

# Surveillance system using HL7 CDA in Korea

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## Abstract

**Objective:** The current process for reporting infectious disease in Korea is a complex workflow based on manual entry and verification of data and requires transmission of report via obsolete technologies such as FAX. As such, it incurs unnecessary time and effort that hinder real time monitoring of epidemic outbreak. Further, the lack of standardized coding of data in the report makes it difficult to manage and analyze the data from different sources. We propose an interoperable infectious disease reporting system based on HL7 standards that simplifies the reporting workflow and enables near real time reporting in Korea. **Method:** We first analyze the current process of infectious disease reporting in Korea and identify its shortcomings in detail. Next we analyze KRFID (Korea Report Form of Infectious Disease) and related regulations to draw a data architecture design. Finally we take existing HL7 CDA implementation guides such as PHIN and Healthcare Associated Infection (HAI) Reports Template and conduct a comparative analysis to derive our design of CDA. **Result:** The final design of CDA consists of Patient and Infection sections. The Patient section includes 4 entries and the Infection section has 6 entries. KRFID is composed of 24 data items, of which 14 are included in the CDA header and the other in the body. The value of each entry is encoded using either SNOMED-CT or LOINC. **Conclusion:** The system we developed enables fast reporting by eliminating unnecessary workload and delays. In the reporting process, the steps for manual entry, printing a form, and sending it via FAX at healthcare providers can be omitted and the procedure in which employees at Regional Health Centers manually enter data through KCDC web portal can also be removed. The system also offers interoperability by using international standards. Specifically, we adopted HL7 CDA for the report form and LOINC and SNOMED-CT for encoding data. Finally, due to the regulatory requirement that all infectious disease reports should be documented and archived, the adoption of CDA as the electronic format of KRFID satisfies the regulation as well as the need for real time monitoring of infectious diseases in Korea.

## Keywords

HL7, Surveillance, CDA, XDR, Interoperability

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EJBI 2012; 8(4):12–15

## 1 Introduction

Due to advanced means of transportation and urbanization of societies, the spread of infectious diseases gets faster and faster nowadays and the importance of real time monitoring of such diseases becomes even bigger to prevent disastrous pandemic. At present, the regulatory process for reporting diagnosed infectious diseases in Korea [1] involves manual entry of data, paper-based reporting formats, obsolete delivery methods such as FAX, and a redundant two stage reporting (from healthcare providers

to Regional Health Centers and back to KCDC (Korea Centers for Disease Control & Prevention) ).

Although a recent effort to modernize the process includes a web portal at KCDC allows that the reporting from Health Centers to KCDC can be done via internet, yet it requires manual entry of data, failing to use available electronic health records (EHRs). All these factors contribute to delayed reports and prevention of effective and real time monitoring of infectious diseases.

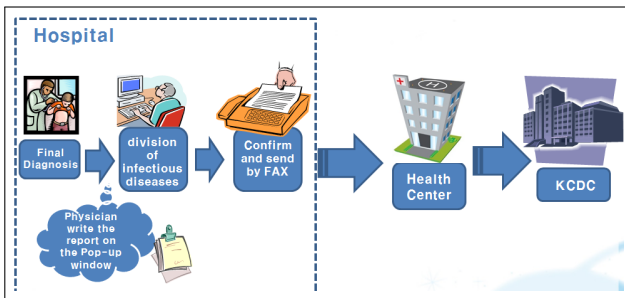


Figure 1: Workflow of infectious diseases report

Another problem with the current reporting process is that there is no regulatory requirement about the terminology and coding system for data included in the reports and it makes hard to process and analyze the data. The regulation also requires that all reports must be archived in the paper form at Regional Health Centers which should be taken into consideration in the design of new system.

In this paper, we design a new electronic infectious disease reporting system that addresses all the above issues with the current reporting process. The system offers a high level of interoperability by adopting international standards including HL7 CDA [2], SNOMED-CT (Systematized Nomenclature of Medicine – Clinical Terms) [3], and LOINC (Logical Observation Identifiers Names and Codes) [4]. It is anticipated that the new system can help establishing a new regulatory process for infectious disease reporting and reduces the cost and time for end-to-end reporting, leading to effective and near real time monitoring and surveillance of infectious diseases.

is as follows. First, a physician upon detecting of an infectious disease reports to the QI (quality improvement) department. Second, the staff of the QI department reviews and confirms the report. Third, the QI department reports it to a Regional Health Center, using a fax, an e-mail or a paper format. Next, the Regional Health Center sends the report to the KCDC. The whole process is illustrated in Figure 1.

Next we analyze KRFID (Korea Report Form of Infectious Disease) [5] and related regulations to draw a data architecture design. There are 2 types of public health reporting (immediately and within 7days). And each type has a report form. In this paper, we are handle the immediately reporting type that requires near real time reporting.

Finally we take existing HL7 CDA implementation guides such as Healthcare Associated Infection (HAI) Reports Template [6] and Consolidated CDA Templates [7] and conduct a comparative analysis to derive our design of CDA. Table 1 lists the data items of KRFID and CDA location. The data items are coded using either LOINC that is a database and universal standard for identifying medical laboratory observations; or SNOMED-CT that is a systematically organized computer processable collection of medical terminology covering most areas of clinical information such as diseases, findings, procedures, microorganisms, pharmaceuticals etc.

Table 1: Lists the data items of KRFID and CDA location

Korea Report Form of Infectious Diseases					
Personal data	Name	Kil-dong Hong	Social Security number	890101-123456DB	
	Phone Number	0531111234	Occupation	Student	Gender Male
	Address	Deagu Korea		Unknown address	X
Name of disease	Cholera				
Onset date	20111201		Diagnosis date	20120101	
Test result	test not done				
Patient Type	Confirmed		Inpatient or out patient	inpatient	
Contact with	Infected group		Infection location	Internal	X
				Abroad	Country China Period 2month
Death or not	Alive	Y	Death reason		
Optional record	Remarks				
	Facility code	123456			
Facility name	Doctor name	Henry	License numbers	123456	
	Kyoung-pook hospital		Facility director	Jhon	

Figure 2: CDA KRFID

Data items	CDA location
Name	CDA head
Parent name	
Social security number	
Phone number	
Gender	
Address	
Zip code	
Facility code	
Doctor name	
Facility name	
Director of Facility	CDA body
Patient occupation	
Name of disease	
Onset date	
Diagnosis date	
Test result	
Patient type	
Contact with	
Infection location	
Reason of death	
Remarks	

## 2 Methods

We first analyze the current process of infectious disease reporting in Korea and identify its shortcomings in detail. The regulatory procedure for reporting in Korea

## 3 Results

We started with the list of data items defined by the PHIN messaging guideline, which is compared with that of KRFID. We first noted that insurance-related data are



Table 4: CDA section and entry

Section	Entry	Remarks
Patient	Patient occupation Patient status Death observation Reason of death	
Infection	Name of disease Test result Patient type Contact with Infection location Remarks	Includes Onset date as effectiveTime Includes Diagnosis date as effectiveTime  Includes Travel priod as effectiveTime

all infectious disease reports should be documented and archived, the adoption of HL7 CDA as the electronic format of KRFID satisfies the regulation as well as the need for real time monitoring of infectious diseases in Korea. [8]

### 5 Acknowledgements

This work was supported by the IT R&D program of MKE/KEIT. [10041145, Self-Organized Software-platform(SOS) for welfare devices]

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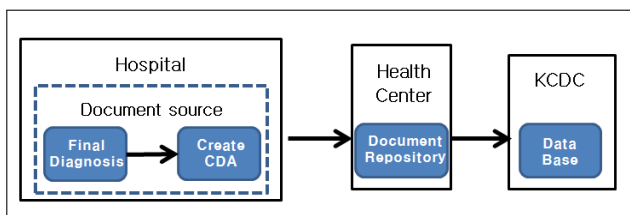


Figure 5: New workflow of infectious diseases report based on CDA

At present the application of the system is limited to the class of infectious diseases that are required to be reported immediately, but will cover the rest of diseases in the future. The current status of the project is final development stage and a pilot program to collect feedbacks and various usage statistics is being planned.