CC and C Solutions

Technical Standards for health data exchange - Bhutan HSDP

Presented to

Ministry of Health,
Royal Government of Bhutan
&
Asian Development Bank
Manila, Philippines

CC AND C Solution Pty Ltd
L20 Zenith Tower A
Chatswood NSW 2067
Telephone: +61 2 9410 9855
www.ccandcsolutions.com

CC AND C Solutions Pty Ltd
Copyright © Strictly Confidential

TABLE OF CONTENTS

Copyright © Strictly Confidential

List of Abbreviations Used

1. DHIS2 – District Health Information System V2
2. DITT – Department of Information Technology & Telecommunications
3. DMS – Department of Medical Services
4. DOMSHI – Department of Medical Supplies and Health Infrastructure
5. DoPH – Department of Public Health
6. EA - Enterprise Architecture
7. eHealth - Information and communications technologies in healthcare
8. ePIS - electronic Patient Information Systems (HIS Project of MoH)
9. HIS - Hospital Information System
10. HMIS – Health Management Information
11. HIMSS Health Information Management Systems Society
12. ICTD - Information Communications and Technology Division (MoH)
13 . IEC – International Electrotechnical Commission
14. ISO – International Standards Organization
15. JDWNRH – Jigme Dorji Wangchuck National Referral Hospital
16 MCH – Maternal and Child Health
17. MoH – Ministry of Health (Bhutan)
18. MOIC – Ministry of Information and Communication
19. NEWARSIS – National Early Warning Alert & Response Surveillance Information System
20. PHC - Primary Health Centres
21. PPD – Policy Planning Division (MoH)
22. RCDC – Royal Centre for Disease Control 2
23. RGoB – Royal Government of Bhutan 21. RRH – Regional Referral Hospitals
24. RIS – Radiology Information System

Copyright © Strictly Confidential

1 Interoperability Standards

1.1 Definition

According to HIMSS, interoperability is the ability of different information systems, devices and applications (systems) to access, exchange, integrate and cooperatively use data in a coordinated manner, within and across organizational, regional and national boundaries, to provide timely and seamless portability of information and optimize the health of individuals and populations globally.

Health data exchange architectures, application interfaces and standards enable data to be accessed and shared appropriately and securely across the complete spectrum of care, within all applicable settings and with relevant stakeholders, including the individual.

Another definition of interoperability is the ability of two or more systems or components to exchange information and to use the information that has been exchanged.

Functional Interoperability

With functional interoperability, two systems are able to transfer or exchange data between themselves but they may not understand the meaning of data exchanged. E.g. An email with PDF attachment can be sent from one system to another but the contents are not acted upon by the receiving system.

Semantic Interoperability

With semantic interoperability, the systems will understand the data exchanged and act upon them. E.g. A medication list in a Discharge summary sent from a hospital to a primary care system will be read by the primary care software and the medication details will be loaded into the corresponding patient's record in the primary care system.

1.2 Benefits of Interoperability Standards

1.2.1 Individuals (clients/patients)

Information is readily available to the treating physician. Individuals can benefit from enhanced quality and safety of treatments received, delivery of healthcare when and where it is required and integrated care plans developed by providers across one or more organisations/settings. Furthermore, interoperability across national borders could facilitate better and more informed emergency care abroad as Bhutan MoH transfers some of the critical patients for treatment in India.

1.2.2 Healthcare providers

Complete patient history and his/her visits to clinics and hospitals are readily available. This adds to the safety and improved quality of healthcare provided to the patient. When all the treatment information is available in machine readable form, decision support systems can enhance the safety of care provided to the patient.

Copyright © Strictly Confidential

1.2.3 Individuals and healthcare providers

Individuals and providers can benefit from the efficiency gains due to reduction of duplicate entry, e.g. entry of patient demographics at multiple locations. Also, there could be efficiency gains by procuring clinical software which conform to open international standards.

1.3 Challenges implementing interoperability Standards

- Initial investment is required in terms of standards compliant systems and software. Many of the international standards are available free or with minimum cost, however the software using these standards will have to be purchased. Procurement and integration of any new software with existing systems becomes easier after we establish the standards to be used.
- Training staff on the use of standards will be required.
- Any new standards will also involve change management and adoption efforts.

2 Types of Interoperability Standards

2.1 Messaging Standards

Messaging Standards outline the structure, content, and data requirements of messages so that effective and accurate sharing of information between systems are possible. For example, an HL7 message sent from a Pathology Laboratory will contain the patient demographics information, order, and result details in a specified format. The receiving system will be able to determine the patient record to which the details are associated and thus be in a position to load the result details in the medical record of the patient.

2.1.1 HL7 Family of Standards

A widely implemented messaging standard that allows the exchange of clinical data between systems. It is designed to support a central patient care system as well as a more distributed environment where data resides in departmental systems.

Message Types

Message types are present in every HL7 message as they explain why you are sending the message in the first place. Each message type has a specific code of three characters and they trigger an event. A trigger event is an actual, real-life event that sparks the communication needed for a message to be shown. It is shown along with the message type. You will find the trigger event and message type in the Message Header MSH-9 part of the message.

For example, if you see ADT-A04 in the MSH-9 section, ADT is the message type and A04 is the Trigger Event. In the HL7 standard, ADT-A04 would signal the message of "patient register." There are a lot of different message formats to keep up on. Here are some of the more commonly used ones:

- ADT - Admit, Discharge, Transfer
- ACK - General acknowledgement
- BAR - Add or change billing account
- MDM - Medical document management

Copyright © Strictly Confidential

- DFT - Detailed financial transaction
- ORM - Order (for treatment or pharmacy)
- MFN - Master Files Notification
- QRY - Query, original mode
- ORU - Observation result unsolicited
- RAS - Pharmacy/treatment administration
- RGV - Pharmacy/treatment give
- RDE - Pharmacy/treatment encoded order
- SIU - Scheduling information unsolicited

The message specification available from HL7.Org may require some customisation based on local requirements.

2.2 Terminology Standards

2.2.1 Logical Observation Identifiers Names and Codes (LOINC)

A universal code system for identifying health measurements, observations and documents. In 1999, it was identified by the HL7 Standards Development Organization as a preferred code set for laboratory test names in transactions between health care facilities, laboratories, laboratory testing devices, and public health authorities. LOINC codes can be grouped into laboratory and clinical tests, measurements and observations.

2.2.2 ICD 11 for classification of diseases

The International Statistical Classification of Diseases and Related Health Problems (ICD) is a medical classification list by the World Health Organisation (WHO). It contains codes for diseases, signs and symptoms, abnormal findings, complaints, social circumstances, and external causes of injury or diseases.

ICD-11 is a substantial improvement on ICD-10. Over 55000 unique codes for injuries, diseases and causes of death are included. A new chapter focuses on traditional medicine, though currently including only some Chinese and Indian root medicine.

WHO website on ICD provides tooling for ICD-11 coding and provides an API allowing electronic access to the International Classification of Diseases.

2.2.3 Systematized Nomenclature of Medicine-Clinical Terms (SNOMED-CT)

SNOMED is a computer processable collection of medical terms covering anatomic terms, Bacteria and viruses, drugs, signs and symptoms and Diagnostic terms. It is a comprehensive clinical health terminology product. It enables the consistent, processable representation of clinical content in electronic health records (EHRs). The SNOMED standard is available on a licence basis from SNOMED International.

The SNOMED CT logical model defines the way in which each type of SNOMED CT component and derivative is related and represented. The core component types are concepts, descriptions and relationships.

It is recommended that the Medical professionals in the MoH review and customise the SNOMED CT Standard, where required, to suit local conditions, and maintain the custodianship/ownership of the Standard.

Copyright © Strictly Confidential

2.2.4 NANDA I – Nursing Terminology Standards International

Nursing Assessment and diagnosis can be based on standardised terminology recommended by NANDA International (North American Nursing Diagnosis association). This ensures standard way of communication between nursing and other clinical staff. This Standard may be progressively implemented after successful implementation of ICD 11 and SNOMED CT.

2.2.5 RxNorm

A terminology used to normalize names for clinical drugs and links its names to many of the drug vocabularies commonly used in pharmacy management and drug interaction software. By providing links between these vocabularies, RxNorm can mediate messages between systems not using the same software and vocabulary.

2.3 Documentation Standards

2.3.1 CDA R2 – Clinical Document Architecture – Release 2

An XML-based document mark-up standard that specifies the structure and semantics of "clinical documents" for the purpose of exchange between healthcare providers and patients. It defines a clinical document as having the following six characteristics: persistence, stewardship, potential for authentication, context, wholeness and human readability. HL7 international has published this standard. More information on this Standard can be obtained from HL7.ORG web site.

2.4 Transport Standards

2.4.1 DICOM

The standard for the communication and management of medical imaging information and related data. DICOM enables the transfer of medical images across systems and facilitates the development and expansion of picture archiving and communication systems.

2.4.2 FHIR

FHIR is an internet-based data standard developed and maintained by HL7. FHIR is designed to connect different discrete data elements.

Data elements, or resources, are assigned standardized, shareable identifiers that function like the URL of a webpage. Resources can include metadata, text, or particular data elements. This enables discrete data sharing rather than document-based exchange.

“The philosophy behind FHIR is to build a base set of resources that, either by themselves or when combined, satisfy the majority of common use cases. FHIR resources aim to define the information contents and structure for the core information set that is shared by most implementations,” according to HL7.

An HL7 standard for exchanging healthcare information electronically. The basic building blocks of FHIR are “resources,” which describe exchangeable health data formats and elements. FHIR also provides standardization for application programming interfaces (APIs). FHIR provides a number of benefits and improvements as a modern healthcare standard including facilitating interoperable exchange with legacy

Copyright © Strictly Confidential

standards, lower overhead, shorter learning curve, an ability to transmit only the necessary pieces of information, potential for patient mediated data, and an energized community of supporters and implementers.

FHIR has very quickly become one of the most popular standards for enabling structural—and in some cases semantic—interoperability. Most major EHR vendors have invested in the standard, which has helped to publicize the approach and cement FHIR as a leading method for data exchange.

2.5 Integrating the Healthcare Enterprise (IHE)

Integrating the Healthcare Enterprise (IHE) has created a set of information resources and tools for vendors and users of healthcare information systems to help them integrate systems and share information more effectively.

IHE Profiles organize and leverage the integration capabilities that can be achieved by coordinated implementation of communication standards, such as DICOM, HL7 W3C and security standards. They provide precise definitions of how standards can be implemented to meet specific clinical needs.

2.6 Privacy and Security Standards

Privacy standards aim to protect an individual's (or organization's) right to determine whether, what, when, by whom and for what purpose their personal health information is collected, accessed, used or disclosed. Security standards define a set of administrative, physical and technical actions to protect the confidentiality, availability and integrity of health information.

In the U.S., the Health Insurance Portability and Accountability Act (HIPAA) outlines standards that safeguard the privacy and security of protected health information.

HIPAA Privacy Rule**:** Establishes national standards to protect individuals' medical records and other personal health information. It applies to health plans, healthcare clearinghouses, and healthcare providers that conduct certain healthcare transactions online. The rule applies safeguards to protect the privacy of personal health information, and sets limits and conditions on the uses and disclosures of such information without patient authorization. The rule also gives patient's rights over their own health information, including the right to examine and obtain a copy of their records, and to request corrections.

While HIPAA provides a framework for establishing information systems Standards, ISO/IEC 27001 provides requirements for establishing, implementing, maintaining and continually improving the information security management system in any organisation. This Standard also aims to preserve the confidentiality, integrity and availability of information by applying risk management processes and gives confidence to intended parties that risks are adequately managed.

If ISO 27001 Security Management Standard is adopted for use in Bhutan eGovernment by DITT, procedures can be developed within the Standards framework to address any privacy and consent requirements applicable to healthcare systems.

Copyright © Strictly Confidential

The principle behind security standards is that the patient information should not be shared with external parties or other providers without an explicit consent from the patient. It is recommended to ensure the privacy and security of patient information according to the legal requirements of Bhutan Government MoH. Similarly, data retention requirements must be followed based on record retention laws of Bhutan Government.

2.7 Identifier Standards

2.7.1 Enterprise Master Patient Index (EMPI)

A data registry used across a healthcare organization to maintain consistent and accurate data on the patients treated and managed within its departments. It is understood that Bhutan Government is considering the use of 'digital identity' solution for accessing all Government services by citizens and residents. This digital identity could be used in the EMPI.

2.7.2 Medical Record Number

An organisation specific code could be used as a systematic documentation of a patient's history and care during a hospital or clinic visit. I understand such a number exists for patients visiting hospitals and clinics in Bhutan though not using a standard format. It is useful to consider standardising the medical record number.

Additionally, a visit number may also be assigned for each hospital visit of a patient. The visit number is used in HL7 messaging formats.

2.7.3 ObjectID (OID)

A globally unique identifier is used for identifying objects. Objects may include code systems, healthcare facilities, etc. e.g. OID 2.16.840.1.113883.6.96 represents SNOMED CT-AU Australian customised version of SNOMED CT. HL7 Organisation in the USA assigns these OID codes and maintains an OID registry.

2.8 Application Programming Interfaces (APIs)

Depending how it is configured, an API can enable a system to send or retrieve data that can update an individual's record or provide collective data that can be used to create reports. An API also can send information from one system to another.

APIs have a big part to play in health IT interoperability in the years ahead. Traditionally, healthcare systems have been exchanging data using a communication network. With FHIR, it is possible to exchange information using the internet. The FHIR API framework is a common language that all of these disparate players can use to facilitate more meaningful exchanges between these systems.

It is our understanding that Bhutan MoH will be selecting an Opensource software package with local enhancements. Also, the clinical systems will be using the enterprise service bus (ESB) infrastructure available as part of the Bhutan eGIF framework. It is recommended that APIs are developed for communication between clinical systems using HL7/FHIR specification as a model.

Copyright © Strictly Confidential

External vendors such as Laboratory systems software or Radiology software may or may not provide API based interfaces. In such instances, there must be provision for receipt of HL7 messages.

3 Use of Interoperability Standards in Bhutan Ministry of Health

The following sections list the suggested use of standards in clinical systems. The standards should be implemented progressively as some are easier to implement than others. Some of these standards may require some customization as well based on local conditions/terminology use. Others may require some trained staff like coders for ICD-11 coding. It is recommended to implement ICD-11 Coding system first before SNOMED CT as the ICD-11 version includes some 'terminologies' as well.

Standards are useful only with quality data collections. There must be well defined data management and governance structures in place so that data quality is ensured at the time of collection, data is well managed and retired according to the rules specified in the governance process.

The Standards referred below were developed for treatment with allopathic medicines only. These Standards may not be relevant in the treatment of patients using traditional medicines in Bhutan.

3.1 Patient Identification

Patient Identification is an important function in both electronic and manual medical record systems. Bhutan MoH is considering the use of bar code identification, in the new ePIS system, in addition to using a 'digital identity' solution. In the absence of bar code reader and/or an authorised 'digital identity', the system should be able to register/retrieve the medical record of a patient with demographic details such as name, date of birth, sex, address etc. The demographic details should be recorded in a standard machine processable format.

Standards – HL7 V2, IHE

3.2 Demographics

Standardised formats for recording Patient's First Name, Surname, Title, Date of birth, Sex, Address, Phone contact details etc. Work on standardising the addresses is in progress as part of the Bhutan eGovernment project.

3.3 Diagnosis, Assessment and Plan

– LOINC and SNOMED CT

3.4 Ordering Diagnostic Tests, e.g. Pathology, Radiology

HL7 v2.4 upwards, FHIR

3.5 Receiving Electronic Test Results

HL7 v2.4 or above, FHIR

3.6 Exchanging Immunisation Data with Immunisation Registries

HL7 v2.4 or above, FHIR

3.7 Healthcare Directory, Provider Directory

HL7, FHIR Provider Directory Implementation Guide v1.0.0

Copyright © Strictly Confidential

3.8 Image Exchange
DICOM – Digital Imaging and Communication in Medicine

3.9 Referrals/Discharge Summaries
CDA R2 – Clinical document Architecture Release 2

3.10 Allergies and Intolerances
LOINC/SNOMED CT

3.11 Patient Dental Encounter Diagnosis
SNODENT/ICD11 – Dental Diagnosis Codes

3.12 Functional Status/Disability
LOINC/SNOMED CT

4 References

1. www.himss.org/resources/interoperability-healthcare
2. www.healthit.gov/isa
3. WWW.HL7.Org
4. https://www.healthit.gov/isa/united-states-core-data-interoperability-uscdi
5. http://snomed.info/sct
6. http://loinc.org
7. www.ihe.net
8. www.icd.who.int

--- End of document ---

Copyright © Strictly Confidential