Standardization and Management of Interface Terminology regarding Chief Complaints, Diagnoses and Procedures for Electronic Medical Records: Experiences of a Four-hospital Consortium

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전자의무기록 표준화 용어 관리 프로세스 정립

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Abstract The purpose of the present study was to document the standardization and management process of interface terminology regarding the chief complaints, diagnoses, and procedures, including surgery in a four-hospital consortium. The process was proposed, discussed, modified, and finalized in 2016 by the Terminology Standardization Committee (TSC), consisting of personnel from four hospitals. A request regarding interface terminology was classified into one of four categories: 1) registration of a new term, 2) revision, 3) deleting an old term and registering a new term, and 4) deletion. A request was processed in the following order: 1) collecting testimonies from related departments and 2) voting by the TSC. At least five out of the seven possible members of the voting pool need to approve of it. Mapping to the reference terminology was performed by three independent medical information managers. All processes were performed online, and the voting and mapping results were collected automatically. This process made the decision-making process clear and fast. In addition, this made users receptive to the decision of the TSC. In the 16 months after the process was adopted, there were 126 new terms registered, 131 revisions, 40 deletions of an old term and the registration of a new term, and 1235 deletions.

요 약 전자의무기록 작성 시 주호소, 진단, 수술(처치) 용어는 작성자가 자유롭게 작성하는 것보다 시스템에 등재된 용어 마스터를 사용해야 의료진간의 의사소통이 원활하고, 데이터 활용을 위한 자료 추출이 가능하므로, 용어 마스터의 관리가 중요하다. 본 연구의 목적은 서울대학교 산하 4개병원(서울대학교병원, 분당서울대학교병원, 서울특별시 보라매 병원, 헬스케어시스템 강남센터)에서 개별적으로 운영하던 용어 마스터를 통합하여 표준화 및 관리 프로세스를 확립한 경험을 제시하는 것이다. 산하 4개 병원의 대표자로 구성된 서울대학교병원 용어표준화위원회는 여러 번의 논의를 거쳐 2016년 표준화 및 관리 프로세스를 확립하였고, 용어 마스터에 대한 요청을 신규 용어 등재, 용어 수정, 기존 용어 삭제 와 신규 용어 등재, 그리고 용어 삭제의 4가지로 분류하였다. 요청에 대한 수용 여부는 유관 부서의 의견 조회와 그 결과 를 검토한 서울대학교병원 용어표준화위원회의 의결로 결정하였다. 의결 정족수는 7명의 위원 중 5명이였으며, 참조 용 어 체계에 대한 매핑은 3명의 보건의료정보관리사가 독립적으로 시행 후 이견이 있을 경우 합의하였다. 모든 과정은 온라인으로 시행하였고, 의결과 매핑 결과는 자동으로 수집되었다. 이러한 과정을 통해, 용어표준화위원회는 시스템에 등재될 용어에 대해 빠르고 명확한 의사결정을 할 수 있었고, 사용자들이 용어표준화위원회의 결정에 동의하도록 할 수 있었다. 프로세스가 정립된 후 16개월 간 126개의 신규 용어 등재, 131개의 용어 수정, 40개의 기존 용어 삭제와 신규 용어 등재, 그리고 1235개의 용어 삭제 가 처리되었다. 본 연구는 의료정보 시스템에 등재된 용어 마스터의 관리 프로세 스를 정립한 최초의 시도라는 데 의의가 있다.

1. Introduction

The standardization of the terminology used to compile medical records is important because it facilitates communication between medical staff. Standardization thereby reduces the occurrence of errors, as well as simplifies the extraction of compiled data to be used in research. For example, the use of standard terminology is useful to enable decision support system[1-3]. Ultimately, this standardization contributes to better healthcare[4]. It is also important to account for individuality, which ensures the accurate recording of each patient's unique situation. As such, the optimal solution is a terminology system that balances standardization and individuality.

Nowadays, medical records are typically recorded in an electronic format. When compiling electronic health records, it is widely accepted for the chief complaints, diagnoses, and procedures to be entered into the record using controlled terminology specific to the system, rather than relying on the terminologies of individual writers; however, there are various opinions on the best methods for constructing a controlled terminology. As noted in prior studies, emphasizing standardization and employing only a reference terminology system to construct the controlled terminology (e.g. the International Statistical Classification of Diseases and Related Health Problems [ICD-10], SNOMED CT) can make it difficult to accurately portray a variety of clinical situations[5]. On the other hand, overemphasis on individuality can lead to difficulties in communication between medical staff and issues with data extraction.

Interface terminology is one of the solutions balancing standardization and individuality in constructing the controlled terminology. Interface terminology consists of local terms mapped to reference terminology such as the ICD-10 or SNOMED CT. For example,

'Mycobacterium avium pulmonary infection' which is a local term can be mapped to 'Infection caused by Mycobacterium avium' which is a reference term (SNOMED CT ID 371685005). Therefore, interface terminology allows users to describe clinical situations using their own terms and guarantee enhanced communication and data extraction via reference terminology[6].

Currently, a number of hospitals have their own interface terminology and methods detailing the development of the interface terminology[7, 8]. At the same time there is also a lack of research on how such interface terminology is operated and updated systematically. Recently, four hospitals in the Republic of Korea have combined their individual interface terminologies to construct a consortium level of interface terminology. Moreover, they have outlined the process of maintaining and updating the interface terminology. The purpose of the present study is to document the standardization and management process of interface terminology in four hospitals.

2. Methods

2.1 Study overview

This study described the standardization and management process of interface terminology used in four hospitals affiliated with a university. The process was proposed, discussed, modified, and finalized through numerous meetings and on-line discussions by the Terminology Standardization Committee (TSC), consisting of personnel across the four hospitals.

2.2 Building a consortium level interface terminology and formation of the TSC

In 2003, the initial interface terminology was built into the electronic medical records of one

of four hospitals. Subsequently, the interface terminology was implemented in the other three hospitals. With time, the interface terminology in each hospital evolved differently.

To enhance communication between hospitals and facilitate common data extraction, interface terminology was standardized across the four hospitals. Through extensive discussions, the initial consortium level interface terminology was built by combining interface terminologies from four hospitals.

It was also decided to form a decision-making body to hold important discussions on the overall interface terminology operations, Therefore, the TSC, consisting of personnel from all the four hospitals, was formed.

The members of the TSC included one professor managing interface terminology and one medical information manager from each of the four hospitals (except one hospital where only a professor was included). Furthermore, the TSC was chaired on a rotational basis by each of the hospitals (Fig 1).

It was agreed that the TSC would manage the interface terminology regarding chief complaints, diagnoses, and procedures (including surgery). Registration, modification, and code changes of interface terminology were determined by TSC. In addition, the TSC oversaw the establishment and revision of the guidelines of interface terminology management.

Before these processes were put in place by the TSC, there was no process to settle the conflicts regarding interface terminology. For example, many users wanted a term to exist in the system exactly as they requested even if synonyms for the term already existed. Once the new process was adopted, the TSC had the authority to make a decision regarding the interface terminology and played a significant role in obtaining the approval of the users.

3. Results

3.1 Process to classify the request

Whenever a request regarding interface terminology is received from a user in any of the
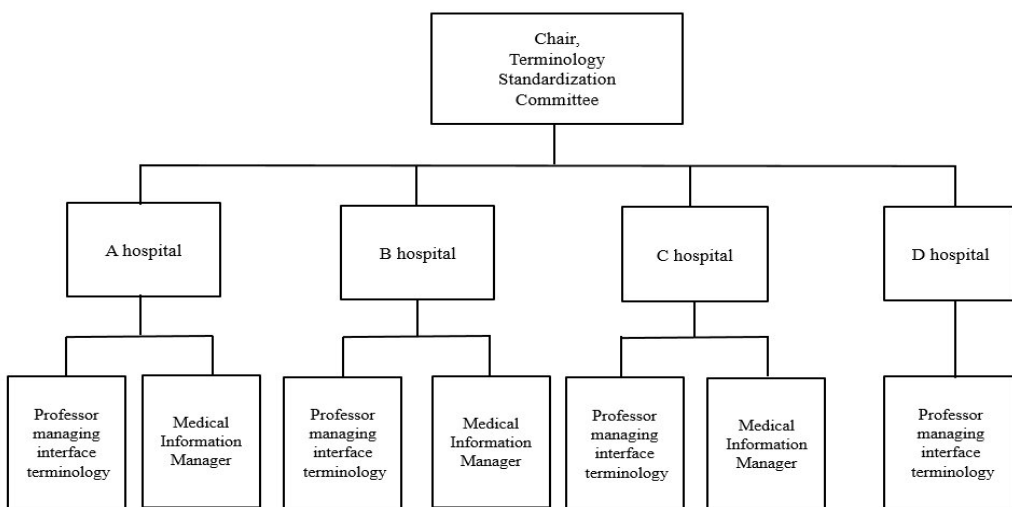

Fig. 1. Structure of the Terminology Standardization Committee modification, and code changes of interface terminology
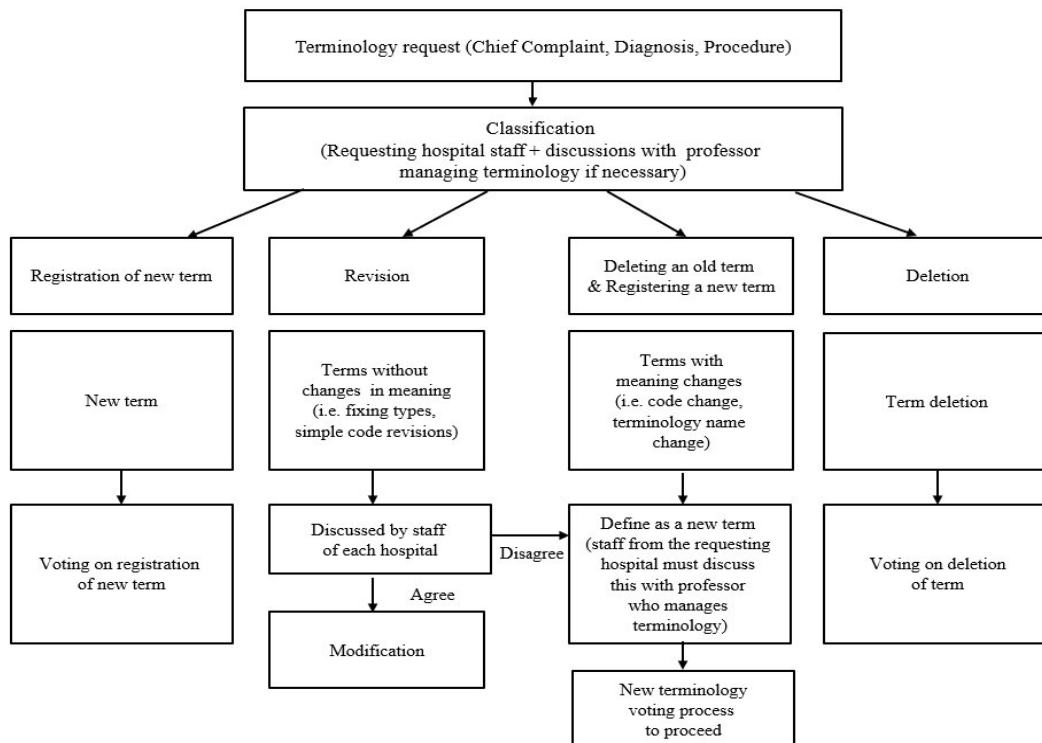
Fig. 2. Flowchart of the Classification of a Request

four hospitals, after erroneous requests (e.g. register a pre-existing terminology) were excluded, the request is classified into one of four categories: 1) registration of new term, 2) revision, 3) deleting an old term & registering a new term, or 4) deletion. Classification was done by the medical information manager of the hospital where the request was submitted. If necessary, the medical information manager will discuss the request with the professor managing interface terminology in that same hospital (Fig 2).

3.2 Process of registering new term

When a request to register a new term is received, the on-site medical information manager identifies the existence of similar terms in the system and collects testimonies from the staff of related departments either agreeing or disagreeing with the registration. When all the

opinions have been collected, a voting process involving the four professors as well as the three medical information managers in TSC is initiated. Registration of the new term is approved when at least 5 out of the 7 possible members of the voting pool agree with it. When registration is declined, the reason for the rejection is sent to the individual who initially sent in the request; if desired, the individual can ask for a review (Fig 3).

3.3 Code mapping process for new terminology

Once the approval for new term registration is received, the three medical information managers individually select corresponding Korean Standard Classification of Diseases (KCD-7) and SNOMED CT codes without consulting each other, and send it to the professor managing the interface terminology at the requesting hospital. If further opinions are
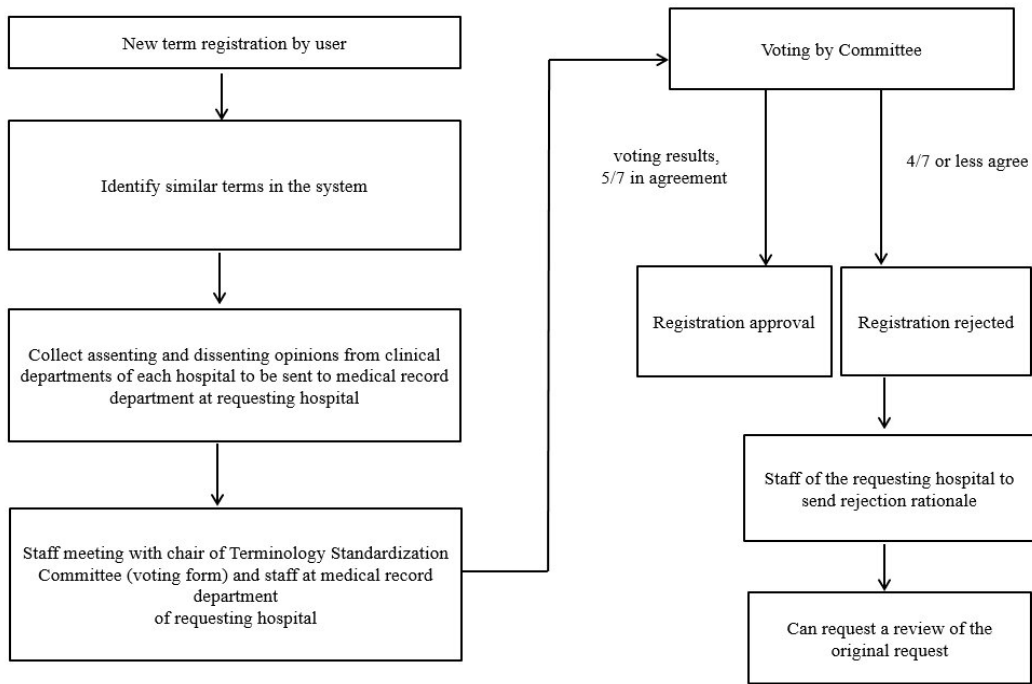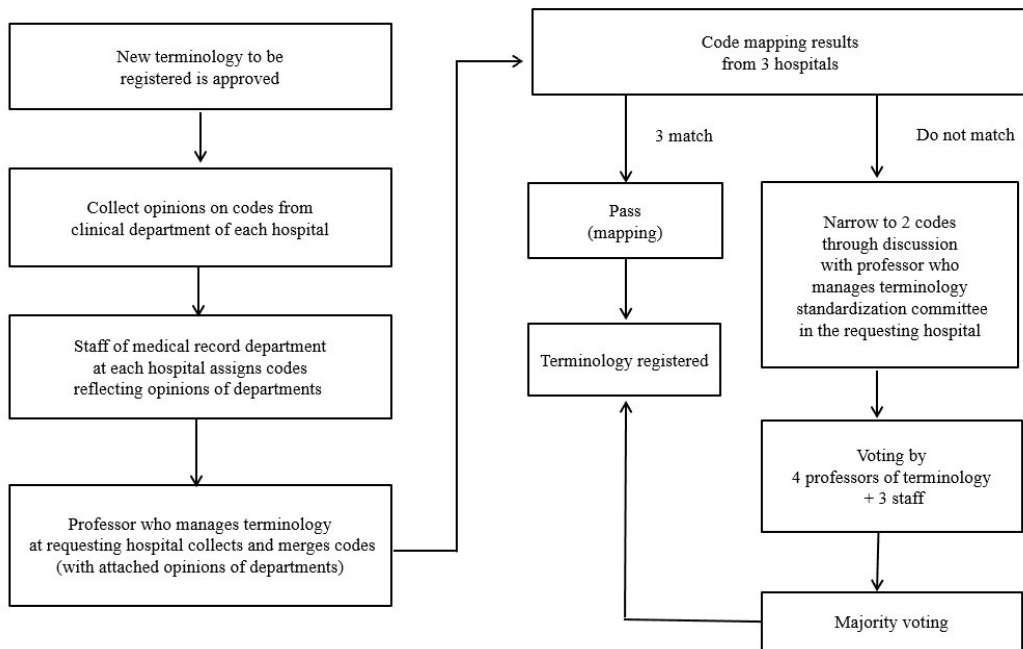
Fig. 3. New terminology registration process

Fig. 4. Code mapping process for new terminology

required from related departments, the medical information manager collects an opinion from related departments regarding assigning the code. The professor managing interface terminology at the requesting hospital collects the codes from each hospital; when the codes from all three hospitals match, the registration proceeds. However, if the codes differ between the hospitals, a vote is proposed to the TSC. Two codes are selected from the list of codes collected after sufficient discussion, and these are then voted on by the 7 members of the TSC. The code voted the majority is then selected as the final registered code. Once the KCD-7 or SNOMED CT code is determined, the medical information manager at the requesting hospital registers the terminology in the interface terminology management system, and each hospital downloads the registered terminology for use (Fig 4).

3.4 Mapping methodology when selecting codes for new terms

When registering a new term, an annotation system based on the Orphanet ICD-10 coding rules for rare diseases is used to typify the mapping of the KCD-7 (Korean Standard Classification of Diseases version 7) and SNOMED-CT codes[9]. These rationales include exact match (E), narrow term to broad term (NTBT), broad term to narrow term (BTNT), not yet decided/unable to decide (ND), and wrong match (W). Clarifying the standards used to assign codes helps ensure the uniformity of data.

3.5 Process for revising terminology

Revisions without changes in meaning such as misspelled terms and simple errors in mapping codes do not require discussions among the members of the TSC and can be immediately reflected in the terminology upon the agreement of the three medical information managers.

However, when agreement is not reached, a request for a vote is proposed to the TSC (Fig 2).

3.6 Process for deleting an old term and registering a new term

Revisions with changes in meaning were regarded as 'deleting an old term and registering a new term'. The process is similar to the registration of new terms. Briefly, testimonies from the staff of related departments are collected and a decision is made by the TSC through a vote (Fig 2).

3.7 Process of deleting a term

When a term deletion request is received for a term that is presently being used, the initiated process is also similar to for the registration of new terms. The decision is made by a TSC vote (Fig 2). The TSC itself regularly issues deletions of terms which are not used for a certain period, in order to maintain the optimal volume of interface terminology.

3.8 Interface terminology management system

The interface terminology management system is jointly operated such that all tasks relating to terminology are uploaded into the system. After uploading tasks, each hospital downloads the consortium level interface terminology to apply to their own in-hospital terminology, allowing for the equal use of terminology across all four hospitals.

The interface terminology management system manages the entire history of the interface terminology, including registration and list management, and allows users to view and download the interface terminology history. This interface terminology management system also permits hierarchical searches according to chief complaint, diagnosis term, and procedure term categories, and manages all information on the KCD-7 and SNOMED CT codes as well as the

short forms, synonyms, and subcategorizations of each term.

3.9 Voting process setup using on-line survey tools

TSC uses on-line survey tools to make the voting process more efficient and to automate data collection. All possible voting scenarios were organized into different survey types according to terminology type (chief complaint, diagnosis term, procedure term) and process (register new, modify, delete and register new, delete, or code mapping).

3.10 Actual operation

In the 16 months (from July 2016 to November 2017), there were 126 new terms registered, 131 revisions, 40 deletions of an old term and registration of a new term, and 8 deletions. In addition, the interface terminology was reorganized by deleting (deactivating) terms used less than a certain number of times over a specific period. Specifically, statistics were calculated for the unused diagnosis terms. To explain further, 1,227 diagnosis terms were deleted because they had not been used even once between March 2013 and April 2017; this represents about 5.4% of the diagnosis term list.

4. Conclusion

We have been successfully maintaining and updating interface terminology for our consortium. The standardization and management process established by TSC made the decision-making process on interface terminology clear and fast. Before we adopt the process, one or few staffs in hospitals decided whether a term is added to the system or not through free discussions. Because there were no documented rules on whom to decide, how to decide and who are responsible

for the decision, users were hard to accept the decision. The clearly documented process made users receptive to the decision of the TSC. We believe the well-curated interface terminology contribute to clinical practice and research.

There is some literature regarding establishment of interface terminology. A study described an experience regarding their own enterprise-wide medical terminology solution and provided suggestions for success[10]. Other studies described the process of building interface terminology for their institutes[7, 11, 12]. Recently published studies described their experience in integration of post-coordination content into a clinical interface terminology[8, 13].

However, to our knowledge, there is no study describing the management process of interface terminology. We think the current study has value in bring the first to describe the management process of interface terminology.

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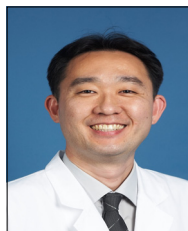
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