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This paper defines the content and the information standards for Hong Kong Special Administrative Region eHR. The document should be read in conjunction with the eHR Data Interoperability Standards which both developed by the eHR Information Standards Office.
### Version Tracking

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<td>23 Jun 2009</td>
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<td>Jan 2013</td>
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<td>b. healthcare practitioner to healthcare professional / healthcare provider (as appropriate)</td>
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<td>b. Clinical note/summary</td>
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<td></td>
<td>c. Adverse drug reactions / allergies</td>
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<td>b. Birth Record</td>
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<td>6. Removed subsection on healthcare practitioner</td>
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1. **Background**

1.1. Healthcare today is confronting an increasing number of tough challenges: highly specialized healthcare fields, aging population, escalating healthcare costs, rising expectations, increasing threats of communicable diseases. Healthcare is now being delivered by teams of practitioner serving patients over long periods. It is not uncommon for a person to be repeatedly asked for one’s medical and social history by multiple healthcare professionals during an episode of care. Or, investigations are repeated because the attending doctor does not know what has been done previously and by whom. Sharing timely and accurate patient information amongst various highly specialized healthcare professionals plays a crucial role for the continuous delivery of safe, quality and efficient patient care in today’s healthcare environment.

1.2. Technology enables us to build a longitudinal womb-to-tomb health record. Electronic data can be exchanged amongst different systems and allow users of different sites and settings to view the record in an integrated fashion. If the shared clinical data is incorporated into the EMR (electronic medical record) systems of the practitioners, then the receiving systems can reuse the data for purposes such as clinical decision support. However an interoperable health information system cannot be realized without extensive standardization. IEEE (1990) defines interoperability as the ability of two or more systems or components to exchange information (functional interoperability) and to use the information that has been exchanged (semantic interoperability) (a).

1.3. Standardization forms the foundation for accurate and efficient communication of electronic data. The current healthcare environment demands a variety of information systems to support its operation, e.g. clinical information systems, laboratory systems, radiology systems, pharmacy systems, financial systems… Standardization allows systems to interface in a uniform way and relieves the developers of clinical software from building separate interfaces for every system their software needs to talk with, thus reducing the cost of technical integration. By using standard terminology, information is interpreted by all users with the same understanding. This supports reuse of data, improves the efficiency of healthcare services by reducing duplicate tests and avoids errors by reducing miscommunication and reducing data transcription and duplication.
1.4. The 2007-08 Policy Address highlighted the requirement of developing a territory-wide, patient-oriented electronic health record (eHR) (b) with the aims to improve efficiency and quality of care, improve continuity and integration of care, enhance disease surveillance and redress public-private imbalance (c). A Steering Committee on eHealth Record Sharing was established in 2007 with three working groups under which to address issues relating to institutional setup, the legal implications and privacy concerns, as well as the eHR content and information standards.

2. Purposes of the Paper

2.1 This paper defines the content and the information standards for Hong Kong eHR. The initial set of content / information standards only identifies the most essential items that are considered fundamental in record sharing when a healthcare recipient is referred from a healthcare provider to another one. The scope and content of the eHR will be enriched with time and this paper will be updated with the growth of the eHR.

2.2 This paper should be read in conjunction to the eHR Data Interoperability Standards which defines the messaging standard to support standards-compliant interoperability.

3. Definition of Electronic Health Record

3.1 eHR is a womb-to-tomb electronic longitudinal health record comprising of all important health data about a healthcare recipient. It is contributed by various healthcare professionals and the person himself/herself, and the data can be accessed at anytime, anywhere by authorized personnel.

3.2 The eHR should consist of sufficient content to support continuity of health care on transfer / referral. It also provides information to improve the quality of health care and health service efficiency, e.g. reducing medical error, enhance timeliness, and reduce duplication of services.
4. Framework in Building eHR

4.1 The pace of development of electronic health information system in Hong Kong varies. On one hand, the Hospital Authority has built a world class electronic patient record for sharing patient data amongst all her institutions and with the private sector. Yet, the adoption of computer at the private healthcare sector needs to catch up.

4.2 Considering the wide range of computerization at the healthcare sector, the advancement in health science, and the ever changing information technology, the eHR interoperability framework should be:

- Concept oriented – ensure the consistency of the meaning of both the data field and field content which are coded to the approved standard terminology
- Data privacy – support the protection of data privacy
- Multiple granularity – support both generalist and specialist documentation
- Simple – easily understood, and implemented
- Generic – able to apply to data captured in any technical environment
- Flexible – support different presentations of the same data
- Robust – able to support high volume of data retrieval

4.3 Central to this framework, every medical concept is uniquely identified with reference to the context under which the medical fact is being captured. The medical concept can flexibly be organized to facilitate data retrieval/ aggregation at various dimensions for different users. For example, the same HbA1C result could be retrieved from the Laboratory section, and also at the Diabetes Mellitus Management section.

5. Structured & Free Text Data

5.1 The granularity of documentation in the traditional record varies depending on the healthcare professional and the setting where healthcare is provided. In an electronic environment, the practice of free-text entry would be continued as free-text data is more expressive and natural to the healthcare professionals who could describe the person condition/history in detail. However, encoding free-text data would not be automatic for various reasons, e.g. clinical data are
context dependent, the limitation of terminology support to understand different users’ expression. Thus, reduce its interoperability capability.

5.2 In the computer world, required information can be collected as discrete data element (data field) holding discrete value (field value) as structured data which is more precise and able to be manipulated for data analysis, aggregation and retrieval though it is more rigid and require maintenance.

5.3 Structured data are preferred for eHR contents which would have a bearing on future data retrieval / aggregation and intelligence support. Structured data should be coded to the approved institution code, and migrate to international (Hong Kong version) terminology to support fully interoperable eHR.

5.4 Free-text data should also be supported in areas where structured data could not fulfill the requirement, e.g. history. It is anticipated that both types of data could exist together to complement each other and provide comprehensive information on a particular patient. However free-text data is by nature much more labour- and time-intensive since it requires a user to read the full text, and this problem is even worse with handwritten records. Thus, to ensure effective communication, free-text data sent to the eHR Sharing System should be generated by computer and healthcare providers should not send scanned hand-written record to the eHR Sharing System.

6. Data Type

6.1 Data type indicates the type of data for a particular data field. It is the basic building block used to construct or restrict the contents of a data field, such as, address, person name, and identifier. Table 1 lists the common ones being used in the eHR. Further reference to the relevant defined code table is required for coded values, e.g. ID, IS.

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE</td>
<td>Coded element</td>
<td>Coding systems/tables specified by eHR project</td>
</tr>
<tr>
<td>ED</td>
<td>Encapsulated data</td>
<td>Encapsulated data, e.g. PDF document, JPG image, from a source system to a destination system</td>
</tr>
</tbody>
</table>
### Code Description Definition

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST</td>
<td>String data</td>
<td>Text data up to 1,000 characters</td>
</tr>
</tbody>
</table>
| TS   | Time stamp  | Date and time  
• Permits varying degrees of granularity from days, hours, to decimal seconds |
| TX   | Text        | Text data up to 65536 characters, for display purpose |

### 7. eHR Content

This section describes the content that should be included in the eHR. The proposed sharable scope has considered the international proposal (d, e) and also the local development at the Hospital Authority. Readers should refer to the appropriate sections of Appendix I to XVII on the details of the eHR content and relevant code tables where appropriate. Unless specified, all clinical data will be considered as present, current when the data was created, and belong to the person. Care should be taken to define the clinical data under the following conditions:

- Data of the past, e.g. history
- Negation data, e.g. absence of
- Data of other persons, e.g. family history

### 7.1. Healthcare recipient

#### 7.1.1 Healthcare recipient

A healthcare recipient is an individual who joins eHR sharing in order to share his/her health record with other parties via the eHR sharing system. He/she can be a patient seeking healthcare services for examination or treatment from a healthcare provider. A healthcare recipient can also be one who attends for routine checkup at a healthcare institute, or simply a person who wants to maintain one’s health data in the eHR.

#### 7.1.2 This includes all information that is required to accurately and uniquely identify a healthcare recipient. This includes:

- A system generated permanent unique identifier for each individual who joins the eHR.
- Identification data, including identity document number, name, sex, date of birth. These data should be recorded according to the information on one’s
identity document.

- Demographic data, e.g. address, phone number. These data helps to contact the person for future healthcare. The demographics could also assist in other purposes, e.g. address for disease surveillance, nationality for use of healthcare service. These data should also be coded as far as practicable.
- Next of kin information which helps to contact the healthcare recipient / family if required, e.g. in emergency.

7.1.3 Accurate record linkage starts with registration of a healthcare recipient at individual healthcare provider. Identity of the healthcare recipient must be verified to ensure clinical data are correctly tagged. Enrolment of a healthcare recipient, or update of a healthcare recipient’s identification data must be supported by his/her identity document.

7.1.4 Clinical data sent to the eHR could be rejected if the essential demographic data do not match with those in the registry. (Please refer to Appendix I for more details)

7.2. Encounter

7.2.1 An encounter is the contact between a healthcare recipient and the healthcare professional who will assess, evaluate and treat a healthcare recipient. An encounter could be scheduled as an appointment, and it could be urgent. An episode is composed of one or more encounter(s), see section 7.4.2.

7.2.2 This includes a list of booked appointments and attended healthcare encounters, e.g. clinic appointment, admission, appointment of / attendance for examination / procedure. Information on the healthcare provider who constitutes the encounter, location of the encounter, and other details of the encounter. Where the event has completed, information on the disposition should also be included. (Please refer to Appendix II for more details)

7.3. Referral

7.3.1 Referral documents the information that is required when a healthcare provider refers all or a portion of a healthcare recipient’s care to another healthcare provider, and also the reply from the receiving healthcare provider to the referrer.
Both the referral and the reply records would include the information as discussed in other areas under Section 7. (Please refer to Appendix III for more details)

7.4. **Clinical note/summary**

7.4.1 The clinical note/summary contains information that record/summarize the following of a particular clinical encounter/episode:

- Reason originates the encounter/episode and the healthcare recipient’s condition during initial encounter
- Adverse drug reactions, allergies and clinical alert found during the encounter/episode (these information should also be separately sent to the eHR as the appropriate section)
- Major diagnostic findings during the course of the episode
- Problems identified
- Significant procedures performed and other related therapeutic treatment, e.g. medication
- The healthcare recipient’s condition, therapeutic orders or treatment plan for that encounter or while preparing a periodic episode summary or upon termination of an episode
- Follow-up arrangement
- Education to the healthcare recipient/family, if applicable

(Please refer to Appendix IV for more details)

7.5. **Adverse reaction/allergy**

7.5.1 This includes information on the type of biological, physical or chemical agents that would result in/is proven to give rise to adverse health effects. Details of the adverse reactions, if occurred, should also be included. Absence of the information does not imply the absence of the condition. ‘No known drug allergy’ information will NOT be displayed in the eHR Sharing System.
(Please refer to Appendix V and VI for more details)

7.6. Clinical Alert
7.6.1 Clinical alert are important information on the condition of the participant and/or the care provided / to be provided to the participant. The information is a critical reference for subsequent clinical care, for example, the alert information on pregnancy status may affect whether a radiology examination should be ordered / performed.

7.7. Problem
7.7.1 Problem list contains all active and inactive significant health and social problems. Problem can be a diagnosis, pathophysiological state, significant abnormal physical sign and examination finding, social problem, risk factor, allergy, reaction to drugs or foods, or health alert.

7.7.2 An initial problem list can be built from the diagnoses / problems recorded in an encounter / episode.

7.7.3 Problem plays a significant role in individual personal care, e.g. developing disease management program or decision support rules. It assists in data retrieval for public health, and the planning and management of healthcare services. Thus, the problem should be coded to the controlled terminology as approved by the Steering Committee on eHealth Record Sharing at a level as granular as possible. The status of the problem should be updated whenever applicable.

(Please refer to Appendix VII for more details)

7.8. Procedure
7.8.1 This includes any significant procedures that are done for diagnosis, exploratory or treatment purposes.

7.8.2 Where the procedure was performed at an inpatient episode, there should be indication of the 'principal procedure' which is defined as follow :
- The most significant procedure performed for treatment of the principal diagnosis; if none -
- The most significant procedure performed for treatment of additional
diagnoses; if none -
  - The diagnostic / exploratory procedure related to the principal diagnosis; if none -
  - The diagnostic / exploratory procedure related to additional diagnoses

7.8.3 Procedures should be coded to the controlled terminology as approved by the Steering Committee on eHealth Record Sharing at a level as granular as possible.

7.8.4 Laboratory diagnostic procedures are excluded.
(Please refer to Appendix VIII for more details)

7.9. **Assessment / Physical examination**

7.9.1 The healthcare professional records one’s observation made on a particular person after a systematic examination which is usually done according to body part, and also body system as assessment / physical examination.

7.9.2 The assessment / physical examination provides information to the healthcare professional for making a diagnosis and planning the care to be provided. It supplements the severity of the disease and effects to the treatment.

7.10. **Birth Record**

7.10.1 The basic information about the healthcare recipient’s birth, e.g. place of birth, birth weight, maturity. Part of the information relating to birth would be fallen under the other sharable scope, e.g. diagnosis, procedure, assessment.
(Please refer to Appendix IX for more details)

7.11. **Social history**

7.11.1 The lifestyle practices that may directly or indirectly affect a healthcare recipient’s health, e.g. occupation, travel, hobbies, habits.

7.12. **Past medical history**

7.12.1 Prior illnesses, injuries, treatment received which may or may not have an effect to the current care. The medical history should be started during the gestation with the gestational record be transferred to the healthcare recipient’s health record at birth. For a well maintained electronic health record, the past medical history can be built from the documentation by all healthcare providers who have
cared for a healthcare recipient.

7.13. **Family history**
7.13.1 Family history includes the hereditary or contact diseases that occurred in the family. The biology relationship of the family members with the healthcare recipient is recorded and could be presented in a pedigree chart.

7.14. **Medication**
7.14.1 This includes medication ordered and/or dispensed/administered during the healthcare process. Where the medication is ordered, information on whether it is dispensed and/or administered should also be included.

7.14.2 Medications acquired over the counter by the patient should also be included in the future when the patient portal is developed.

(Please refer to Appendix X & XI for more details)

7.15. **Immunization**
7.15.1 Immunization should include all immunization administered to the patient and those on the immunization plan. Information on immunity (whether acquired or induced) or resistant to a particular pathogen should also be included.

(Please refer to Appendix XII for more details)

7.16. **Clinical request**
7.16.1 Clinical request is the health intervention that a healthcare professional instructed for the treatment of a healthcare recipient. The health intervention includes a wide range of healthcare services which could be provided by other disciplines, e.g. nurses, therapists, other practitioners being done at point-of-care or off-site.

7.16.2 The clinical request usually include the following information:

- Details of the healthcare professional who made the request
- Details of the healthcare recipient who required the service
- Details of the request, e.g. type of service, timing of the service
- Whether the request has been fulfilled

7.16.3 Different types of tests would be requested in the same clinical request. Each clinical request should be uniquely identified, so as the individual requested test
that was included in the same request.

7.16.4 The clinical request should also be linked with the results of the requested intervention to promote safety and improve efficiency of healthcare services.

7.16.5 Computerized clinical request (it also termed as computerized physician order entry) communicates the requested intervention directly to the healthcare provider who provides the service. Thus, it will reduce errors due to handwriting or transcription; avoid delay in providing the treatment to an healthcare recipient; and support error-checking, e.g. allergy checking.

7.17. Diagnostic test result (laboratory / radiology / others)

7.17.1 This includes results of various types of diagnostic tests, e.g. laboratory, radiology, electronic medical diagnostic tests, and other diagnostic tests.

7.17.2 Laboratory test results should be subclassified according to the nature of the test, namely anatomical pathology, biochemistry, haematology, microbiology, virology, and other laboratory test.

7.17.3 Radiology results would include radiology report and images. They are subclassified according to modality, e.g. plain x-ray, fluoroscopy, ultrasound, computer tomography, magnetic resonance imaging, nuclear medicine, angiography and vascular interventional radiography, non-vascular interventional radiography, positrone emission tomography and others.

7.17.4 Other diagnostic test results could be of diverse range as discrete data element or a full report of the diagnostic test. Images, e.g. clinical photos, tracing, could also be included.

7.17.5 As a healthcare recipient could have numerous diagnostic tests being done throughout one’s life. Where applicable, the result should include a conclusive statement for easy reference, in particular for free-text reports.

7.17.6 Where possible, diagnostic tests should be linked to the diagnoses / problem lists. Special diagnostic results, e.g. radiology examination, should also be fed to the procedure list.

(Please refer to Appendix XIII to XVII for more details)

7.18. Care & treatment plan

7.18.1 Care & treatment plan includes all planned / scheduled clinical requests,
appointments, referrals, procedures, education and/or services that a healthcare professional considers that would aid in the diagnosis of/treatment to a healthcare recipient

8. **Level of Compliance**

8.1. All clinical data sent to the eHR should provide some basic information (the Header) including the following information using HL7 message format (please refer to the eHR Data Interoperability Standards):

- The healthcare recipient’s eHR number
- The healthcare recipient’s identification data
- The data creation/update information
- The healthcare provider who creates the clinical data
8.2. Given the diversity and complexity of various information standards, and the different levels of adoption of information technology by the healthcare sectors, a multi-level compliance to the defined standard is recommended (see table 2).

8.3. The minimum requirement would be providing descriptive information or as scanned document/file, e.g. PDF to the eHR (Level 1). This allows the sharing of health information at an ‘automated paper environment’. Appropriate measures must be in place to ensure information is tagged to the right patient, in particular for images.

8.4. Various healthcare professionals can define the data fields using institution-defined codes, and migrate to international codes (Hong Kong version) for both data fields (Level 2.2). This facilitates the integration of same type of information at the eHR and supports easy retrieval of health information at the eHR. However, at this level, same concept could be differently represented by various institutions, e.g. diabetes mellitus could be recorded as DM, diabetes mellitus, or D.M. Human interpretation is required to understand the meaning of the shared data. Yet, such flexibility could be confusing sometimes as the same description could carry different meanings, e.g. PID could be pelvic inflammatory disease, or prolapsed intervertebral disc.

8.5. Healthcare providers can also provide field value using codes tables / recognized terminologies which are defined by the eHR (see para. 8.6), to support a fully interoperable eHR (Level 3). Healthcare providers can reuse the data captured by the other healthcare organizations. The eHR can also provide information for secondary uses, e.g. public health purpose, health services planning.

<table>
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<th>HL7</th>
<th>Data field</th>
<th>Field Content</th>
<th>Value</th>
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<tr>
<td>2.1</td>
<td>2</td>
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<td>institutional (free text) description</td>
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</tr>
</tbody>
</table>
8.6. In the eHR project, code tables have been defined for individual domains. Healthcare providers can reference to these code tables and send data to the eHR as level 3 data to facilitate an interoperable eHR. Some of these code tables are defined by the eHR project, e.g. the sex table for identifying the sex of the healthcare recipient. Some code tables are referring to various terminologies – the eHR “recognized terminologies”, including:

8.6.1 Hong Kong Clinical Terminology Table (HKCTT)
8.6.2 Compendium of Pharmaceutical Products (CPP)
8.6.3 International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10), includes ICD-10 2001 and 2010 versions, and Mental and Behavioural Disorders (ICD10-MBD)
8.6.4 International Classification of Primary Care, Second edition (ICPC-2)
8.6.5 Logical Observation Identifiers Names and Codes (LOINC)
8.6.6 Systematized Nomenclature of Medicine-Clinical Terms (SNOMED CT)
9. Implementation

9.1. Healthcare providers shall share all data (including historical data) falling within the eHR sharable scope if readily sharable electronically belonging to the healthcare recipients who have enrolled in eHR sharing and granted an express and informed consent to the subject healthcare provider.

9.2. A phased approach is recommended for passing data to the eHR with reference to the experience of developing electronic medical records at overseas and Hong Kong. Such phased approach facilitates the healthcare providers to develop their clinical information systems and also identifies the prioritization of the development of related health information standards.

9.3. At the initial stage, healthcare providers can send the most essential items at a human readable level to the eHR for ongoing health care. At later stage with more health information standards being well defined and as providers’ systems are more advanced, health data can be sent at a semantic based machine readable level to the eHR. Please refer to table 3 for details.

<table>
<thead>
<tr>
<th>Table 3 : eHR Implementation Phases</th>
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<tbody>
<tr>
<td>eHR Content</td>
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<tr>
<td>Healthcare recipient</td>
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<tr>
<td>Encounter</td>
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<tr>
<td>Referral</td>
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<tr>
<td>Clinical note / summary</td>
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<tr>
<td>Adverse reaction / allergy</td>
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<tr>
<td>Clinical alert</td>
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<tr>
<td>Problem</td>
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<tr>
<td>Procedure</td>
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<tr>
<td>Birth record</td>
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</table>
10. Summary

The eHR Sharing System will provide an opportunity to further enhance the quality and efficiency of healthcare delivery. The proposed eHR sharable scope and phased implementation approach will facilitate healthcare providers with different levels of computer adoption to contribute to the eHR Sharing System. Healthcare providers are encouraged to reference to the proposed sharable scope and enhance their electronic medical records so that data can be shared at the highest standards compliance level to facilitate the reviewing of the eHR data. The eHR Information Standards Office will review and update the proposed sharable scope, as appropriate.
11. References


