

ク「あじさいネットワーク」稼働, 病院新  
時代, 査読無, 三菱ウエルファーマ, 19:8  
-10, 2005

なし

#### H. 知的財産権の出願・登録状況

1. 特許情報  
なし
2. 実用新案登録  
なし
3. その他

図1 あじさいネットの診療情報連携

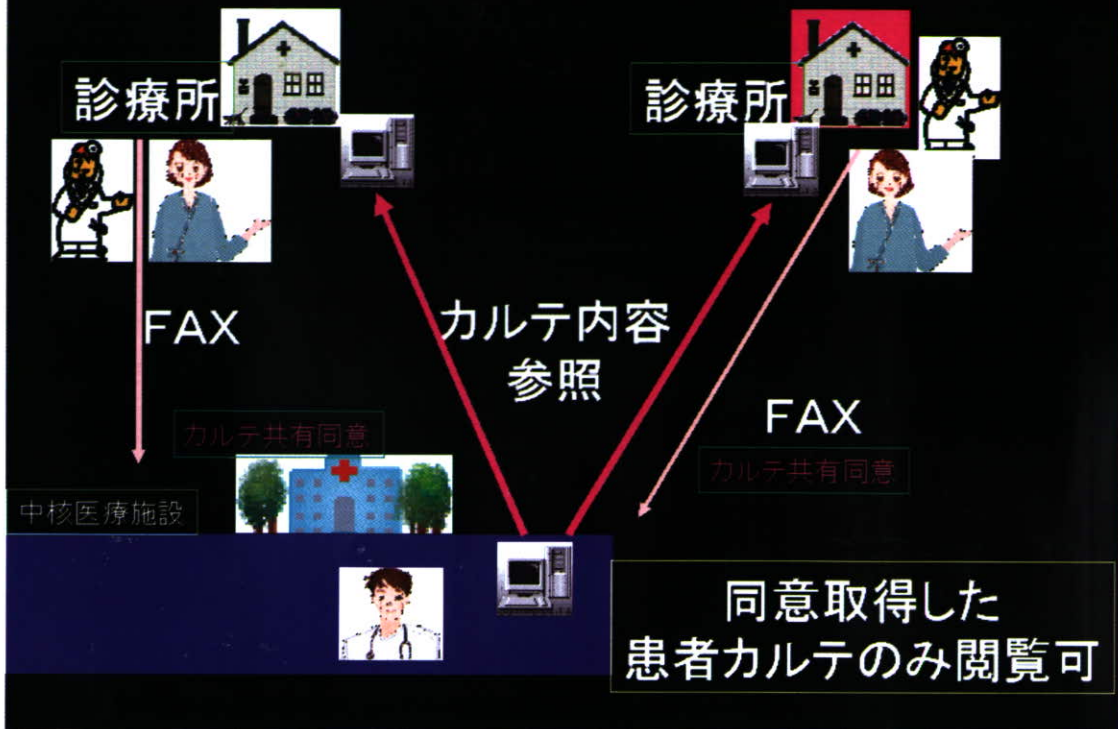


図2 あじさいネット(長崎医療センター版)

あじさいネット

患者基本情報 | 受診歴情報 | 保険情報 | 関連患者

基本 装置

条件設定 | 業務終了

診療終了

プロダクトノート

上野中野院検査

表1 登録数の経過

1000名 : 05/7/13 9ヶ月目  
 2000名 : 06/5/08 10ヶ月目  
 3000名 : 07/2/05 9ヵ月目  
 4000名 : 07/9/06 7ヵ月目

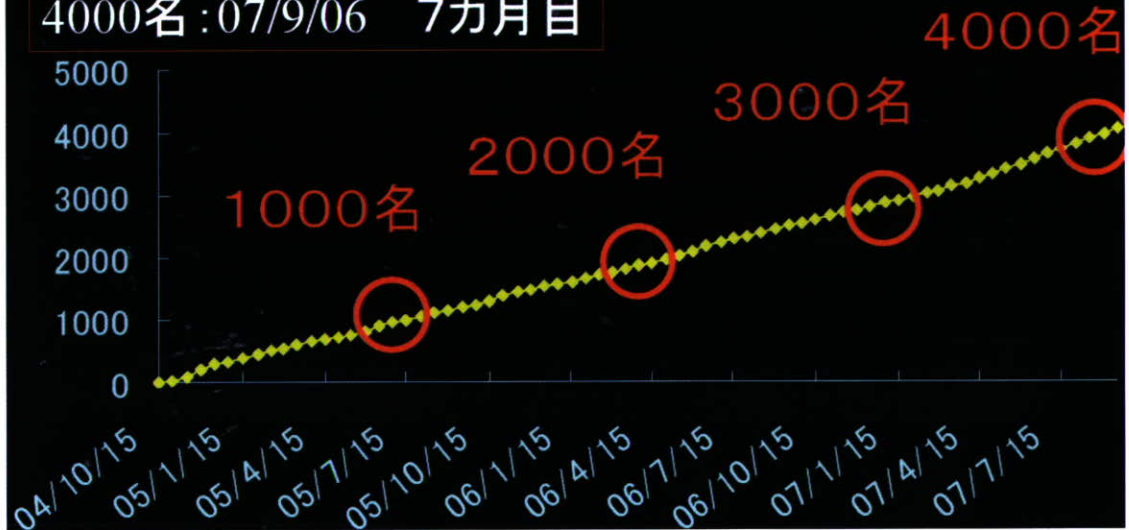
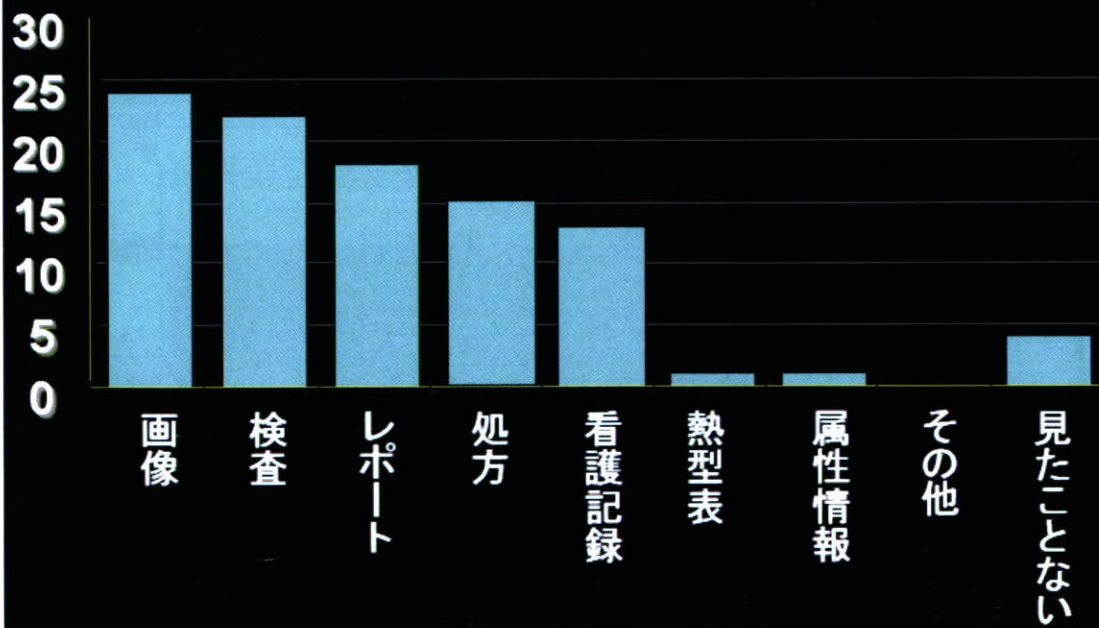


図3 よく利用する診療情報




第6章  
参考資料

世界医療情報会議 MEDINFO2007  
(ブリスベン市、オーストラリア、  
2007年8月)における研究発表内容

@電子ポスター発表

@掲載論文

本多正幸



以下に示す報告は、平成19年度厚生労働科学研究補助金(医療安全・医療技術評価総合研究事業)、「個人情報保護を指向した地域医療連携におけるセキュリティシステム構築及び運用管理に関する研究」(H18-医療-一般-042)によって支援されたものである。

平成19年8月にブリスベン市(オーストラリア)で開催された世界医療情報会議MEDINFO2007において研究成果を発表した際の電子ポスター発表による内容である。

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1



## An effective approach for development of regional medical information system using XML technology

Masayuki Honda<sup>a</sup>, Takehiro Matsumoto<sup>a</sup>, Yoshiyuki Nakayama<sup>b</sup>, Hiroaki Sudo<sup>b</sup>, Kazuo Yanase<sup>c</sup>, Ryuichi Fujita<sup>c</sup>

<sup>a</sup> Department of Medical Informatics, Nagasaki University Hospital, Japan

<sup>b</sup> Government and Public Corporation Information Systems Division, Hitachi, Ltd., Tokyo, Japan

<sup>c</sup> Kbsoft corporation, Nagasaki, Japan

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2



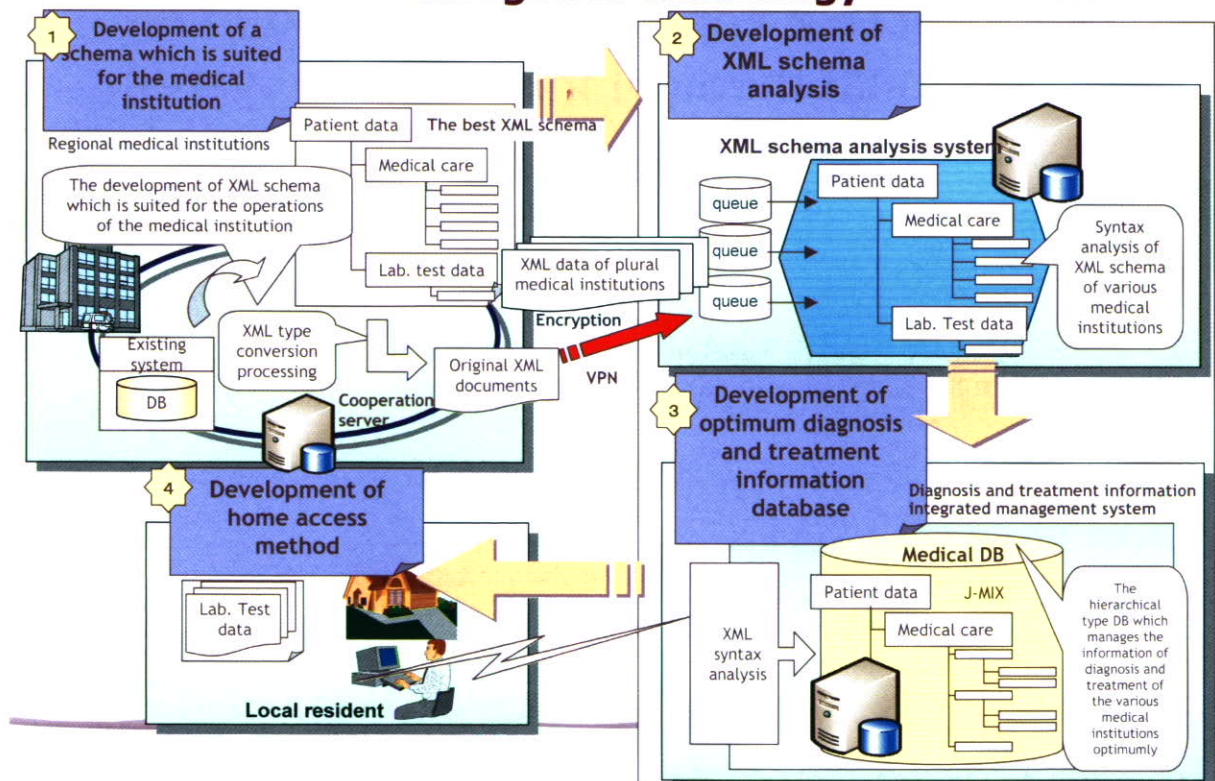
# Abstract

The system proposed here accepts XML-documented patient records and transforms them into a common schema through the style sheet. Because we adopted an XML format, the users of this system will easily get the information exchanged among medical facilities. The characteristics of this system include;

- (1) automatic creation of an appropriate structure of database from the XML schema information for each hospital, enabling to store any records of XML format for which XML schema information is known in advance,
- (2) facilitation of a dynamic control of information flow by introducing an idea of standardized interface structure,
- (3) reduction of the costs at which regional medical information systems are built up and
- (4) increase of the number of hospitals sharing this DB of patient records by exploiting a common XML schema.

3

## Development of regional medical information system using XML technology



# Methods

## 1.XML text Viewing and editing

We can create and edit XML files in a text format using the XML Schema design view of XMLspy (released by Altova).

## 2.Developing XML-to-XML Mappings

To develop an XML-to-XML mapping, what needs to get done is simply to load XML document and XML Schema in MapForce (released by Altova) and to draw drag connecting lines between the elements or attributes of the source and target.

## 3.Generating Program Codes

MapForce generates XSLT style-sheets program codes for marshalling medical data from the source to the target content model. All code generated by MapForce can easily be used in XML data transforming.

5

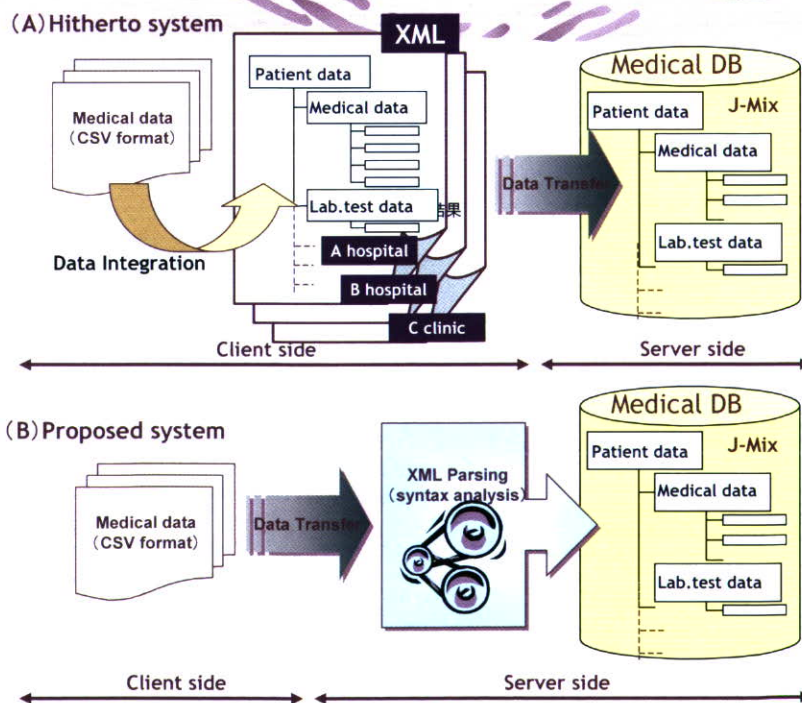
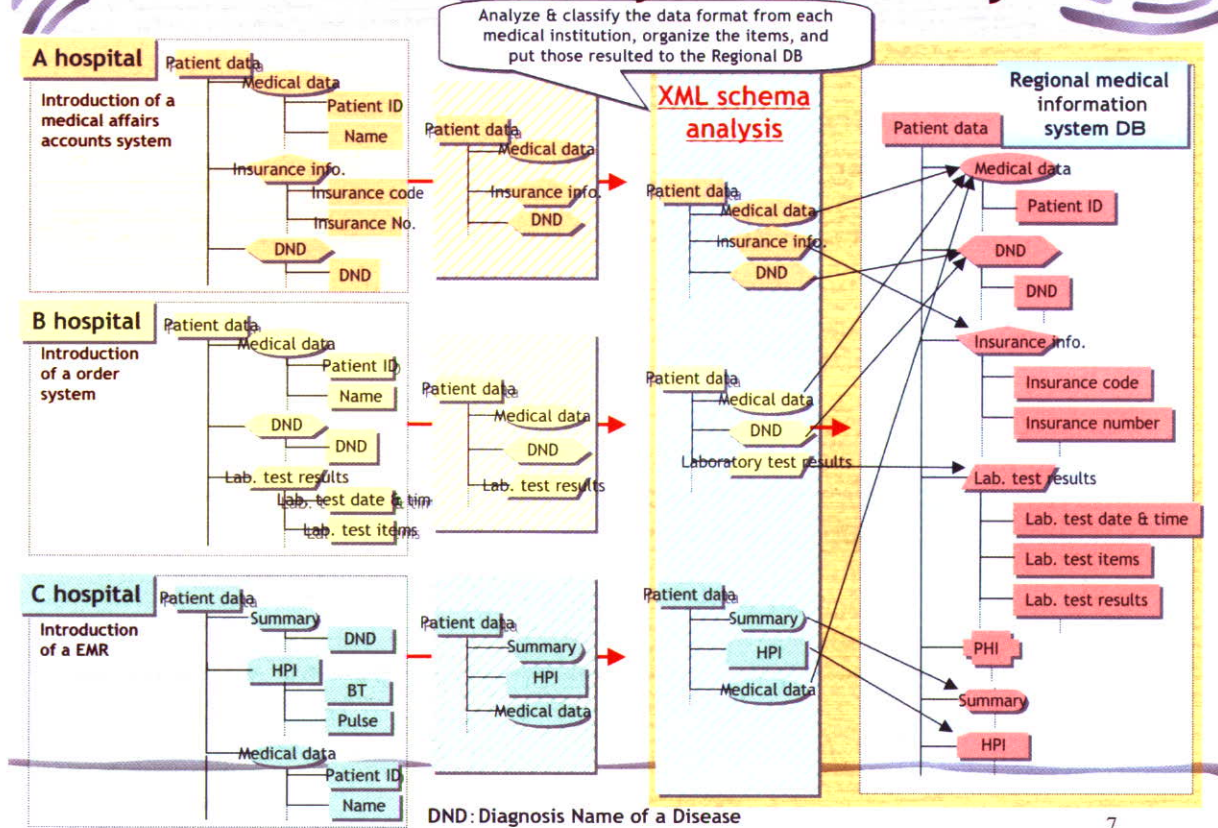


Fig. Comparison between hitherto system and proposed systems.

6



# XML schema analytical summary



7

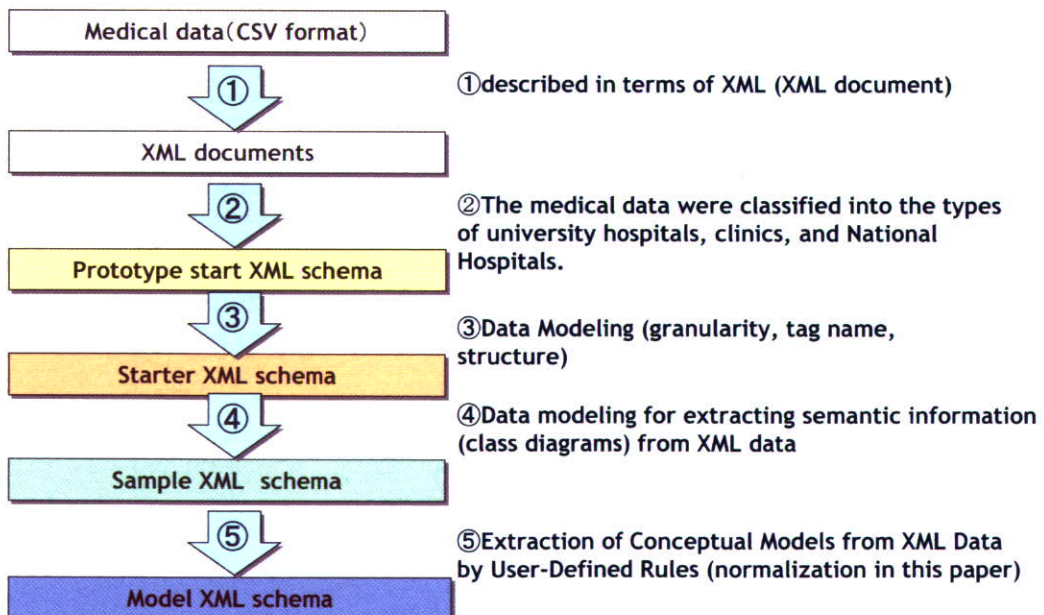


Fig. Common XML schema making procedure (developing an XML schema for extracting semantic information from an XML data given).

8



## The procedure which processes each medical institution diagnosis and treatment data with the XML schema (1)

患者番号(外部)	患者属性コード	患者属性名称	カナ氏名	漢字氏名	性別	生年月日	国籍	本籍コード	国籍	本籍
650001.02	...	...	...	...	...	...	...	...	...	...
6500014.02	...	...	...	...	...	...	...	...	...	...
6500027.02	...	...	...	...	...	...	...	...	...	...
6500030.02	...	...	...	...	...	...	...	...	...	...
6500043.02	...	...	...	...	...	...	...	...	...	...
6500056.02	...	...	...	...	...	...	...	...	...	...
6500069.02	...	...	...	...	...	...	...	...	...	...
6500072.02	...	...	...	...	...	...	...	...	...	...
6500085.02	...	...	...	...	...	...	...	...	...	...
6500098.02	...	...	...	...	...	...	...	...	...	...
6500102.01	...	...	...	...	...	...	...	...	...	...
6500115.02	...	...	...	...	...	...	...	...	...	...
6500128.01	...	...	...	...	...	...	...	...	...	...
6500131.01	...	...	...	...	...	...	...	...	...	...
6500144.02	...	...	...	...	...	...	...	...	...	...
6500157.01	...	...	...	...	...	...	...	...	...	...
6500160.02	...	...	...	...	...	...	...	...	...	...
6500173.02	...	...	...	...	...	...	...	...	...	...
6500186.02	...	...	...	...	...	...	...	...	...	...
6500199.01	...	...	...	...	...	...	...	...	...	...
6500203.01	...	...	...	...	...	...	...	...	...	...
6500216.02	...	...	...	...	...	...	...	...	...	...
6500229.01	...	...	...	...	...	...	...	...	...	...
6500232.02	...	...	...	...	...	...	...	...	...	...
6500245.02	...	...	...	...	...	...	...	...	...	...
6500258.02	...	...	...	...	...	...	...	...	...	...
6500261.02	...	...	...	...	...	...	...	...	...	...
6500274.02	...	...	...	...	...	...	...	...	...	...

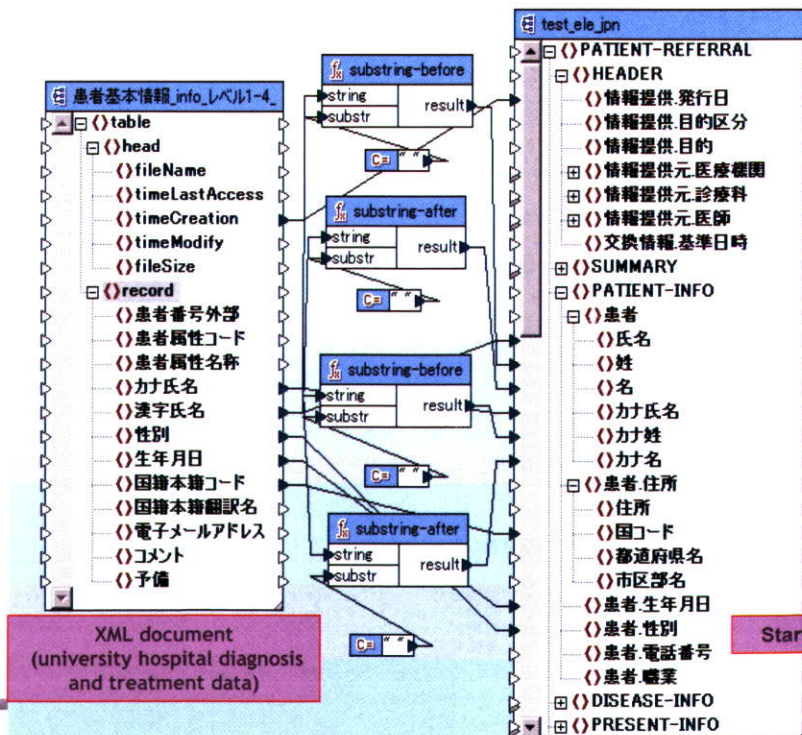
```

<?xml version="1.0" encoding="UTF-8" standalone="yes" ?>
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      <th>患者属性コード</th>
      <th>患者属性名称</th>
      <th>カナ氏名</th>
      <th>漢字氏名</th>
      <th>性別</th>
      <th>生年月日</th>
      <th>国籍</th>
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    </tr>
  </tbody>
</table>
  
```

- ① Outputting patient data with the CSV file format
- ② Converts the data to the XML document

9

## The procedure which processes each medical institution diagnosis and treatment data with the XML schema (2)



10

## From a prototype start XML schema to a start XML schema

```

1 <?xml version="1.0" encoding="UTF-8"?>
2 <!--
3
4 This file was generated by MAPFORCE 2004:
5
6 YOU SHOULD NOT MODIFY THIS FILE, BECAUSE IT WILL BE
7 OVERWRITTEN WHEN YOU RE-RUN XSLT GENERATION.
8
9 Refer to the MAPFORCE 2004 Documentation for further details.
10 http://www.altova.com/mapforce
11 -->
12
13 <xsl:stylesheet version="1.0" xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
14   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
15   <xsl:output method="xml" encoding="UTF-8"/>
16   <xsl:param name="NameInstance" select="'D:\Sample.xml'"/>
17   <xsl:param name="NameInstance2" select="'D:\Sample2.xml'"/>
18   <xsl:param name="NameInstance3" select="'D:\Sample3.xml'"/>
19   <xsl:param name="NameInstance4" select="'D:\Sample4.xml'"/>
20   <xsl:param name="NameInstance5" select="'D:\Sample5.xml'"/>
21   <xsl:param name="NameInstance6" select="'D:\Sample6.xml'"/>
22   <xsl:template match="/doc">
23     <xsl:variable name="MainInstance" select="/"/>
24     <PATIENT-REFERRAL>
25       <xsl:attribute name="xsi:noNamespaceSchemaLocation" D:/xsl_schema.xsd/>
26       <xsl:for-each select="recode">
27         <PATIENT-INFO>
28           <患者>
29             <xsl:for-each select="漢字氏名">
30               <氏名>
31                 <xsl:value-of select="."/>
32               </氏名>
33             </xsl:for-each>
34             <xsl:for-each select="カナ氏名">
35               <カナ氏名>
36                 <xsl:value-of select="."/>
37               </カナ氏名>
38             </xsl:for-each>
39           </患者>
40           <患者_住所>
41             <xsl:for-each select="国籍本籍コード">

```

Example of the XSLT code which is obtained by the mapping of medical data elements (C university hospital)

11

## From a prototype start XML schema to a start XML schema

```

1 <?xml version="1.0" encoding="UTF-8"?>
2 <!--#C Schema は xslspy v2004 rel. 4 U (http://www.xslspy.com) で生成されています-->
3 <xs:schema elementFormDefault="qualified" xmlns:xs="http://www.w3.org/2001/XMLSchema">
4   <xs:element name="T大">
5     <xs:complexType>
6       <xs:sequence>
7         <xs:element name="患者基本情報">
8           <xs:complexType>
9             <xs:sequence>
10              <xs:element name="基本情報レベル">
11                <xs:complexType>
12                  <xs:sequence>
13                    <xs:element name="基本情報1レベル">
14                      <xs:complexType>
15                        <xs:sequence>
16                          <xs:element name="カナ氏名" type="xs:string"/>
17                          <xs:element name="漢字氏名" type="xs:string"/>
18                          <xs:element name="性別" type="xs:string"/>
19                          <xs:element name="生年月日" type="xs:string"/>
20                          <xs:element name="国籍・本籍コード" type="xs:string"/>
21                        </xs:sequence>
22                      </xs:complexType>
23                    </xs:element>
24                  </xs:sequence>
25                </xs:complexType>
26              </xs:element>
27              <xs:element name="住所情報レベル">
28                <xs:complexType>
29                  <xs:sequence>
30                    <xs:element name="郵便番号" type="xs:string"/>
31                    <xs:element name="住所1" type="xs:string"/>
32                    <xs:element name="住所2" type="xs:string"/>
33                    <xs:element name="電話番号1" type="xs:string"/>
34                  </xs:sequence>
35                </xs:complexType>
36              </xs:element>
37            </xs:sequence>
38          </xs:complexType>
39        </xs:element>
40        <xs:element name="患者病名管理">

```

Portion of the start XML schema which is obtained by converted the prototype start XML schemer with the XSLT code (C university hospital)

12



# References

- [1] Honda M, Yamanobe Y, Nakayama Y, Sudo H, and Yanase K. Development of regional medical information system -using XML technology- (in Japanese). Japan Journal of Medical Informatics 2005: 25(1): 1-5.
- [2] Honda M, and Yamanobe Y. On the current problems of user authentication for EMR in HIS, MEDINFO 2004, M.Fieschi et al.(Eds), Amsterdam:IOS Press, 1644, 2004

# Acknowledgments

This work was supported by the Health and Labour Sciences Research Grants (HLSRG) program No.H16-iryuu-049.

# Contact detail

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●e-mail:m-honda@net.nagasaki-u.ac.jp

# MEDINFO2007におけるポスター発表ー1

**An effective approach for development of regional medical information system using XML technology**  
Masayuki Honda, Takehiro Matsumoto, Yoshiyuki Nakayama, Hiroaki Sudo, Kazuo Yanase, Ryuichi Fujita  
Department of Medical Informatics, Nagasaki University Hospital, Sakamoto, Nagasaki 852-8501, Japan  
Government and Public Corporation Information Systems Division, Hitachi, Ltd., Tokyo, Japan  
Khorol corporation, Nagasaki, Japan

**ABSTRACT**  
The system proposed here converts XML documented patient records and transform them into a common schema through the style sheet. Because we adopted an XML format, the users of this system will easily get the information exchanged among medical facilities.  
The characteristics of this system include:  
(1) consistent structure of interoperable structure of database from the XML schema information for each hospital, enabling to store any records of XML format for which XML scheme information is known in advance.  
(2) realization of a dynamic control of information flow by introducing an idea of standardized interface scheme.  
(3) reduction of the costs at which regional medical information systems are built up and increase of the number of hospitals sharing this DB of patient records by exploiting a common XML scheme.

**XML SCHEMA ANALYTICAL SUMMARY**  
The medical data were classified into the types of primary hospitals, clinics, and further hospital.  
1) Data Mapping (specification)  
2) Data Mapping (specification)  
3) Data Mapping (specification)  
4) Data Mapping (specification)  
5) Data Mapping (specification)  
6) Data Mapping (specification)  
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**SECURE EXCHANGE SYSTEM OF THE ENCODING XML DOCUMENT IN REGIONAL MEDICAL COOPERATION (FUTURE WORK)**

**ROUGH SKTCH OF TOTAL SYSTEM FLOW**

**SCHEMATIC DIAGRAM OF MAKING A MODEL XML SCHEMA**

**CONCLUSIONS**  
1. The approach is also applicable to infrastructure to improve the quality and accessibility of health care and to enable the delivery of integrated health care services.  
2. In the future, the technological approach for implementing regional medical information systems is based on XML, while the underlying capabilities allow for dynamic control responses according to personalized and user preferences and authorities.

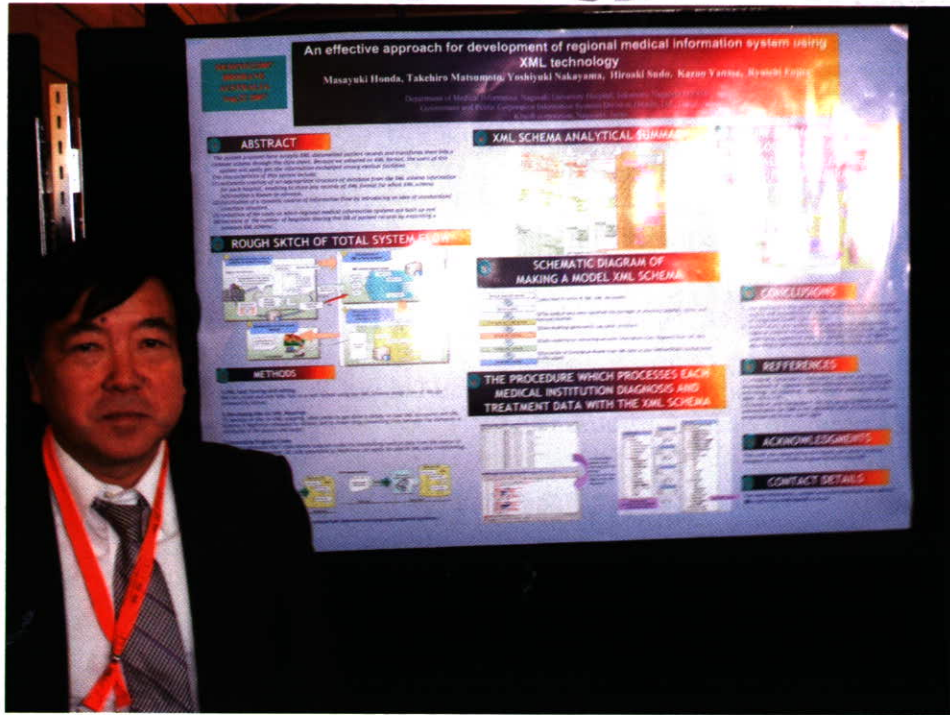
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# MEDINFO2007におけるポスター発表ー2



# An effective approach for development of regional medical information system using XML technology

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## Abstract

*The system proposed here accepts XML-documented patient records and transforms them into a common schema through the style sheet. Because we adopted an XML format, the users of this system will easily get the information exchanged among medical facilities. The characteristics of this system include; (1) automatic creation of an appropriate structure of database from the XML schema information for each hospital, enabling to store any records in an XML format for whose XML schema information is known in advance, (2) facilitation of a dynamic control of information flow by introducing an idea of standardized interface structure, (3) reduction of the costs at which regional medical information systems are built up and (4) increase of the number of hospitals sharing this DB of patient records by exploiting a common XML schema.*

## Keywords:

Medical Informatics, Databases, Information Storage and Retrieval

## Introduction

XML is useful for both display of data (e.g., in a web browser) and also for electronic data interchange messaging between systems. Many trials other than those of our research have been reported for structuring medical records with XML. In the United States, HL7 (Health Level Seven) is generally used to exchange medical information, and HL7 v2 messages have come to be translated into XML format; v3 messages will be exclusively in XML. In Japan, electronic medical record systems that are equipped with and operating on an XML interface include OpenDolphin and Wine. Also expected to make an appearance are MML-supporting electronic medical records that have been being newly sought in connection with a cooperative system of the Tokyo Medical Association (HOT Project).

For electronic exchange of medical information among

hospitals, it is necessary to standardize data formats. In Japan, however, exchanges of medical information are still not common, resulting in few hospitals which actually have their medical information exchanged with each other [1]. We proposed here an effective approach, for development of the regional medical information system and sharing patients DB among hospitals.

## Methods

### XML text Viewing and editing

We can create and edit XML files in a text format using the XML Schema design view of XMLspy (released by Altova).

### Developing XML-to-XML Mappings

To develop an XML-to-XML mapping, what needs to get done is simply to load XML document and XML Schema in MapForce (released by Altova) and to draw connecting lines between the elements or attributes of the source and target.

### Generating Program Codes

MapForce generates XSLT style-sheets program codes for marshalling medical data from the source to the target content model. All code generated by MapForce can easily be used in XML data transforming.

## Results

### Related work in exchange technologies of medical information

There are no standards for medical information using XML interface, other than the MML until now in Japan. In European countries, the most popular standard is the Electronic Data Interchange (EDI) according to the UN/EDIFACT (United Nations/Electronic Data Interchange For Administration,

Commerce and Transport standard) which is the message exchange standard for trading established by the United Nations to allow exchange of structured data. Furthermore, the Netherlands has developed a protocol called MEDEUR for medical purpose using the EDIFACT standard. The medical association in the Netherlands is managing this system. In the United States, the Health Level Seven (HL7) is generally used to exchange medical information. The MML is mainly designed to describe comprehensive medical information. In contrast, the HL7 is designed to exchange the database for each specific purpose (use case). Since many trials other than MML and HL7 have been reported for structuring medical records with XML for this purpose. ASTM E31.25 subcommittee, "XML DTDs for Health Care" was formed to enhance existing levels of interoperability among the various XML/SGML standardization efforts, products and systems in health care.

The rules for such exchange technologies of medical information are already. However, it is expected that various challenges and difficulties will be faced at the next step where we will start to use these technologies in medical information systems [2]. Realistic importance is that easy-to-use and inexpensive system are hoped for as a medical information exchange system.

The next sections are for an overview of exchange technology of medical information will be focused on verifying effectiveness of the XML interface as the exchange standard while checking with problems from the viewpoint of implementation.

### Proposed system architecture

As shown in Figure 1, there were some problems in both the user operation and the cost. On the other hand, proposed system that executes data exchange at an integrated server seems to be an ideal method. We expect that current problems can be solved (Fig.1).

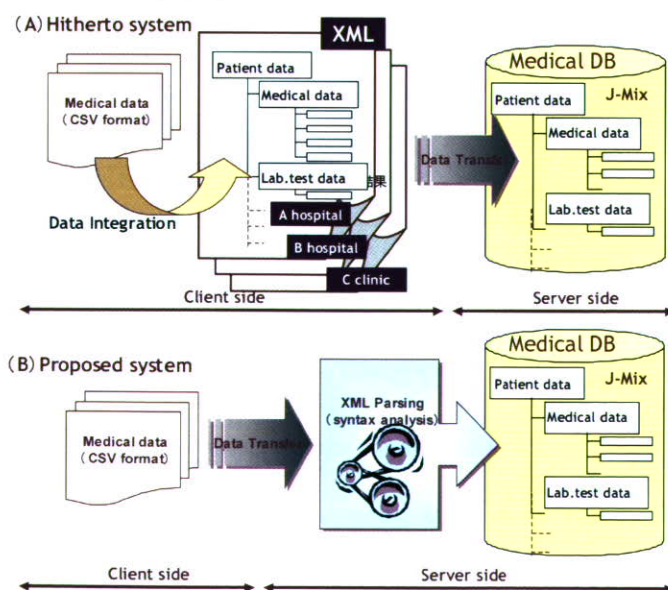


Fig.1 Schematic diagram of comparison between existing and proposed systems.

### XML schema design

First, to establish an analytical procedure of medical data, the medical facilities were classified into the types of university hospitals, clinics, and National Hospitals. Medical information used by a certain medical facility type was described in terms of XML (XML document). Second, our XML schema is designed according to each specific the type of university hospitals, clinics, and National Hospitals and respective data modeling (starter XML schema). Furthermore, a starter XML leads to a sample XML schema that provides common medical information to each medical facility type. Finally, we make a model of XML schema for medical records that can be used in common with each medical facility group (model XML schema), as shown in the Figure 2 below. The XML elements in this research were selected referring to J-Mix which is standardized medical terminology in Japan.

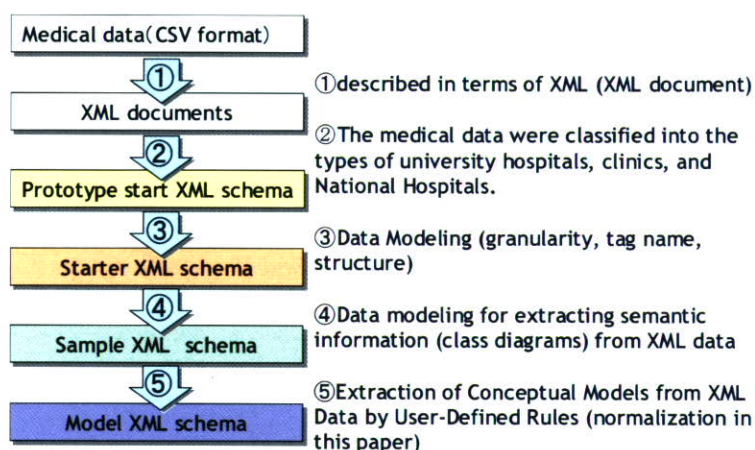


Fig.2 Schematic diagram of making a model XML schema that can be used in common with each medical facility group.

### Conclusion

Our approach is also good for an infrastructure to improve both quality and accessibility of health care and to enable the delivery of integrated health care services. In the future, the technological approach for implementing regional medical information systems is based on XML, while its underlying capabilities allow for dynamic clinical navigation according to personalized end-user preferences and authorities.

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### Ⅲ. 研究成果の刊行に関する一覧表

## 研究成果の刊行に関する一覧表

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