

How nice it is,
to have HL7 standardized storage



- Wide variety of applications out of Ministry's project based on HL7

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Dept. of Medical Informatics
HL7 Japan chair

CPOE and EMR in Japan, 2006

⌘ Order entry system

⌘ 75% or more of the hospitals with more than 400 beds.

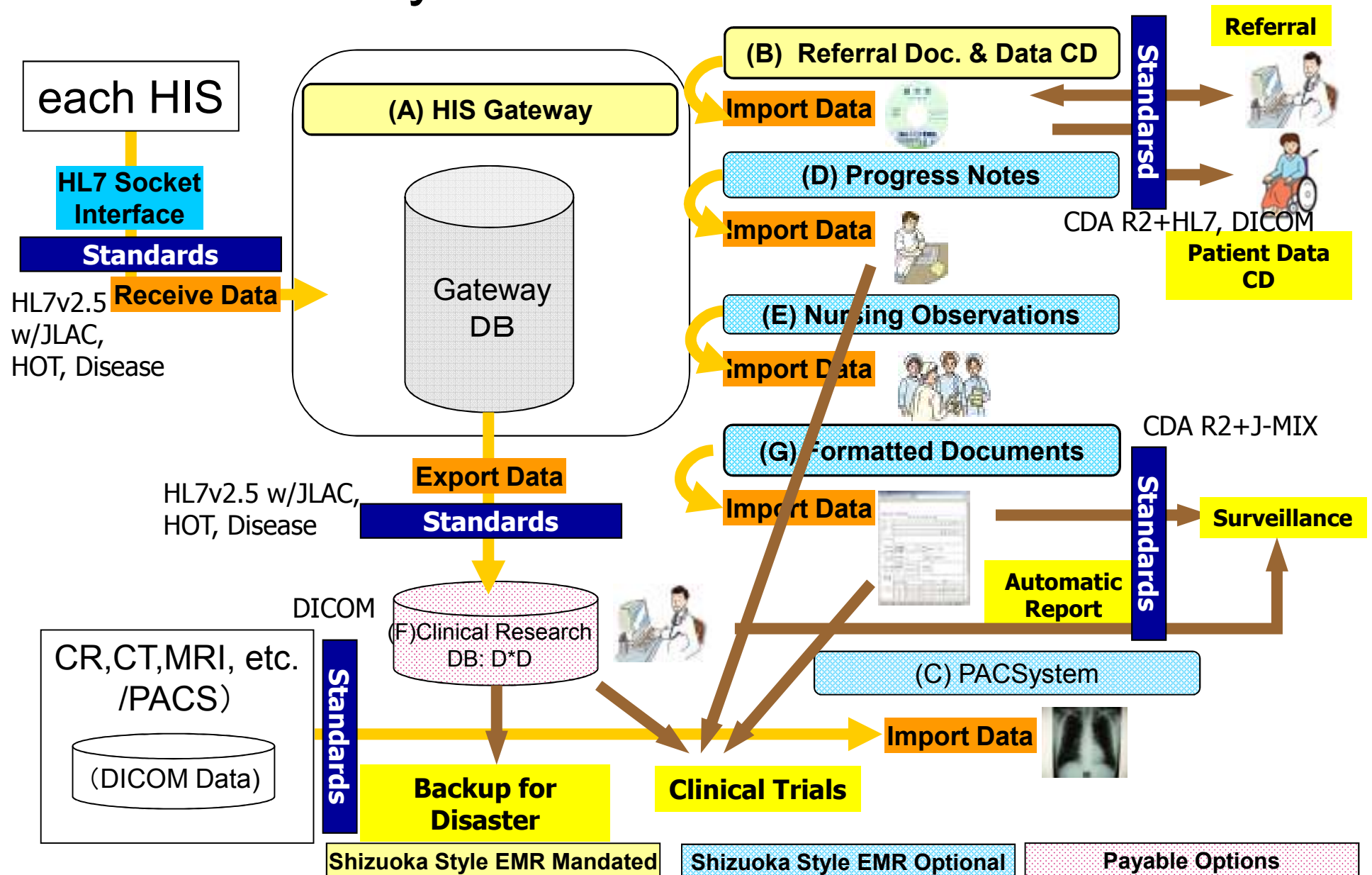
⌘ Electronic medical record system

⌘ 22% of the hospitals with more than 400 beds and 5% of clinic.

Enclosures

- ⌘ Until recently, HL7 format export was not equipped, nor optional, but customization
- ⌘ A vendor appeals that our EMR already has master files of drugs, examinations (of their own)(no standard code)
- ⌘ "We have more confidence on our proprietary format than HL7."
- ⌘ At replacing CPOE of vendor A, challenging vendor B required to pay 60,000,000 yen for "data conversion" to vendor A, in a real deal of 300,000,000 yen, as user required to carry over past data, naturally
 - ⊡ Trump is the precious patients' data, by efforts of whole clinical staffs!
 - ⊡ "Leave data in standardized format, at the completion of the contract" (A divorce clause at marriage contract).

Shizuoka Style EHR Structure



⌘ Referral document

⌘ HL7 prescriptions and lab results

⌘ DICOM images

⌘ Also can "sell" to patients who want this,



Progress Note

Problem oriented

Stamp repeats

XML editor with template

Text format

Nursing observations

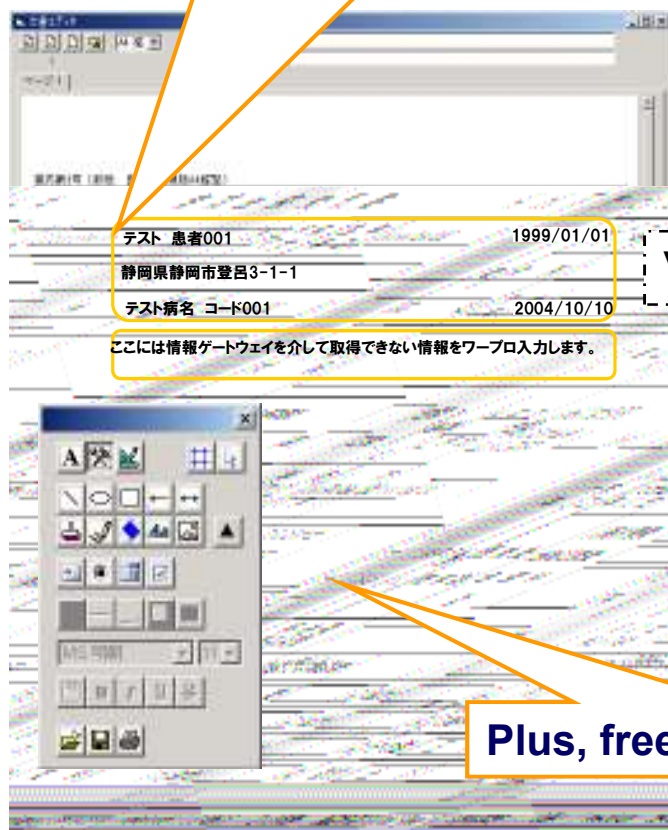


- ✓ Orders and observations from HIS
- ✓ Plus, nursing observations, orders,

- ✓Vital signs and observations
- ✓Viewable by hours, days, weeks

Formatted documents

Some contents (Demographics, disease classifications, etc. imported from HIS)



Viewable by XML viewer

Plus, free texts or pull downs

A screenshot of a medical application form titled "申請書ビューワ" (Application Form Viewer). The form contains various fields for patient information, including name, address, and dates. It also includes a section for medical history and a table for test results. The form is designed for data entry and viewing.

診療情報提供書（患者紹介）

2007 年 3 月 23 日

医療機関

初夢クリニック
内科医療
機関
名コンベンション医療セ
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1丁目1番1号電話
番号

054-221-2406

TEL 011-XXX-XXXX

医師
氏名

富士鷹 茄子

患者氏 名	駿河 葵	生 年 月 日	1952 年 7 月 17 日	女
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紹介目 的	胃潰瘍投薬治療後の経過観察
現疾患 (診断 内容)	胃潰瘍
現在の 処方 (現投 与)	MSコンチン錠 10mg 2錠 1日2回 12時間毎 内服 7日分
身体所	身長: 170cm、体重: 48kg

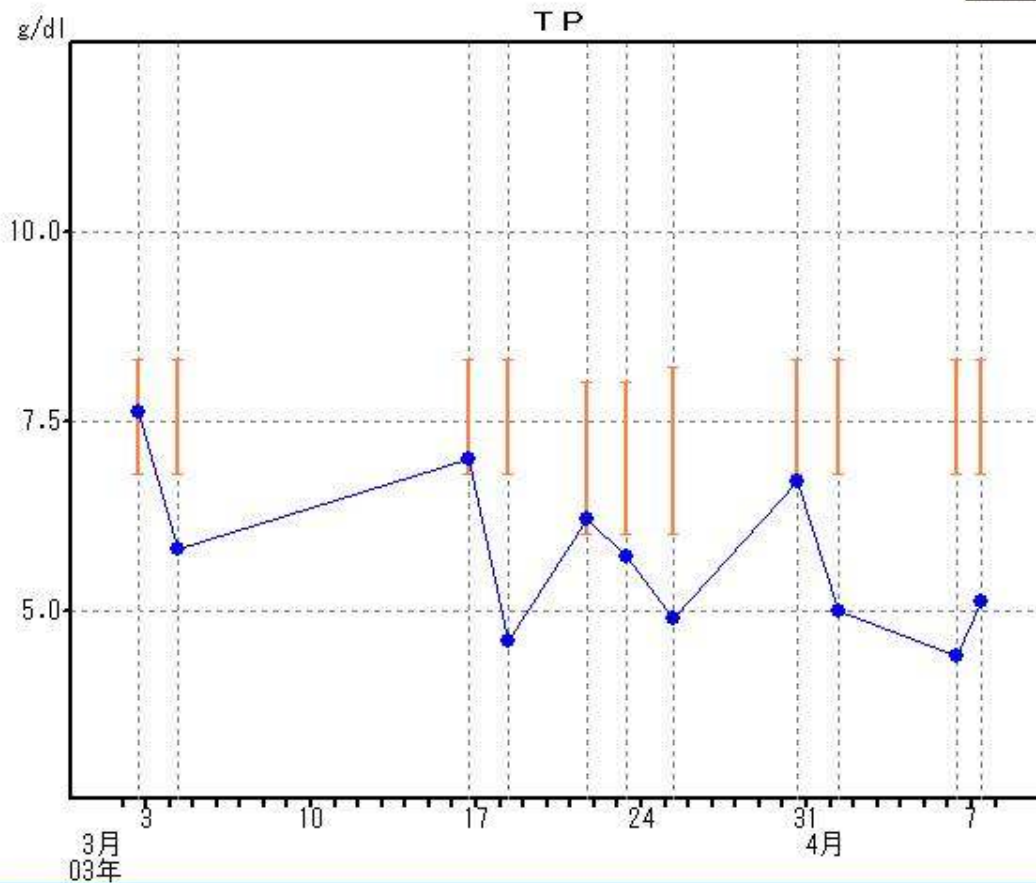
処方一覧 処方経過 検査結果 画像参照

すべて 年割 月割

		2003											
		3/3	3/4	3/5	3/7	3/12	3/17	3/19	3/20	3/20	3/21	3/22	3/23
TP	g/dl	7.6		5.8			7.0	4.6					6.1
ALB	g/dl	3.7		3.0			3.3	2.2					
A/G比		0.95		1.07			0.89	0.92					
ZTT	K-U			7									
GOT(AST)	IU/L	39		18	26		27	10	22				3

2003 2005

グラフの設定



The Japan Times

May 17, 2006

THE JAPAN TIMES • WEDNESDAY, MAY 17, 2006 3

NATI

Shizuoka hospitals test electronic patient charts

By KOICHI MIYAGAWA

SHIZUOKA (Kyodo) In a radical departure from the practice of writing out patient medical records, the Shizuoka Prefectural Government has developed and is trying out a system to keep the documents in electronic form.

Two municipal hospitals, in the cities of Numazu and Fukuoka, started using the electronic chart system in January after getting it for free from the prefecture.

Eleven other hospitals are scheduled to follow suit sometime over the next 12 months.

Prefectural officials hope to introduce the system to all Shizuoka hospitals by fiscal 2009. The system is unique in that it has standardized data formats.

This, its creators say, enables the information to be more easily shared when patients are transferred, and outpatients will be able to use their home computers to view information compiled by their doctors, including diagnoses.

The health ministry is keeping a close eye on the experiment in hopes it can be expanded to hospitals nationwide.

Under the trial, patients undergoing treatment at the two hospitals can obtain a CD-ROM with such information as the names of their medicines and drugs used to treat

them. Each disc has a special password for the patient.

Included in the data are reports on medicines taken, results of blood pressure checks and CAT scans. Each CD contains software that lets a patient convert blood pressure data into graphics or merge CAT scan images.

A prefectural official said patients can view their medical charts on any PC and use the information if they seek second opinions.

"The system can also contribute to enhancing medical services for patients and improve the transparency of medical care," the official said.

In many cases, treatment results are handwritten by doctors on patient charts.

The patients, however, often have trouble with these handwritten medical records when seeking other opinions or when transferring to another medical institution.

Although many medical facilities compile electronic records of treatment, the records cannot be accessed by other hospitals if their formats differ, requiring a patient seeking transfer to another institution to repeat certain tests.

The central government had hoped to have standardized electronic charts at more than 60 percent of hospitals with more than 400 beds and

clinics in the current fiscal year, but little progress had been made due to the vast funds needed to develop and introduce such a system.

A Health, Labor and Welfare Ministry official gave high marks to the Shizuoka system.

"In addition to standardizing the data format, Shizuoka Prefecture's electronic record system is one that can be easily introduced at small clinics," the official said.

Dr. Nobuo Akiyama, an honorary director of Numazu Municipal Hospital, said many patient charts and letters of introduction are simply difficult to read due to doctors' poor handwriting, causing problems for patients and medical practitioners alike.

He said medical care administered by teams of experts has now become common, and thus patient charts must break out of the realm of just being records kept by individual physicians.

"Electronic patient charts are appropriate for information disclosure," Akiyama said, adding they can be used by any hospital where patients are transferred as long as the formats are standardized.

He predicted that electronic charts will come into widespread use, "although it may take time."



FUKUOKA — Taro Okamoto, in December. KYODO

Display

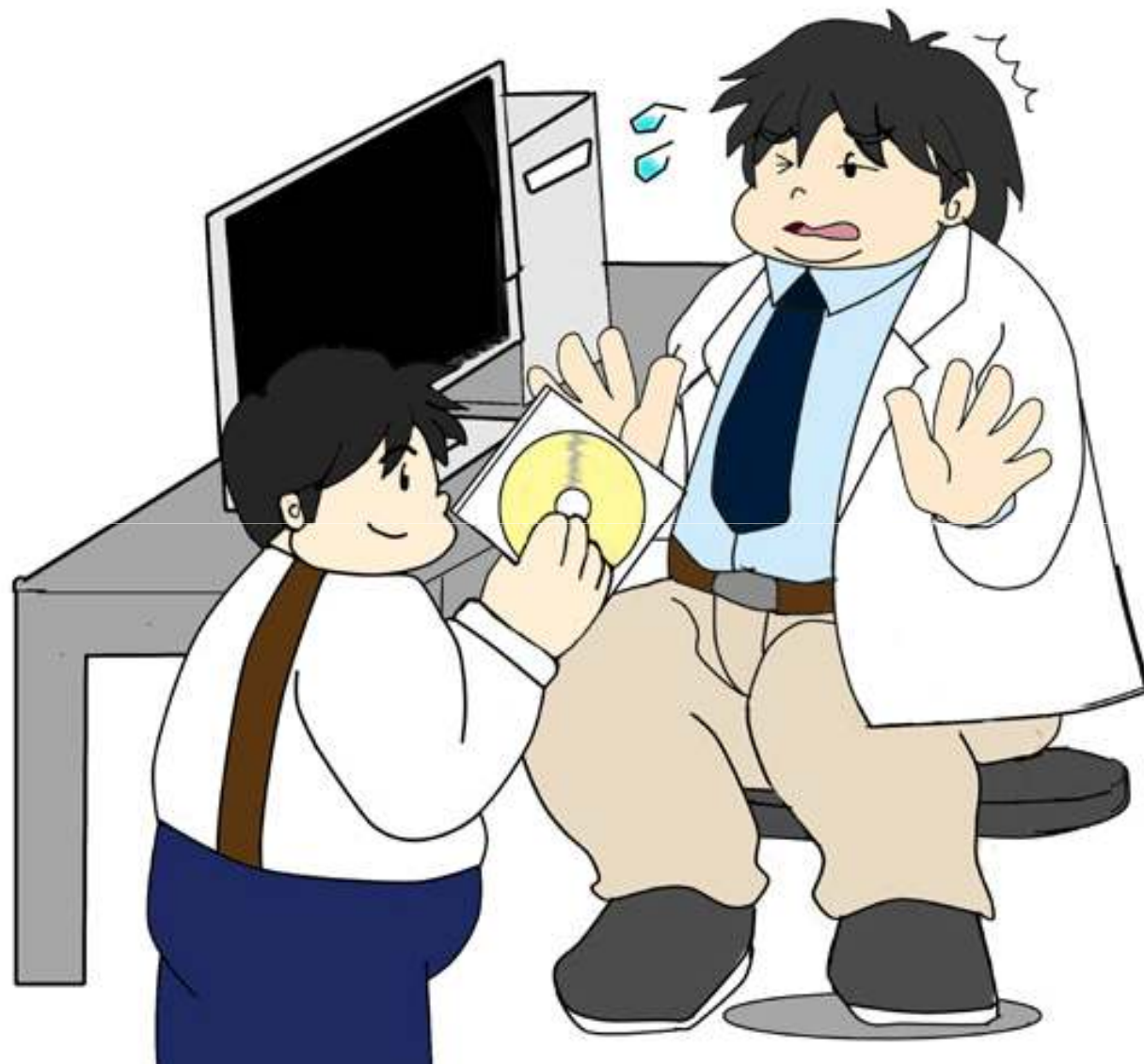
HAGASAKI (Kyodo) Hiroshima residents have been put on permanent exhibits Japanese artist Taro (1911-1996) that depicts the bombing of Hiroshima.

But neither one of the expressed eagerness to offer home for the long-lost "My room," which was brought nearly a year ago from N

A foundation running the Hiroshima Memorial Museum is to display the mural, which is high and spans 30 meters after it undergoes restoration. The foundation hopes to mount exhibition site.

CDs at Hamamatsu Univ. by month

	CDs accepted	CDs taken in	Referral CDs	"Souvenir" CDs
	持込CD数	取り込み可能	紹介状CD	患者CD
08/05	34	25		
08/06	74	50		
08/07	76	64		
08/08	68	56		
08/09	76	54		
08/10	89	65	3	
08/11	101	76	32	1
08/12	97	75	24	1
09/01	74	62	38	
09/02	94	80	46	1





MHLW promotes Shizuoka

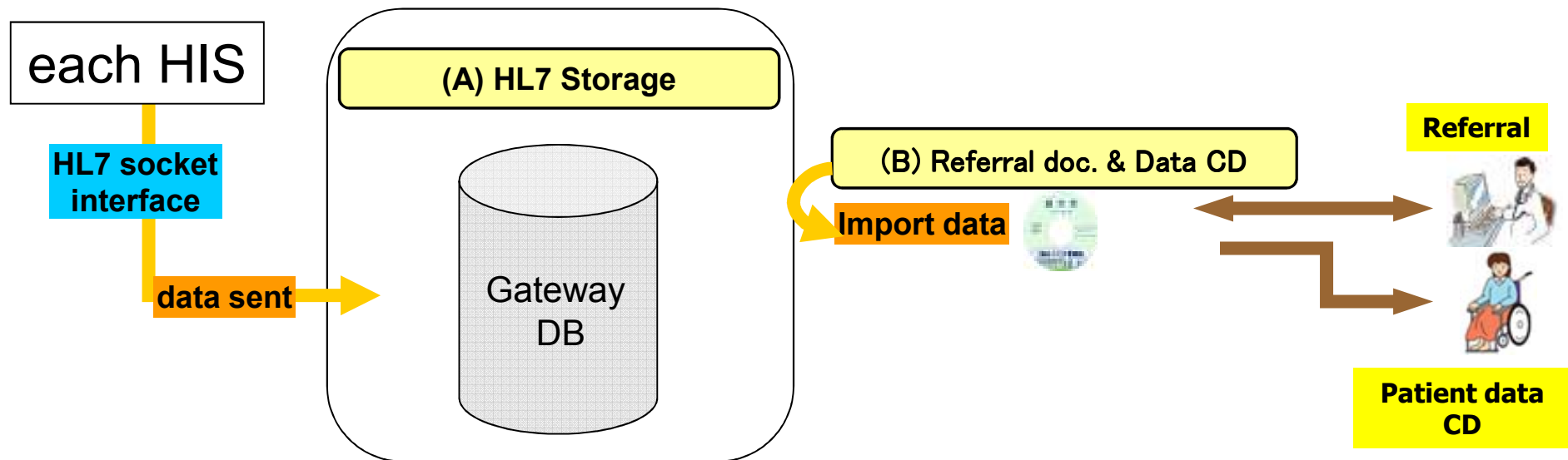
Prefecture EHR for Nationwide Use ...04/'06

- ⌘ 88M yen
- ⌘ CD (referral and data for patients) free components software nationwide, like Shizuoka
- ⌘ CD for patient can be payable like diagnosis certificate (3000 yen)
 - ☑ prescriptions, lab results, images + documents
- ⌘ Part of Shizuoka EHR is now SS-MIX (Standardized Structured Medical Information eXchange).

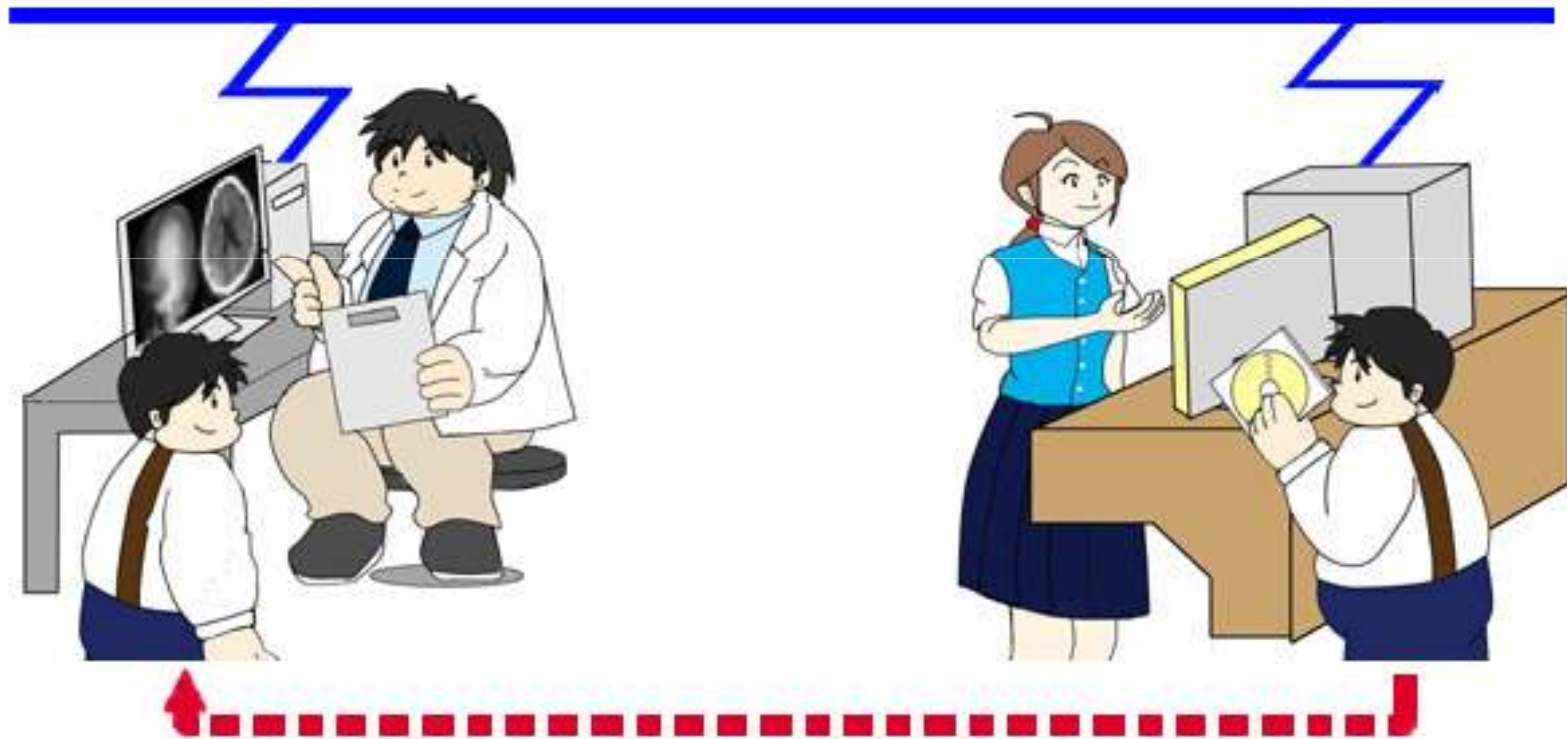


SS-MIX for Hospitals

With patient demographics, lab, prescription from CPOE in HL7 v2.5 format, CD (referral or data for patients) is created



Reception desk receives CD, checks virus,
imports information, which can be viewed at clinics
(Free software, provided by Ministry project)



PDI Agreement

⌘ Images exchanged by CD started, but making some annoyance

- ☒ Not conforming PDI, DICOM
- ☒ Too many slices, too many studies
- ☒ Multiple patients in one CD
- ☒ etc.

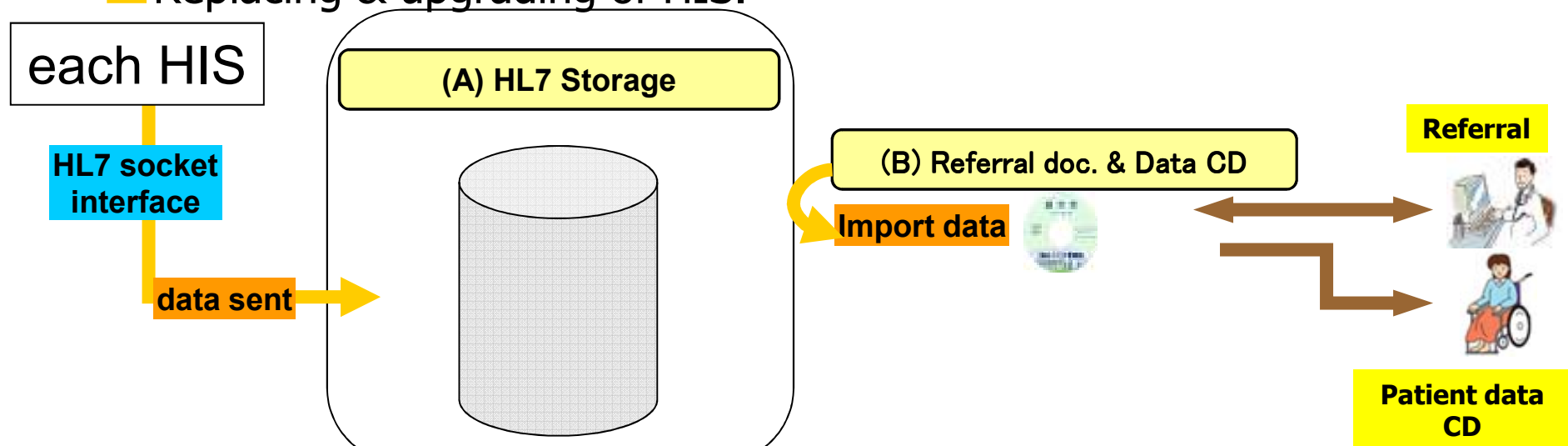
⌘ By academic assoc.(JAMI, JRS, JSRT), vendor assoc. (JIRA, JAHIS), and IHE-J

- ☒ 1 patient, 1 CD
- ☒ Conform PDI
- ☒ Conform DICOM
- ☒ Reasonable amount of slices (no 1000+ MDCT), and studies
- ☒ If include report, must be in "other files" position and note it

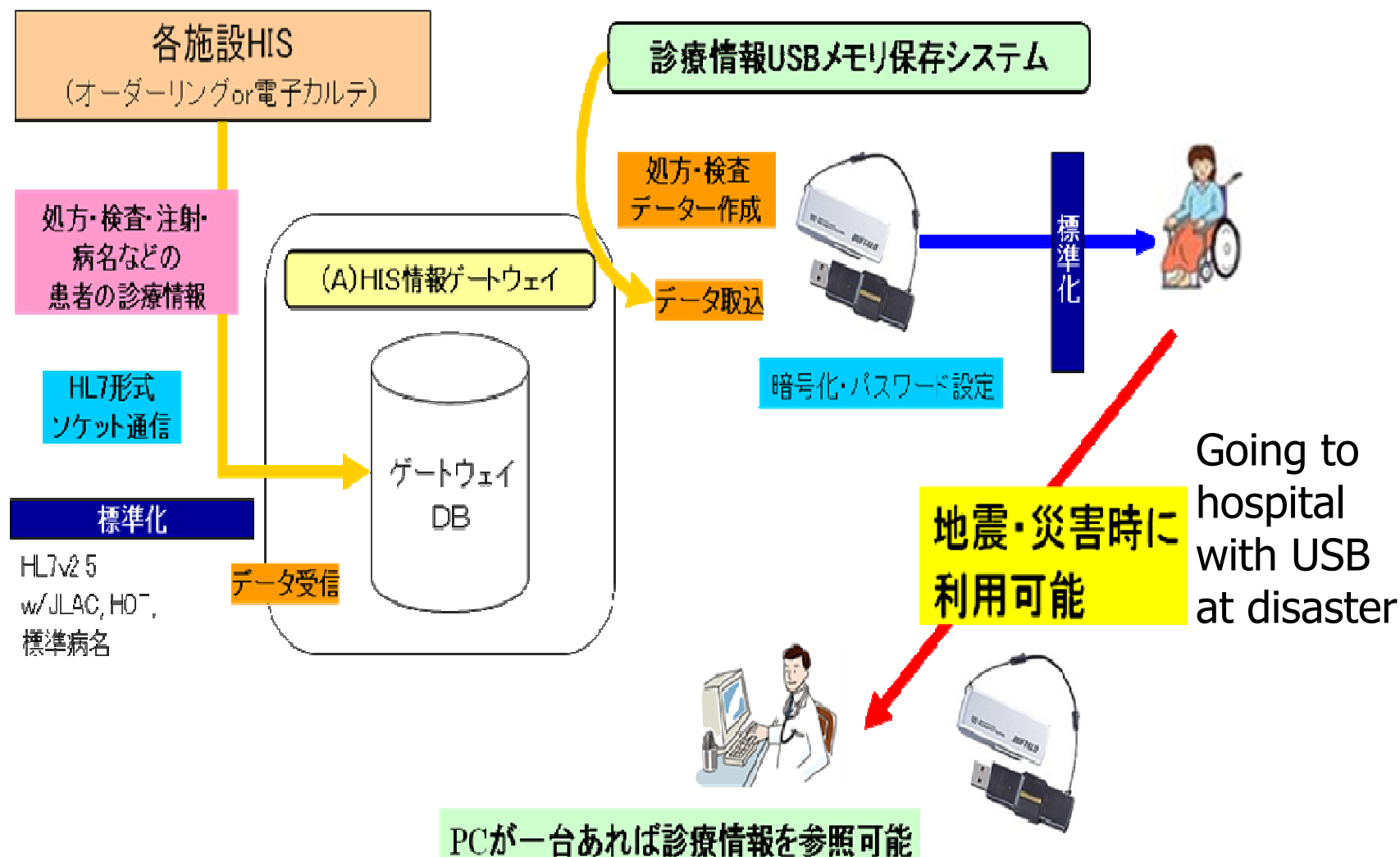
Wide variety of applications on HL7 standardized storage

⌘ We have patient demographics, prescriptions & injections, lab results, diagnosis classifications in HL7 v2.5

- ☒ PHR
- ☒ Making documents
- ☒ Data retrieval
- ☒ Interoperability with peripheral systems
- ☒ Replacing & upgrading of HIS.



-PHR by fingerprint-secured USB memory



Trial at Fukuroi Municipal Hospital

2008-12-05 Disaster Drill

- ⌘ 5 patients(actually, hospital staffs) have accumulated their data from HL7 storage
 - ⏏ 49.7 seconds (average) from USB memory being handed, fingerprint authenticated, then data displayed.



Questionnaires for 12 staffs involved

5 level Likart scale: very good, good, average, poor, very poor

⌘ Times spent until display of data

☒ (Fast) 3-8-4-0-0 (Slow)

⌘ Prescriptions, lab results (no images) are enough?

☒ (Enough) 3-5-5-3-0 (Not enough)

⌘ Which you prefer, caring patient without paper record picked-up and delivered, or this method?

☒ (This method) 2-6-4-3-0 (Without paper record)

⌘ This USB PHR is useful for disaster

☒ (Agree) 2-5-6-2-0 (Disagree)

-Making documents with HL7 storage



- ⌘ Patient demographics, prescriptions & injections, lab results, diagnosis classifications can be pre-populated
 - ☑ Adverse event report
 - ☑ Diagnosis certificate for submission to insurance organizations, etc.
 - ☑ Infection control report
 - ☑ Certificate for subsidy by local governments
 - ☑ Clinical research case card.

Post Market Report

- ⌘ Paper-based
- ⌘ Manually collected in busy clinics



Form Filling

- ⌘ Manually
- ⌘ But, most items are in CPOE and EMR



Lab results (as well as prescriptions) are pre-populated from HL7 standardized storage

[illegible]

Adverse events must be input by reporting doctors

AEReport - Windows Internet Explorer

http://localhost/AEReport/TPID=1014300

患者情報 1014300 Surge Aoi 患者指定 編集文書指定 新規文書作成

1952/07/17生まれ 女性 患者情報 文書修正・再読 文書登録 文書印刷 *****TabletsEventReport (00000005) (確定)

処方歴

2008/04/21
OHP (surgery)
Rp1
Amlodipine Tablets 2.5mg 1 TAB
Lipitor Tablets 10mg 1 TAB
ACTOS Tablets 15mg 1 TAB
1 time per day, after breakfast 28 Days

2008/05/26
OHP (surgery)
Rp1
Amlodipine Tablets 2.5mg 1 TAB
Lipitor Tablets 10mg 1 TAB
ACTOS Tablets 15mg 1 TAB
1 time per day, after breakfast 28 Days

2008/06/09
OHP (surgery)

2008/06/23
OHP (surgery)

2008/07/07
OHP (surgery)

検査結果歴

	2008/09/01	08/18/08	08/04/07	07/22/07	07/07/06	06/23/06	06/09/05
GOT(AST)	15	14	12	15	12	21	14
GPT(ALT)	10	9	9	10	10	31	9
ALP	167	147	146	167	167	169	147
LDH	185	139	149	185	148	122	139
T-Bil	0.3	0.7	0.4	0.3	0.5	0.4	0.7
Urea-N	8	12	12	8	13	16	12
Cre	0.59	0.53	0.54	0.59	0.57	0.55	0.53
T-CHO	212	175	201	212	212	176	175
Ca	8.5	8.5	8.7	8.5	8.9	8.2	8.5
CRP		2.0				0.3	2.0
TP	6.4	5.8	5.8	6.4	6.4	5.8	5.8
Na	144	140	138	144	146	140	140
K	4.3	4.0	4.3	4.3	4.7	4.2	4.0
Cl	110	104	105	110	99	104	104
RBC	417	397	390	417	417	401	397
HGB	13.6	12.8	12.9	13.6	13.6	13.0	12.8
WBC	6.9	7.1	4.5	6.9	6.9	7.7	7.1
HT	39.5	37.9	37.6	39.5	39.5	36.3	37.9

2008/06/08~2008/09/08

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[Adverse Events]

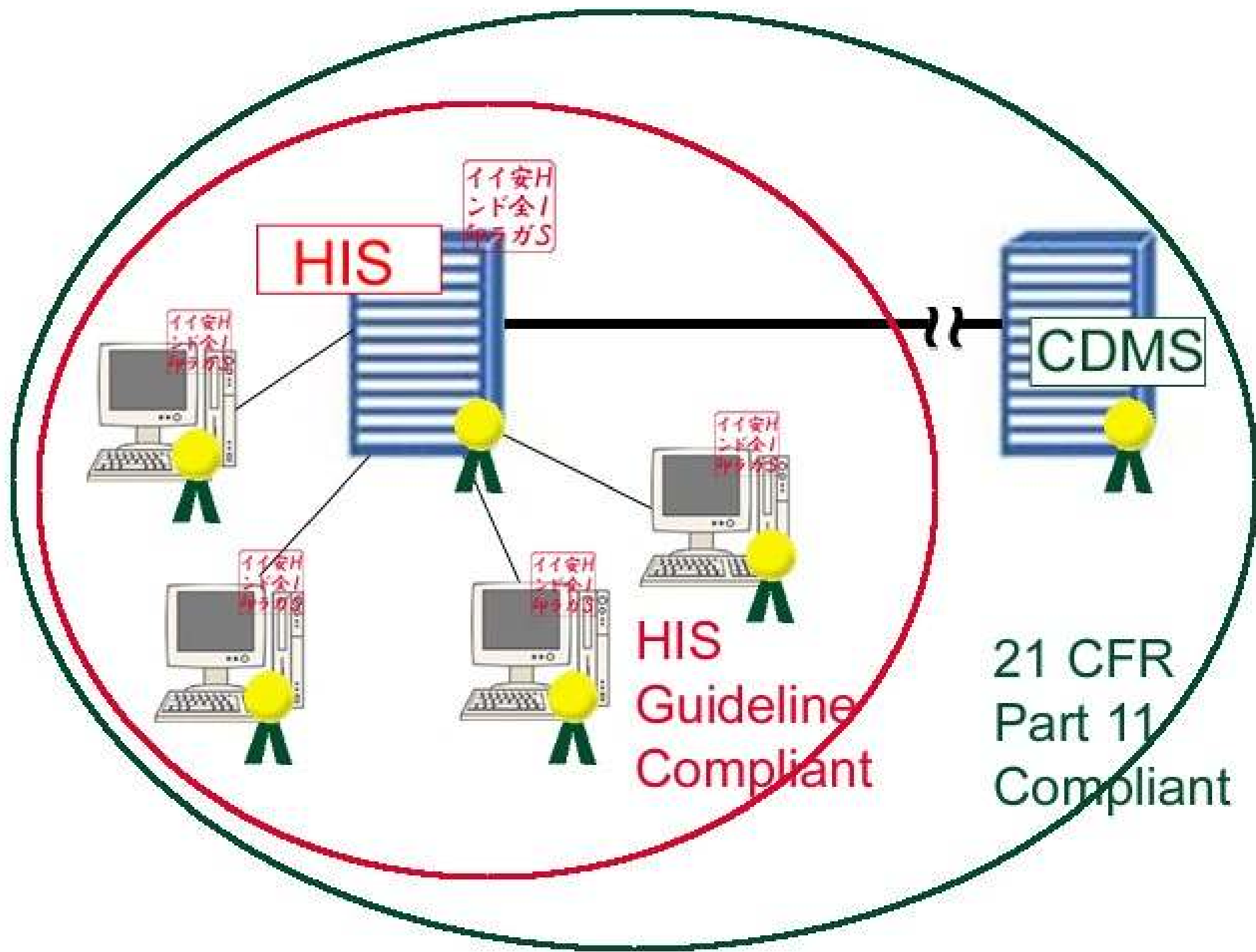
☐ N ☒ Y → Report in the followings

Severe event number:

1. Death
2. Threat to death
3. Permanent disorder
4. Extension of hospitalization
5. Other severe events to avoid above situations
6. May cause disorder in descendants

Adverse event	Severity	Disposition		Outcome	Relation to this drug
		Medication	Others		
Conc	<input checked="" type="radio"/> Severe Severe event # () <input type="radio"/> Not Severe <input type="radio"/> Slight <input type="radio"/> Not slight	<input checked="" type="radio"/> Continue <input type="radio"/> Dose decrease <input type="radio"/> Interruption	<input type="radio"/> N <input type="radio"/> Y	Outcome date 2008/08/15 <input checked="" type="radio"/> Recovery <input type="radio"/> Better <input type="radio"/> Not recovered <input type="radio"/> Recovery with sequel <input type="radio"/> Death <input type="radio"/> Unknown	<input type="radio"/> Apparently related <input type="radio"/> Probably related <input type="radio"/> Possibly related <input type="radio"/> No relation <input type="radio"/> No enough evidence
	<input type="radio"/> Severe Severe event # () <input type="radio"/> Not Severe <input type="radio"/> Slight <input type="radio"/> Not slight	<input type="radio"/> Continue <input type="radio"/> Dose decrease <input type="radio"/> Interruption	<input type="radio"/> N <input type="radio"/> Y	Outcome date / / <input type="radio"/> Recovery <input type="radio"/> Better <input type="radio"/> Not recovered <input type="radio"/> Recovery with sequel <input type="radio"/> Death <input type="radio"/> Unknown	<input type="radio"/> Apparently related <input type="radio"/> Probably related <input type="radio"/> Possibly related <input type="radio"/> No relation <input type="radio"/> No enough evidence
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ローカルイントラネット 100%



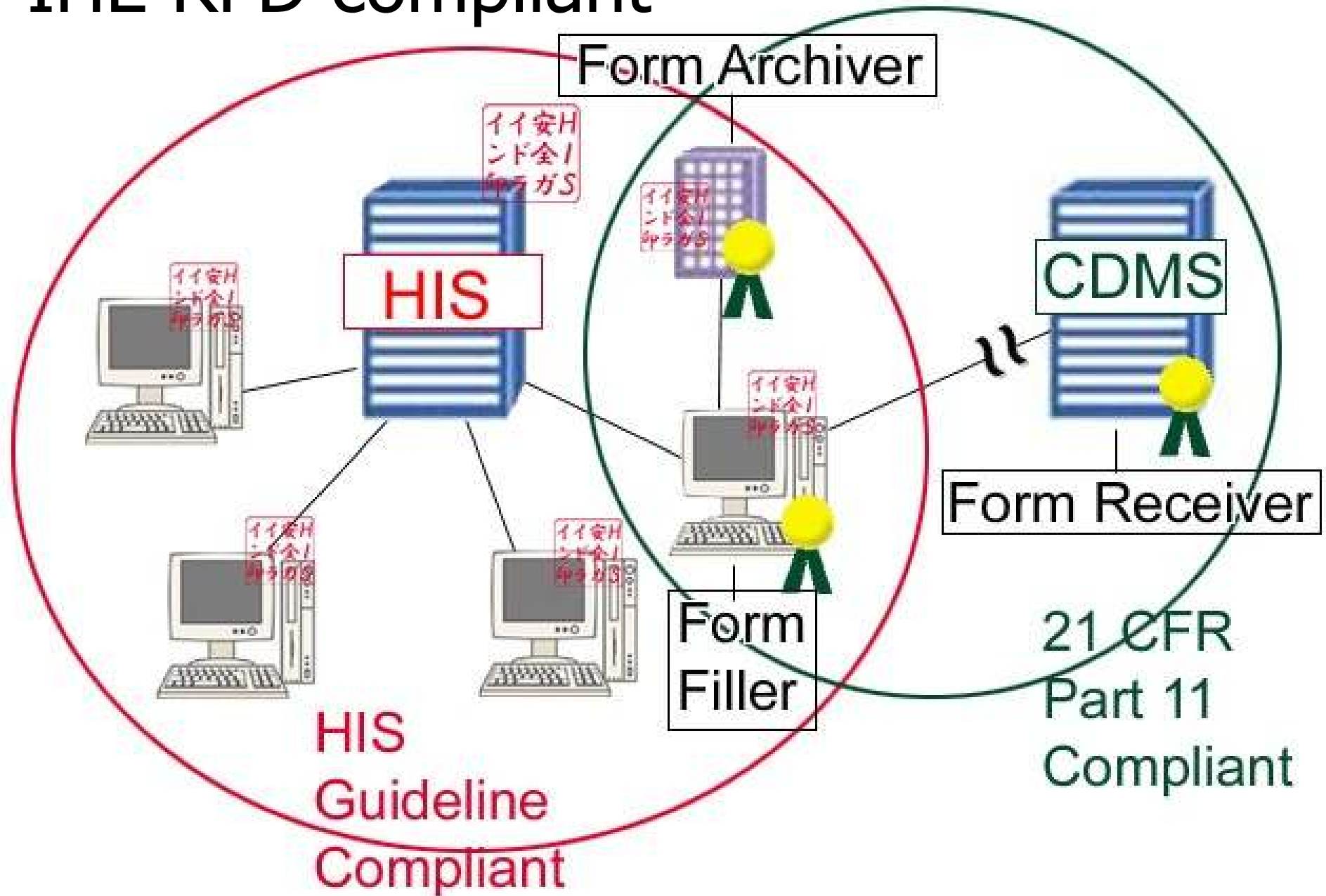
HIS

CDMS

HIS
Guideline
Compliant

21 CFR
Part 11
Compliant

IHE RFD compliant



-Clinical Database: D*D at Hamamatsu Univ.



⌘ 73,709,298 records of 10 years of Lab.
results, Prescriptions, Diagnoses,, all from
HL7 storage

⌘ "Pravastatin (any titer, with generics)
prescribed and recorded AST > 150 within
two weeks" resulted in "83 Patients", took
112.22 seconds

"pravastatin (or others, any titer) and AST > 150 subsequently within 2 weeks"

Search result: 83 patients, search time 112.22 seconds

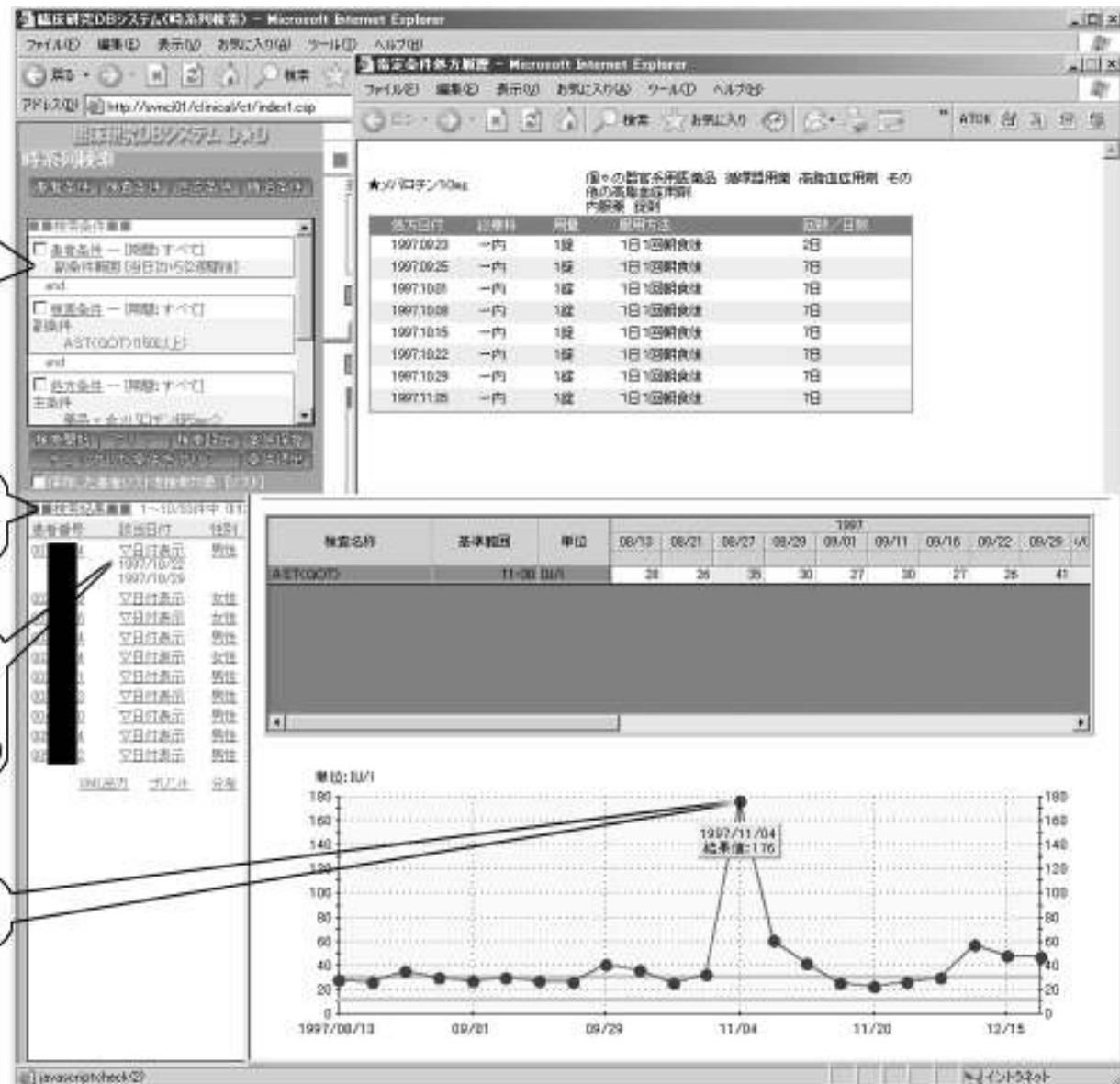
Patient list shows a selected patient has "HIT" prescription twice, 1997/10/22, and 10/29, and graph of AST show peak high value recorded on 1997/11/04, within two weeks of the medication.

Mevalotin (Pravastatin) and other generic drugs prescribed, and within 2 weeks, recorded AST > 150

Result: 83 patients, search time 112.22 seconds

List of patients, with "sequence" timing dates
First patient has "HIT" sequence timing twice, 1997/10/22, 1997/10/29

AST=176 on 1997/11/04



Translational Study

- ⌘ Selected clinical data into Genome Database
- ⌘ You may not be able to check what you thought of.



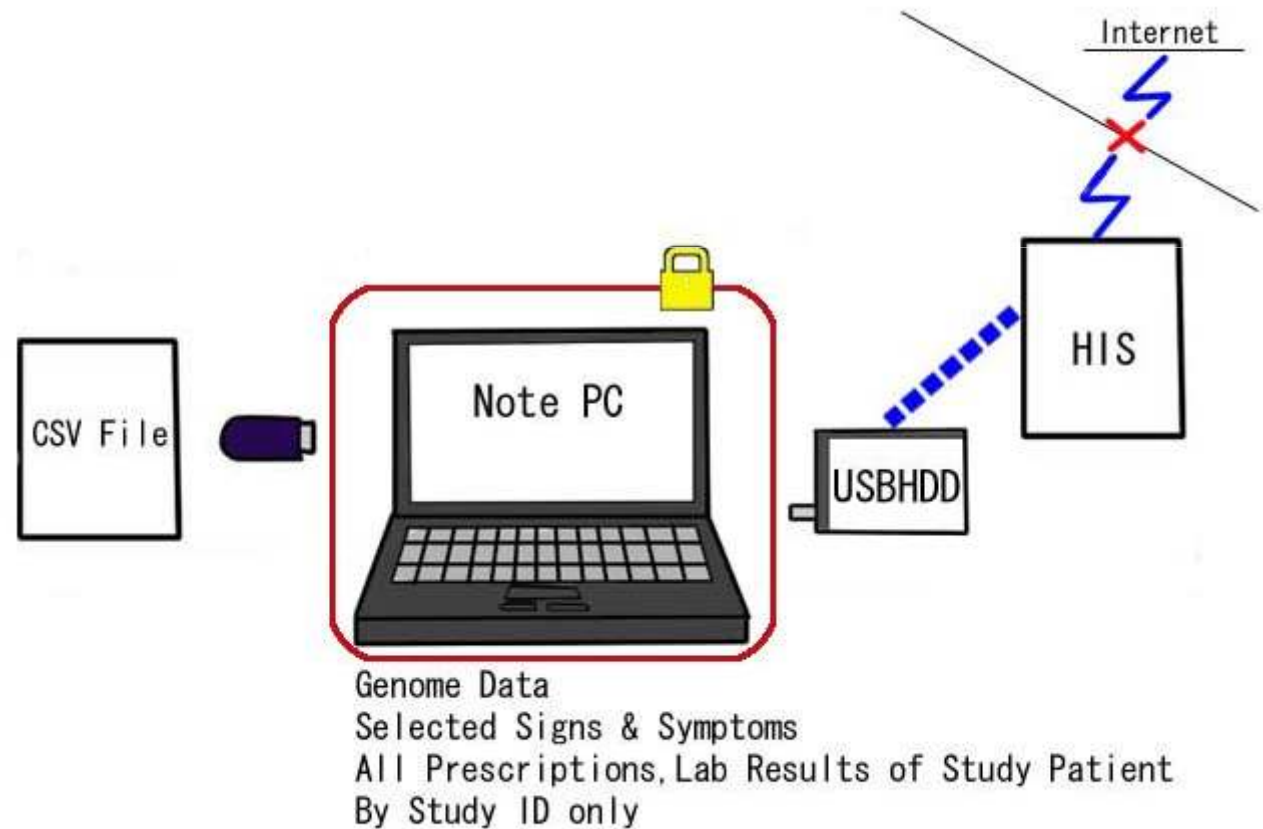
BG's, SU's
HbA1c, IRI,
Neuropathy,
Nephropathy,
:

Genome
Database

Then, put Genome data into Clinical DB, not Clinical data into Genome DB

⌘ So, you can try whatever you think of medication, lab results, to try.

⌘ Safely apart from network, other users.



"CYP2C19 genotype is associated with symptomatic recurrence of GERD during maintenance therapy with low-dose lansoprazole" EJCP-2008-0363.R1

- ⌘ 125 patients of gastroesophageal regurgitation, their CYP2C19 genotype status, presence or absence of heartburn condition, are put into Clinical DB.
- ⌘ We tested the relation of genotype (rapid, intermediate and poor metabolizers), examination results, such as calcium and total protein,,,,,
- ⌘ Finally, we tested an example of improvement where the given dose of PPI could remain reduced 8 weeks after the start of medication. We found a significant difference between PM-RM and PM-IM (PM-RM $P=0.014$, PM-IM $P=0.104$).
- ⌘ This study design (effectiveness judgment by PPI and relation with Genotype) required less than one hour.

Search
condition:
Phenotype=
poor
metabolizer
&
PPI prescribed

30
patients,
in 2.88sec.

Other Genome
information of
the selected
patient

The screenshot displays a web-based clinical research database system. The left pane shows the search interface with filters for 'Phenotype: PM' and 'PPI prescribed'. The main pane displays a list of 30 patients, with the first 10 shown in the table below.

患者番号	氏名	性別	年齢
31225927	■■■■■	男性	65
31239196	■■■■■	男性	59
31273467	■■■■■	男性	54
31472346	■■■■■	男性	90
31717230	■■■■■	女性	73
31718579	■■■■■	男性	78
31805677	■■■■■	女性	50
31857295	■■■■■	女性	68
31905759	■■■■■	女性	38
32046128	■■■■■	男性	67

The right pane shows the 'Genome Information' for the selected patient (ID: 31472346, Male, Born: 1918.08.29). It includes a table of genomic data and a list of clinical parameters.

項目名称	項目内容
Gene Code	273
MDR1 C3435T	C/T
MDR1 3435 T/T or not	C/C or C/T
MDR1 3435 T carrier or not	C/T or T/T
m1	m1/m1
m2	wt
m1&m2	m100.00
Phenotype	PM

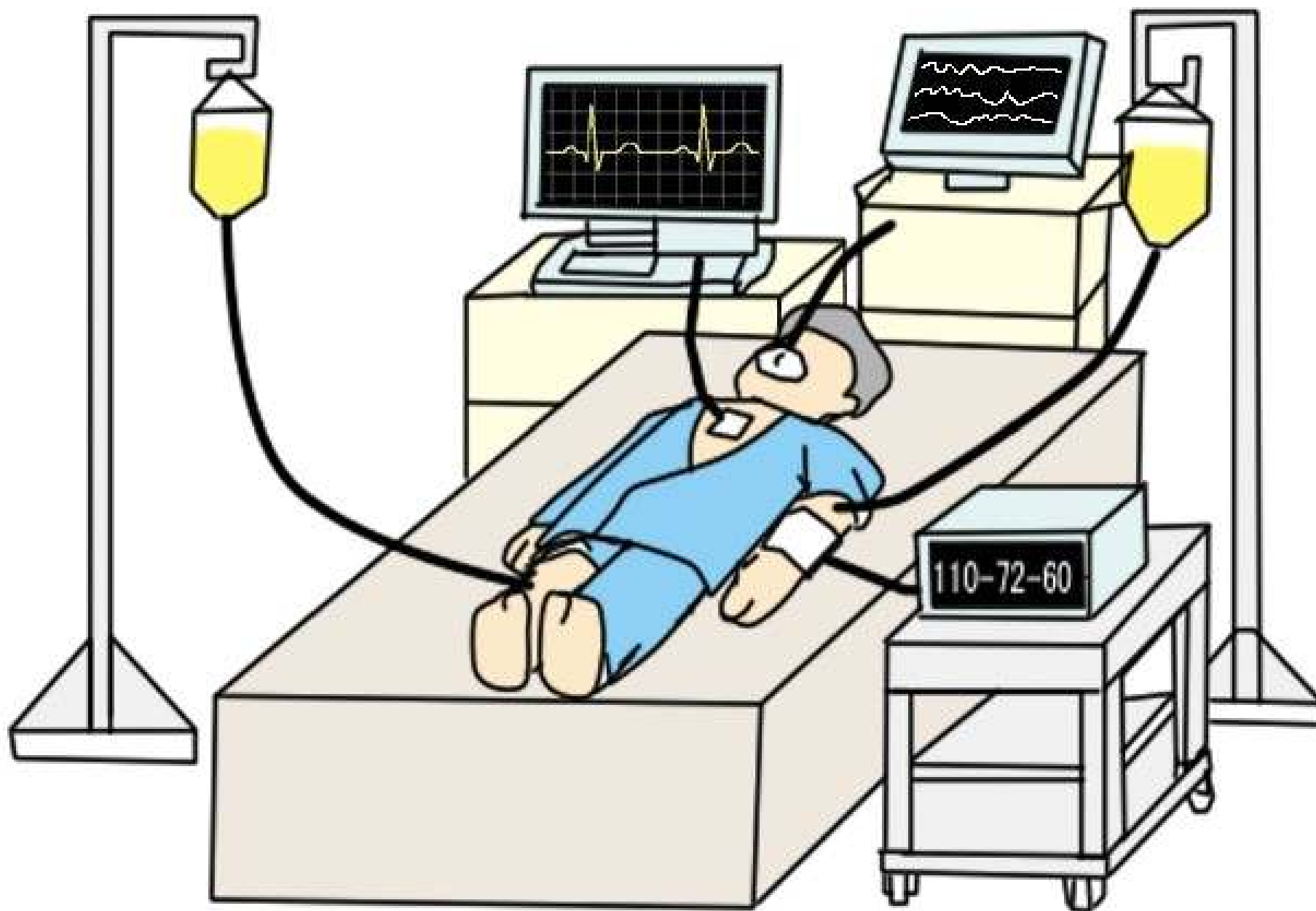
At the bottom, there is a section for 'Clinical Parameters' (検査結果) with a table of various lab tests and their results.

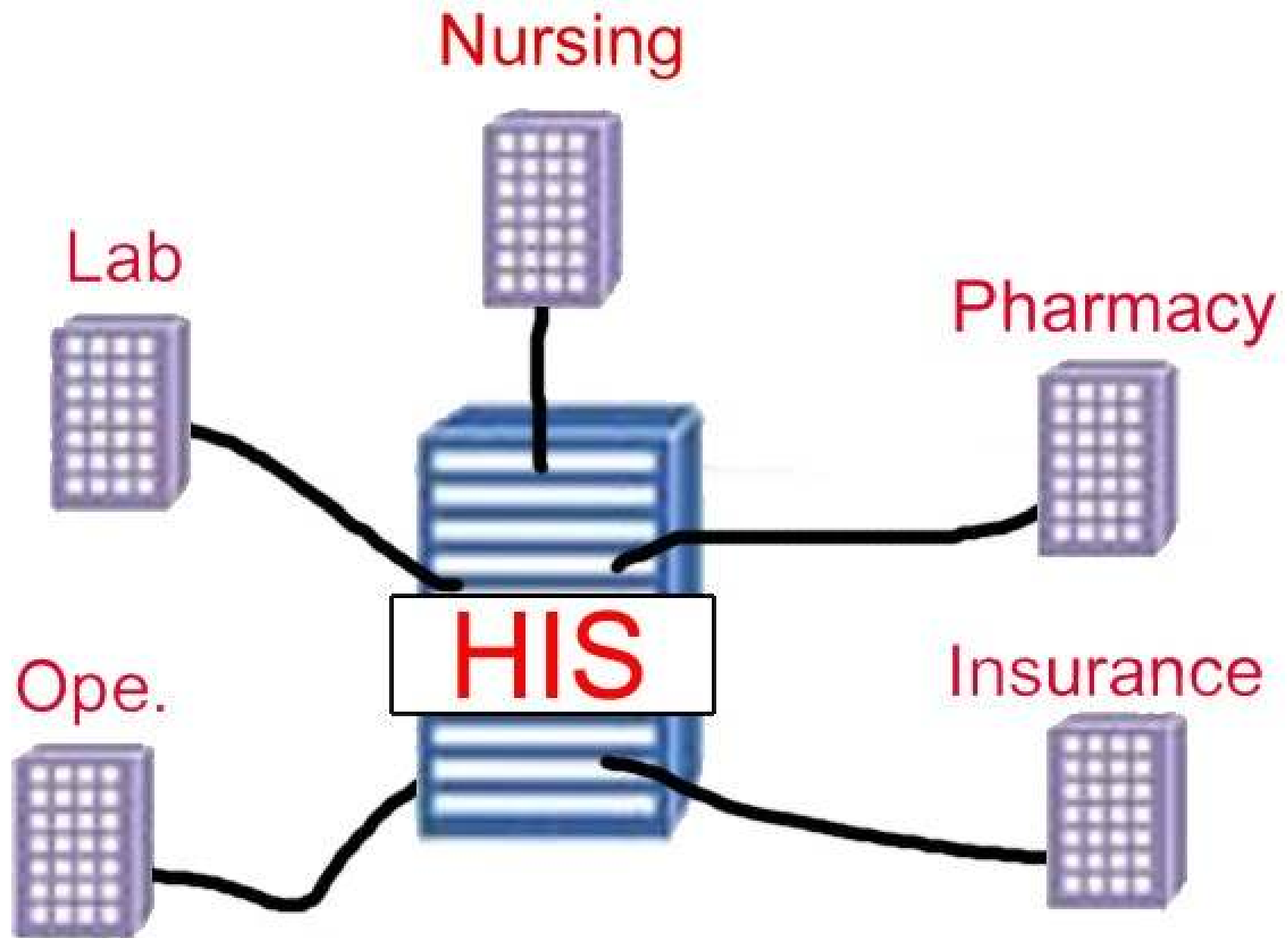
検査項目	検査結果
PT	LD(LDH)
LDH/AST比	アルカリフォスファターゼ
γ-GTP	クレアチニン
クレアチニン	BUN/CRE比
尿酸	BUN
ナトリウム	カリウム
クロール	CL/NA比
白血球数	赤血球数
ヘモグロビン濃度	ヘマトクリット値
血小板数	MCV
MCH	MCHC
トロンボテスト	CK(CPK)
AST(GOT)	AST/ALT比
ALT(GPT)	

The bottom of the screen shows the system status: 'sizu update: 2007/07/06 [13:15]' and the taskbar with the time '14:44'.

-Interoperability with peripheral systems








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- ⌘ Lab results
(infection),
and patient
demographi
cs are pre-
populated

Michio Kim

Merits of standards come late: Hamamatsu Univ. Hospital HIS replaces



- ⌘ HIS(NEC)-LIS(Lab by A&T) by HL7 since 2002
- ⌘ Usually this connection costs around 10,000,000 yen, but in Hamamatsu 2007 replacement, only 1,500,000 yen spent
- ⌘ In 2007, TeraRecon(3D), DIOWAVE(web PACS), NTT Data(Clinical DB) developed new features, while other non-standardized departments were struggling hard to meet the cut-over date, saying "data is coming in the same format (HL7, DICOM), isn't it?".

Very Recent Government Activities

⌘ Interoperability of Health Information Systems Project by METI ...'04-'07

- ☒ HL7 v2.5 is basis of interoperability, 5 major vendors participated
- ☒ IHE Japan activity support

⌘ MHLW promotes Shizuoka Prefecture EHR for Nationwide Use ...04/'06

- ☒ Standardized referral documents, and HL7 storage
- ☒ Let CPOE become able to export data in HL7 v2.5

⌘ Clinical Trial 5 year Promotion Aid by MHLW ...'07-'11

- ☒ CDISC and HL7.. watching BRIDG model

⌘ Mandated Health Check Up for all 40-75 citizens from '08

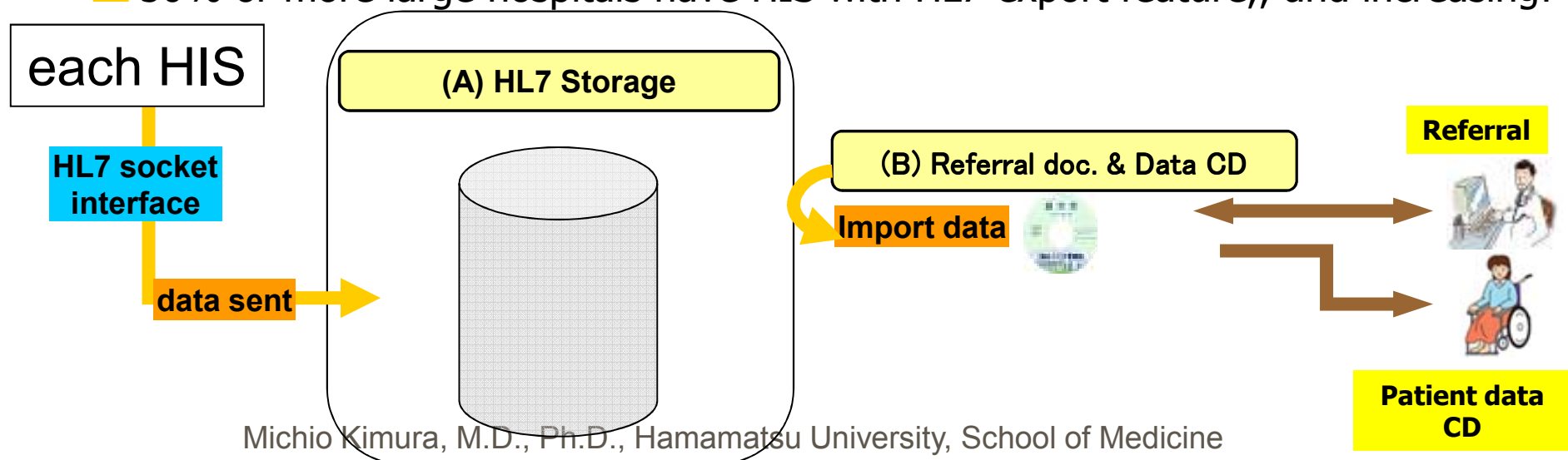
- ☒ In hope of healthcare cost reduction
- ☒ Standardized (HL7 CDA R2) export of data
- ☒ Each insurer's performance measured by % of check up

Now, HIS's able to export in HL7 v2.5 are;

- ⌘ Fujitsu: GX series, FX series(at regular version up)
- ⌘ NEC: EMR HR series, CPOE AD series v.4 and after
- ⌘ SBS: Doctor-X, and PrimeKARTE series
- ⌘ Software Service: e-Karte series

⌘ They were in market since 2006.

☒ 50% or more large hospitals have HIS with HL7 export feature,, and increasing!



Final remarks with old sayings

⌘ 朝三暮四 (列子)

- ☒ "Count the gross amount, not just in front" by Liezi
- ☒ Merit of standardization comes later

⌘ 君子和而不同、小人同而不和 (論語、孔子)

- ☒ "Lord harmonizes, doesn't follow blindly, knows why he is harmonizing, Petty men are clannish, not harmonious" from Analects by Confucius
- ☒ Even for different purposes, we know what we should share as standards, and what are for future developments.

