

Standardization of Terminology in Laboratory Medicine II

Standardization of medical terminology is essential in data transmission between health care institutes and in maximizing the benefits of information technology. The purpose of this study was to standardize medical terms for laboratory observations. During the second year of the study, a standard database of concept names for laboratory terms that covered those used in tertiary health care institutes and reference laboratories was developed. The laboratory terms in the Logical Observation Identifier Names and Codes (LOINC) database were adopted and matched with the electronic data interchange (EDI) codes in Korea. A public hearing and a workshop for clinical pathologists were held to collect the opinions of experts. The Korean standard laboratory terminology database containing six axial concept names, components, property, time aspect, system (specimen), scale type, and method type, was established for 29,340 test observations. Short names and mapping tables for EDI codes and UMLS were added. Synonym tables were prepared to help match concept names to common terms used in the fields. We herein described the Korean standard laboratory terminology database for test names, result description terms, and result units encompassing most of the laboratory tests in Korea.

Key Words : Standard; Terminology; Laboratory Medicine; Korea

Kap No Lee, Jong-Hyun Yoon*,
Won Ki Min[†], Hwan Sub Lim[‡],
Junghan Song[§], Seok Lae Chae[¶],
Seongsoo Jang[‡], Chang-Seok Ki[¶],
Sook Young Bae, Jang Su Kim,
Jung-Ah Kwon, Chang Kyu Lee,
and Soo-Young Yoon**

Department of Laboratory Medicine, Korea University Guro Hospital, Korea University College of Medicine, Seoul; Seoul National University Boramae Hospital*, Seoul; Seoul National University College of Medicine, Seoul; Asan Medical Center[†], University of Ulsan College of Medicine, Seoul; Myungji Hospital[‡], Kwandong University College of Medicine, Goyang; Seoul National University Bundang Hospital[§], Seoul National University College of Medicine, Seongnam; Dongguk University International Hospital[¶], Dongguk University College of Medicine, Goyang; Samsung Medical Center[¶], Sungkyunkwan University College of Medicine, Seoul; Korea University Ansan Hospital**, Korea University College of Medicine, Ansan, Korea

Received : 9 July 2007
Accepted : 25 December 2007

Address for correspondence

Soo-Young Yoon, M.D.
Department of Laboratory Medicine, Korea University Ansan Hospital, Korea University College of Medicine, 516 Gojan-dong, Danwon-gu, Ansan 425-707, Korea
Tel : +82.31-412-5303, Fax : +82.31-412-5314
E-mail : ysy5613@kumc.or.kr

INTRODUCTION

In 2004, the National Health Information Standard Committee (NHISC) was established under the Korean Ministry of Health and Welfare (MOHW) to standardize national health information, and 14 practical committees composed of field specialists were organized. The laboratory test terminology practical committee was in charge of standardizing laboratory medicine terminology, in vitro radioimmunoassay, and pathology.

In Korea, the work regarding the terminology used in the medical field started in 1977 with the publication of the 1st edition of medical terminology dictionary "*English-Korean, Korean-English medical terminology*", which was revised in 2001 in its fourth edition (1), but research into standardizing terminology regarding information exchange has been rare. Yoon et al. tried to standardize and to code laboratory medicine terminology in the 1990's, but implementation of this terminology into local laboratory systems was unsuccessful.

Whereas digitalization and computerization has progressed rapidly in Korean medicine, data have not been easily interchangeable because medical information systems were developed independently at individual institutes. To fix this problem, medical terminology should be standardized because it is essential in data transmission between health institutes and would maximize the benefits of information technology by decreasing unnecessary test duplicates, enabling interchangeable electronic medical record (EMR)/electronic health record (EHR), and utilizing the individual health care Smart Card.

Among efforts to standardize medical terminology, one of the most representative systems in laboratory terminology is the Logical Observation Identifier Names and Codes (LOINC) system developed by the Regenstrief Institute for Health Care at Indiana University in 1994 (2). It provides a standard for data exchange among the laboratories in America, is continuously revised to reflect changes in laboratory tests, and includes most of the laboratory observations.

Based on the first year of this study, from December 2004 to May 2005 (3), we decided to standardize test name, specimen, units, result description terms, etc and to adopt the six axial structure of LOINC that can be used in national public health network. During the second year, a standard database of concept names for all laboratory terms was developed, including the terms used by tertiary health care institutes and reference laboratories in Korea.

MATERIALS AND METHODS

Entire laboratory terms among LOINC database (4) were considered to be adopted. Test names that either had been deleted or were not currently used in Korea were excluded. It was discussed with the staff in Regenstief whether LOINC could be used as one of the key terminology sets to be adapted, and we were told that there was no specific obligation in using them.

Standard expression was determined by an "English-Korean, Korean-English medical dictionary" (1) published by the Korean Medical Association and "the rules for foreign language expression" were legislated by the national institute of the Korean language (5). The names of microorganisms and antigens for allergy tests were expressed in English. Abbreviations frequently used in routine work were selectively adopted after inquiry to the committee or a section of specialists in the relevant field. A program for mapping between LOINC and electronic data interchange (EDI) codes, and a program for translation from English into Korean were used. To collect the opinions of experts, a public hearing and a workshop for the clinical pathologists were held on 28 September 2005 and 14 April 2006, respectively, and opinions from these meetings were reflected in this work.

Table 1. Final products of the standardization in laboratory terminology

Database	Fields	N of records
Concept name table	Korean component, property, time, system (specimen), scale, method, Korean short term, LOINC code, LOINC 6 axis, short term, insurance EDI code, UMLS CUI code	28,858
Synonym table	K-code, preferred term, English term, Synonym	6,105
EDI mapping table	Insurance EDI code and LOINC code mapping	11,341

LOINC, Logical Observation Identifier Names and Codes; EDI, Electronic Data Interchange; UMLS, Unified Medical Language System; CUI, Unique Concept Identifier.

RESULTS

We named the Korean standard laboratory terminology system the Korean Logical Observation Identifier Names and Codes (K-LOINC). Korean concept names for laboratory tests were expressed as combinations of six-axis concept names: components, property, time aspect, system (specimen), scale type, and method type. The naming principle followed the LOINC user manual (6).

The basic concept name table consisted of K-LOINC code, K-LOINC component, K-LOINC property, K-LOINC time aspect, K-LOINC system, K-LOINC scale, K-LOINC short name, LOINC code, LOINC component, LOINC property, LOINC time aspect, LOINC system, LOINC scale, LOINC short name, EDI code, EDI test name, UMLS unique con-

Table 2. K-LOINC and LOINC by class

CLASS*	Laboratory medicine	Nuclear medicine	K-LOINC	LOINC
MICRO	7,896	41	7,937	7,896
ABXBACT	1,292		1,292	1,292
HEM/BC	1,406		1,406	1,406
COAG	458		458	459
CHEM	5,768	525	6,293	5,768
SERO	1,000	30	1,030	1,000
ALLERGY	701	701	1,402	2,654
BLDBK	688		688	688
CELLMARK	823		823	823
CHAL		941	941	1,991
DRUG/TOX	4,989	11	5,000	4,989
DRUGDOSE	377		377	377
HLA	352		352	352
MOLPATH	25		25	35
MOLPATH.DEL	11		11	11
MOLPATH.MUT	499		499	499
MOLPATH.REARRANGE	13		13	14
MOLPATH.TRINUC	27		27	27
MOLPATH.TRISOMY	12		12	12
MOLPATH.TRNLOC	54		54	54
UA	216	1	217	216
FERT		1	1	177
Total	26,607	2,251	28,858	30,740

*, Abbreviation for class.

ABXBACT, antibiotic susceptibility; ALLERGY, response to antigens; BLDBK, blood bank; CELLMARK, cell surface models; CHAL, challenge tests; CHEM, chemistry; COAG, coagulation study; DRUG/TOX, drug levels and toxicology; DRUGDOSE, drug dose (for transmitting doses for pharmacokinetics); FERT, fertility; HEM/BC, hematology (coagulation) and differential count; HLA, HLA tissue typing antigens; MICRO, microbiology; MOLPATH, molecular pathology; MOLPATH.DEL, gene deletion; MOLPATH.MUT, gene mutation; MOLPATH.REARRANGE, gene rearrangement; MOLPATH.TRINUC, gene trinucleotide repeats; MOLPATH.TRISOMY, gene chromosome trisomy; MOLPATH.TRNLOC, gene translocation; SERO, serology (antibodies and most antigens except blood bank and infectious agents); UA, urinalysis; K-LOINC, Korean logical observation identifier names and codes; LOINC, logical observation identifier names and codes.

cept identifier (CUI) code, and UMLS name for 28,858 test observations (Table 1, 2). Among the 30,740 LOINC codes, 89.6% were adopted and 1,307 were added. A mapping table for the EDI codes and UMLS was also prepared. Synonym tables for concept names, words, and terms using the six axes were prepared to help find concept names with common terms used in the fields. The final product from the 2nd year of this study is accessible on-line at the homepage of the National Health Information Standard Committee (7).

DISCUSSION

During the 1st year's work, we examined a suitable structure in Korea and found that four axes, test name, specimen, method, and scale type were enough to express all laboratory observations. However, the six-axis concept names of LOINC, consisting of components, property, time aspect, system (specimen), scale type, and method type, was adopted in consideration of international data exchange in the future.

In the LOINC system, the method field was specified only when there was a significant difference in the test results or reference intervals. To reflect the special situation of the presence of an independent department in the analysis and reimbursement for radioimmunoassays (RIA) in Korea, codes for in vitro radioimmunoassay were duplicated and the method was specified as RIA.

Because terminology for microbiology in the LOINC system was quite different from those currently use in Korea and EDI codes, several inquiries and consultations were conducted with the relevant experts of the Korean Society of Laboratory Medicine. Finally, this study decided to adopt the LOINC system *per se* and to make tries to apply into local laboratories by combining concept names. Still, mapping with EDI codes was almost impossible.

It was necessary to match K-LOINC (LOINC codes adopted in Korea) with EDI to facilitate implementation of a standard code at the local hospital and institutes. Several problems, however, arose because the structure and granularity for concepts between the two systems were significantly different. Because EDI codes were developed to reimburse laboratory tests fees, it used the same codes for running tests at the same cost, regardless of methods or specimens, which leads to n:1 mapping of the standard codes vs. EDI. On the contrary, there were EDI codes, including several tests as a set, which led to 1:n mapping. Most standard codes for describing results were not matched to EDI codes because of the absence of concepts in the EDI system.

LOINC for molecular biology tests did not completely cover the present tests. Because this field is growing rapidly, it was suggested that a standing committee be organized to create a consistent naming system for the upcoming tests, which need new test codes and to refine present test names. The National Health Information Standard Committee (NHISC)

uses UMLS codes to connect standard health information terminologies in each division. To map K-LOINC to UMLS, mapping tables of the LOINC database and UMLS were used.

To facilitate the implementation of standard terminology in local laboratories, it is necessary to have instruments and/or reagent companies provide accurate standard codes for the instruments and reagents they produce, as well as provide mapping tables with Korean EDI codes for reimbursement.

Terminology for laboratory tests is one of the well standardized areas with a report for coding clinical laboratory information in Japan as well as LOINC and UMLS in America. (8) The LOINC system, however, initiated by the civil institute, and UMLS, provided by the government, were not fully implemented in laboratories and there has been no report of trying these systems in Australia or Europe. In this respect, nation-wide standardization of health information terminology would be a model when it is successfully implemented and would greatly contribute to the global competitiveness of Korea. Here, we report the Korean standard laboratory terminology database for test names, result description terms, and result units covering most of the laboratory tests in Korea.

ACKNOWLEDGMENT

The authors deeply appreciate Mr. Jin-Young Cho for the mapping and translation programs.

REFERENCES

1. Korean Medical Association, ed. *English-Korean, Korean-English medical terminology*. 4th ed. Korea: Korean Medical Association, 2001.
2. Forrey AW, McDonald CJ, DeMoor G, Huff SM, Leavelle D, Leland D, Fiers T, Charles L, Griffin B, Stalling F, Tullis A, Hutchins K, Baenziger J. *Logical observation identifier names and codes (LOINC) database: a public use set of codes and names for electronic reporting of clinical laboratory test results*. *Clin Chem* 1996; 42: 81-90.
3. Yoon SY, Yoon JH, Min WK, Lim HS, Song J, Chae SL, Lee CK, Kwon JA, Lee KN. *Standardization of Terminology in Laboratory Medicine I*. *Korean J Lab Med* 2007; 27: 151-5.
4. The Regenstrief Institute. *LOINC database*. 2.16 ed. <http://www.regenstrief.org/loinc/> (Updated on Dec. 2005).
5. National institute of the Korean language. The rule for foreign language expression. http://www.korean.go.kr/06_new/rule/rule05.jsp (Updated on Jan. 2006).
6. McDonal CJ, Huff S, Suico J, Mercer K. *LOINC user's guide*. <http://www.regenstrief.org/loinc/> (updated on Dec. 2005).
7. National Health Information Standard Committee. *National Health Information Standard Committee*. <http://www.medistds.or.kr/> (Updated on Nov. 2006).
8. Sakurabayashi I. *Coding for clinical laboratory information*. *Rinsho Byori* 1997; 45: 573-6.