

## Activities for Endoscopy Information Systems Standardization in Japan

Hideto Yokoi, Masayuki A. Fujino

**Abstract**— There are two activities for Japanese endoscopy information system. One is for a standard terminology (Minimal Standard Terminology: MST) for endoscopy reporting. Other is Integrating Healthcare Enterprise Japan (IHE-J) for an integration of hospital information system. In IHE-J activity, the members revealed specificities of an endoscopy workflow by making a comparison with a radiology workflow. The authors will propose a scheme for systematic standardization based on our experiences in the standardization activities.

### I. INTRODUCTION

In Japan, MHLW (Ministry of Health, Labour and Welfare) made a plan to spread electronic medical record (EMR) system. They aimed at spreading EMR to 60 percent of the hospitals with 400 beds or more. Though some subsidy was provided and many hospitals utilized it for EMR, we were not able to find the systems connecting hospitals or medical institutes. The cause was a delay in the development of the medical information standardization.

There are some standards for medical information. International Organization for Standardization (ISO) has groups discussing standardization for medical data. But worldwide discussion resulted in vague conclusions because of huge variances among the nations. More concrete solutions are requested on the site of the medical treatment.

The current authors are members of two standardization organizations for digestive endoscopy information system. One is World Organisation of Digestive Endoscopy (OMED)[1] which established a standard terminology (Minimal Standard Terminology: MST)[2] for endoscopy reporting. Other is Integrating Healthcare Enterprise Japan (IHE-J)[3] which is an initiative to make a guideline for an integration of hospital information system. The authors will propose some schemes for systematic standardization based on our experiences in the standardization activities.

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

Masayuki A. Fujino is with Professor Emeritus, University of Yamanashi & 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@sempos.or.jp).

### II. STANDARDIZATION ACTIVITIES IN JAPANESE DIGESTIVE ENDOSCOPY SCENE

#### A. Two methods of standardization

We can categorize standardization methods into two: (1) Standardization of contents, and (2) Standardization of data communication.

The former includes terminologies, lists of synonyms. They are necessary in medical expression for progress notes written by physicians, reports of examinations (medical images, laboratory tests, pathology etc.), nursing records, and other records in medical care. The latter include protocols for communication between systems, file formats for data exchange by media.

Needless to say, standardization brings a greater usability to users. If we use standardized data format, we can import patient data to a new (replacing) system with few costs. We can have multi-central clinical trial easily, because there is no need for data mapping between systems. If we accept standardized data transfer protocols, we can connect some systems easily and can save cost and time. Additionally, it is helpful when we secondary use the data, such as data mining [4].

#### B. MST spreading

MST established by OMED. Actual endoscopy reports were analyzed, extracting anatomical terms and terms for description of the findings used in the frequency higher than 5 %.

MST in Japanese was published on the Homepage of the Japan Gastroenterological Endoscopy Society (JGES)[5] in 2001 after discussion by the Terminology Committee of JGES. MST was translated in several languages. Using multi-lingual MST, we can communicate through multi-lingual endoscopy reporting systems

#### C. IHE-J activities

IHE-J acts mainly for integration of computerised physician order entry systems (CPOE), radiology department

systems (radiology information system: RIS), and picture archiving and communication systems (PACS). They made a harmonization with IHE members of other regions (North America, Europe, Asia, and Oceania), so that fundamental parts of IHE-J activities are compatible with other regions. IHE does not make original protocols. Recommended protocols in IHE confirmed HL7 (Health Level 7) and DICOM (Digital Image COMMunication in Medicine): Both of them are widespread protocols in the world. IHE referred them and made the guideline of more concrete use cases.

Endoscopy Working Group (WG) in IHE-J was formed in September 2003, sponsored by the Ministry of Economy, Trade and Industry, with the support of Japanese Association of Healthcare Information Systems Industry (JAHIS)[6], and Japan Industries Association of Radiological Systems (JIRA)[7]. The WG is composed of endoscopists, endoscope engineers, PACS engineers, and researchers of medical informatics.

The aim of the WG is to establish a standard endoscopy workflow model which leads interconnectivity between the CPOE and Endoscopy Department System.

### III. DATA ANALYSIS PERFORMED BY IHE-J ENDOSCOPY WG

#### A. Necessity of “evidences”

As the first step, the WG is focusing on gastroenterological (almost the same meaning as “digestive”) endoscopy that is most frequently conducted among other endoscopy variations (e.g., capsule endoscopy, laparoscopy). Gastroenterological endoscopy is hereinafter called “endoscopy”.

The WG has a conflict between standardization and specialization. There is already a guideline for radiology. Some radiologists believe that the radiology workflow in the guideline should fit an endoscopy procedure. The endoscopy WG has been basically motivated to utilize framework of the radiology guideline. But WG impression was that an endoscopy workflow is quite different from that of radiology (Table I). They made a strategy of making a specialized IHE protocol for endoscopy based on “evidences” of difference between endoscopy and radiology.

The achievements of WG are as follows:

[Endoscopy scheduled workflow (SWF)]

- Established “Integration Profile” for “Upper GI Endoscopy for Outpatients”

- Specified Endoscopy procedure

- Compared the Workflow between Endoscopy and Radiology

IHE recommends not only protocols of transactions but also a total workflow that followed clinical scene. The workflow with some variations is called “Integration Profile”. The WG established a typical workflow model for “Upper GI Endoscopy for Outpatients”. Next they compared the workflow between endoscopy and radiology in a university hospital analyzing data stored in the hospital information system. They got samplings for a month from an endoscopy

department system and a radiology department system in Chiba university hospital in June 2004.

#### B. A result of the comparison survey

The WG got 654 cases of endoscopy, 11677 cases of radiology in the month. The data showed the radiology department almost performed as original orders and had few cases (1.2%) of order modifications (Table II). On the other hand, the endoscopy department experienced a lot of order modifications. They had some variations of modifications in a pre-medication phase (Table III). The ratio of order modifications for the pre-medication is totally 40.7%. We can see another significant character of endoscopy by their high rate of performing a biopsy that is a procedure to get specimens for pathological diagnosis (Table IV). The merging number of endoscopy order modifications was almost half of whole case number (Table V).

## IV. DISCUSSION

#### A. The achievement of Endoscopy WG

The results encouraged Endoscopy WG making drastic change from a radiology workflow (Fig.1, 2, 3). They established the concrete workflow model as “endoscopy scheduled workflow” (Fig.4), finally published the draft of “Technical Framework” described “Integration Profile” in it and they got some public comments for the draft.

The WG decided to have transactions for the linkage information between Endoscopy order/report and Pathology order/report. Endoscopists should reduce some input items for pathology order, because they can copy them from an endoscopy report. Physicians can refer an endoscopy report and a relative pathology report conveniently with the linkage information.

#### B. Ideal standardization scheme

IHE-J Endoscopy WG made an original workflow in IHE protocol scheme. IHE-J has other two groups in it for original workflows. One is for laboratory tests (blood, urine etc.), another is for pathology. They struggle in the scenes making new workflows and protocols. But IHE has a concrete policy for making new protocols that is certain helpful for us. IHE has a system development and implementation activity called “Connectathon” which is a compound word of “Connect” and “Marathon”, cross-vendor connecting tests. The results of a “Connectathon” will publish and the document certifies vendors’ adaptations to IHE protocols.

In a phase of system development and implementation, the procedures are performed systematically. So the planning phase that is making “Integration profile” in an initiative of clinician should be scientific.

Now, Endoscopy WG performed making “Integration profile” with data from the exiting hospital information system. Next, they prepare to propose a more concrete standardization model using clinical evidences. The WG experienced the necessity of evidences. Standardization should be based on statistical evidences, not on existing products by system vendors. At that time, there are few systems that provide linkage information between endoscopy order/report and pathology order/report, against many endoscopists hope. They have to gather more data from many institutes for accurate evidences. The action will make standard protocols more useful.

## REFERENCES

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Table I: The Workflow Comparison between Endoscopy and Radiology

Item	Radiology	Endoscopy
Operator	Mainly Radiological Technicians	<b>Endoscopist</b>
Pre-treatment	Mainly Contrast Medium	<b>Suppressant of GI, GI cleansing, Anesthesia</b>
Modification of Order	Rare	<b>Frequently</b>
Additional Order	Not so many	<b>i.e. biopsy</b>
Reporting	Mainly Freetext	<b>Using “MST”</b>

Table II: Order Modified Cases in Radiology

Modality		Modified cases	Total cases	Ratio(%)
CR	Department	31	5955	0.5
	Portable	18	1160	1.6
DR with contrast	Room for GI	11	285	3.9
	Room for Urology	0	116	0.0
Angiography (DSA)		45	168	26.8
CT		18	2962	0.6
MRI		12	1031	1.2
<b>Total</b>		<b>135</b>	<b>11677</b>	<b>1.2</b>

Department of Radiology, Chiba University Hospital, June 2004

Table III: Order Modified Cases in Endoscopy (Pre-Medication)

Modality	Order modified			Not modified	Total
	Change a drug	Dose up	No order	No change	
Colonoscopy	68	8	0	91	167
ERCP	11	0	0	3	14
Upper GI	132	9	21	281	443
Gastostomy	0	0		1	1
Others	15	0	2	12	29
Total (cases)	226	17	23	388	654
Ratio (%)	34.6	2.6	3.5	<u>59.3</u>	100.0

Department of Endoscopy, Chiba University Hospital, June 2004

Table IV: Order Modified Cases in Endoscopy (Biopsy)

Modality	Done	Total Cases	Ratio(%)
Upper GI	26	443	5.9
Colonoscopy	26	167	15.6
ERCP	1	14	7.1
Gastostomy	0	1	0.0
Others	4	29	13.8
Total	57	654	8.7

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Table V: The Comparison Survey between Endoscopy and Radiology

Order	Endoscopy	Radiology(*)
Modified	315 ( 48.2%)	135 ( 1.2%)
Ordinary	339 ( 51.8%)	11542 ( 98.8%)
Total	654 (100.0%)	11677 (100.0%)

\* excluding RI, radiation therapy

Chiba University Hospital, June 2004

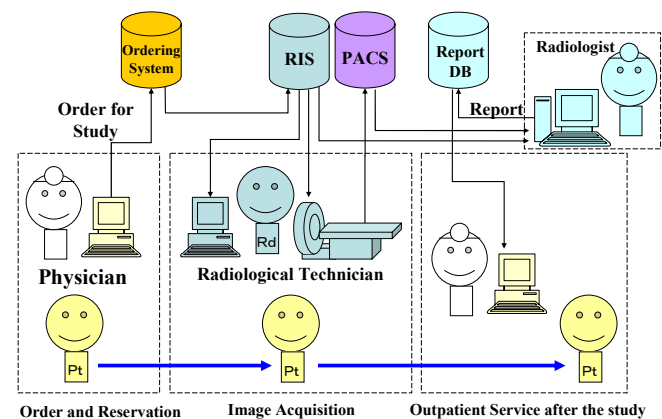


Fig.1: The Workflow of Radiology

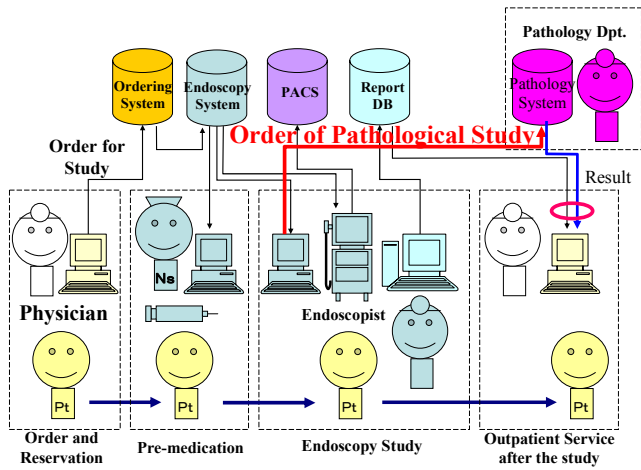


Fig.2: The Workflow of Endoscopy

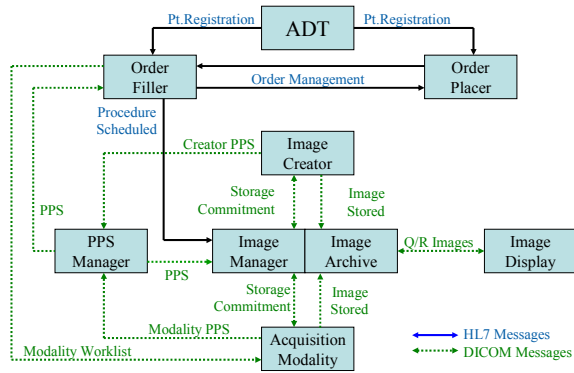


Fig.3: Scheduled Workflow of Radiology

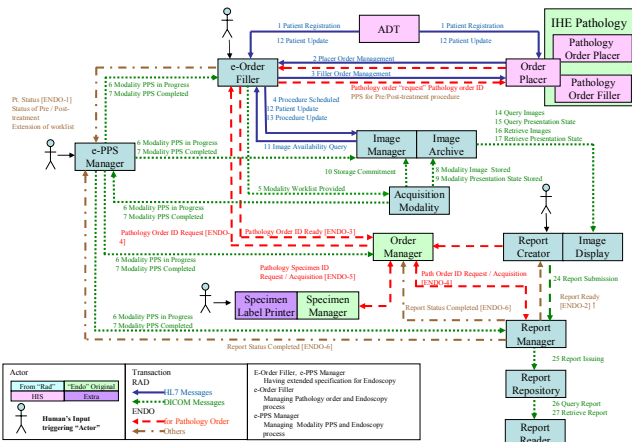


Fig.4: Endoscopy Scheduled Workflow