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HL7 Version 3 Implementation Guide: Context-Aware Knowledge Retrieval Application (Infobutton), Release 4 June 2014

**Sponsored by:
Clinical Decision Support Work Group**

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1 Purpose

Clinicians face numerous knowledge needs during the course of patient care and the majority of these needs are not met, compromising the quality of care. Online health knowledge resources that are capable of solving many of these knowledge needs are now widely available, but a series of barriers hinder a more effective and frequent use of these resources at the point of care. *Infobuttons* are decision support tools that integrate knowledge resources into electronic health record (EHR) and personal health record (PHR) systems as an attempt to lower these barriers. To facilitate the integration of knowledge resources into EHR and PHR systems, the Clinical Decision Support Technical Committee developed the *Context-aware knowledge retrieval (Infobutton)* standard specification.

This implementation guide provides a specification for URL-based implementations of the *Context-aware knowledge retrieval (Infobutton)* standard. The intent of this specification is to support the majority of knowledge retrieval implementations that offer URLs as the primary or exclusive communication protocol. The ultimate goal is to enable a stepwise transition from URL-based implementations to a services-oriented approach. Release 4 of this implementation guide reflects changes made to its normative parent specification (*Context-aware Knowledge retrieval, Knowledge Request Standard*). It also includes clarifications regarding the use of coded attributes and provides a quick reference of code systems used in the implementation guide.

2 Special notes and disclaimers

The URL-based specification is one alternative, not normative, implementation of the *Context-aware Knowledge retrieval standard*. The main goal of this implementation approach is to support compatibility with most EHR and knowledge resource implementations, maximizing adoption. This document assumes knowledge of the *Context-aware Knowledge Retrieval (Infobutton)* standard normative specification. For a detailed description of the standard, readers should refer to the *Context-aware Knowledge Retrieval (Infobutton)* section in the HL7 Version 3 Standard documentation.

2.1 Changes from Release 4 DSTU

The following changes were introduced in the present specification:

- 1) Guidance on representing laboratory test results in a URL using the observation class (Section 6.4.4).
- 2) Guidance on requests for verifying drug-drug interactions given a patient's medications list (Appendix 4).

3 URL-based implementation

The URL-based representation is directly derived from the *Context-aware Knowledge Retrieval (Infobutton)*, *knowledge request* message information model. The method described in the following sections allows *knowledge request* message payloads to be converted from XML to URL-based through a simple automated process. The set of rules described below SHALL be followed to convert an XML-based *knowledge request* payload into a set of parameter names that can be transmitted through the HTTP/HTTPS protocol, using the GET or POST methods.

3.1 Conversion of XML entities into URL parameter names

Rule #1: All XML attribute and element names that contain values SHALL be converted to an HTTP/HTTPS parameter name. The parameter SHALL be named by concatenating the element / attribute antecedent names (2 levels up) with the element / attribute name. Element / attribute names shall be separated by a dot as follows: [name of the level 2 antecedent] + '.' + [name of the level 1 antecedent] + '.' + [name of the element or attribute]. A few of the XML element / attributes cannot be unambiguously converted to a parameter name using the proposed rule. The name translations listed in Table 1 SHALL be used to address these cases. For convenience, Appendix 1 contains an exhaustive list of XML entities and their respective parameter name translations.

Note: To provide backwards compatibility with the previous versions of the present implementation guide while in DSTU status, the *MainSearchCriteria.value.** and *SubTopic.value.** class attributes MAY still be converted to *mainSearchCriteria.c.** and *subtopic.c.** respectively. However, this option has been deprecated as of January 2010 and SHOULD not be used in new implementations. Existing implementations SHALL plan to migrate from the previous version to the new one, in which the parameter names for those two classes SHALL be *mainSearchCriteria.v.** and *subTopic.v.**.

Table 1 – Exceptions to the parameter name translation rule.*

Xpath	URL parameter name
//assignedEntity/ representedOrganization/id@root	assignedEntity. representedOrganization.id.root
//performer/healthCareProvider/ code@code	performer.healthCareProvider.c.c
//performer/healthCareProvider/ code@codeSystem	performer.healthCareProvider.c.cs
//performer/healthCareProvider/ code@displayName	performer.healthCareProvider.c.dn
//informationRecipient /healthCareProvider/code@code	informationRecipient. healthCareProvider.c.c
//informationRecipient /healthCareProvider/ code@codeSystem	informationRecipient. healthCareProvider.c.cs

//informationRecipient /healthCareProvider/ code@displayName	informationRecipient. healthCareProvider.c.dn
//performer// languageCommunication/ languageCode@code	performer.languageCode.c
//performer//languageCommunication/ languageCode@codeSystem	performer.languageCode.cs
//performer//languageCommunication/ languageCode@displayName	performer.languageCode.dn
//informationRecipient// languageCommunication/ languageCode@code	informationRecipient.languageCode.c
//informationRecipient// languageCommunication/ languageCode@codeSystem	informationRecipient.languageCode.cs
//informationRecipient// languageCommunication/ languageCode@displayName	informationRecipient.languageCode.dn
//informationRecipient/ healthCareProvider/	informationRecipient=PROV ¹
//informationRecipient/patient/	informationRecipient=PAT ¹
//informationRecipient/payor/	informationRecipient=PAYOR ¹
//performer/healthCareProvider/	performer=PROV ¹
//performer/patient/	performer=PAT ¹
//performer/payor/	performer=PAYOR ¹

* Note that some of the parameter names listed above are abbreviated according to abbreviation rules defined below in Table 3.

3.2 Parameter cardinality

Rule #2: Parameter cardinality SHALL follow the same restrictions defined in the *Knowledge request RMIM*, except for the following:

- 1) Attributes based on a coded data type and that are bound to a single fixed code in the knowledge request message information model SHOULD be completely omitted (i.e., *mainSearchCriteria.code*, *subtopic.code*, *ageGroup.code*, *age.code*).
- 2) Coded attributes that are bound to codes from one single code system MAY have the *codeSystem* omitted as long as the code is from the recommended value set (see

¹ *PROV*, *PAT*, and *PAYOR* correspond to the the respective class codes obtained from the RoleClass code system [2.16.840.1.113883.5.110].

Appendix 2). The only attributes that do not meet this criterion are *mainSearchCriteria.value*, *subTopic.value*, *observation.code*, and *observation.value*. Therefore, *codeSystem* SHALL be provided for these latter attributes if a *code* is present.

- 3) The *displayName* attribute MAY be omitted in all knowledge request parameters.
- 4) For the *Observation* class, if the *Observation* code is an ASSERTION (e.g., assertion that the patient has a specific problem, diagnosis, or symptom), *observation.c.c* MAY be omitted. If *observation.c.c* is absent, fillers of a knowledge request SHALL assume that *observation.c.c=ASSERTION*.

Note: Attributes that accept codes from multiple code systems SHALL include the *codeSystem* attribute (e.g., *mainSearchCriteria.value*, *subTopic.value*, *observation.code*, *observation.value*).

Example: *codeSystem* and *displayName* attributes properly omitted in *administrativeGender*, *task*, *performer*, and *informationRecipient*):

```
mainSearchCriteria.v.c=1202&mainSearchCriteria.v.cs=2.16.840.1.113883.6.88&
patientPerson.administrativeGenderCode.c=F&
task.c.c=MEDOE&
performer=PROV&informationRecipient=PAT&
subTopic.v.c=Q000009&subTopic.v.cs=2.16.840.1.113883.6.177
```

Verbose version with all *codeSystem* and *displayName* attributes included:

```
mainSearchCriteria.v.c=1202&mainSearchCriteria.v.cs=2.16.840.1.113883.6.88&
mainSearchCriteria.v.dn=atenolol&
patientPerson.administrativeGenderCode.c=F&
patientPerson.administrativeGenderCode.cs=2.16.840.1.113883.5.1&
patientPerson.administrativeGenderCode.dn=Female&
task.c.c=MEDOE&task.c.cs=2.16.840.1.113883.5.4&task.c.dn=Medication+Order+Entry
&performer=PROV&informationRecipient=PAT&
subTopic.v.c=Q000009&subTopic.v.cs=2.16.840.1.113883.6.177&subTopic.v.dn=adverse
effects
```

Rule #3: Multiple instance parameters SHALL be suffixed with a sequential integer that denotes the cardinality of a particular parameter instance: the first instance in a given sequence SHALL not be suffixed; the second element SHALL be suffixed with the integer “1;” the third element SHALL be suffixed with “2;” and so forth. Table 2 shows an example with three instances of the *mainSearchCriteria* element. Other parameters that also follow the same rule are those derived from the *LocationOfInterest* and *Observation* classes.

Table 2 – Conversion example of multiple *mainSearchCriteria* elements*.

XML node	URL parameter name
<pre><mainSearchCriteria> <value code="1202" codeSystem= "2.16.840.1.113883.6.88" > <displayName value="atenolol"/> </value></pre>	<pre>mainSearchCriteria.v.c=1202& mainSearchCriteria. v.cs=2.16.840.1.113883.6.88& mainSearchCriteria.v.dn=atenolol mainSearchCriteria.v.c1=401.1& mainSearchCriteria. v.cs1=2.16.840.1.113883.6.103&</pre>

<pre> </mainSearchCriteria> <mainSearchCriteria> <value code="401.1" codeSystem= "2.16.840.1.113883.6.103"> <displayName value="Benign essential hypertension"/> </value> </mainSearchCriteria> <mainSearchCriteria> <value code="250" codeSystem= "2.16.840.1.113883.6.103"> <displayName value=" Diabetes mellitus"/> </value> </mainSearchCriteria> </pre>	<pre> mainSearchCriteria. v.dn1=Benign+essential+hypertension mainSearchCriteria.v.c2=250& mainSearchCriteria. v.cs2=2.16.840.1.113883.6.103& mainSearchCriteria. v.dn2=Diabetes+mellitus </pre>
---	--

* Note that some of the parameter names listed above are abbreviated according to abbreviation rules defined below in Table 3.

3.3 Addressing length limitations of HTTP GET

Rule #4: To address URL length limitations imposed by the HTTP GET protocol, the attribute / element names listed in Table 3 SHALL be abbreviated. This list is intended to be immutable regardless of changes to the normative *knowledge request* RMIM.

Table 3 – List of required entity abbreviations.

Element / attribute	Abbreviation
code	c
codeSystem	cs
codeSystemName	csn
displayName	dn
originalText	ot
value	v
unit	u
name	n

3.4 HTTP/HTTPS GET vs. POST

Rule #5: Clinical Information Systems MAY choose whether to implement an infobutton *knowledgeRequest* with HTTP/HTTPS GET, HTTP/HTTPS POST, or both. Despite the parameter abbreviations listed above, specific knowledge request payload instances may still lead to URLs that exceed the length limitations imposed by the HTTP/HTTPS GET protocol, especially when a payload contains multiple instances of a given parameter, such as *mainSearchCriteria*. In these cases, clinical information systems SHOULD use HTTP/HTTPS POST.

Rule #6: Knowledge resources and infobutton managers SHALL be able to consume a *knowledgeRequest* both as HTTP/HTTPS GET and HTTP/HTTPS POST.

NOTE: Implementers should consider whether to implement the request above using HTTP vs. HTTPS, for example depending on whether the knowledge resource resides on a trusted or untrusted network. This implementation guide does not require the implementation of one alternative vs. another from a security standpoint.

3.5 Knowledge request via HTTP/HTTPS POST

The following rule should be followed to submit a knowledge request using the HTTP/HTTPS POST protocol:

Rule #7: Parameter names and values in an HTTP POST/HTTPS request SHALL be sent as a set of name-value pairs, using the same parameter names and values defined for GET requests.

3.6 URL translation examples

Table 4 contains examples of XML representations extracted from an *knowledge request* message payload and the equivalent URL-based representations.

Table 4 – Examples of XML representations followed by the equivalent URL-based translation.

XML representation	URL-based representation
<pre><patientPerson> <administrativeGenderCode code="F"> </patientPerson></pre>	<pre>patientPerson. administrativeGenderCode.c=F</pre>
<pre><age> <code code="30525-0"/> <value value="77" unit="a"/> </age></pre>	<pre>age.c.c=30525-0& age.v.v=77& age.v.u=a</pre>
<pre><mainSearchCriteria> <value code="D018410" codeSystem="2.16.840.1.113883.6.177" codeSystemName="MSH" > <displayName value="Bacterial Pneumonia"/> <originalText value="Pneumonia"/> </value> </mainSearchCriteria></pre>	<pre>mainSearchCriteria.v.c=D018410& mainSearchCriteria.v.cs=2.16.840.1 .113883.6.177& mainSearchCriteria.v.csn=MSH& mainSearchCriteria.v.dn=Bacterial+ Pneumonia& mainSearchCriteria.v.ot=Pneumonia</pre>

4 Appendix 1 – List of parameter names

Table 5 contains a comprehensive list of XML entities and their associated parameter name translations. Detailed descriptions of these parameters are outside the scope of this Implementation Guide. The reader should refer to the Context-aware knowledge retrieval (“Infobutton”) normative specification for a detailed description of the underlying message model and its attributes.

Table 5 – List of XML entities and their associated parameter name translations.

Xpath	URL parameter name
//knowledgeRequestNotification/effectiveTime@value	knowledgeRequestNotification.effectiveTime.v
//holder/assignedEntity/name	holder.assignedEntity.n
//holder/assignedEntity/certificateText	holder.assignedEntity.certificateText
//assignedEntity/assignedAuthorizedPerson/id@root	assignedAuthorizedPerson.id.root
//assignedEntity/representedOrganization/id@root	representedOrganization.id.root
//assignedEntity/representedOrganization/name	assignedEntity.representedOrganization.n
//patientPerson/administrativeGenderCode@code	patientPerson.administrativeGenderCode.c
//patientPerson/administrativeGenderCode/displayName/@value	patientPerson.administrativeGenderCode.dn
//age/code@value	age.v.v
//age/code@unit	age.v.u
//ageGroup/value@code	ageGroup.v.c
//ageGroup/value@codeSystem	ageGroup.v.cs
//ageGroup/value/displayName/@value	ageGroup.v.dn
//taskContext/code@code	taskContext.c.c
//taskContext/code/displayName/@value	taskContext.c.dn
//subTopic/value@code	subTopic.v.c
//subTopic/value@codeSystem	subTopic.v.cs
//subTopic/value/displayName/@value	subTopic.v.dn
//subTopic/value/originalText/@value	subTopic.v.ot

//subTopic/value@code	subTopic.c.c (deprecated)
//subTopic/value@codeSystem	subTopic.c.cs (deprecated)
//subTopic/value/displayName/@value	subTopic.c.dn (deprecated)
//mainSearchCriteria/value@code	mainSearchCriteria.v.c
//mainSearchCriteria/value@codeSystem	mainSearchCriteria.v.cs
//mainSearchCriteria/value /displayName/@value	mainSearchCriteria.v.dn
//mainSearchCriteria/value/ originalText/@value	mainSearchCriteria.v.ot
//mainSearchCriteria/value@code	mainSearchCriteria.c.c (deprecated)
//mainSearchCriteria/value@codeSystem	mainSearchCriteria.c.cs (deprecated)
//mainSearchCriteria/value /displayName/@value	mainSearchCriteria.c.dn (deprecated)
//mainSearchCriteria/value/ originalText/@value	mainSearchCriteria.c.ot (deprecated)
//severityObservation /interpretationCode@code	severityObservation. interpretationCode.c
//severityObservation/ interpretationCode@codeSystem	severityObservation. interpretationCode.cs
//severityObservation/ interpretationCode/displayName/@value	severityObservation. interpretationCode.dn
//informationRecipient/patient/	informationRecipient=PAT
//informationRecipient/ healthCareProvider/	informationRecipient=PROV
//informationRecipient/payor/	informationRecipient=PAYOR
//performer/patient/	performer=PAT
//performer/healthCareProvider/	performer=PROV
//performer/payor/	performer=PAYOR
//performer/healthCareProvider/ healthCarePerson/code@code	performer.healthCareProvider. c.c
//performer/healthCareProvider/ healthCarePerson/code@codeSystem	performer.healthCareProvider. c.cs
//performer/healthCareProvider/ healthCarePerson/code/displayName/@va lue	performer.healthCareProvider. c.dn

//informationRecipient/ healthCareProvider/healthCarePerson/ code@code	informationRecipient. healthCareProvider.c.c
//informationRecipient/ healthCareProvider/ healthCarePerson/code@codeSystem	informationRecipient. healthCareProvider.c.cs
//informationRecipient/ healthCareProvider/healthCarePerson/ code/displayName/@value	informationRecipient. healthCareProvider.c.dn
//performer//languageCommunication/ languageCode@code	performer.languageCode.c
//informationRecipient// languageCommunication/ languageCode@code	informationRecipient. languageCode.c
//encounter/code@code	encounter.c.c
//encounter/code@codeSystem	encounter.c.cs
//encounter/code/displayName/@value	encounter.c.dn
//serviceDeliveryLocation/id@root	serviceDeliveryLocation.id.root
//observation/code@code	observation.c.c
//observation/code@codeSystem	observation.c.cs
//observation/code/displayName/@value	observation.c.dn
//observation/value@code	observation.v.c
//observation/value@codeSystem	observation.v.cs
//observation/value/displayName/@value	observation.v.dn
//observation/value@value	observation.v.v
//observation/value@unit	Observation.v.u
//locationOfInterest/addr/part/[@code ="ZIP"]/@value	locationOfInterest.addr.ZIP
//locationOfInterest/addr/part/[@code ="CTY"]/@value	locationOfInterest.addr.CTY
//locationOfInterest/addr/part/[@code ="STA"]/@value	locationOfInterest.addr.STA
//locationOfInterest/addr/part/[@code ="CNT"]/@value	locationOfInterest.addr.CNT

5 Appendix 2 – Terminology Reference

LAST DATE APPENDIX 2 WAS UPDATED: December 3rd, 2013

IMPORTANT NOTE: The content below is a quick reference to common codes and code systems that can be used in a knowledge request. **This list is not exhaustive and may not be current.** The complete and up-to-date reference for HL7 code systems is available in the HL7 Normative Edition vocabulary (under the Foundation>Vocabulary menu). The easiest way to find the value sets that are referred in the list below is by clicking on the attribute names of interest in the knowledge request Reference Message Information Model (R-MIM), which is available in the Knowledge Request Normative Edition (under the Universal Domains>Clinical Decision Support>Context-aware Knowledge Retrieval (Infobutton) Topic>Reference Message Information Model).

5.1 *administrativeGenderCode*

Concept domain: AdministrativeGender

Code system: HL7 AdministrativeGender

Code system OID: 2.16.840.1.113883.5.1

Value set: AdministrativeGender [2.16.840.1.113883.1.11.1]

Extensions to the value set allowed (CWE): No

Concept code	Display name
F	Female
M	Male
UN	Undifferentiated

5.2 *ageGroup*

Concept domain: AgeGroupObservationValue

Code system: MeSH

Code system OID: 2.16.840.1.113883.6.177

Value set: AgeGroupObservationValue [2.16.840.1.113883.11.75]

Extensions to the value set allowed (CWE): Yes

Concept code	Display name
D007231	infant, newborn; birth to 1 month
D007223	Infant; 1 to 23 months
D002675	child, preschool; 2 to 5 years
D002648	child; 6 to 12 years
D000293	adolescent; 13-18 years
D055815	young adult; 19-24 years
D000328	adult; 19-44 years
D000368	aged; 56-79 years

D008875	middle aged; 45-64 years
D000369	aged, 80 and older; a person 80 years of age and older

5.3 Age units

CodeSystem: Unified Code for Units of Measure (UCUM)
Code system OID: 2.16.840.1.113883.6.8
Value set: AgePQ_UCUM [2.16.840.1.113883.11.20.9.21]
Extensions to the value set allowed (CWE): No

Code	Display Name
min	Minute
h	Hour
d	Day
wk	Week
mo	Month
a	Year

5.4 taskContext

Concept domain: ActTaskCode
CodeSystem: HL7 ActCode (ActTaskCode value set)
Code system OID: 2.16.840.1.113883.5.4
Value set: ActTaskCode [2.16.840.1.113883.1.11.19846]
Extensions to the value set allowed (CWE): Yes

Concept code	Display name
OE	order entry
LABOE	laboratory test order entry
MEDOE	medication order entry
PATDOC	patient documentation
ALLERLREV	allergy list review
CLINNOTE	clinical note entry
DIAGLISTE	diagnosis list entry
DISCSUME	discharge summary entry
PATEDUE	Patient education entry
DISCHINSTE	Discharge instruction entry
PATREPE	pathology report entry
PROBLISTE	problem list entry
RADREPE	radiology report entry
REMLE	reminder list entry
WELLREMLE	wellness reminder list entry
PATINFO	patient information review

ALLERLE	allergy list entry
CLINNOTEREV	clinical note review
DISCHSUMREV	discharge summary review
DIAGLISTREV	diagnosis list review
IMMLE	immunization list entry
LABRREV	laboratory results review
MICRORREV	microbiology results review
MICROORGRREV	microbiology organisms results review
MICROSENSRREV	microbiology sensitivity test results review
MLREV	medication list review
MARWLREV	medication administration record work list review
OREV	orders review
PATPREV	pathology report review
PROBLISTREV	problem list review
RADPREV	radiology report review
IMMLREV	immunization list review
REMLREV	reminder list review
WELLREMLREV	wellness reminder list review
RISKASSESS	risk assessment instrument
FALLRISK	falls risk assessment instrument

5.5 encounter

Concept domain: ActEncounterType

Code system: HL7 ActCode (ActEncounterCode value set)

Code system OID: 2.16.840.1.113883.5.4

Value set: ActEncounterCode [2.16.840.1.113883.1.11.13955]

Extensions to the value set allowed (CWE):

Concept code	Display name
AMB	Ambulatory
EMER	Emergency
FLD	Field
HH	Home health
IMP	Inpatient encounter
ACUTE	Inpatient acute
NONAC	Inpatient non-acute
SS	short stay
VR	virtual

5.6 performer.languageCode & informationRecipient.languageCode:

Concept domain: HumanLanguage

Code system: tags for the identification of languages (ietf3066)

Code system OID: 2.16.840.1.113883.6.121

http://en.wikipedia.org/wiki/List_of_ISO_639-1_codes

Value set: HumanLanguage [2.16.840.1.113883.1.11.11526]

Extensions to the value set allowed (CWE): No

Concept code	Display name
en	English
es	Spanish
...	...

5.7 performer.healthCareProvider.code & informationRecipient.healthCareProvider.code

Concept domain: HealthCareProviderRoleType

Code system: NUCC Health Care provider taxonomy

Code system OID: 2.16.840.1.113883.6.101

http://www.nucc.org/index.php?option=com_wrapper&Itemid=50

Value set: NUCCProviderCodes [2.16.840.1.113883.1.11.19465]

Extensions to the value set allowed (CWE): No

Examples:

Concept code	Display name
200000000X	Allopathic & Osteopathic Physicians
163W00000X	Registered nurse
...	...

5.8 mainSearchCriteria

Concept domain: KnowledgeSubjectObservationValue

Code systems [OIDs]:

- ICD9-CM [2.16.840.1.113883.6.103]
- ICD10-CM [2.16.840.1.113883.6.90]
- ICD10 [2.16.840.1.113883.6.3]
- SNOMED-CT [2.16.840.1.113883.6.96]
- RxNorm [2.16.840.1.113883.6.88]
- MeSH [2.16.840.1.113883.6.177]
- NDC [2.16.840.1.113883.6.69]
- LOINC [2.16.840.1.113883.6.1]

Value set: KnowledgeSubjectObservationValue [2.16.840.1.113883.11.76]

Extensions to the value set allowed (CWE): Yes

5.9 severityObservation.interpretationCode

Concept domain: SeverityObservation

Value set: ObservationInterpretationNormality [2.16.840.1.113883.1.11.10206]

Code system: ObservationInterpretation

Code system OID: 2.16.840.1.113883.5.83

Extensions to the value set allowed (CWE): Yes

Concept code	Display name
A	Abnormal
AA	Abnormal alert
H	High
HH	High alert
L	Low
LL	Low alert
N	Normal

5.10 subTopic

Concept domain: KnowledgeSubTopicObservationValue

Value set: KnowledgeSubtopicObservationValue [2.16.840.1.113883.11.77]

Code system: MeSH

Code system OID: 2.16.840.1.113883.6.177

Extensions to the value set allowed (CWE): Yes

Concept code	Display name
Q000008	administration & dosage
Q000744	contraindications
Q000009	adverse effects
D004347	drug interaction
Q000145	classification
Q000209	etiology
Q000175	diagnosis
Q000628	therapy
D011379	prognosis
Q000627	therapeutic use
Q000493	pharmacokinetics
Q000494	pharmacology
Q000633	toxicity
Q000506	poisoning

Code system: SNOMED CT

Code system OID: 2.16.840.1.113883.6.96

Concept code	Display name
79899007	Drug interaction
47965005	Differential diagnosis
404204005	Drug interaction with drug
95907004	Drug interaction with food
95906008	Drug interaction with alcohol

5.11 locationOfInterest (country)

Concept domain: Country

Value set: Country [2.16.840.1.113883.1.11.171]

Code system: ISO 3166 Part 1 Country Codes, 2nd Edition, Alpha-3

(http://en.wikipedia.org/wiki/ISO_3166-1_alpha-3)

Code system OID: 1.0.3166.1.2.3

Extensions to the value set allowed (CWE): No

Concept code	Display name
USA	United States
CAN	Canada
MEX	Mexico
BRA	Brazil
ARG	Argentina
GBR	United Kingdom
ESP	Spain
DEU	Germany
DNK	Denmark
NLD	Netherlands
FRA	France
ITA	Italy
NOR	Norway
AUT	Austria
AUS	Australia
NZL	New Zealand
CHN	China
IND	India
...	...

6 Appendix 3 – Constraints for the Observation Class

This section describes specific use cases for the knowledge request *Observation* class and the constraints associated with each of these use cases. The list is not exhaustive, hence implementers MAY use the observation class for other use cases not described below. However, to implement the use cases described below, implementers SHALL follow their respective constraints.

6.1 Renal function

A patient's impaired renal function may affect recommendations for the use of several kinds of medications. For example, specific medication classes may be contraindicated when the patient's has impaired renal function, or the dose of these medications need to be adjusted. Therefore, knowledge resources can use the patient's renal function to adjust the content that is retrieved for this particular patient. One of the most commonly used measures of renal function is *creatinine clearance*. The constraints below specify how to convey the patient's creatinine clearance using the knowledge request *Observation* class.

observation.c.c	SHALL use the SNOMED-CT code "102811001"
observation.c.cs	SHALL use the SNOMED-CT code system OID: "2.16.840.1.113883.6.96"
observation.v.v	SHALL be a numeric value that denotes the creatinine clearance measurement for the patient (e.g., 110) in mL/min or in mL/min/1.73m ² .
observation.v.u	SHALL use the UCUM code "mL/min" or "mL/min/1.73m ² "

XML and URL fragments for a Creatinine Clearance of 65 mL/min:

```
<observation>
  <code code="102811001" codeSystem="2.16.840.1.113883.6.96">
    <displayName value="Creatinine renal clearance"/>
  </code>
  <value xsi:type="PQ" value="65" unit="mL/min"/>
</observation>
```

```
observation.c.c=102811001
observation.c.cs=2.16.840.1.113883.6.96
observation.v.v=65
observation.v.u=mL/min
```

6.2 Pregnancy Status

The treatment/management of certain conditions is very different when a patient is pregnant. Therefore, knowledge resources can use a patient's pregnancy status to adjust the content that is retrieved. The constraints below specify how to convey that a patient is pregnant using the knowledge request *Observation* class.

observation.v.c	SHALL use the SNOMED-CT code "77386006" (patient currently pregnant)
-----------------	--

observation.v.cs	SHALL use the SNOMED-CT code system OID: "2.16.840.1.113883.6.96"
------------------	--

XML and URL fragments indicating that the patient is pregnant:

```
<observation>
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <value xsi:type="CD">
    <code code="77386006" codeSystem="2.16.840.1.113883.6.96">
      <displayName value="patient currently pregnant"/>
    </code>
  </value>
</observation>
```

```
observation.c.c=ASSERTION
observation.c.cs=2.16.840.1.113883.5.4
observation.v.c=77386006
observation.v.cs=2.16.840.1.113883.6.96
```

6.3 Vital Signs

Implementers can use multiple instances of the Observation class to represent the patient's vital signs following the constraints described below. The source of the observation codes is the HITSP *Vital Sign Result Value Set* [2.16.840.1.113883.3.88.12.80.62].

observation.c.c	SHALL be one of the LOINC codes below <ul style="list-style-type: none"> - 8310-5 [Body Temperature] - 8462-4 [BP Diastolic] - 8480-6 [BP Systolic] - 8287-5 [Head Circumference] - 8867-4 [Heart Rate] - 8302-2 [Height] - 8306-3 [Height (Lying)] - 59408-5 [O₂ Saturation in Arterial Blood] - 9279-1 [Respiratory Rate] - 3141-9 [Weight Measured] - 39156-5 [BMI (Body Mass Index)] - 3140-1 [BSA (Body Surface Area)]
observation.c.cs	SHALL use the LOINC code system OID: "2.16.840.1.113883.6.1"
observation.v.v	SHALL be a numeric value that denotes one of the measurements listed above.
observation.v.u	SHALL be one of the UCUM codes below that represents the unit in which the observation is measured. For vital signs in which more than one unit is allowed, the sender SHALL be able to send one of the allowed units. The receiver SHALL be able to process all the allowed units.

	<ul style="list-style-type: none"> - Body Temperature: <i>Cel; [degF]</i> - Blood Pressure: <i>mm[Hg]</i> - Head Circumference: <i>cm; [in_i]</i> - Heart Rate & respiratory rate: <i>/min</i> - Height: <i>cm; [in_i]</i>; - O₂ Saturation: <i>%</i> - Weight Measured: <i>kg; g; [lb_av]; [oz_av]</i> - BMI (Body Mass Index): <i>kg/m2</i> - BSA (Body Surface Area): <i>m2</i>
--	--

```

XML and URL fragments for a body temperature of 39.2°C:

<observation>
  <code code="8310-5" displayName="Body temperature"
    codeSystem="2.16.840.1.113883.6.1"
codeSystemName="LOINC" />
  <value xsi:type="PQ" value="39.2" unit="Cel" />
</observation>

observation.c.c=8310-5
observation.c.cs=2.16.840.1.113883.6.1
observation.v.v=39.2
observation.v.u=Cel

```

6.4 Problems, medications, medication allergies, and laboratory test results

To enhance content retrieval, implementers can augment the patient context by adding to a knowledge request the patient’s active problems, active medications, medication allergies, and relevant laboratory test results. This can be done via one or more instances of the *Observation* class as specified below.

NOTE on *MainSearchCriteria* vs. *Observation* class: Both classes may be used to convey the patient’s problems or medications. However, *MainSearchCriteria* conveys the main concept of interest in a knowledge request, while the *Observation* class conveys secondary information that may help make the knowledge retrieval more specific to the patient’s needs. For example, *MainSearchCriteria* may indicate that the concept of interest is *warfarin* and *Observation* may convey that the patient has *atrial fibrillation* and is also on five other medications. In such a request, a knowledge resource will focus on warfarin, but may attempt to narrowing the knowledge retrieval to the use of warfarin specifically for atrial fibrillation.

6.4.1 Problems

observation.c.c	SHALL be the HL7 code “ASSERTION”
observation.c.cs	SHALL use the HL7 code system OID: “2.16.840.1.113883.5.4”
observation.v.c	A code that represents the patient’s problem.
observation.v.cs	The code system used to represent the patient’s problem (e.g., SNOMED-CT, ICD9-CM, ICD10).

XML and URL fragments for a patient with *hypertension* and *heart failure*:

```
<observation>
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <value xsi:type="CD">
    <code code="38341003" codeSystem="2.16.840.1.113883.6.96">
      <displayName value="Hypertensive+disorder"/>
      <originalText value="Hypertensive+disorder"/>
    </code>
  </value>
</observation>
<observation>
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <value xsi:type="CD">
    <code code="84114007" codeSystem="2.16.840.1.113883.6.96">
      <displayName value="Heart+failure"/>
    </code>
  </value>
</observation>
```

```
observation.c.c=ASSERTION
observation.c.cs=2.16.840.1.113883.5.4
observation.v.c=38341003
observation.v.cs=2.16.840.1.113883.6.96
observation.v.dn=Hypertensive+disorder
observation.v.ot=hypertension
```

```
observation.c.c1=ASSERTION
observation.c.cs1=2.16.840.1.113883.5.4
observation.v.c1=84114007
observation.v.cs1=2.16.840.1.113883.6.96
observation.v.dn1=Heart+failure
```

6.4.2 Medications

observation.c.c	SHALL be the SNOMED-CT code: "410942007" [Drug or medicament]
observation.c.cs	SHALL use the SNOMED-CT code system OID: "2.16.840.1.113883.6.96"
observation.v.c	A code that represents the patient's medication.
observation.v.cs	The code system used to represent the patient's medication. MAY use the RxNorm code system: "2.16.840.1.113883.6.88"

XML and URL fragments for a patient with *hypertension* and *heart failure*:

```
<observation>
  <code code="410942007" codeSystem="2.16.840.1.113883.6.96"/>
  <value xsi:type="CD">
    <code code="855350" codeSystem="2.16.840.1.113883.6.88">
      <displayName value="Warfarin Sodium 0.5 MG Oral Tablet"/>
    </code>
```



```

    </value>
</observation>
<observation>
  <code code="410942007" codeSystem="2.16.840.1.113883.6.96"/>
  <value xsi:type="CD">
    <code code="858813" codeSystem="2.16.840.1.113883.6.88">
      <displayName value="Enalapril Maleate 5 MG Oral Tablet"/>
    </code>
  </value>
</observation>

observation.c.c=410942007
observation.c.cs=2.16.840.1.113883.6.96
observation.v.c=855350
observation.v.cs=2.16.840.1.113883.6.88
observation.v.dn=Warfarin+Sodium+0.5+MG+Oral+Tablet

observation.c.c1=410942007
observation.c.cs1=2.16.840.1.113883.6.96
observation.v.c1=858813
observation.v.cs1=2.16.840.1.113883.6.88
observation.v.dn1=Enalapril+Maleate+5+MG+Oral+Tablet

```

6.4.3 Medication allergies

observation.c.c	SHALL be the SNOMED-CT code "416098002" [Drug allergy]
observation.c.cs	SHALL use the SNOMED-CT code system OID: "2.16.840.1.113883.6.96"
observation.v.c	A code that represents the medication ingredient or medication class that the patient is allergic to.
observation.v.cs	The code system used to represent the medication ingredient or medication class.

XML and URL fragments for a patient allergic to penicillin:

```

<observation>
  <code code="416098002" codeSystem="2.16.840.1.113883.6.96"/>
  <value xsi:type="CD">
    <code code="70618" codeSystem="2.16.840.1.113883.6.88">
      <displayName value="penicillin"/>
    </code>
  </value>
</observation>

observation.c.c=416098002
observation.c.cs=2.16.840.1.113883.6.96
observation.v.c=70618
observation.v.cs=2.16.840.1.113883.6.88
observation.v.dn=penicillin

```

6.4.4 Laboratory test results

observation.c.c	SHALL be the LOINC code for the laboratory test result parameter
observation.c.cs	SHALL use the LOINC code system OID: "2.16.840.1.113883.6.1"
observation.v.v	The result value in case the result is a physical quantity
observation.v.u	The result unit in case the result is a physical quantity
observation.v.c	The result code in case the result is in the form of coded data
observation.v.cs	The code system of the result code
observation.v.dn	A human-readable representation for the result code

XML and URL fragments for a HbA1c of 7.5%:

```
<observation>
  <code code="4548-4" displayName="Hb A1c MFr Bld"
        codeSystem="2.16.840.1.113883.6.1"
codeSystemName="LOINC"/>
  <value xsi:type="PQ" value="7.5" unit="%" />
</observation>
```

```
observation.c.c=4548-4
observation.c.cs=2.16.840.1.113883.6.1
observation.v.v=7.5
observation.v.u=% // Note: URL encoded form is
observation.v.u=%25
```

XML and URL fragments for a urine pregnancy test:

```
<observation>
  <code code="2106-3" displayName="HCG Preg Ur Q1"
        codeSystem="2.16.840.1.113883.6.1"
codeSystemName="LOINC"/>
  <value xsi:type="CD" code="POS"
codeSystem="2.16.840.1.113883.5.83" displayName="positive"/>
</observation>
```

```
observation.c.c=2106-3
observation.c.cs=2.16.840.1.113883.6.1
observation.v.c=POS
observation.v.cs=2.16.840.1.113883.5.83
```

6.4.5 Negation and unknown values in observations

Observations like problems can be associated with a negation or unknown value. For example, a knowledge request may indicate that a patient does not have a "prior history of delivery with Group B Strep Infection of the infant" or such as previous history for this patient is unknown. The following specifications indicate how to convey observations with a negated or unknown value. When processing observations, implementers SHALL check for the presence of the *observation.valueNegationInd* and *observation.nullFlavor* attributes.

observation.c.c	SHALL be the HL7 code "ASSERTION"
observation.c.cs	SHALL use the HL7 code system OID: "2.16.840.1.113883.5.4"
observation.v.c	A code that represents the patient's problem.
observation.v.cs	The code system used to represent the patient's problem (e.g., SNOMED-CT, ICD9-CM, ICD10).
observation.valueNegationInd	SHALL be "true" if the observation is negated.
observation.nullFlavor	SHALL be "UNK" if the observed value is unknown.

XML and URL fragments for a patient who does not have *hypertension*:

```
<observation valueNegationInd="true">
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <value xsi:type="CD">
    <code code="38341003" codeSystem="2.16.840.1.113883.6.96">
      <displayName value="Hypertensive+disorder"/>
      <originalText value="Hypertensive+disorder"/>
    </code>
  </value>
</observation>
```

```
observation.valueNegationInd=true
observation.c.c=ASSERTION
observation.c.cs=2.16.840.1.113883.5.4
observation.v.c=38341003
observation.v.cs=2.16.840.1.113883.6.96
observation.v.dn=Hypertensive+disorder
observation.v.ot=hypertension
```

XML and URL fragments for a patient for whom the diagnosis of *hypertension* is unknown:

```
<observation nullFlavor="UNK">
  <code code="ASSERTION" codeSystem="2.16.840.1.113883.5.4"/>
  <value xsi:type="CD">
    <code code="38341003" codeSystem="2.16.840.1.113883.6.96">
      <displayName value="Hypertensive+disorder"/>
      <originalText value="Hypertensive+disorder"/>
    </code>
  </value>
</observation>
```

```
observation.nullFlavor=UNK
observation.c.c=ASSERTION
observation.c.cs=2.16.840.1.113883.5.4
observation.v.c=38341003
observation.v.cs=2.16.840.1.113883.6.96
observation.v.dn=Hypertensive+disorder
observation.v.ot=hypertension
```

7 Appendix 4 – Special Use Cases

This section provides implementation guidance for specific use cases of general interest. Although these use cases can be implemented with the current specification, additional guidance is needed to ensure consistent implementation across different systems.

7.1 Drug-drug interactions

A knowledge request for checking interactions among the medications a patient is receiving can be represented as follows:

- 1) Checking for interactions between one medication of interest (e.g., a medication being prescribed) and other medications in the patient's medications list:
 - a. The medication of interest SHALL be represented using the *mainSearchCriteria* class.
 - b. All other medications in the medications list SHALL be represented in the *observation* class as described in Section 6.4.2.
 - c. The subtopic class SHALL be set to the SNOMED-CT code 404204005 [drug interaction with drug] and the code system to 2.16.840.1.113883.6.96
- 2) Checking for interactions between all medications in the patient's medications list.
 - a. The *mainSearchCriteria* class SHOULD be absent.
 - b. All medications in the medications list SHALL be represented in the *observation* class as described in Section 6.4.2.
 - c. The subtopic class SHALL be set to the SNOMED-CT code 404204005 [drug interaction with drug] and the code system to 2.16.840.1.113883.6.96

Example: URL fragment in a request for drug-drug interaction where a new drug is being prescribed (selegiline) and interactions need to be checked against two other drugs that the patient is taking (warfarin and enalapril):

```
mainSearchCriteria.v.c=865220
mainSearchCriteria.v.cs=2.16.840.1.113883.6.88
mainSearchCriteria.v.dn=selegiline+hydrochloride+10+MG+Oral+Tablet

observation.c.c=410942007
observation.c.cs=2.16.840.1.113883.6.96
observation.v.c=855350
observation.v.cs=2.16.840.1.113883.6.88
observation.v.dn=Warfarin+Sodium+0.5+MG+Oral+Tablet

observation.c.c1=410942007
observation.c.cs1=2.16.840.1.113883.6.96
observation.v.c1=858813
observation.v.cs1=2.16.840.1.113883.6.88
observation.v.dn1=Enalapril+Maleate+5+MG+Oral+Tablet
```

```
subTopic.v.c=404204005
subTopic.v.cs=2.16.840.1.113883.6.96
subtopic.v.dn=drug+interaction+with+drug
```

Example: URL fragment in a request for drug-drug interaction checking among all the drugs the patient is taking (all drug pairs are checked):

```
observation.c.c=410942007
observation.c.cs=2.16.840.1.113883.6.96
observation.v.c=865220
observation.v.cs=2.16.840.1.113883.6.88
observation.v.dn=selegiline+hydrochloride+10+MG+Oral+Tablet
```

```
observation.c.c1=410942007
observation.c.cs1=2.16.840.1.113883.6.96
observation.v.c1=855350
observation.v.cs1=2.16.840.1.113883.6.88
observation.v.dn1=Warfarin+Sodium+0.5+MG+Oral+Tablet
```

```
observation.c.c2=410942007
observation.c.cs2=2.16.840.1.113883.6.96
observation.v.c2=858813
observation.v.cs2=2.16.840.1.113883.6.88
observation.v.dn2=Enalapril+Maleate+5+MG+Oral+Tablet
```

```
subTopic.v.c=404204005
subTopic.v.cs=2.16.840.1.113883.6.96
subtopic.v.dn=drug+interaction+with+drug
```

8 Appendix 5 - Examples

Each of the following examples contains an *Infobutton event notification* XML message payload and its equivalent URL-based representation.

8.1 Example 1

In this example the user is looking at a coded problem list of a male, 77 years-old patient with Bacterial Pneumonia. The user clicks on an infobutton that presents a series of questions. The user selects “How do I treat Bacterial Pneumonia?” The following message payload represents the communication between the EHR systems and knowledge resources.

XML representation:

```
<?xml version="1.0" encoding="UTF-8"?>
<knowledgeRequestNotification xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
classCode="ACT" moodCode="DEF">
  <effectiveTime value="20120706001023"/>
  <subject1 typeCode="SBJ">
    <patientContext classCode="PAT">
      <patientPerson classCode="PSN" determinerCode="INSTANCE">
        <administrativeGenderCode code="M"
codeSystem="2.16.840.1.113883.5.1" codeSystemName="AdministrativeGender"/>
      </patientPerson>
      <subjectOf typeCode="SBJ">
        <age classCode="OBS" moodCode="DEF">
          <code code="30525-0"
codeSystem="2.16.840.1.113883.6.1" codeSystemName="LN"/>
          <value value="77" unit="a"/>
        </age>
      </subjectOf>
    </patientContext>
  </subject1>
  <subject2 typeCode="SUBJ">
    <mainSearchCriteria classCode="OBS" moodCode="DEF">
      <code code="KSUBJ" codeSystem="2.16.840.1.113883.1.11.20385"
codeSystemName="ActCode"/>
      <value code="385093006" codeSystem="2.16.840.1.113883.6.96"
codeSystemName="SNOMED-CT">
        <displayName value="Community acquired pneumonia"/>
      </value>
    </mainSearchCriteria>
  </subject2>
  <subject3 typeCode="SUBJ">
    <taskContext classCode="ACT" moodCode="DEF">
      <code code="PROBLISTREV" codeSystem="2.16.840.1.113883.1.11.19846"
codeSystemName="ActTaskCode"/>
    </taskContext>
  </subject3>
  <subject4 typeCode="SUBJ">
    <subTopic classCode="OBS" moodCode="DEF">
      <code code="KSUBT" codeSystem="2.16.840.1.113883.1.11.20385"
codeSystemName="ActCode"/>
      <value code="Q000628" codeSystem="2.16.840.1.113883.6.177"
codeSystemName="MSH">
        <displayName value="therapy"/>
      </value>
    </subTopic>
  </subject4>
</knowledgeRequestNotification>
```

URL representation (678 characters):

```
http://www.e-resource.com/api?
knowledgeRequestNotification.effectiveTime.v=20060706001023&
patientPerson.administrativeGenderCode.c=M&patientPerson.administrativeGenderCode
.dn=Male&
age.v.v=77&age.v.u=a&
ageGroup.v.c=D000368&ageGroup.v.cs=2.16.840.1.113883.6.177&ageGroup.v.dn=Aged&
taskContext.c.c=PROBLISTREV&taskContext.c.dn=Problem+list+review&
subTopic.v.c=Q000628&subTopic.v.cs=2.16.840.1.113883.6.177&subTopic.v.dn=therapy&
mainSearchCriteria.v.c=D018410&mainSearchCriteria.v.cs=2.16.840.1.113883.6.177&
mainSearchCriteria.v.dn=Bacterial+Pneumonia&
mainSearchCriteria.v.ot=Pneumonia
```

HTTP POST example:

```
knowledgeRequestNotification.effectiveTime.v=20060706001023
patientPerson.administrativeGenderCode.c=M
age.v.v=77
age.v.u=a
ageGroup.v.c=D000368
taskContext.c.c=PROBLISTREV
subTopic.v.c=Q000628
subTopic.v.cs=2.16.840.1.113883.6.177
subTopic.v.dn=therapy
mainSearchCriteria.v.c=D018410
mainSearchCriteria.v.cs=2.16.840.1.113883.6.177
mainSearchCriteria.v.ot=Bacterial+Pneumonia
mainSearchCriteria.v.ot=Pneumonia
```

8.2 Example 2

The user (an RN) is looking at a medications list of a female, Spanish speaker, 8 years-old patient who came for an outpatient appointment. The user clicks on the infobutton next to “albuterol sulfate” and is presented with a series of links. The user selects the “patient education” link.

XML representation:

```
<?xml version="1.0" encoding="UTF-8"?>
<knowledgeRequestNotification xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
classCode="ACT" moodCode="DEF">
  <effectiveTime value="20120706001023"/>
  <subject1 typeCode="SBJ">
    <patientContext classCode="PAT">
      <patientPerson classCode="PSN" determinerCode="INSTANCE">
```

```

        <administrativeGenderCode code="F"
codeSystem="2.16.840.1.113883.5.1" codeSystemName="AdministrativeGender"/>
    </patientPerson>
    <subjectOf typeCode="SBJ">
        <age classCode="OBS" moodCode="DEF">
            <code code="30525-0"
codeSystem="2.16.840.1.113883.6.1" codeSystemName="LN"/>
            <value value="8" unit="a"/>
        </age>
    </subjectOf>
</patientContext>
</subject1>
<performer typeCode="PRF">
    <healthCareProvider classCode="PROV">
        <code code="163W00000X" codeSystem="2.16.840.1.113883.6.101"
codeSystemName="NUCC Health Care Provider Taxonomy">
            <displayName value="Registered Nurse"/>
        </code>
        <healthCarePerson classCode="PSN" determinerCode="INSTANCE">
            <languageCommunication>
                <languageCode code="en"
codeSystem="2.16.840.1.113883.6.121" codeSystemName="Tags for the Identification of
Languages"/>
            </languageCommunication>
        </healthCarePerson>
    </healthCareProvider>
</performer>
<informationRecipient typeCode="IRCP">
    <patient classCode="PAT">
        <patientPerson classCode="PSN" determinerCode="INSTANCE">
            <languageCommunication>
                <languageCode code="es"
codeSystem="2.16.840.1.113883.6.121" codeSystemName="Tags for the Identification of
Languages"/>
            </languageCommunication>
        </patientPerson>
    </patient>
</informationRecipient>
<subject2 typeCode="SUBJ">
    <mainSearchCriteria classCode="OBS" moodCode="DEF">
        <code code="KSUBJ" codeSystem="2.16.840.1.113883.1.11.20385"
codeSystemName="ActionCode"/>
        <value code="49502-693-03" codeSystem="2.16.840.1.113883.6.69"
codeSystemName="NDC">
            <displayName value="Albuterol sulfate inhalation solution
1.25 mg"/>
            <originalText value="Albuterol sulfate"/>
        </value>
    </mainSearchCriteria>
</subject2>
<subject3 typeCode="SUBJ">
    <taskContext classCode="ACT" moodCode="DEF">
        <code code="MEDLISTREV" codeSystem="2.16.840.1.113883.1.11.19846"
codeSystemName="ActTaskCode"/>
    </taskContext>
</subject3>
<subject4 typeCode="SUBJ">
    <subTopic classCode="OBS" moodCode="DEF">
        <code code="KSUBT" codeSystem="2.16.840.1.113883.1.11.20385"
codeSystemName="ActionCode"/>
        <value code="Q000008" codeSystem="2.16.840.1.113883.6.177"
codeSystemName="MSH">
            <displayName value="administration and dosage"/>
        </value>
    </subTopic>
</subject4>

```


</knowledgeRequestNotification>

URL representation (626 characters):

```
http://www.e-resource.com/api?
knowledgeRequestNotification.effectiveTime.v=20060706001023&
patientPerson.administrativeGenderCode.c=F
age.v.v=8&
  age.v.u=a&
taskContext.c.c=MEDLISTREV&
performer=PROV&
informationRecipient=PAT&
performer.languageCode.c=en&
informationRecipient.languageCode.c=es&
performer.healthCareProvider.c.c=163W00000X&
mainSearchCriteria.v.c=49502-693-03&mainSearchCriteria.v.cs=
  2.16.840.1.113883.6.69&mainSearchCriteria.v.dn=
  Albuterol+sulfate+inhalation+solution+1.25+mg&mainSearchCriteria.v.ot=
  Albuterol+sulfate
```

HTTP POST example:

```
knowledgeRequestNotification.effectiveTime.v=20060706001023
patientPerson.administrativeGenderCode.c=F
age.v.v=8
age.v.u=a
taskContext.c.c=MEDLISTREV
performer=PROV
informationRecipient=PAT
performer.healthCareProvider.languageCode.c.c=en
informationRecipient.patientPerson.languageCode.c=es
performer.healthCareProvider.c.c=163W00000X
performer.healthCareProvider.c.dn=Registered Nurse
mainSearchCriteria.v.c=49502-693-03
mainSearchCriteria.v.cs=2.16.840.1.113883.6.69
mainSearchCriteria.v.dn= Albuterol+sulfate
mainSearchCriteria.v.ot= Albuterol+sulfate+inhalation+solution+1.25+mg
```

8.1 Example 3 – Observation class

8.1.1 – Example 3.a - Observation class with value as a code

A nurse would like to know more about the treatment of hypertension in a 28 year-old pregnant patient.

XML representation:

```
<?xml version="1.0" encoding="UTF-8"?>
<knowledgeRequestNotification xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
classCode="ACT" moodCode="DEF">
  <effectiveTime value="20120706001023"/>
  <subject1 typeCode="SBJ">
    <patientContext classCode="PAT">
      <patientPerson classCode="PSN" determinerCode="INSTANCE">
        <administrativeGenderCode code="F"
codeSystem="2.16.840.1.113883.5.1" codeSystemName="AdministrativeGender"/>
      </patientPerson>
      <subjectOf typeCode="SBJ">
        <observation classCode="OBS" moodCode="DEF">
          <code code="ASSERTION"
codeSystem="2.16.840.1.113883.5.4"/>
          <value xsi:type="CD" code="77386006"
codeSystem="2.16.840.1.113883.6.96">
            <displayName value="Patient currently
pregnant"/>
          </value>
        </observation>
      </subjectOf>
    </patientContext>
  </subject1>
  <subject2 typeCode="SUBJ">
    <mainSearchCriteria classCode="OBS" moodCode="DEF">
      <code code="KSUBJ" codeSystem="2.16.840.1.113883.1.11.20385"
codeSystemName="ActCode"/>
      <value value="28" unit="a"/>
    </mainSearchCriteria>
  </subject2>
  <subject3 typeCode="SUBJ">
    <taskContext classCode="ACT" moodCode="DEF">
      <code code="MEDOE" codeSystem="2.16.840.1.113883.1.11.19846"
codeSystemName="ActTaskCode"/>
    </taskContext>
  </subject3>
  <subject4 typeCode="SUBJ">
    <subTopic classCode="OBS" moodCode="DEF">
      <code code="KSUBT" codeSystem="2.16.840.1.113883.1.11.20385"
codeSystemName="ActCode"/>
      <value code="Q000628" codeSystem="2.16.840.1.113883.6.177"
codeSystemName="MSH">
        <displayName value="therapy"/>
      </value>
    </subTopic>
  </subject4>
</knowledgeRequestNotification>
```

```

        </subTopic>
    </subject4>
</knowledgeRequestNotification>

```

URL representation (562 characters):

```

http://www.e-resource.com/api?
knowledgeRequestNotification.effectiveTime.v=20120706001023&
patientPerson.administrativeGenderCode.c=F&
age.v.v=28&
  age.v.u=a&
taskContext.c.c=MEDOE&
performer=PROV&
performer.healthCareProvider.c.c=163W00000X&
mainSearchCriteria.v.c=38341003&
  mainSearchCriteria.v.cs=2.16.840.1.113883.6.96&
  mainSearchCriteria.v.dn=Hypertensive disorder&
  mainSearchCriteria.v.ot=Systemic+arterial+hypertension&
observation.v.c=77386006&
  observation.v.cs=2.16.840.1.113883.6.96&
subtopic.v.c=Q000628&
  subtopic.v.cs=2.16.840.1.113883.6.177&
  subtopic.v.dn=therapy

```

8.1.2 – Example 3.b Observation class with value as a physical quantity

A physician is planning to prescribe a medication (atenolol) for a female, 67 years-old patient who came for an outpatient appointment. The patient's creatinine clearance is 65 mL/min. The physician would like to check dosing information of atenolol.

XML representation:

```

<?xml version="1.0" encoding="UTF-8"?>
<knowledgeRequestNotification xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
classCode="ACT" moodCode="DEF">
  <effectiveTime value="20120706001023"/>
  <subject1 typeCode="SBJ">
    <patientContext classCode="PAT">
      <patientPerson classCode="PSN" determinerCode="INSTANCE">
        <administrativeGenderCode code="F"
codeSystem="2.16.840.1.113883.5.1" codeSystemName="AdministrativeGender"/>
      </patientPerson>
    </subjectOf typeCode="SBJ">
      <observation classCode="OBS" moodCode="DEF">
        <code code="102811001"
codeSystem="2.16.840.1.113883.6.96"><displayName value="Creatinine renal
clearance"/></code>
        <value xsi:type="PQ" value="65" unit="mL/min"/>
      </observation>
    </subjectOf>
  </subjectOf typeCode="SBJ">
    <age classCode="OBS" moodCode="DEF">
      <code code="30525-0"
codeSystem="2.16.840.1.113883.6.1" codeSystemName="LN"/>
      <value value="67" unit="a"/>
    </age>
  </subjectOf typeCode="SBJ">

```

```

        </subjectOf>
    </patientContext>
</subject1>
<performer typeCode="PRF">
    <healthCareProvider classCode="PROV">
        <code code=" 200000000X" codeSystem="2.16.840.1.113883.6.101"
codeSystemName="NUCC Health Care Provider Taxonomy">
            <displayName value="Allopathic & Osteopathic
Physicians"/>
        </code>
        <healthCarePerson classCode="PSN" determinerCode="INSTANCE">
            <languageCommunication>
                <languageCode code="en"
codeSystem="2.16.840.1.113883.6.121" codeSystemName="Tags for the Identification of
Languages"/>
            </languageCommunication>
        </healthCarePerson>
    </healthCareProvider>
</performer>
<subject2 typeCode="SUBJ">
    <mainSearchCriteria classCode="OBS" moodCode="DEF">
        <code code="KSUBJ" codeSystem="2.16.840.1.113883.1.11.20385"
codeSystemName="ActCode"/>
        <value code="197379" codeSystem="2.16.840.1.113883.6.88"
codeSystemName="RxNorm">
            <displayName value="Atenolol 100 mg Oral Tablet"/>
            <originalText value="Atenolol"/>
        </value>
    </mainSearchCriteria>
</subject2>
<subject3 typeCode="SUBJ">
    <taskContext classCode="ACT" moodCode="DEF">
        <code code="MEDOE" codeSystem="2.16.840.1.113883.1.11.19846"
codeSystemName="ActTaskCode"/>
    </taskContext>
</subject3>
<subject4 typeCode="SUBJ">
    <subTopic classCode="OBS" moodCode="DEF">
        <code code="KSUBT" codeSystem="2.16.840.1.113883.1.11.20385"
codeSystemName="ActCode"/>
        <value code="Q000008" codeSystem="2.16.840.1.113883.6.177"
codeSystemName="MSH">
            <displayName value="administration and dosage"/>
        </value>
    </subTopic>
</subject4>
</knowledgeRequestNotification>

```

URL representation (631 characters):

```

http://www.e-resource.com/api?
knowledgeRequestNotification.effectiveTime.v=20120706001023&
patientPerson.administrativeGenderCode.c=F&
age.v.v=67&
age.v.u=a&
taskContext.c.c=MEDOE&
performer=PROV&
performer.healthCareProvider.c.c=200000000X&
encounter.c.c=AMB&
mainSearchCriteria.v.c=197379&

```

```

mainSearchCriteria.v.cs=2.16.840.1.113883.6.88&
mainSearchCriteria.v.dn=Atenolol 100 mg Oral Tablet&
mainSearchCriteria.v.ot=Atenolol&

observation.v.c= 102811001&
observation.v.cs=2.16.840.1.113883.6.96&
observation.v.v=65&
observation.v.u=mL/min&

subtopic.v.c=Q000008&
subtopic.v.cs=2.16.840.1.113883.6.177&
subtopic.v.dn=administration+and+dosage

```

8.2 Example 4 - use of location of interest

A physician enters a chief complaint of “fever” for a male, 39 years-old patient at the emergency room. The patient was had been traveling across several locations in the US recently.

XML representation:

```

<?xml version="1.0" encoding="UTF-8"?>
<knowledgeRequestNotification xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="urn:hl7-org:v3
file:///C:/Guilherme/HL7/Infobutton/Documentation/Knowledge%20request%20R2/schemas/knowledgeRequest.xsd" xmlns="urn:hl7-org:v3" classCode="ACT" moodCode="DEF">
  <effectiveTime value="20120706001023"/>
  <subject1 typeCode="SBJ">
    <patientContext classCode="PAT">
      <patientPerson classCode="PSN" determinerCode="INSTANCE">
        <administrativeGenderCode code="M"
codeSystem="2.16.840.1.113883.5.1" codeSystemName="AdministrativeGender"/>
        </patientPerson>
        <subjectOf typeCode="SBJ">
          <age classCode="OBS" moodCode="DEF">
            <code code="30525-0"
codeSystem="2.16.840.1.113883.6.1" codeSystemName="LN"/>
            <value value="39" unit="a"/>
          </age>
        </subjectOf>
      </patientContext>
    </subject1>
    <performer typeCode="PRF">
      <healthCareProvider classCode="PROV">
        <code code="200000000X" codeSystem="2.16.840.1.113883.6.101"
codeSystemName="NUCC Health Care Provider Taxonomy">
          <displayName value="Allopathic & Osteopathic
Physicians"/>
        </code>
        <healthCarePerson classCode="PSN" determinerCode="INSTANCE">
          <languageCommunication>
            <languageCode code="en"
codeSystem="2.16.840.1.113883.6.121" codeSystemName="Tags for the Identification of
Languages"/>
          </languageCommunication>
        </healthCarePerson>
      </healthCareProvider>
    </performer>
    <location typeCode="LOC">
      <locationOfInterest classCode="EXLOC">
        <addr>
          <part code="ZIP" codeSystem="2.16.840.1.113883.5.16"
value="02368"/>
          <part code="CNT" codeSystem="2.16.840.1.113883.5.16"
value="USA"/>
        </addr>
      </locationOfInterest>
    </location>
  </subject1>

```

```

        </locationOfInterest>
    </location>
    <subject2 typeCode="SUBJ">
        <mainSearchCriteria classCode="OBS" moodCode="DEF">
            <code code="KSUBJ" codeSystem="2.16.840.1.113883.1.11.20385"
codeSystemName="ActCode" />
            <value>
                <originalText value="fever" />
            </value>
        </mainSearchCriteria>
    </subject2>
    <subject3 typeCode="SUBJ">
        <taskContext classCode="ACT" moodCode="DEF">
            <code code="PROBLISTE" codeSystem="2.16.840.1.113883.1.11.19846"
codeSystemName="ActTaskCode" />
        </taskContext>
    </subject3>
</knowledgeRequestNotification>

```

URL representation (408 characters):

```

http://www.e-resource.com/api?
knowledgeRequestNotification.effectiveTime.v=20120706001023&
patientPerson.administrativeGenderCode.c=M&
age.v.v=39&
age.v.u=a&
taskContext.c.c=PROBLISTE&
performer=PROV&
performer.healthCareProvider.c.c=200000000X&
encounter.c.c=EMER&
mainSearchCriteria.v.ot=fever&
locationOfInterest.addr.ZIP=90001&
locationOfInterest.addr.ZIP1=84081&
locationOfInterest.addr.ZIP2=89044

```