

Terminology and Global Standardization of Endoscopic Information: Minimal Standard Terminology (MST)

Masayuki A. Fujino, Shigeru Bito, Kazuko Takei, Shigeto Mizuno, Hideto Yokoi

Abstract—Since 1994, following the leading efforts by the European Society for Gastrointestinal Endoscopy, Organisation Mondiale d'Endoscopie Digestive (OMED) has succeeded in compiling minimal number of terms required for computer generation of digestive endoscopy reports nicknamed MST (Minimal Standard Terminology). Though with some insufficiencies, and though developed only for digestive endoscopy, MST has been the only available terminology that is globally standardized in medicine.

By utilizing the merits of a unified, structured terminology that can be used in multiple languages we can utilize the data stored in different languages as a common database. For this purpose, a standing, terminology-managing organization that manages and maintains and, when required, expands the terminology on a global level, is absolutely necessary. Unfortunately, however, the organization that performs version control of MST (OMED terminology, standardization and data processing committee) is currently suspending its activity.

Medical practice of the world demands more and more specialization, with resultant needs for information exchange among specialized territories.

As the cooperation between endoscopy and pathology has become currently the most important problem in the Endoscopy Working Group of Integrating Healthcare Enterprise-Japan (IHE-J,) the cooperation among different specialties is essential.

There are DICOM or HL7 standards as the protocols for storage, and exchange (communication) of the data, but there is yet no organization that manages the terminology itself astride different specialties.

We hereby propose to establish, within IEEE, for example, a system that promotes standardization of the terminology that can transversely describe a patient, and that can control different societies and groups, as far as the terminology is concerned.

Masayuki A. Fujino is a Professor Emeritus, University of Yamanashi & the Director, The Yokohama Seamen's Insurance Hospital, 43-1 Kamadai-cho, Hodogaya-ku Yokohama, 240-8585 Japan (corresponding author to provide phone: +81-45-331-1251; fax: +81-45-333-2408; e-mail: masayuki_fujino@sempo.or.jp).

Shigeru Bito is with Seafic Software Corporation, 1-19-20-202 Hiranuma, Nishi-ku Yokohama, 220-0023 Japan(e-mail: bito@seafic.co.jp).

Kazuko Takei is with Seafic Software Corporation, 1-19-20-202 Hiranuma, Nishi-ku Yokohama, 220-0023 Japan(e-mail: takei@seafic.co.jp).

Shigeto Mizuno is with Nara Hospital Kinki University School of Medicine, 1248-1, Otoda-cho, Ikoma-city, Nara, Japan(e-mail: mizuno@nara.med.kindai.ac.jp).

Hideto Yokoi is with Kagawa University Hospital, 1750-1 Ikenobe, Miki-cho, Kagawa, 761-0793, Japan(e-mail: yokoi@med.kagawa-u.ac.jp).

I. BACKGROUND

THE value of digitalized information lies in the fact its manipulation, storage, processing and communication are easily done by the computer without causing degradation of the original information.

Logical consequence of the development of electronic endoscopy utilizing CCD to transform endoscopic images to electrical signals was firstly archiving of endoscopic images by the computer. This was the rationale for developing the so-called filing system of endoscopic images. The format for image management had to be standardized, resulting in the development and wide acceptance of digital image communication in medicine (DICOM), supplement for visible light.

Then the terminology for digestive endoscopy was standardized and came to be known as MST.

In 1990 during the 9th World Congress of Gastroenterology in Sydney, European Society for Gastrointestinal Endoscopy (ESGE) held a few-membered ad hoc committee participated by one of the authors (MAF) and came to a unanimous conclusion to launch a new committee aiming to select a minimum number of terms required to make computer-generated endoscopy reports. From 1991 onward, the meetings of this new committee were held 2 to 3 times annually with all the members lodging at the same hotels.

Actual endoscopy reports were analyzed, extracting anatomical terms and terms for description of the findings used in the frequency higher than 5 % (tentatively named as MST.) The list of terms was submitted to the discussion of the general meetings of the committee. All the terms used in the frequency of 1 % or higher were included ultimately, after the field tests by the committee members in Europe and in Japan, later also in the United States. Finally, the terms required for diagnosis and procedure description were added.

Thus those for the esophagogastroduodenoscopy (EGD,) colonoscopy and ERCP were compiled with new definition of difficult or controversial terms and published in 1994 as the Working Party Report of the 10th World Congress of Gastroenterology in Los Angeles. MST in Japanese was published on the Homepage of the Japan Gastroenterological Endoscopy Society (JGES) in 2001 after discussion by the Terminology Committee of JGES.

MST for endoscopic ultrasonography was developed following the same format as that for EGD, and colonoscopy

by the International Working Group chaired by Robert Hawes of South Carolina, U.S.A. It will come to be accepted at the Terminology Committee of the Organisation Mondiale d'Endoscopie Digestive.

II. POLICY OF MST

MST is an important achievement in the framework of standardization. Standardization excludes variations of expression and removes the degree of freedom in description. Construction of a database common to different institutions and countries at the sacrifice of those freedoms is an essential step for the daily medical practice to evolve toward an evidence-based medicine.

MST has not been developed as a tool for specialized research. It is in the freedom of individual researchers to use researcher-specific terms for their research in the free text section.

MST has a built-in limitation of being a “minimal requirement.” Regional difference in the disease structure and procedural variation may result in the necessity for regional modification; in order to maintain its being standard, however, the version control function by the MST committee will work.

Introduction of various classifications into diagnostic terms is possible. This is much more easily done than in the terms for findings. As diagnostic terms ICD-10 will probably be utilized.

III. SYSTEMATIZATION OF MST

MST has been created since its beginning as a structured terminology, with the aim of its being processed by the computer. It is a rare terminology that has been translated into 10 languages (English, German, French, Italian, Portuguese, Spanish, Russian, Hungarian, Czech and Turkish) in addition to Japanese.

By the use of globally standardized endoscopic terms, globally common recognition will be realized, resulting in non-occurrence of discrepancies in the understanding of disease or pathological conditions in basic and clinical researches. By the secondary utilization of the endoscopic data, common statistics and mutual translation can be realized among different institutions, regions, and countries, thus contributing greatly to the progress in endoscopy and technology on a global level. Even a good terminology cannot be utilized efficiently, until it is appropriately systematized. Secondary utilization will not become possible until the primary data have been accumulated.

At the systematization, adoption of a user-friendly interface, above all else, must be borne in mind. A system will be meaningless, if it is not used by the customers. For international exchange of the MST, it was necessary to construct a system that is astride languages and enables easy accessibility to a desired term.

IV. PROBLEMS IN GLOBAL STANDARDIZATION

On constructing a system astride different languages, it was necessary to verify that the MST for each language is truly exchangeable. MST is translated into different language versions based on the English version and it was known that the part dealing with the superficial cancers was expanded. In other words, the 10 language versions other than Japanese were presupposed to be completely interexchangeable. On examining the actual language versions, 115 varied problems were found.

In Chicago in May 2005 we had a meeting with Dr. Michel Delvaux, who was the chairman of the OMED Terminology, Standardization and Data Processing Committee. Main problems are summarized into the following 5 categories: Categories 1 through 3 can be solved by coding the individual terms. Categories 4 and 5 must be unified by the controlling system.

1. Inconsistencies in the terms, attributes, attribute values (Expansion, excessive ramification, lacking, wrong interpretation)
2. Inconsistent order of the terms, attributes and attribute values.
3. Inconsistencies in the layer structure of terms.
4. Inconsistencies in handling the free text
5. Inconsistencies in the definition of terms (definition of terms being the specification of the terminology.)

Language	Terms for the esophagus	Terms	Attributes	Attribute Values			
Japanese	Terms for the esophagus	Flat lesions	Iodine unstained area	Number	Single	Multiple	Specify
English	Terms for the esophagus	Flat lesions					
French	Termes pour l'oesophage	Lésions planes					
Czech	Termíny pro jícen	ploché léze					
German	Begriffe für den Ösophagus	Flache Läsionen					
Hungarian	Táblázat Az oesophagus fogalmairól	Lapos elváltozások					
Italian	Termini per l'esofago	Lesioni piatte					
Russian	Термины для описания пищевода	Плоские поражения					
Portuguese	Terminologia para o esófago	Lesões planas					
Spanish	Términos para el esófago	Lesiones planas					
Turkish	Özofagus için terimler	Düz lezyonlar					

Fig.1. Example of expansion

Table No.6 in MST. Japanese version expands the term “flat lesion” with regard to iodine staining: non-staining/number/single, multiple, specify.

Japanese	English	Czech	Portuguese	Russian
Angiectasia	Angiectasia	angiektázie	Angiectasia	Ангиектазия
Benign tumor	Benign tumor	benigní nádor	Canro Gástrico Superficial	Варикозное расширение вен
Bleeding of unknown origin	Bleeding of unknown origin	cauř třešao	Cauřao	Гастростаз
Dieulafoy lesion	Dieulafoy lesion	časný karcinom žaludku	Compresso Extraesica	Гибридный мезодермальный
Diverticulum	Diverticulum	Divertikulace	Corpo redarito	Дивертикул
Remnant cancer after endoscopic mucosal resection				
Cancer recurrence after endoscopic mucosal resection				
Malignant lymphoma				
MALT lymphoma				
Early gastric cancer	Early gastric cancer	divertik	Diverticulo	Доброкачественная опухоль
Extrinsic compression	Extrinsic compression	Extrínobnřní komprese	Esôse gástrica	Исчурное тело
Fistula	Fistula	řivnř	Fistula	Кровоточение из неустановленного источника
Foreign body	Foreign body	řivnř	Gastropatia Papulosa	Папиллярная гастропатия
Gastric retention	Gastric retention	řivnř	Helicobacter pylori	Поздняя (необязательно) добавка в список в некоторых
Helicobacter pylori	Helicobacter pylori	řivnř	Hemorrágie de Duodeno	Поздняя добавка
Papulous gastropathy	Papulous gastropathy	řivnř	Lesão de Dieulafoy	Порезание двенадцатиперстной кишки
Parasites (should be added to the list in some countries)	Parasites (should be added to the list in some countries)	řivnř	Parasites	Ранний рак желудка
Post-operative appearance	Post-operative appearance	řivnř	Post-operatório	Рубцы
Scar	Scar	řivnř	Tumor Benigno	Связки (фистулы)
Submucosal tumor	Submucosal tumor	řivnř	Tumor submucoso	Сращивание кишок
Varices	Varices	řivnř	Varices	Состояние после операции

Fig. 2. Difficulty in matching due to alphabetical order of terms. Table No.20 in MST. This compares the orders of the terms in Others in the diagnosis. If every term in languages is coded by a uniform system matching of the same diagnosis is easy, but if coding is done independently in individual languages, confusion is inevitable.

Language	List of stomach diagnosis	Other Diagnoses	Early gastric cancer	Other (specify)
Japanese	List of stomach diagnosis	Other Diagnoses		Other (specify)
English	List of stomach diagnosis	Other Diagnoses	Early gastric cancer	
French	Liste des diagnostics au niveau de l'estomac	Autres diagnostic	Cancer gastrique in situ	
Czech	Seznam diagnóz pro žaludek	Jiné diagnózy	časný karcinom žaludku	
German	Liste der Diagnosen im Magen	Andere Diagnosen	Magenfrühkarzinom	Anderes (bitte anführen)
Hungarian	Táblázat A gyomor diagnó zisainak jegyzéke	Kisérő diagnózis	Korai gyomor carcinoma	
Italian	Lista delle diagnosi per lo stomaco	Altre diagnosi.	Early gastric cancer	Altro
Russian	Список диагнозов для желудка	Другие диагнозы	Ранний рак желудка	
Portuguese	Listagem dos Diagnósticos do Estômago	Outros Diagnósticos	Canro Gástrico Superficial	
Spanish	Lista de diagnósticos del estómago	Otros diagnósticos	Cáncer gástrico precoz	
Turkish	Mide tanıların listesi	Diğer tanılar	Erken gastrik kanser	

Fig. 3. Examples of un-unified Other (Specify) Table No.20 in MST. List of gastric diagnosis/Other diagnoses/Other (Specify) are seen in Japanese, Italian, and German. Only in the Japanese version there is no early gastric cancer in the list of gastric diagnosis/Other diagnoses. In Czech, Russian, and Portuguese there was found to be differences in the place where a term appears. From this we found that the order of appearance varies in languages.)

There are some differences in the layer structures in the individual language version of MST. In the English version, Crohn's disease and Ulcerative colitis appear as children of the mother term Inflammatory bowel disease, while in

Japanese all those three terms appear on the same level without layer structure, while further in the Italian, the layer where inflammatory bowel disease should appear is blank, and in the layer beneath this blank, both terms of IBD: colite di Crohn and IBD: colite ulcerosa appear.

In such a mother-child relationship it is not clear in the current MST, whether selection of the child is required or whether choice at the level of the mother is sufficient.

V. FUNCTION AND APPLICATION OF MST

It must be emphasized as a function of MST that MST is a structured language concerning endoscopic information. In every case the indication of endoscopy, the data concerning endoscopic procedure, the organs visualized by the procedure, their findings, diagnostic and therapeutic procedures, and the diagnosis, and, if necessary, therapeutic outcome will be described using the same structured language.

As the roles of the MST with such functions, 1) computer generation of endoscopy reports, 2) construction of a database of endoscopic information, 3) statistical analysis, 4) quality control of endoscopic examination and endoscopic treatment, 5) safety management, and further by linking with the hospital information system, 6) scheduling of the procedures and patients, 6) management of the distribution of the goods, and 7) billing will be automatically realized.

MST is a terminology for digestive endoscopy, but its concepts are applicable not only to digestive endoscopy; the current authors succeeded in constructing reporting systems for gastrointestinal radiology, computed radiology of the chest, computer tomography (CT) of the chest, magnetic resonance imaging (MRI) of the head, and for ultrasonography in general.

VI. SUMMARY

By utilizing the merits of a unified, structured terminology that can be used in multiple languages we can utilize the data stored in different languages as a common database. For this purpose, a standing, terminology-managing organization that manages and maintains and, when required, expands the terminology on a global level, is absolutely necessary. Unfortunately, however, the organization that performs version control of MST (OMED terminology, standardization and data processing committee) is currently suspending its activity.

Medical practice of the world demands more and more specialization, with resultant needs for information exchange among specialized territories.

As the cooperation between endoscopy and pathology has become currently the most important problem in the Endoscopy Working Group of Integrating Healthcare Enterprise-Japan (IHE-J) in Japan, the cooperation among different fields is essential.

There are DICOM or HL7 standards as the protocols for storage, and exchange (communication) of the data, but there is yet no organization that manages the terminology itself

astride different specialties.

We hereby propose to establish, within IEEE, for example, a system that promotes standardization of the terminology that can transversely describe a patient, and that can control different societies and groups, as far as the terminology is concerned.

REFERENCES

- [1] Minimal Standard Terminology.
http://195.30.252.198/index.php/resorces/re_mst/
- [2] Minimal Standard Terminology for Digestive Endoscopy.
Normed Verlag. ISBN 3-89199-075-8
- [3] Delvaux M: Image management: the viewpoint of the clinician. *The Gastroenterologist* 4: 3-5, 1996
- [4] Crespi M, Delvaux M, Schapiro M et al: Minimal standards for a computerized endoscopic database.
Am J Gastroenterol 89: S144-153, 1994
- [5] Maratka Z: Terminology, difinitions and diagnostic criteria in Digestive Endoscopy, 4th Ed. Normed Verlag, Bas Homburg, Germany, 1994
- [6] Crespi M, DelvauxM, Schapiro M et al: Working party report by the Committee for Minimal Standards of Terminology and Documentation in Digestive Endoscopy of the European Society of Gastrointestinal Endoscopy. Minimal Standard Terminology for a Computerized Endoscopic Database. *Am J Gastroenterol* 91:191-216, 1996
- [7] Delvaux M, Crespi M, Armengol-Miro JR et al; Minimal Standard Terminology for Digestive Endoscopy: Prospective testing and validation in the GASTER project. *Endoscopy* 32: 345-355, 2000
- [8] Minimal Standard Terminology for Digestive Endoscopy. Version 2.0. International Editor: M. Delvaux. *Endoscopy* 32: 159-188, 2000
- [9] Digital imaging and communication in medicine (DICOM), NEMA PS3.1-PS3.12. The National Electorical Manufacturers Association, Rosslyn, VA, 1992, 1993, 1995, 1997
- [10] Digital imaging and communication in medicine (DICOM, NEMA PS3 Supplement 23: Structured reporting. The National Electorical Manufacturers Association, Rosslyn, VA, 1997
- [11] Browm NJG, Britton KE, Plummer DL: Standardisation in medical image management. *Int J Med Inform* 48: 227-238, 1998
- [12] Korman LY, Delvaux M, Bidgood D: Structured reporting in gastrointestinal endoscopy: Integration with DICOM and Minimal Standard Terminology. *J Med Inform* 48: 201-206m 1998
- [13] Korman LY, Delvaux M, Crespi M: The Minimal Standard Terminology in digestive endoscopy: perspective on a standard endoscopic vocabulary. *Gastrointest Endosc* 53: 392-396, 2001
- [14] Fujino MA, Ikeda M, Yamamoto Y et al: Development of an integrated filing system for endoscopic images. *Endoscopy* 23: 11-15, 1991
- [15] Fujino MA, Ikeda M, Yamamoto Y et al: Degital/analog hybrid system for filing of endoscopic images. *Comput Methods Program Biomed* 37: 291-298, 1992
- [16] Fujino MA, Morozumi A, Kawai T et al: Management of endoscopic images and advances in optical disk technology. *Gastrointest Endosc Clin North Am* 2: 313-334, 1992
- [17] Minimal Standard Terminology in Gastrointestinal Endosonography. *Dig Endosc* 10: 159-184, 1998
- [18] Terminology Committee of Japan Gastroenterological Endoscopy Society: Minimal Standard Terminology (Japanese version).
<http://www.jges.net/mst-ja/mst-ja.html>.
- [19] Shigeru Bito, Kazuko Takei, Hideto Yokoi, Shigeto Mizuno, Masayuki A. Fujino: Consideration on and proposal for design of user interface (UI) of the reporting system utilizing Multiple language version MST (Minimal Standard Terminology). The 25th Joint Conference on Medeical Infomatics, 2005