

XML

XML

2001 12



2

가

가

가

가

.....	iii
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.....	v
1.	1
1.1	1
1.2.	5
1.3.	6
2.	7
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X M L

1998

W3C

XML(eXtensible Markup

Language)

XML

50%

가

가

가

XML

Schema

XSL

XML

XML

가

XML

HTML

: XML,

1.

1.1

· ,
,
, ,
, ,
, 가 .(Kasuhiko Ohe, 1995)

가,

· ,
·
(75%) , 가 ,
가
가 .(, 2001)

, 가
가 가

. 1,2 3 3
가 가 1,2
. (, 1999)

, 가
.
EDI
가 88% 가

가 CGI(Common Gateway Interface)가 ,

가

88%

(, 1999)

가

3

50%

가

.(, 1999)

가

XML(eXtensible Markup Language) . 1998

W3C(World Wide Web Consortium) ,

XML ,

.(, 2001) XML

.(Eric Ray, 2001)

HTML(HyperText Markup

Language)

XML

XML 가 HL7(Health

Level 7) Structured Document TC(Technical Committee)

XML SIG(Special Interest Group)

HL7 specification

XML HL7 . 2000 12 , HL7

CDA(Clinical Document Architecture) Version 1 , CDA

PRA(Patient Record Architecture) , clinical

document() EMR(Electronic
Medical Record) XML . CDA XML

HL7 W3C
.(<http://www.HL7.org/about/>) XML

EMR 가 .
가
가 XML

XML
. XML

1.2.

XML
가

, XML

XML Schema .

, XML

1.3.

XML
가
가 , Y S
XML .
EDI 가 ,
가 .
가
가가 XML
가 .
XML XML
,
XML 가 .
가 .

2.

2.1. XML

2.1.1 XML

가
HTML ,
HTML 가 ,
SGML(Standard Generalized Markup Language)
가
(XML)
,1998) XML 1998 W3C
, XML 1.0 , 가
. HTML, SGML, XML 1 .(
,2001)
1 XML SGML HTML
HTML 가
가 . HTML

1. HTML, SGML, XML

	HTML	SGML	XML
	가	가	가 SGML
	가	가	가
			SGML
			SGML 가
		가 , 가	SGML
	HTML (<a>)	HyTime	XLL(XLink, XPointer)
	CSS	DSSSL	XSL(XSLT)

1)

HTML 가 ,
. HTML

2) 가
HTML ,
. HTML
, , . XML
HTML Schema
.

3) (Validation)
HTML 가 .
가
. HTML 가
DTD(Document Type Definition)
가 .(, 2000)
SGML .

1) (optional feature)
, .

2) SGML DSSSL(Document Style Semantics and
Specification Language) ,
.

2) 가 .
XML SGML SGML
SGML HTML

가 , SGML XML
가 , HTML

.(, 2001)

2.1.2 XML

1) XML

➤ XML HTML 가 가
가 .

➤ XML , .

➤ XML SGML ,

➤ Data style content management

➤ XML ,

2) XML

W3C XML 가 .

SGML

가

XML

XML

XML

XML

XML

XML

XML

가

XML

,

XML

, XML

가

가

. SGML

,

가,

가 가

DTD

, XML

. XML

. XML ISO 10646 (Unicode)

. XML

가

.(http://sookmyung.ac.kr/~ksh/index1.html)

2.1.1.3 XML

XML

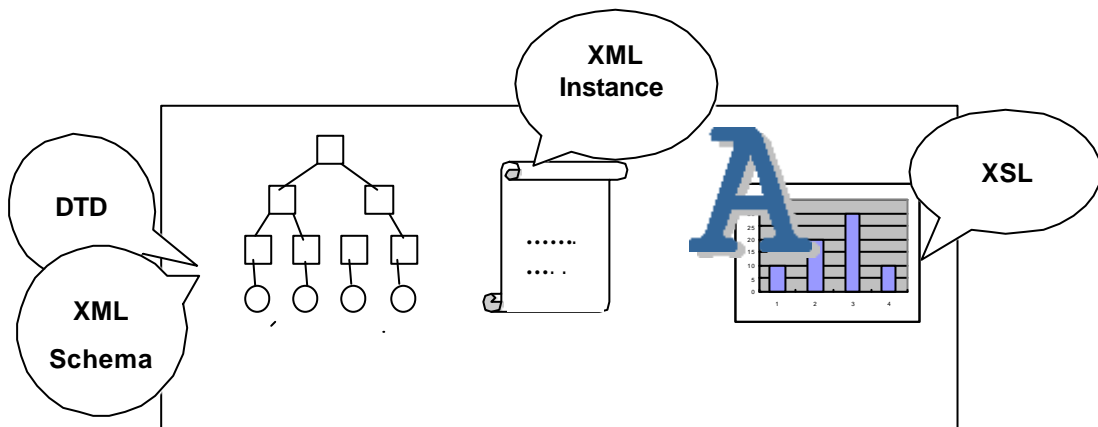
XML

DTD Schema, XSL(eXtensible

Style Language)

. XML

가



1. XML, DTD/Schema, XSL

1 XML DTD XML Schema ,
XSL, 가

1) DTD(Document Type Definition) XML Schema

DTD XML , ,
가 .(
.2001) , W3C

, 2001 5 XML Schema가 .

(DTD) XML .

DTD

. DTD (element),
(attribute), (entity) .
(Element declaration) XML 가 ,
. XML 가

. (<http://sookmyung.ac.kr/~ksh/>)

XML Schema DTD , ,

. 2 DTD XML Schema .

2. DTD XML Schema

	DTD	XML Schema
	SGML DTD	XML
가	()	(가)
	(?,+,*)	/ (minOccurs, maxOccurs)
	W3C	W3C (2001.5)

2) XSL(eXtensible Style Language)

XSL XML style sheet .

XML SGML XSL DSSSL . DSSSL SGML 가 Web repository . XSL DSSSL

Web .

XSL (formatting) (Transformation: XSLT)

. XSLT 99 11 . XSL Web community

style sheet CSS(Cascading Style Sheets)

Web DSSSL

CSS XML
, XSL XML
XML
HTML XML 가
(<http://www.xmlportal.co.kr>)

2.1.4 XML

XML
CSS XML
W3C
(, 2001)
1)
XML
XML
(namespace), XLink
2) XML
XML 가 HTML XML
가 XHTML, MathML
3)

(DTD) XML Schema

4)

XPath,

XPointer,

XQL(extensible Query Language)

5)

. XSLT XSL-FO

(XSL),

CSS가

6)

XML

(DOM, Document Object Model)

가

XML Information Set,

XML Fragment Interchange,

XML

Simple API for XML(SAX)

2.1.5 XML

XML

가

XML

XML 가 XML

1) XML

HTML

2

XML

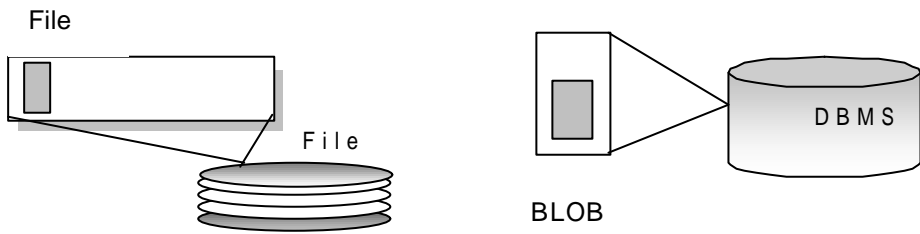
BLOB(binary

large object)

(document -centric)

가

.(, 2001)



2. XML

File

DBMS

2) XML

XML

DBMS(Database Management System)

XML

XML 가 ,
 (data-centric) . XML element,
 attribute, text, path element, attribute, text, path가
 가 ,

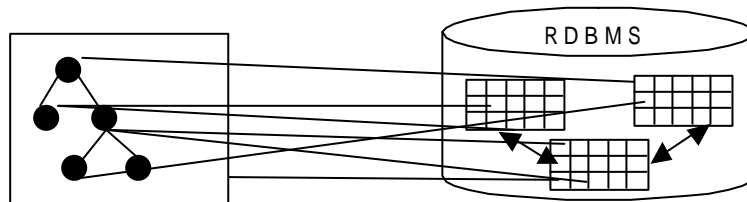
database object가 .

XML
 . XML 가
 XML 가 .
 XML
 가
 가 . XML
 , XML Schema

2 . , XML 가

2

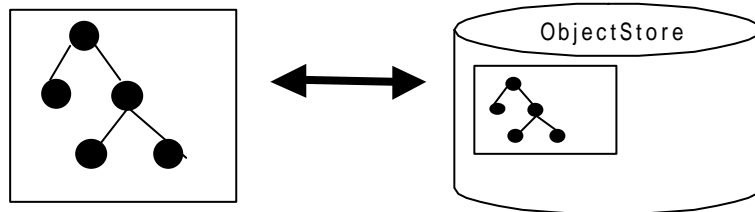
(, 2001) 3



3. XML

3) XML

. XML
 / DBMS
 . DBMS
 XML
 XML XML
 가
 (Object management),
 (version management), (relationship management), (dynamic
 extensibility), (notification) .(
 , 2001) 4 XML



4. XML

2.2.

2.2.1

50%

3

.(, 1999)

3.

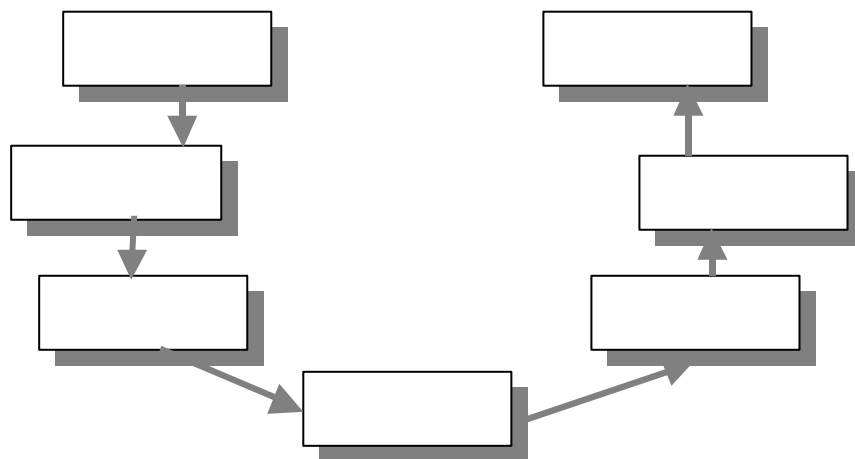
	,
	,
	,

5

7

가

2000)



5.

5가

.(, 1999)

5가

2.2.2

. Y

(24

)

4가

4,5,6,7

1)

4.

Calcium	Na	PC 2hr. Glucose
Inorganic P	K	γ-GT
Glucose	Cl	CK
BUN	TCO ₂ content	CK-MB

Creatinine	Serum Iron	LD(LDH)
Uric Acid	TIBC	T.Acid Phos
Cholesterol	Triglyceride	Prostatic A.P.
T.Protein	HDL -cholesterol	Amylase
Albumin	NH3	Lipase
T.Bilirubin	Magnesium	Cholinesterase
Alk.Phos.	Lithium	Osmol(Serum)
AST(GOT)	D.Bilirubin	Osmol(Urine)
ALT(GPT)	Glucose(AC)	Fructosamine
Free Fatty Acid		

2)

5.

Glucose Tolerance Test(I.V. /Oral)	Valproic acid	Quantitation
Fasting	Primidone	Ig G Quantitation
PC 30M	Methotrexate	Ig A Quantitation
60M	Quinidine	Ig M Quantitation
90M	Disopyramide	Hepatogobulin
120M	Procainamide	C ₃
180M	Salicylate	C ₄
Blood sugar	Electrophoresis	α_1 MG
Urine(sugar, aceton)	Total Protein	α_2 AT
LDH isoenzyme:	Albumin	Rmax
LDH ₁	α_1 Globulin	CA 15-3
LDH ₂	α_2 Globulin	CA 19-9
LDH ₃	β Globulin	CA 125
LDH ₄	γ Globulin	Helicobacter pylori Ig G

LDH ₅	Hb electrophoresis	Helicobacter pylori Ig A
SPI	Lipoprotein	Helicobacter pylori Ig M
Glycate(gHb)	Immunoelectrophoresis	T3
SCC	Lysozyme	T4
Ethanol	Lipoprotein(a)	TSH
Digoxin	Ferritin	PSA
Phenobarbital	CEA	HCG
Dilantin	Estrogen Receptor	Apo A1
Aminophylline	Progesteron Receptor	Apo B
Carbamazepine	R15	Shake test
O.D. 650	Ig G subclass G1	Ig G subclass G2
Ig G subclass G3	Ig G subclass G4	

3)

6.

24hr volume	Ca	Creatinine clearance(Ht, Wt)
Protein	P	24h Urine Cr
Albumin	Amylase	Serum Cr
Sugar	Urea nitrogen	Ccr
Creatinine	PSP	molality
Na	Addis Count	
K	Urine Osmolality	

4)

7.

Color(, , , ,)	Voided(/Catheterized/clean catch/Timed specimen(ml/hr)	Microscopy
		WBC
		RBC
Turbidity	Ketone	Special urinalysis
SG()	Urobilinogen	Porphobilinogen
pH	Bilirubin	Uroporphyrin
Protein	Glucose	Coproporphyrin
Blood	Nitrite	Hemoglobin
WBC	Sediment	Hemosiderin

3. XML

3.1

3.1.1

가

XML Schema XSL . ,
, .(, 1999)

가

가

Y 3

, , (24) .

4가 ,

(element) (attribute) ,

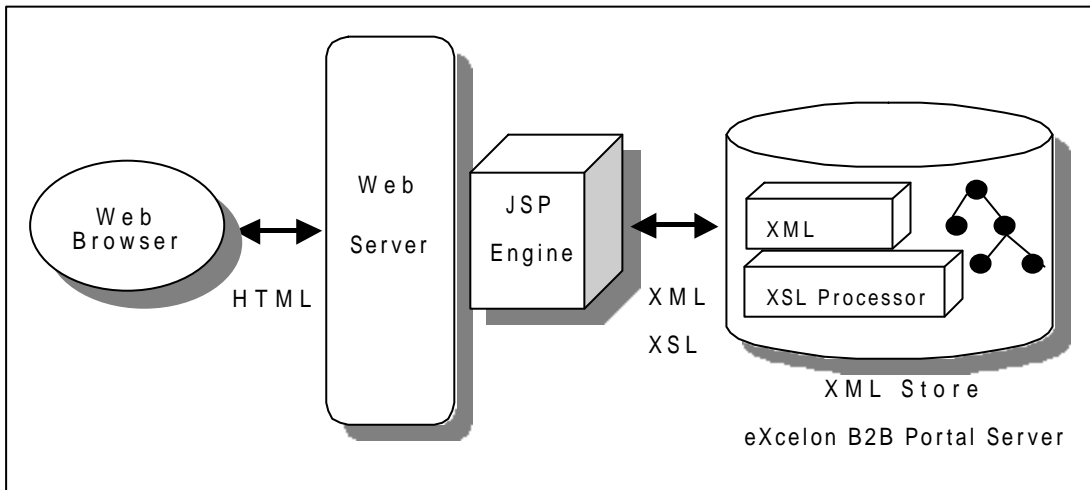
XML Schema XSL .

. XML Schema XML Instance

XML , JSP(Java Server Pages)

XML Schema XML Spy 4.0, XSL Stylus Studio(eXcelon),
XML eXcelon B2B Portal Server, XML Schema
XML Parser
XSLT Processor eXcelon Server
JSP tomcat, IE 5.0

3.1.2



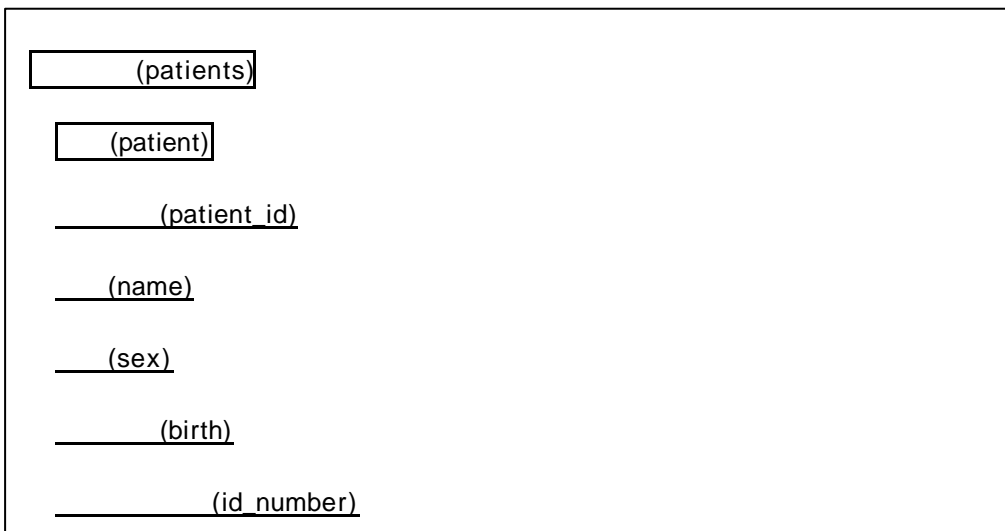
6.

XML Schema
Schema XML
XSL
XML

3.1.1.3 XML Schema

Schema XML Tree

가 (patients) (lab_result)



(diagnosis)

- (ward-bed)

(clinic)

(lab_results)

(lab_result)

(lab_name)

(order_date)

(result_date)

(specimen)

(order_doctor)

(general_chemistry)

Calcium(_____,_____)

Inorganic P(_____,_____)

Glucose (_____,_____)

(special_chemistry)

Lipoprotein(a) (_____,_____)

Ferritin(_____,_____)

CEA (_____,_____)

(urine_analysis)

Protein(_____,_____)

Blood(_____,_____)

Color	(_____)
	(day_urine)
Protein	(_____)
Albumin	(_____)
Sugar	(_____)

7.

8 XML Schema . XML Schema
XML Spy 4.0 . Schema

8. XML Schema

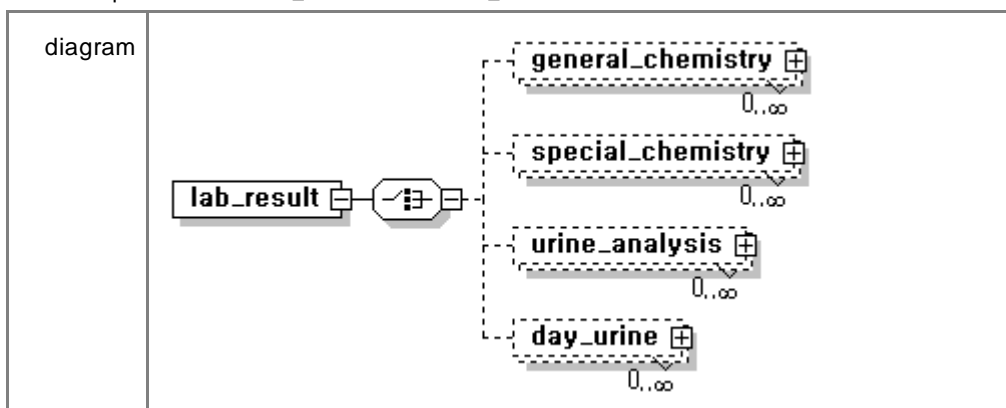
diagram	
children	<u>patient</u>

element patient

diagram	
children	<u>diagnosis</u> <u>ward_bed</u> <u>clinic</u> <u>lab_results</u>
used by	element <u>patients</u>

attributes	Name	Type	Use	Default	Fixed
	patient_id	xs:ID	required		
	name	xs:string	required		
	sex	xs:string	required		
	birth	xs:string	required		
	id_number	xs:string	required		
Source	<pre> <xs:element name="patient"> <xs:complexType> <xs:sequence> <xs:element name="diagnosis" type="xs:string"/> <xs:element name="ward_bed" type="xs:string" minOccurs="0"/> <xs:element name="clinic" type="xs:string" minOccurs="0"/> <xs:element name="lab_results"> <xs:complexType> <xs:sequence> <xs:element name="lab_result" maxOccurs="unbounded"> <xs:complexType> <xs:choice>.. () </pre>				
diagram					

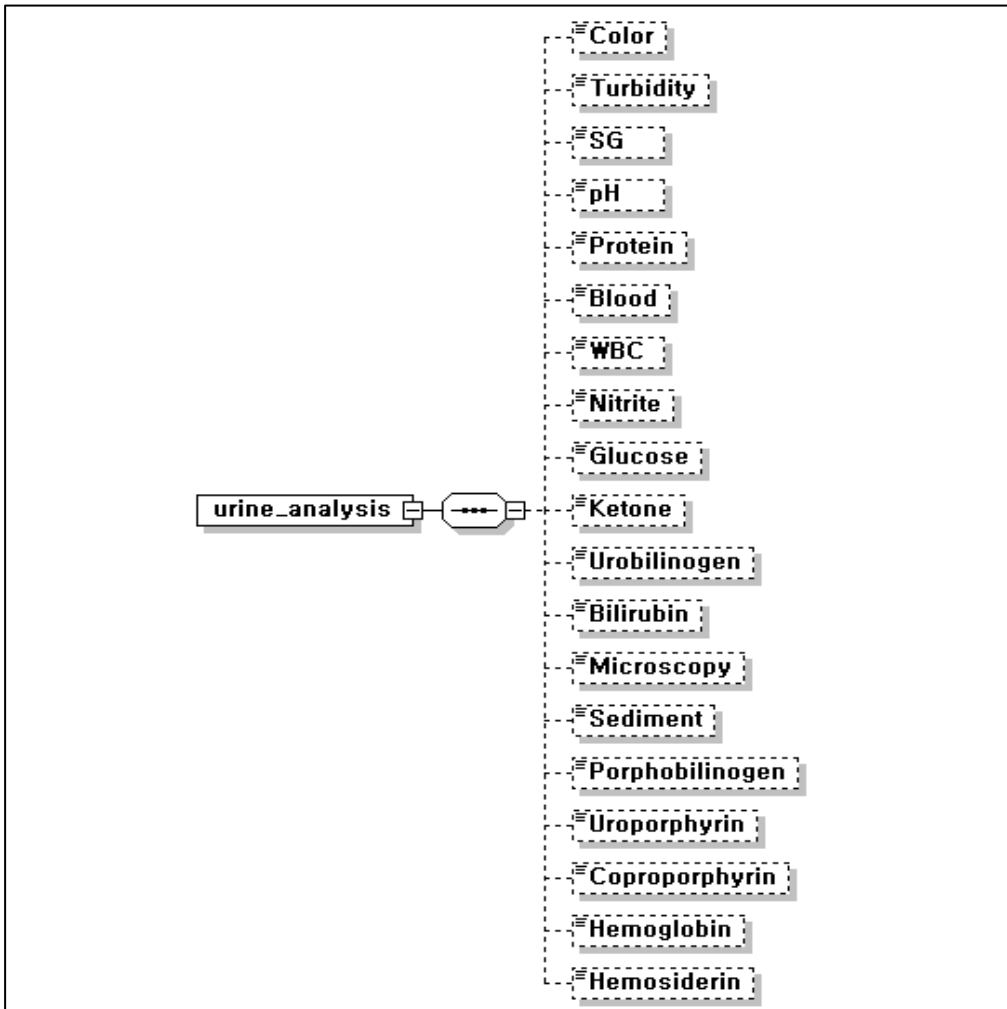
element patient/lab_results/lab_result



children	<u>general_chemistry</u> <u>special_chemistry</u> <u>urine_analysis</u> <u>day_urine</u>				
attributes	Name	Type	Use	Default	Fixed
	order_date	xs:dateTime	required		
	result_date	xs:dateTime	required		
	specimen	xs:string	required		
	order_doctor	xs:string	required		
source					

24

8



8. 24

3.1.1.4 XML

ADO ODBC,
JDBC . eXcelon server
XML (XML Spy) XML Schema
XML . XML
XML eXcelon B2B Portal Server .
XML .

```
<?xml version="1.0" encoding="EUC -KR"?>
<patients xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:noNamespaceSchemaLocation="C:\Documents\Administrator\chemistry.xsd">
  <patient patient_id="11111" name=" " sex=" " age="45" id_number="560103-
2164957">
    <diagnosis>breast cancer</diagnosis>
    <clinic> </clinic>
    <lab_results>
      <lab_result lab_type=" " order_date="2001.11.29"
result_date="2001.11.29" specimen="Serum" order_doctor=" ">
        <general_chemistry>
          <Calcium>10.6</Calcium>
          <InorganicP>3.9</InorganicP>
          <Glucose_AC>99</Glucose_AC>
          <BUN>13.4</BUN>
          <Creatinine>1</Creatinine>
          <Cholesterol>145</Cholesterol>
          <T.Protein>7.3</T.Protein>
          <Albumin>4.3</Albumin>
```

```

    <T.Bilirubin>0.5</T.Bilirubin>
    <Alk.Phos.>76</Alk.Phos.>
    <AST.GOT>32</AST.GOT>
    <ALT.GPT>16</ALT.GPT>
    <Na>138</Na>
    <K>3.84</K>
    <Cl>101</Cl>
    <tCO2content>23</tCO2content>
    <Triglyceride>188</Triglyceride>
  </general_chemistry>
</lab_result>
</lab_results>
</patient>

```

9. XML

3.1.1.5 XSL

XSL . XSL XML
 . XSL , XSLT
 1.0 . XSLT XML
 가 . XSLT
 HTML ,
 Stylus Studio . 10 XSLT
 XSLT .

```

<?xml version="1.0" encoding="utf-8"?>
<xsl:stylesheet version="1.0" xmlns:xsl=http://www.w3.org/1999/XSL/Transform
  xmlns:fo="http://www.w3.org/1999/XSL/Format">
<xsl:output method="html"/>
<xsl:template match="/">

```

```

<html>
<head><title>          </title></head>
  <body>
    <b><h2>              XSL</h2></b>
    <table bgcolor="pink" border="1" width="800">
      <tr><td width="150" height="35"><p align="center"><b>    ID</b></p></td>
        <td width="150"><p align="center"><b>    </b></p></td>
        <td width="111"><p align="center"><b>    </b></p></td>
        <td width="111"><p align="center"><b>    </b></p></td>
        <td width="252"><p align="center"><b>          </b></p></td>
        <td width="150"><p align="center"><b>    </b></p></td>
        <td width="200"><p align="center"><b>    </b></p></td></tr>
      <xsl:for-each select="patients/patient">
        <tr><td><p align="center"><xsl:value-of select="@patient_id"/></p></td>
          <td><p align="center"><xsl:value-of select="@name"/></p></td>
          <td><p align="center"><xsl:value-of select="@sex"/></p></td>
          <td><p align="center"><xsl:value-of select="@age"/></p></td>
          <td><p align="center"><xsl:value-of select="@id_number"/></p></td>
          <td><p align="center"><xsl:value-of select="diagnosis"/></p></td>
          <td><p align="center"><xsl:value-of select="clinic"/></p></td></tr>
      </xsl:for-each></table></body>
</html>
</xsl:template>
</xsl:stylesheet>

```

10. XSLT

XML

HTML



11. HTML

XSLT

XSLT

XSLT

XML

가

```

<?xml version="1.0" encoding="EUC -KR"?>
<xsl:stylesheet version="1.0" xmlns:xsl=http://www.w3.org/1999/XSL/Transform
  xmlns:fo="http://www.w3.org/1999/XSL/Format">
<xsl:output method="html"/>
<xsl:template match="/">
<html>
  <head><title>          </title></head>

```

```

<body>
  <b><h2>                </h2></b>
  <xsl:for-each select="patients/patient[@patient_id='11111']">
  <table width="345">
  <tr>
    <td width="360" height="206">
      <table border="1" width="343" cellspacing="0" bordercolordark="white"
        bordercolorlight="black">
        <tr><td><p align="center"><b>                </b></p></td></tr>
        <tr><td><p><b>ID</b></p></td>
          <td><p><xsl:value-of select="@patient_id"/></p></td>
          <td><p><b>    </b></p></td>
          <td><p><xsl:value-of select="@age"/></p></td>
        </tr>
    .....
```

```

<xsl:for-each select="patients/patient[@patient_id='11111']/lab_results/lab_result">
<table border="1" width="470" cellpadding="0" cellspacing="0" bordercolordark="white"
  bordercolorlight="black">
  <tr><td><p align="center"><b>                </b></p></td>
    <td><p align="center"><b>                </b></p></td>
    <td><p align="center"><b>                </b></p></td>
    <td><p align="center"><b>                </b></p></td></tr>
  <tr><td><p><xsl:value-of select="./@order_date"/></p></td>
    <td><p><xsl:value-of select="./@result_date"/></p></td>
    <td><p><xsl:value-of select="./@lab_type"/></a></p></td>
    <td><p align="center"><xsl:value-of select="./@order_doctor"/></p></td></tr>
</table> ...

```

3.2

3.2.1

1)

Window 2000 Server, eXcelon B2B Portal
Server, JSP 가 tomcat
Java XML
가 JSP(Java
Server Pages)

	Window 2000 Server
	eXcelon B2B Portal Server
JSP &	Jakarta tomcat 3.2.2
	JSP
	IE 5.0

9.

3.2.2

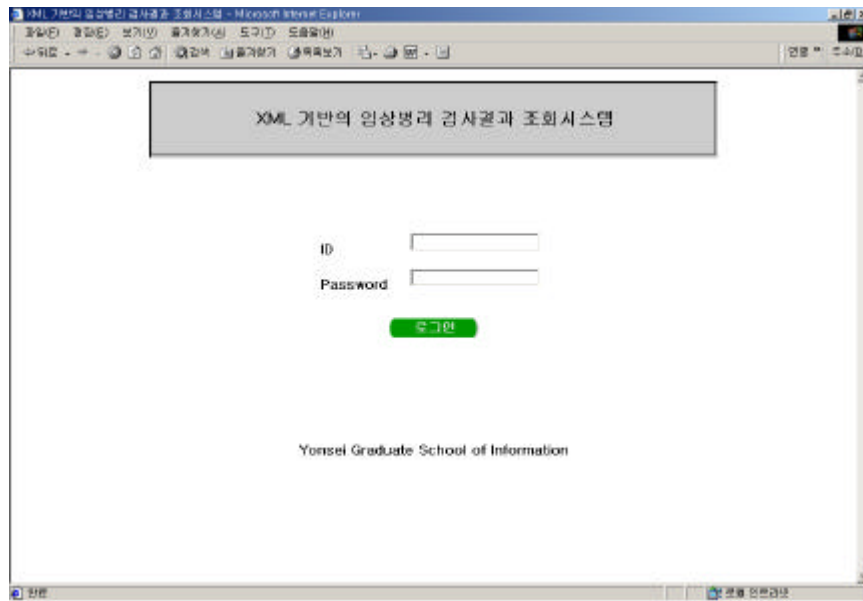
()가 ID Password

ID

가

1)

ID Password



13.

2)

ID

가

ID,

가

가

ID

The screenshot shows a web browser window with the following content:

환자 정보

ID: 11111	
이름: 김경희	성명: 김
나이: 45	
진료과: 중부인내	
진단명: breast cancer	

검사결과

검사명	검사결과	참고치	단위
Calcium	10.6	8.8-10.5	mg/dL
InorganicP	3.8	2.5-4.5	mg/dL
Glucose.AC	90	70-110	mg/dL
BUN	13.4	5-25	mg/dL
Creatinine	0.9	0.5-1.4	mg/dL
Cholesterol	155	120-220	mg/dL
T.Protein	7.0	5.0-8.0	g/dL
Albumin	4.3	3.3-5.3	g/dL
T.Bilirubin	0.5	0.2-1.2	mg/dL
Alk.Phos	80	30-115	I.U/L
AST(GOT)	35	8-30(M), 8-20(F)	I.U/L
ALT(GPT)	10	0-30(M), 0-20(F)	I.U/L
Na	130	135-145	mEq/L

과거검사

진료일	검사종류	검사일	진료의사
2001. 11. 29	일반생화학사	2001. 11. 29	신성우
2001. 11. 30	일반화학검사	2001. 11. 30	신성우

14.

4.

·
,
·
,
·
HTML HTML
가
XML
·
XML XML
Schema 가 ,
가 ,
· 2001
5 W3C XML Schema ,
XSL XML Schema XML
·
JSP ·

XML

HTML

. HTML

XML

, XML Schema

가 .

XML Schema

HTML

WML

PC

PDA

Schema

XML Schema

XSL

XML Schema가

XML

가

XML Schema가

가 .

XML

XML vocabularies가

. XML vocabularies

, ,

HL7

.

가

가

XML Schema

, XML

가

.

, EMR

가

,

HL7

XML

가

.

, “ - ”,

, 2001

, “ ! JSP XML”, , 2001-12-07

, , “ 가 가 XML Camp ”, Press, 2001

p.23

, “ B2B XML CATALOG MANAGEMENT SYSTEM”,

, , 2001

, “ ”, , 1999 p.263

, “ ”, , 1994

, “ XML ”,

, 2000

, , , , , , “

”, 5-1, 149-155, 1999

, “ ”, , 1998

, “ ”, , 1994

, , , , , , “

”, , 2000 p.181

, “ ”, , 1996

, “ ”,

, 2000

, “ 研究 ”, ,

2000

, “ 가 () ”, 1998

, Jstorm , “ JavaServer Pages ”, O ’ REILLY, , 2001

Elizabeth Castro, “visual quickstart guide XML / ”,

, 2001

Eric Ray , “ XML ”, O ’ REILLY, , 2001 p.18

Kevin Dick , “e - XML ”,

, 2000

Jeffrey F.Rayport, Bernard J.Jaworski, “ e-Commerce ”, McGraw -Hill, 2001

Jeffey A.Hoffer, Joey F.George, Jeseoph S.Valacich, Modern Systems Analysis
& Design 2nd edition, ADDISON-WESLEY, 1999

Kasuhiko Ohe, “ Hospital Information System and the Internet ”, 1995,
<http://www.isoc.org/HMP/PAPER/238/html/paper.html#CH3>

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- ADO : ActiveX Data Objects
API

- Attribute

- Element
XML

- CGI : Common Gateway Interface

- CSS : Cascading Style Sheets
<style> Style ,
.XSL ,W3C

- DBMS : Database Management System

- DOM : Document Object Model
Document Style, Content, Structure

- DSSSL : Document Style Semantics and Specification Language

➤ DTD : Document Type Definition

➤ EMR : Electronic Medical Record

➤ HL7 : Health Level 7

, 1994 ANSI(

)가 (SDO)

➤ HTML : Hypertext Markup Language

가 SGML

가

➤ ISO : International Organization for Standardization

SGML

➤ JSP : Java Server Pages

➤ JDBC : Java Database Connectivity

➤ Markup

가 가

➤ ODBC : Open Database Connectivity

- SAX : Simple API for XML
XML , XML DOM
- SGML : Standard General Markup Language
(ISO 8879)
- Style Sheet
- W3C : World Wide Web Consortium
- XML : eXtensible Markup Language
SGML 1998 2 10 W3C
- XML Parser
XML .
- XML Schema
DTD XML . DTD XML
XML , 2001 5
- XSL : eXtensible Style Language
DTD XML style
sheet .
- XSLT : XSL Transformations

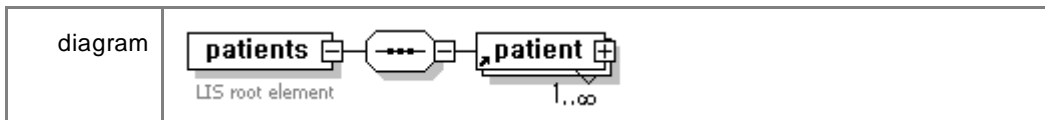
XML

HTML

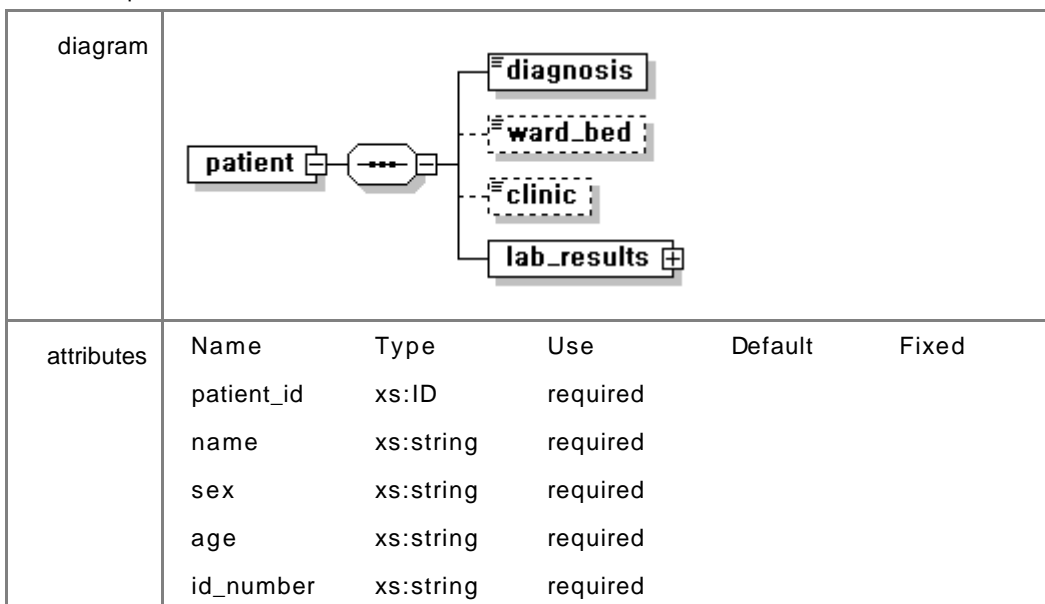
XML Schema

Schema chemistry.xsd

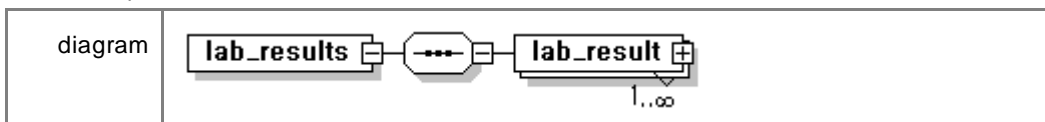
element patients (LIS root element)



element patient



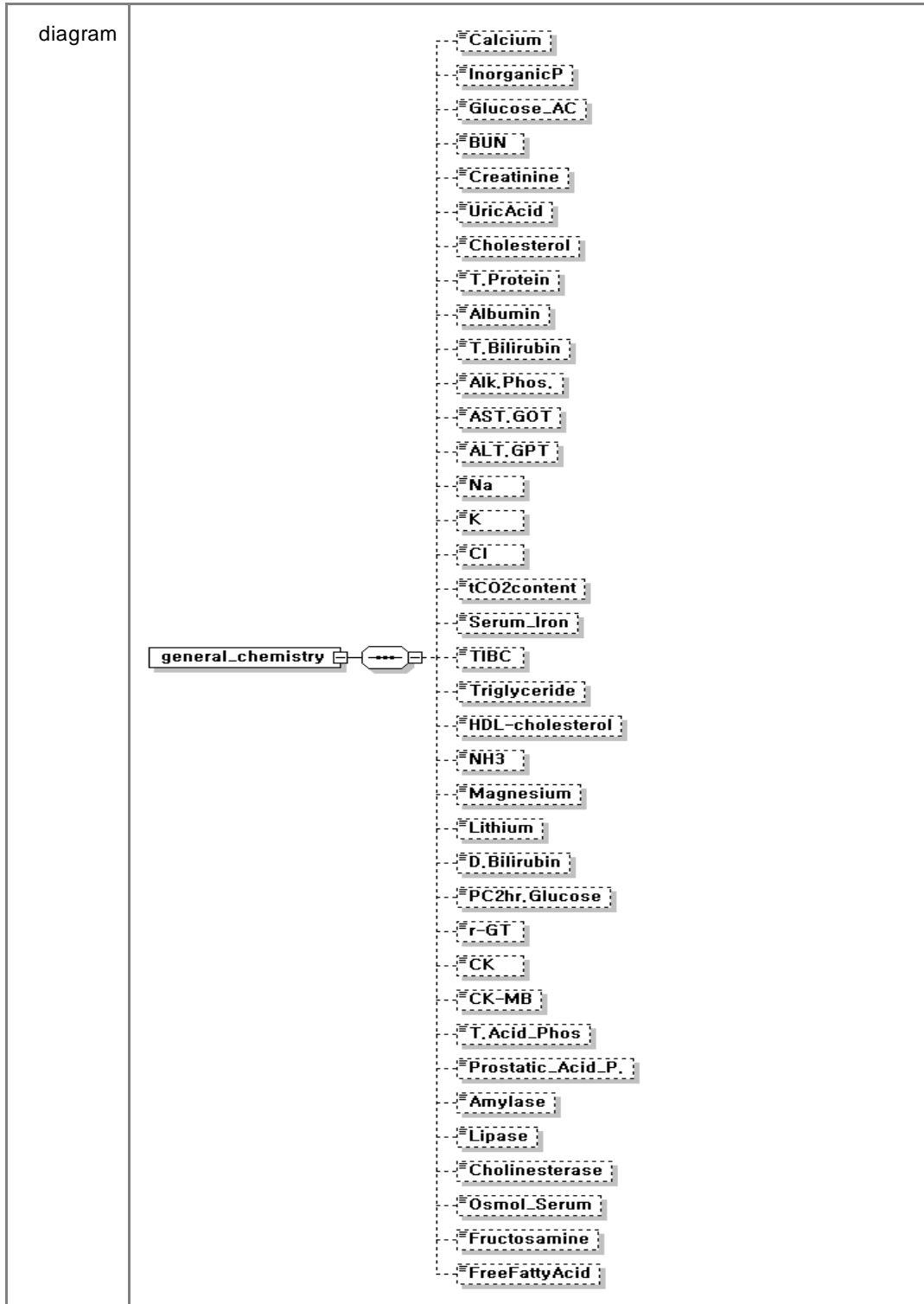
element patient/lab_results



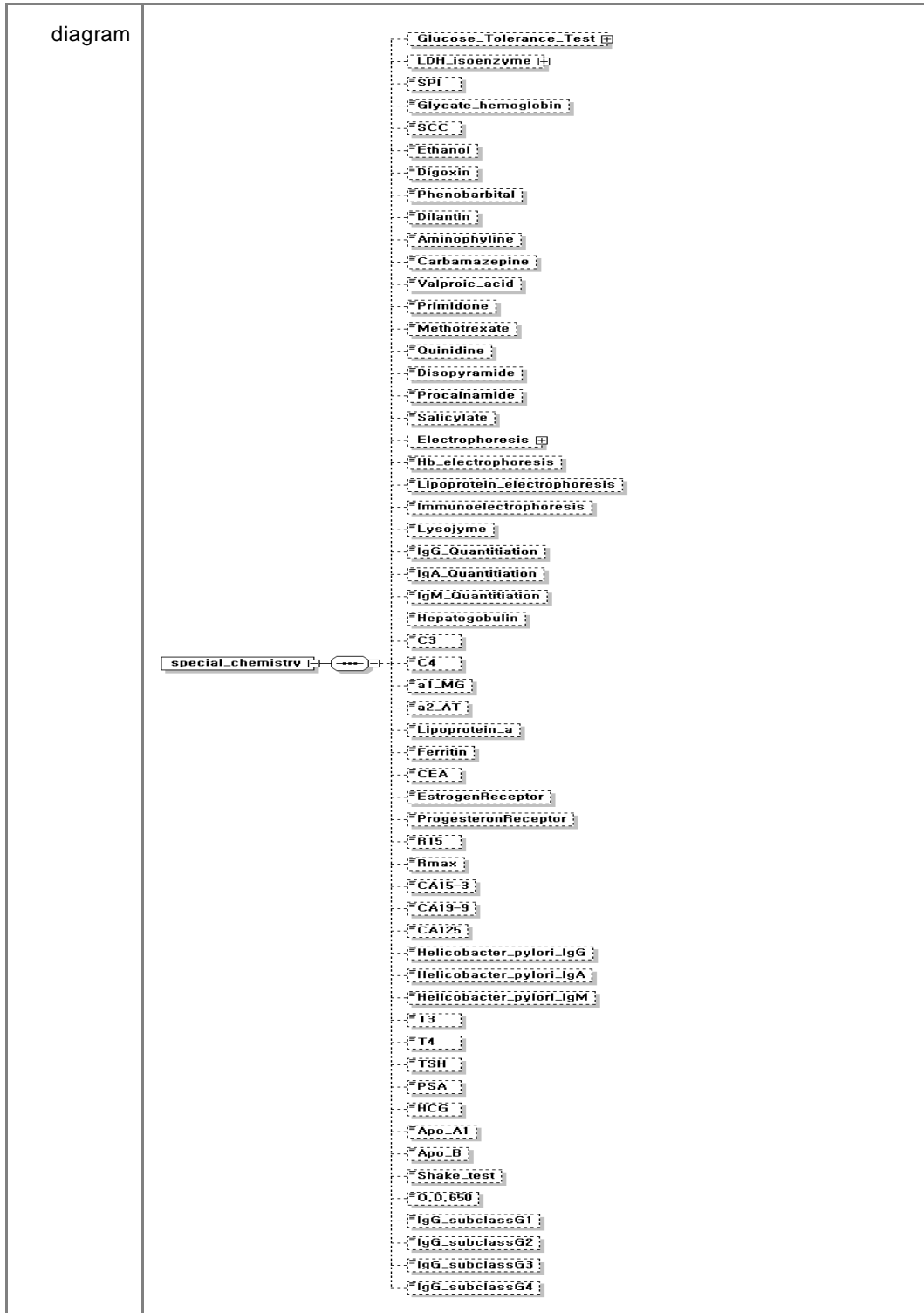
element patient/lab_results/lab_result

| <p>diagram</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------|--|----------|---------|-------|---------|-------|----------|-----------|----------|--|--|------------|-----------|----------|--|--|-------------|-----------|----------|--|--|----------|-----------|----------|--|--|--------------|-----------|----------|--|--|--|--|--|--|
| <p>attributes</p> | <table border="1"> <thead> <tr> <th>Name</th> <th>Type</th> <th>Use</th> <th>Default</th> <th>Fixed</th> </tr> </thead> <tbody> <tr> <td>lab_type</td> <td>xs:string</td> <td>required</td> <td></td> <td></td> </tr> <tr> <td>order_date</td> <td>xs:string</td> <td>required</td> <td></td> <td></td> </tr> <tr> <td>result_date</td> <td>xs:string</td> <td>required</td> <td></td> <td></td> </tr> <tr> <td>specimen</td> <td>xs:string</td> <td>required</td> <td></td> <td></td> </tr> <tr> <td>order_doctor</td> <td>xs:string</td> <td>required</td> <td></td> <td></td> </tr> </tbody> </table> | Name | Type | Use | Default | Fixed | lab_type | xs:string | required | | | order_date | xs:string | required | | | result_date | xs:string | required | | | specimen | xs:string | required | | | order_doctor | xs:string | required | | | | | | |
| Name | Type | Use | Default | Fixed | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| lab_type | xs:string | required | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| order_date | xs:string | required | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| result_date | xs:string | required | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| specimen | xs:string | required | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| order_doctor | xs:string | required | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

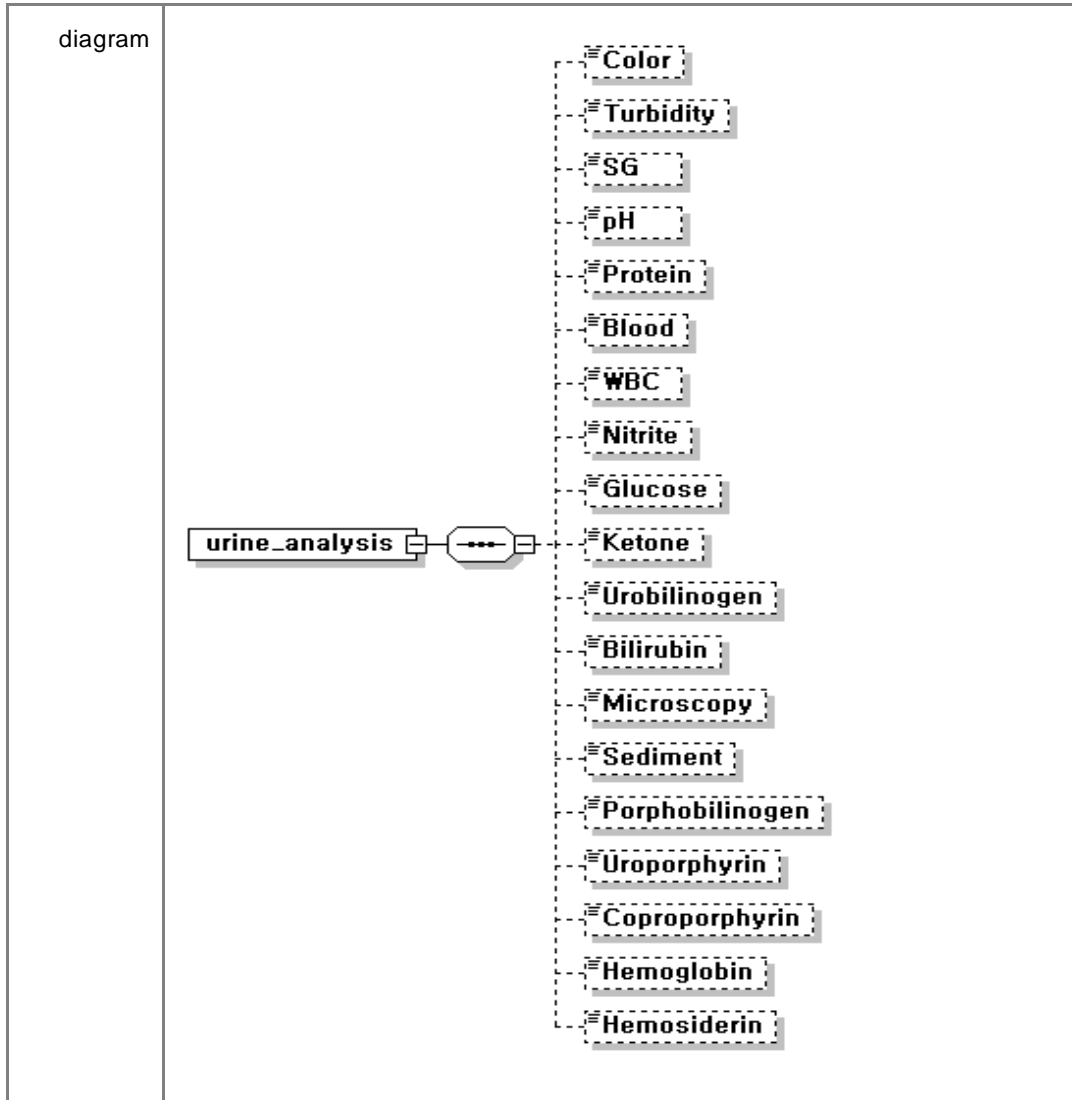
element patient/lab_results/lab_result/general_chemistry



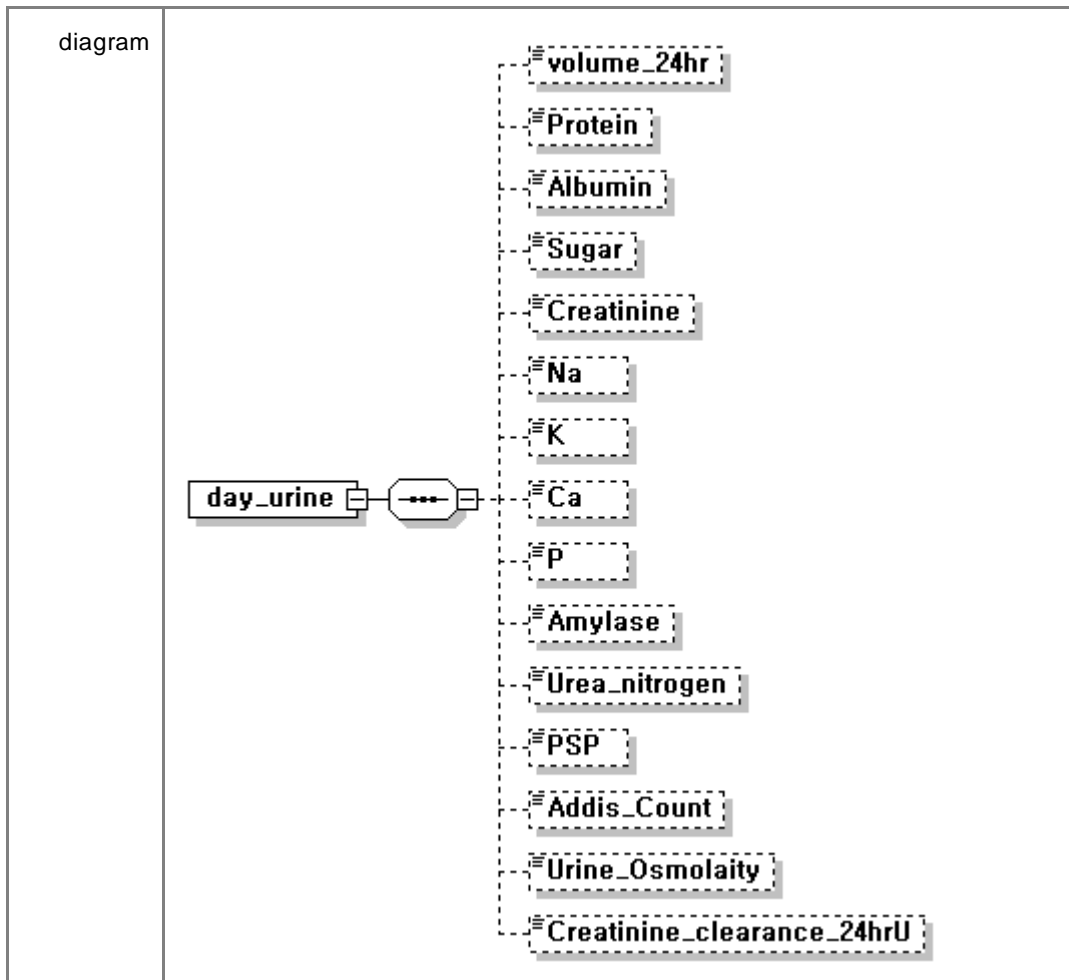
element patient/lab_results/lab_result/special_chemistry



element patient/lab_results/lab_result/urine_analysis



element patient/lab_results/lab_result/day_urine



➤ XML Schema source

```

<?xml version="1.0" encoding="UTF-8"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema">
  <xs:element name="patients">
    <xs:annotation>
      <xs:documentation>LIS root element</xs:documentation>
    </xs:annotation>
    <xs:complexType>
      <xs:sequence>

```



```

        <xs:element ref="patient" maxOccurs="unbounded"/>
    </xs:sequence>
</xs:complexType>
</xs:element><xs:element name="patient">
<xs:complexType>
    <xs:sequence>
        <xs:element name="diagnosis" type="xs:string"/>
        <xs:element name="ward_bed" type="xs:string" minOccurs="0"/>
        <xs:element name="clinic" type="xs:string" minOccurs="0"/>
        <xs:element name="lab_results">
            <xs:complexType>
                <xs:sequence>
                    <xs:element name="lab_result" maxOccurs="unbounded">
                        <xs:complexType>
                            <xs:choice>
                                <xs:element name="general_chemistry" minOccurs="0"
maxOccurs="unbounded">
                                    <xs:complexType>
                                        <xs:sequence>
                                            <xs:element name="Calcium" minOccurs="0">
                                                <xs:complexType>
                                                    <xs:simpleContent>
                                                        <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="8.8~10.5"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mg/dL"/>
                                                        </xs:extension>
                                                    </xs:simpleContent>
                                                </xs:complexType>
                                            </xs:element>
                                            <xs:element name="InorganicP" minOccurs="0">
                                                <xs:complexType><xs:simpleContent>
                                                    <xs:extension base="xs:float">

```

```

<xs:attribute name="reference-range" type="xs:string" use="required" fixed="2.5~4.5"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mg/dL"/>
    </xs:extension></xs:simpleContent>
</xs:complexType></xs:element>
<xs:element name="Glucose_AC" minOccurs="0">
    <xs:complexType><xs:simpleContent>
        <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="70~110"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mg/dL"/>
            </xs:extension></xs:simpleContent></xs:complexType>
        </xs:element>
<xs:element name="BUN" minOccurs="0">
            <xs:complexType><xs:simpleContent>
                <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="5~25"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mg/dL"/>
                    </xs:extension></xs:simpleContent></xs:complexType>
                </xs:element>
<xs:element name="Creatinine" minOccurs="0">
                    <xs:complexType><xs:simpleContent>
                        <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="0.5~1.4"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mg/dL"/>
                            </xs:extension></xs:simpleContent></xs:complexType>
                        </xs:element>
<xs:element name="UricAcid" minOccurs="0">
                            <xs:complexType><xs:simpleContent>
                                <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="2.5~7.5"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mg/dL"/>
                                    </xs:extension></xs:simpleContent></xs:complexType>
                                </xs:element>

```

```

<xs:element name="Cholesterol" minOccurs="0">
  <xs:complexType><xs:simpleContent>
    <xs:extension base="xs:integer">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="120~220"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mg/dL"/>
    </xs:extension></xs:simpleContent></xs:complexType>
  </xs:element>
  <xs:element name="T.Protein" minOccurs="0">
    <xs:complexType><xs:simpleContent>
      <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="6.0~8.0"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="g/dL"/>
      </xs:extension></xs:simpleContent></xs:complexType>
    </xs:element>
    <xs:element name="Albumin" minOccurs="0">
      <xs:complexType><xs:simpleContent>
        <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="3.3~5.3"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="g/dL"/>
        </xs:extension></xs:simpleContent></xs:complexType>
      </xs:element>
      <xs:element name="T.Bilirubin" minOccurs="0">
        <xs:complexType><xs:simpleContent>
          <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="0.2~1.2"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mg/dL"/>
          </xs:extension></xs:simpleContent></xs:complexType>
        </xs:element>
        <xs:element name="Alk.Phos." minOccurs="0">
          <xs:complexType><xs:simpleContent>
            <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="30~115"/>

```

```

<xs:attribute name="unit" type="xs:string" use="required" fixed="IU/L"/>
    </xs:extension></xs:simpleContent></xs:complexType>
</xs:element>
<xs:element name="AST.GOT" minOccurs="0">
    <xs:complexType><xs:simpleContent>
        <xs:extension base="xs:integer">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="8~30(M)
8~28(F)"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="IU/L"/>
    </xs:extension></xs:simpleContent></xs:complexType>
</xs:element>
<xs:element name="ALT.GPT" minOccurs="0">
    <xs:complexType><xs:simpleContent>
        <xs:extension base="xs:integer">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="8~30(M)
8~28(F)"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="IU/L"/>
    </xs:extension></xs:simpleContent></xs:complexType>
</xs:element>
<xs:element name="Na" minOccurs="0">
    <xs:complexType><xs:simpleContent>
        <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="1.5~145"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mM/L"/>
    </xs:extension></xs:simpleContent></xs:complexType>
</xs:element>
<xs:element name="K" minOccurs="0">
    <xs:complexType><xs:simpleContent>
        <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="3.5~5.5"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mM/L"/>
    </xs:extension></xs:simpleContent></xs:complexType>

```

```

</xs:element>
<xs:element name="Cl" minOccurs="0">
  <xs:complexType><xs:simpleContent>
    <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="98~110"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mM/L"/>
    </xs:extension></xs:simpleContent></xs:complexType>
  </xs:element>
  <xs:element name="tCO2content" minOccurs="0">
    <xs:complexType><xs:simpleContent>
      <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="24~30"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mM/L"/>
      </xs:extension></xs:simpleContent></xs:complexType>
    </xs:element>
    <xs:element name="Serum_Iron" minOccurs="0">
      <xs:complexType><xs:simpleContent>
        <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="58~180(M)
40~158(F)"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="ug/dL"/>
        </xs:extension></xs:simpleContent></xs:complexType>
      </xs:element>
      <xs:element name="TIBC" minOccurs="0">
        <xs:complexType><xs:simpleContent>
          <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="275~438(M),
271~435(F)"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="ug/dL"/>
          </xs:extension></xs:simpleContent></xs:complexType>
        </xs:element>
        <xs:element name="Triglyceride" minOccurs="0">

```

```

        <xs:complexType><xs:simpleContent>
            <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="44~166"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mg/dL"/>
            </xs:extension></xs:simpleContent></xs:complexType>
        </xs:element>
        <xs:element name="HDL-cholesterol" minOccurs="0">
            <xs:complexType><xs:simpleContent>
                <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="30~80"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mg/dL"/>
                </xs:extension></xs:simpleContent></xs:complexType>
            </xs:element>
            <xs:element name="NH3" minOccurs="0">
                <xs:complexType><xs:simpleContent>
                    <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="75N    "/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="ug/dL"/>
                    </xs:extension></xs:simpleContent></xs:complexType>
                </xs:element>
                <xs:element name="Magnesium" minOccurs="0">
                    <xs:complexType><xs:simpleContent>
                        <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="1.47~1.89"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mEq/L"/>
                        </xs:extension></xs:simpleContent></xs:complexType>
                    </xs:element>
                    <xs:element name="Lithium" minOccurs="0">
                        <xs:complexType><xs:simpleContent>
                            <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="0.5~1.0"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mEq/L"/>
                            </xs:extension></xs:simpleContent></xs:complexType>
                        </xs:element>
                    </xs:element>
                </xs:element>
            </xs:element>
        </xs:element>
    </xs:complexType>

```

```

        </xs:extension></xs:simpleContent></xs:complexType>
    </xs:element>
    <xs:element name="D.Bilirubin" minOccurs="0">
        <xs:complexType><xs:simpleContent>
            <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required"/>
<xs:attribute name="unit" type="xs:string" use="required"/>
            </xs:extension></xs:simpleContent></xs:complexType>
        </xs:element>
        <xs:element name="PC2hr.Glucose" minOccurs="0">
            <xs:complexType><xs:simpleContent>
                <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="75~125"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mg/dL"/>
                </xs:extension></xs:simpleContent></xs:complexType>
            </xs:element>
            <xs:element name="r-GT" minOccurs="0">
                <xs:complexType><xs:simpleContent>
                    <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="0~30(M),
0~25(F)"/>
                    </xs:extension></xs:simpleContent></xs:complexType>
                </xs:element>
                <xs:element name="CK" minOccurs="0">
                    <xs:complexType><xs:simpleContent>
                        <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="20~134"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="IU/L"/>
                        </xs:extension></xs:simpleContent></xs:complexType>
                    </xs:element>
                    <xs:element name="CK-MB" minOccurs="0">

```

```

        <xs:complexType><xs:simpleContent>
            <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="2~8"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="IU/L"/>
            </xs:extension></xs:simpleContent></xs:complexType>
        </xs:element>
        <xs:element name="T.Acid_Phos" minOccurs="0">
            <xs:complexType><xs:simpleContent>
                <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="6.5 (M),
5.5 (F)"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="U/L"/>
                </xs:extension></xs:simpleContent></xs:complexType>
            </xs:element>
            <xs:element name="Prostatic_Acid_P." minOccurs="0">
                <xs:complexType><xs:simpleContent>
                    <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="2.6 "/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="U/L"/>
                    </xs:extension></xs:simpleContent></xs:complexType>
                </xs:element>
                <xs:element name="Amylase" minOccurs="0">
                    <xs:complexType><xs:simpleContent>
                        <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="60~180"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="U/dL"/>
                        </xs:extension></xs:simpleContent></xs:complexType>
                    </xs:element>
                    <xs:element name="Lipase" minOccurs="0">
                        <xs:complexType><xs:simpleContent>
                            <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="0~190"/>

```



```

<xs:attribute name="unit" type="xs:string" use="required" fixed="IU/L"/>
    </xs:extension></xs:simpleContent></xs:complexType>
</xs:element>
<xs:element name="Cholinesterase" minOccurs="0">
    <xs:complexType><xs:simpleContent>
        <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="2400~4800"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="U/L"/>
            </xs:extension></xs:simpleContent></xs:complexType>
        </xs:element>
        <xs:element name="Osmol_Serum" minOccurs="0">
            <xs:complexType><xs:simpleContent>
                <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required" fixed="289~308"/>
<xs:attribute name="unit" type="xs:string" use="required" fixed="mOsm/kg"/>
                    </xs:extension></xs:simpleContent></xs:complexType>
                </xs:element>
                <xs:element name="Fructosamine" minOccurs="0">
                    <xs:complexType><xs:simpleContent>
                        <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required"/>
<xs:attribute name="unit" type="xs:string" use="required"/>
                            </xs:extension></xs:simpleContent></xs:complexType>
                        </xs:element>
                        <xs:element name="FreeFattyAcid" minOccurs="0">
                            <xs:complexType><xs:simpleContent>
                                <xs:extension base="xs:float">
<xs:attribute name="reference-range" type="xs:string" use="required"/>
<xs:attribute name="unit" type="xs:string" use="required"/>
                                    </xs:extension></xs:simpleContent></xs:complexType>
                                </xs:element>
                            </xs:sequence>

```

```

        </xs:complexType>
    </xs:element>
    <xs:element name="special_chemistry" minOccurs="0" maxOccurs="unbounded">
        <xs:complexType>
            <xs:sequence>
                <xs:element name="Glucose_Tolerance_Test" minOccurs="0">
                    <xs:complexType>
                        <xs:sequence>
                            <xs:element name="Fasting" type="xs:float" minOccurs="0"/>
                            <xs:element name="PC_30M" type="xs:float" minOccurs="0"/>
                            <xs:element name="PC_60M" type="xs:float" minOccurs="0"/>
                            <xs:element name="PC_90M" type="xs:float" minOccurs="0"/>
                            <xs:element name="PC_120M" type="xs:float" minOccurs="0"/>
                            <xs:element name="PC_180M" type="xs:float" minOccurs="0"/>
                        </xs:sequence>
                        <xs:attribute name="test_tpye" use="required">
                            <xs:simpleType>
                                <xs:restriction base="xs:string">
                                    <xs:enumeration value="I.V."/>
                                    <xs:enumeration value="Oral"/>
                                </xs:restriction>
                            </xs:simpleType>
                        </xs:attribute>
                        <xs:attribute name="specimen" use="required">
                            <xs:simpleType>
                                <xs:restriction base="xs:string">
                                    <xs:enumeration value="Blood Sugar"/>
                                    <xs:enumeration value="Urine Sugar"/>
                                    <xs:enumeration value="Urine Aceton"/>
                                </xs:restriction></xs:simpleType></xs:attribute>
                            </xs:complexType>
                        </xs:element>

```

```

<xs:element name="LDH_isoenzyme" minOccurs="0">
  <xs:complexType><xs:sequence>
    <xs:element name="LDH1" type="xs:float" minOccurs="0"/>
    <xs:element name="LDH2" type="xs:float" minOccurs="0"/>
    <xs:element name="LDH3" type="xs:float" minOccurs="0"/>
    <xs:element name="LDH4" type="xs:float" minOccurs="0"/>
    <xs:element name="LDH5" type="xs:float" minOccurs="0"/>
  </xs:sequence></xs:complexType>
</xs:element>
<xs:element name="SPI" type="xs:float" minOccurs="0"/>
<xs:element name="Glycate_hemoglobin" type="xs:float" minOccurs="0"/>
<xs:element name="SCC" type="xs:float" minOccurs="0"/>
<xs:element name="Ethanol" type="xs:float" minOccurs="0"/>
<xs:element name="Digoxin" type="xs:float" minOccurs="0"/>
<xs:element name="Phenobarbital" type="xs:float" minOccurs="0"/>
<xs:element name="Dilantin" type="xs:float" minOccurs="0"/>
<xs:element name="Aminophyline" type="xs:float" minOccurs="0"/>
<xs:element name="Carbamazepine" type="xs:float" minOccurs="0"/>
<xs:element name="Valproic_acid" type="xs:float" minOccurs="0"/>
<xs:element name="Primidone" type="xs:float" minOccurs="0"/>
<xs:element name="Methotrexate" type="xs:float" minOccurs="0"/>
<xs:element name="Quinidine" type="xs:float" minOccurs="0"/>
<xs:element name="Disopyramide" type="xs:float" minOccurs="0"/>
<xs:element name="Procainamide" type="xs:float" minOccurs="0"/>
<xs:element name="Salicylate" type="xs:float" minOccurs="0"/>
<xs:element name="Electrophoresis" minOccurs="0">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Total_Protein" type="xs:float" minOccurs="0"/>
      <xs:element name="Albumin" type="xs:float" minOccurs="0"/>
      <xs:element name="a1_Globulin" type="xs:float" minOccurs="0"/>
      <xs:element name="a2_Globulin" type="xs:float" minOccurs="0"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>

```

```

        <xs:element name="b_Globulin" type="xs:float" minOccurs="0"/>
        <xs:element name="r_Globulin" type="xs:float" minOccurs="0"/>
    </xs:sequence></xs:complexType>
</xs:element>
<xs:element name="Hb_electrophoresis" minOccurs="0">
    <xs:complexType><xs:simpleContent>
        <xs:extension base="xs:float">
            <xs:attribute name="specimen"/>
        </xs:extension>
    </xs:simpleContent></xs:complexType>
</xs:element>
<xs:element name="Lipoprotein_electrophoresis" type="xs:float" minOccurs="0"/>
<xs:element name="Immunoelectrophoresis" type="xs:float" minOccurs="0"/>
    <xs:element name="Lysojyme" type="xs:float" minOccurs="0"/>
    <xs:element name="IgG_Quantitation" type="xs:float" minOccurs="0"/>
    <xs:element name="IgA_Quantitation" type="xs:float" minOccurs="0"/>
    <xs:element name="IgM_Quantitation" type="xs:float" minOccurs="0"/>
    <xs:element name="Hepatoglobulin" type="xs:float" minOccurs="0"/>
    <xs:element name="C3" type="xs:float" minOccurs="0"/>
    <xs:element name="C4" type="xs:float" minOccurs="0"/>
    <xs:element name="a1_MG" type="xs:float" minOccurs="0"/>
    <xs:element name="a2_AT" type="xs:float" minOccurs="0"/>
    <xs:element name="Lipoprotein_a" type="xs:float" minOccurs="0"/>
    <xs:element name="Ferritin" type="xs:float" minOccurs="0"/>
    <xs:element name="CEA" type="xs:float" minOccurs="0"/>
    <xs:element name="EstrogenReceptor" type="xs:float" minOccurs="0"/>
    <xs:element name="ProgesteronReceptor" type="xs:float" minOccurs="0"/>
    <xs:element name="R15" type="xs:float" minOccurs="0"/>
    <xs:element name="Rmax" type="xs:float" minOccurs="0"/>
    <xs:element name="CA15-3" type="xs:float" minOccurs="0"/>
    <xs:element name="CA19-9" type="xs:float" minOccurs="0"/>
    <xs:element name="CA125" type="xs:float" minOccurs="0"/>

```

```

<xs:element name="Helicobacter_pylori_IgG" type="xs:float" minOccurs="0"/>
<xs:element name="Helicobacter_pylori_IgA" type="xs:float" minOccurs="0"/>
<xs:element name="Helicobacter_pylori_IgM" type="xs:float" minOccurs="0"/>
<xs:element name="T3" type="xs:float" minOccurs="0"/>
<xs:element name="T4" type="xs:float" minOccurs="0"/>
<xs:element name="TSH" type="xs:float" minOccurs="0"/>
<xs:element name="PSA" type="xs:float" minOccurs="0"/>
<xs:element name="HCG" type="xs:float" minOccurs="0"/>
<xs:element name="Apo_A1" type="xs:float" minOccurs="0"/>
<xs:element name="Apo_B" type="xs:float" minOccurs="0"/>
<xs:element name="Shake_test" type="xs:float" minOccurs="0"/>
<xs:element name="O.D.650" type="xs:float" minOccurs="0"/>
<xs:element name="IgG_subclassG1" type="xs:float" minOccurs="0"/>
<xs:element name="IgG_subclassG2" type="xs:float" minOccurs="0"/>
<xs:element name="IgG_subclassG3" type="xs:float" minOccurs="0"/>
<xs:element name="IgG_subclassG4" type="xs:float" minOccurs="0"/>
</xs:sequence></xs:complexType>
</xs:element>
<xs:element name="urine_analysis" minOccurs="0" maxOccurs="unbounded">
<xs:complexType><xs:sequence>
<xs:element name="Color" minOccurs="0">
<xs:complexType><xs:simpleContent>
<xs:extension base="xs:string">
<xs:attribute name="color_type" use="optional">
<xs:simpleType><xs:restriction base="xs:string">
<xs:enumeration value="yellow"/>
<xs:enumeration value="brown"/>
<xs:enumeration value="straw"/>
<xs:enumeration value="amber"/>
<xs:enumeration value="green"/>
<xs:enumeration value="orange"/>
<xs:enumeration value="red"/>

```

```

        <xs:enumeration value="etc." />
    </xs:restriction></xs:simpleType></xs:attribute>
</xs:extension></xs:simpleContent></xs:complexType>
</xs:element>
<xs:element name="Turbidity" type="xs:string" minOccurs="0" />
<xs:element name="SG" type="xs:float" minOccurs="0" />
<xs:element name="pH" type="xs:float" minOccurs="0" />
<xs:element name="Protein" type="xs:string" minOccurs="0" />
<xs:element name="Blood" type="xs:string" minOccurs="0" />
<xs:element name="WBC" type="xs:string" minOccurs="0" />
<xs:element name="Nitrite" type="xs:string" minOccurs="0" />
<xs:element name="Glucose" type="xs:string" minOccurs="0" />
<xs:element name="Ketone" type="xs:string" minOccurs="0" />
<xs:element name="Urobilinogen" type="xs:float" minOccurs="0" />
<xs:element name="Bilirubin" type="xs:string" minOccurs="0" />
<xs:element name="Microscopy" minOccurs="0">
<xs:complexType><xs:simpleContent>
    <xs:extension base="xs:string">
        <xs:attribute name="WBC" type="xs:string" use="optional" />
        <xs:attribute name="RBC" type="xs:string" use="optional" />
    </xs:extension></xs:simpleContent></xs:complexType>
</xs:element>
<xs:element name="Sediment" type="xs:string" minOccurs="0" />
<xs:element name="Porphobilinogen" type="xs:string" minOccurs="0" />
<xs:element name="Uroporphyrin" type="xs:string" minOccurs="0" />
<xs:element name="Coproporphyrin" type="xs:string" minOccurs="0" />
<xs:element name="Hemoglobin" type="xs:string" minOccurs="0" />
<xs:element name="Hemosiderin" type="xs:string" minOccurs="0" />
</xs:sequence>
<xs:attribute name="test_type" use="required">
    <xs:simpleType><xs:restriction base="xs:string">
        <xs:enumeration value="Voided" />

```

```

        <xs:enumeration value="Catheterized"/>
        <xs:enumeration value="Clean catch"/>
        <xs:enumeration value="Timed specimen"/>
    </xs:restriction></xs:simpleType>
</xs:attribute></xs:complexType>
</xs:element>
<xs:element name="day_urine" minOccurs="0" maxOccurs="unbounded">
    <xs:complexType>
        <xs:sequence>
            <xs:element name="volume_24hr" type="xs:float" minOccurs="0"/>
            <xs:element name="Protein" type="xs:float" minOccurs="0"/>
            <xs:element name="Albumin" type="xs:float" minOccurs="0"/>
            <xs:element name="Sugar" type="xs:float" minOccurs="0"/>
            <xs:element name="Creatinine" type="xs:float" minOccurs="0"/>
            <xs:element name="Na" type="xs:float" minOccurs="0"/>
            <xs:element name="K" type="xs:float" minOccurs="0"/>
            <xs:element name="Ca" type="xs:float" minOccurs="0"/>
            <xs:element name="P" type="xs:float" minOccurs="0"/>
            <xs:element name="Amylase" type="xs:float" minOccurs="0"/>
            <xs:element name="Urea_nitrogen" type="xs:float" minOccurs="0"/>
            <xs:element name="PSP" type="xs:float" minOccurs="0"/>
            <xs:element name="Addis_Count" type="xs:float" minOccurs="0"/>
            <xs:element name="Urine_Osmolaity" type="xs:float" minOccurs="0"/>
            <xs:element name="Creatinine_clearance_24hrU" minOccurs="0">
                <xs:complexType><xs:simpleContent>
                    <xs:extension base="xs:float">
                        <xs:attribute name="Ht" type="xs:float" use="required"/>
                        <xs:attribute name="Wt" type="xs:float" use="required"/>
                    </xs:extension></xs:simpleContent></xs:complexType>
                </xs:element></xs:sequence></xs:complexType>
            </xs:element></xs:choice>
        <xs:attribute name="lab_type" type="xs:string" use="required"/>
    </xs:complexType>
</xs:element>

```

```
<xs:attribute name="order_date" type="xs:string" use="required"/>
<xs:attribute name="result_date" type="xs:string" use="required"/>
<xs:attribute name="specimen" use="required">
  <xs:simpleType><xs:restriction base="xs:string">
    <xs:enumeration value="Serum"/>
    <xs:enumeration value="Urine"/>
    <xs:enumeration value="CSF"/>
    <xs:enumeration value="Other"/>
  </xs:restriction></xs:simpleType></xs:attribute>
  <xs:attribute name="order_doctor" type="xs:string" use="required"/>
</xs:complexType></xs:element></xs:sequence></xs:complexType>
</xs:element></xs:sequence>
<xs:attribute name="patient_id" type="xs:ID" use="required"/>
<xs:attribute name="name" type="xs:string" use="required"/>
<xs:attribute name="sex" type="xs:string" use="required"/>
<xs:attribute name="age" type="xs:string" use="required"/>
<xs:attribute name="id_number" type="xs:string" use="required"/>
</xs:complexType>
</xs:element>
```


ABSTRACT

Design of Laboratory Information System Using XML

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The growth and development of the Internet have affected HIS(Hospital Information System) greatly. The sharing of clinical data among hospitals has become especially more important with the expansion of Internet. XML(eXtensible Markup Language) was recommended to express scalable and flexible data, or document on Web by W3C(World Wide Web Consortium) in 1998.

The objectives of this study are to design XML Schema of clinical data or document in order to share data resulting in the laboratory, and to design web-based system in order to retrieve laboratory data implemented in XML.

The subject of the study is "laboratory data", for its similarity among hospitals. That is, it is thought to be standardized and it takes over 50% in all hospital examinations. Moreover it has high need of data sharing. First, after analyzing laboratory result data, XML Schema and XSL were designed. And then XML instance was created and stored in database. Finally, to retrieve laboratory result data on web, interfaces with web page and database were

designed.

This study, on the designing of standardized clinical data using XML, will enhance sharing clinical data. In addition it will be the basic model to realize EMR(Electronic Medical Record) and differentiate the existing one from HTML based web system.

Key words : XML, sharing of clinical data, laboratory result data, web-based system, standard