIC
AMEBOID
AMORPHOUS
ANGIOID
ASYMMETRICAL
ATTENUATED
BAND
BICONCAVE
BICUSPID.
BIFID
BLUNTED "
BONING
BROAD
BULGING
BULKY
CAUDAIS
CHAIN
CLOSURS
CLUBBED
CLUMP
CLUSTER
CLUSTERED
COLUMNAR
CONFLUENT
CONGLOMERATE
OONICAL
CONJUGATE
CONJUGATED
CONSTRICTED
CONVOLUTED
CORKSCREW
CRESCENT
CRESCSsTIC
CUBOIDAL
CURLIN3
CURVE
CURVILINEAR
CYSTIC
DEPRESSED
DIFFUSE
DIFFUSELY
DIIATED
DISTD'IDED
DISTORTED

DISTORTION
ECIDPIC
ELONGATION
ENGORGED
ENLARGED
ENLARGEMENT
EXPANSILE
FILLED-OUT
FIXED
FLAME-SHAPED
FIAT
FUSED
GIANT
HELDC
HONEYCOMB
HORSESHOE
HORSE,SHOE-SHAPED
HYPERSEGMENTED
INTERLACING
INVERTED
IRREGULAR
JACKNIFE-POSITTON
LENTICULAR
UNEftR
LOEULAR
LOBULATED
LOBUIATION
MASKLIKE
MASTOID
MIUARY
ICNOARnCULAR
MDNCNUCIEAR
MXN
MULTINUCIEATED
NAPR3W
NODULAR
NOTCHED
OPEN
OUTLINE
PAPULAR
PATCHY
PLATE-LIKE
PLBCMORPHIC
PROMINENT
PROTFUBERANT
PROTUBERANT
PUNCHED-OUT
PYRAMIDAL
RAISED
RAT-TAIL
RETICULAR
RETROVERTED
ROSETTE
ROUND
ROUNDED
SACCULAR
SADDLE
SEGMEi'TTAL
SEPTATE
SPHEROID

SPICUIAIED
SPIKE
SPIKE-LIKE
SPINDLE
SPINDLE-SHAPED
SPIRAL
SPLINTER
SQUAMOUS
STELLATE
STIPPLED
STOOPED
STRAIGHT
SYMMETRICAL
TANGLE
TRICUSPID
TUBULAR
TURBINATE
VACUOIATED
VESICAL
WALLED
HEDGE
WELL-DIFFERENTIATED
WHORL
WIDE
WIDENED .
WIDENING

*** SOCIAL-STATUS ***

HOMOSEXUALITY

*** SOUND ***

A2
AMPHORIC
CLICK
COOING
CREPITANT-
CREPITUS
DECRESCENDO
EGOFHONY
HICCUP
HICCUPS
HUM
HYPERRESONANT
MONOTONAL
PISTOL-SHOT
RALES
RHONCHI
RUMBLING
SI-SOUND
S2-SOUND
S3-SOUND
S4-SOUND
SNAP
SPIASH
STRIDOR
TAMBOUR

THRILL
WHEEZE
WHISPERED

*** SFBdFIC-BOCY-CHEMICAL ***

17-KEIO-STEROID
17-Oi-CCKFICQSTEROID
AdH
ACTIVATED-PARTIAL-THROMBOPLASTIN
AEH
ALBUMIN
ALDOSTERONE
ALKALINE-M0SFHA1ASE
ALPHA-1-ANTITRYPSIN
ALfHA-rFETOPROTEIN
AMTNOLEVULINIC-ACID
AMP
AMYLASE
ANGIOTENSIN
ANGIOTENSIN-CONVERTING-ENZYME
ANTIHEMOFHILIC-FACIDR
ANTTIHRCMBIN-III
ANITIRYPSIN
B12
BEIA-GLUOOSIEASE
BICARBONATE
BHIRXBIN
C-PEPITDE
a-CCMPLEMENT
C4-CX]MPILEMEWr
CALCTTCWIN
CALCIUM
CALCCUM-OXALATE
CARBDN-DIOXIDE
CATECHOLAMINE
CERLJLOPLASMIN
CHOLESTEROL
CHRISIMAS-EACTOR
COFRDPORHKRIN
OORTICOSTERIOD-17-OH
CORTICOSTEROID
CORTISOL
CPK
CREATTNE
CREATINE-KINASE
CREATININE
CYSTINE
EPDJEPHRINE
ESTRADIOL
ESTROGEN
FACTOR-IX
FACTOR-V
FACTOR-V1I
FACTOR-VIII
FACTOR-X
FERRTTIN
FETOPHOTEIN

FIBRINOGEN
FOLATE
FSH
GABA
GALACTOSIDASE
GAMMA-GLOBULIN
GAMMA-GLUTAMYL-TRANSPEPTIDASE
GASTRIN
GLOBULIN
GLUCAGON
GLUCOCEREBROSIDASE
GLUCOSE
GLUCOSIDASE
GLUTAMINE
GLUTAMYL
GROWTH-HORMONE
HAPTOGLOBIN
HEMATOCRIT
HEMOGLOBIN
HEMOSIDERIN
HIAA
HISTAMINE
HLA
HLA-TYPE-A1
HLA-TYPE-A3
HLA-TYPE-A8
HLA-TYPE-B17
HLA-TYPE-B27
HLA-TYPE-B8
HLA-TYPE-DR2
HLA-TYPE-DR3
HLA-TYPE-DR4
HUMAN-CHORIONIC-GONADOTROPIN
HYALURONIDASE
HYDROXYINDOLEACETIC-ACID
HYDROXYPROLINE
IGA
IGD
IGE
IGG
IGM
INSULIN
IRON
LACTASE
LACTATE
LACTOSE
LDH
LH
LIPASE
LYSOZYME
MAGNESIUM
METANEPHRINE
MURAMIDASE
MYOGLOBIN
NITROGEN
NOREPINEPHRINE
OXYGEN
PARATHORMONE
PHOSPHATASE
PHOSPHATE

FOLYFEPTTDE
FORHiOBILINOGEN
POTASSIUM
PRQACCELERIN
FROCCNVERTTN
FRDINSULIN
FROIACTTN
PROTHRCMBIN
PROTOPORPHYRIN
KRIDOXINE
RENIN
SECRETS?
SGOT
SGPT
STKEFIOKDASE
STUART-FACTOR
STUART-EACICR-X
T3
T4
TESTOSTERONE
THIAMINE
THRCMBIN
THRCMBOFIASTIN
THYROGLOBULIN
THYROXINE
TRANSAMD SE
TRANSFERRIN
TRANSPEPTIDfiSE
TRIQIYCERIDE
TSH
TYRAMINE
URATE
UREA
URIC-ACID
UROBIUNOGEN
UROPORPHYRIN
VANILLyiMANEELrC-ACID
VITAMIN-D
VON-WniEERANDS-EACTOR

*** SUBSTANCE ***

PRODUCT

*** SUBSTANCE-TECHNIQUE ***

ACID-REFII3X-TEST
AOGU7ITNATT0N-TEST
ANITTOXIN-^^EUTRALIZATICN-TEST
BERNSTEIN-TEST
BISULFITE-TEST
CAT-SCRATCH-SKIN-TEST
COID-HEMDI^SIN-TEST
OCMPLOlENT-FIXATTCei
CCMPLZMENT-FTXATTCN-TEST
DEXAMETHASONE-TEST
DONATH-IANDSTEINER-TEST
ECHINOCOCCAL-IMMUNODIFFUSION-TEST

EEROPHONIUM-^EEST
ELESA
ELLSA-ASSAY
ELESA-MEIHOD
ELISA-TECHNIQUE
ETHANOLrGEI/JIEST
FTXATIOM
FIOOOUIATICN-JIEST
GEL-DIFEUSICN
GIIXaSE-IQRDINS
GUAIAC-TEST
HEMAGGLUTINATION

HEMAGGIUnNATICN-TEST
DMINODIITUSION
IMMUNOELECTROPHORESIS
IhMUNOEI£CIHDPHORESIS-TEST
INDIRECr-HEMAQGIUITKATION
INIUSICN
INSULIN-HYPOGLYCEMIC-TEST
INSULIN-TOLERftNCE-TEST
ISOIATION
KVEIM-TEST
IAIEX-AGGHFTINATION
ICAD-TEST
LOADING
NEUIRALIZAnCN-IEST
NITROGEN-WASHOUT
FREdPITIN-TEST
PREGNANCY-TEST
PREPARATICN
FROTAMINE-PARAOQAGUIAnCN-TEST
RADIOIMMUNQASSAY
RIA
KPR
SEROIDGY
TENSH£K-TEST
TOLBUTAMIDE-TEST

*** SURGICAL-K«XZDURE ***

AERENAIZCTCMY
AMEUIATICK
APFENDECTOMY
BYPASS
CHOLECYSTECTOMY
CURETIAGE
GASTRECICtff
LIGATION
MASTECTOMY
PLICATION
PORTACAVAL-SHUNT
RESBCTICK
SPLENECTOMY
THYROIDSCTCM*
TRANSPIAVTATICN

*** TEMPCJRAL-REIATI\'E-^EftSURE ***

ABRUPT
ADULT
AFTER
BEFORE
CURRENT
DELAYED
DURING;
EARL*
IMMATURE
IMMEDIATELY
IMPENDS*?
LASTING
LATE
MATURE
PREMATURE
PRIOR
PROLONGED
RAPID
RAPIDLY
RECENT
REMOTE
SIMULTANEOUS
SLOW
SPONTANEOUS
SUDDEN
SUSTAIKED
SYNCHRONOUS
TRANSIENT

*** TEMPQRAIHJNIT ***

DAY
HOUR
HR
MINUTE
MONIH
SECOND
TRIMESTER
WEEK
YEAR

*** TEST-OF-DYNAMIC-FUNCTICN ***

DOPPLER
FEV
FEV1
FINGER-TO-NOSE-TEST
GRADED-EXERCISE-TEST
HEELrTO-WJEE-TEST
MVELOID-SERIES
STRAIGHT-LBG-RAISING-TEST
TOLERANCE-TEST
TOURNIQUET-TEST
\'ALSAL\'A

*** TEXIURE/STATE ***

ADHERENT
BLOODY
BOGGY
BOSSELATED
BRITTLE
BULLOUS
CALCIFIED
CAUSTIC
CHUNKY
CIRCUMSCRIBED
COARSE
ECHOGENIC
EDEMATOUS
EPITHELIALIZED
FATTY
FECULENT
FIBROUS
FINE
FLACCID
FRESH
FRIABLE
FURROWED
GEL
GRANULAR
HARD
HOMOGENEOUS
INDURATED
LAMELLATED
MATTED
MEMBRANOUS
MICROCYTIC
MILKY
MOTTLED
MUCOID
MYELOCYTIC
OILY
OSTEOID
PIGMENTED
PITTING
PLAQUE-LIKE
PUFFY
RARE
RIGID
SEROSANGUINEOUS
SEROSANGUINOUS
SEROUS
SHINY
SMOOTH
SOFT
SOLID
SPONGIFORM
STAINED
STRIATED
TARRY
UNIFORM
UNPASTEURIZED
VILLOUS
WATERY
WAXY

WOOL

*** THERAPEUTIC-INSTRUMENT ***

CONTRACEPTIVE
HEAKP-VALVE-PROSTHETTC
PACEMAISR
PROSTHETIC
TAMPON

*** THERAPEUTIC-PROCEDURE ***

BLDOD-TOANSTOSION
CaTHETERIZATION
HEMDDIAIXSIS
RADIATION-TOEAIMENT
TRANSFUSION
TOEA3MENT

*** TISSUE-EXTRACTION ***

BIOPSY
aJIDOCENTESIS
SCRAPING

*** TISSUE-TECHNIQUE ***

ANAEROBIC-CULIURE
BKUSH-BIOPSY
CCCMBS-TEST
CRDSS-M?LTCHING
CUI3URE
CYTOIDGY
DiTE
FUKHESCEWr-ANTIBOEY-STAIN
FIIXDRESCENT-ANTIBODVr-TEST
GRAM-STAIN
HISTOPATHOIJDGY
IE-TEST
PAP-SMEAR
ROSE-BENGAIr-STAINING
SKIN-TEST
SMEAR
STAIN
STAINING
THRQAT-CULTORE
TOUCH-PREPARATICN
VDRL

*** VIRUS ***

CYTOMEGALOVIRUS
HEPATIl'iS-A
HEPAITnS-B
BtfUUENZA-VTRUS

VARICELJLA
ZOSTER