Conceptual Health Data Model v2.3

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# Table of Contents

1. **Executive Summary** ................................................................. 1  
   1.1 The Problem ............................................................................. 1  
   1.2 The Conceptual Health Data Model - Part of the Solution .......... 1  

2. **Introduction** ............................................................................ 2  
   2.1 Background ............................................................................. 2  
   2.2 The Context ............................................................................ 2  
   2.3 Why do we need a Health Data Model? .................................... 3  
   2.4 What is a Health Data Model? ................................................. 3  

3. **The Health Data Model Project** ................................................. 4  
   3.1 Objectives .............................................................................. 4  
   3.2 Purposes of a Conceptual Health Data Model ......................... 4  
   3.3 Definitions and Scope ............................................................. 5  
   3.4 Development Approach ........................................................ 6  
   3.5 Mapping, Modeling and the Conceptual Health Data Models ...... 7  

4. **Contextual Health Data Model** .................................................. 8  
   4.1 Major Entities and Definitions ............................................... 10  

5. **Conceptual Health Data Model** ................................................ 18  
   5.1 The Conceptual Health Data Model Overview ....................... 20  
   5.2 Common Enabling Concepts ............................................... 20  
   5.3 People View of the Conceptual Health Data Model ................. 22  
   5.4 Environment View of the Conceptual Health Data Model ........ 24  
   5.5 Governance View of the Conceptual Health Data Model .......... 24  
   5.6 Resources View of the Conceptual Health Data Model .......... 26  

6. **Implementation Considerations** ............................................... 28  
   6.1 The Privacy Challenge .......................................................... 28  
   6.2 A Common Conceptual Data Model is Necessary—But Not Sufficient .... 31  
   6.3 Data Model as a Basis for Knowledge Management .................. 31  
   6.4 Who’s going to collect all that data? ......................................... 34  
   6.5 Alignment to the HL7 RIM & Other International Modeling Efforts .................. 34  

7. **Conclusion** ............................................................................... 35  

Appendix A: Rationale for Selecting the HL7 RIM as the Starting Model .... 0  
Appendix B: Mapping the Health Information Framework to a Data Model .... 0  
Appendix C: Scenarios ...................................................................... 0  
Appendix D: A Mapping Exercise: CHDM → HL7 RIM ........................ 0
1. Executive Summary

1.1 The Problem

The health system relies on the provision of correct, consistent and comprehensive information to manage the provision of Healthcare at the personal, facility, regional, provincial, and federal levels. The following paragraph illustrates some of the challenges we face when data is captured and transformed into information through both human and automated processes to support many different purposes.

A clinician reviews the results of a series of tests and concludes the probable health condition of a patient. The diagnosis is discussed in natural medical language with colleagues and recorded in the medical record as free text. The medical record is transmitted to a medical record clerk who reads the text describing the diagnosis and chooses which of a set of code values most closely represents the diagnosis text. The medical record is coded into a form that can be readily analysed by computer. The electronic record is processed as a claim for reimbursement. A separate process uses the electronic record as input to another process to determine resource allocation at a health program and health region level. The same electronic record is also used to produce management information for various levels of management. Researchers may also identify research projects that use the record to measure health outcomes, or evaluate health programs or any of a number of utilization reviews.

The good news is that the value of data is enhanced the more it is used. The bad news is that very little of that value is experienced by the clinician that initially captured the data.

This is not an isolated example. The health system and health care processes are extremely information intensive, but very little effort has been expended to identify what data needs to be captured to meet the information needs of a wide variety of information users. These users often request that information be captured at a level of detail or in a format that has no relevance to the actual data used in the source processes i.e., the actual treatment of an actual patient. Manual transformation of initial observations to requested formats introduces inconsistent interpretations and transcription errors. Information essential to understanding the context of the data is usually not captured at all.

1.2 The Conceptual Health Data Model - Part of the Solution

The Conceptual Health Data Model project provides an overview of the essential foundations of data to be captured that can then be transformed into meaningful information to support the many different uses across the health system. Consistent data capture and systematic information transformation processes can result in more effective
evidence being available to support health system management purposes. More importantly, value-added information can be supplied back to the clinician at the point of care, not only improving the clinician’s ability to deliver quality health care but also providing an incentive to the clinician to capture the highest quality data as a by-product of providing first quality care.

2. Introduction

2.1 Background

The Canadian Institute for Health Information (CIHI) launched the Partnership for Health Informatics/Telematics in March 1996. The Partnership aims to enable the creation of a non-redundant, non-conflicting set of health informatics and telematics standards for Canada. Members of the Partnership are among Canada’s leaders in health information and technology.

The goals of the Partnership are to:

- define and adopt emerging standards for health informatics and telematics in order to ensure the evolution of a non-redundant, non-conflicting set of standards for Canada;
- collaborate with other standards-setting organizations in Canada and internationally; and
- use the standards to enable the development of national, longitudinal electronic health records, accessible to health providers, researchers, policy makers, as well as health monitoring and surveillance agencies.

The Partnership for Health Informatics/Telematics is organized into Working Groups that have been established to address standards in the following areas: health information modelling; terminology, classifications, and identification; privacy, confidentiality and security; and interoperability standards. This document, the Conceptual Health Data Model, was developed by Working Group 1 of the Partnership as a successive document to the Health Information Framework that was first published in April 1997. Version 2.0 of the CHDM is an enhancement of the first release of the CHDM, that was published in June of 1999.

2.2 The Context

The objective of Working Group 1 is to develop a Health Information Model that can be used as a tool to manage information. It allows for the co-ordination of multi-disciplinary efforts, supports information exchange, and enables the development of consistent standards for information and data.
A multi-faceted approach is being used to develop the Health Information Model. It includes work in the following areas:

- the health information framework;
- stakeholder information needs;
- the health data model;
- the personal health record; and
- the health systems architecture.

### 2.3 Why do we need a Health Data Model?

The Health Information Framework (HIF) sets the scope and classification criteria for health information in the Canadian context. It organizes and describes information (qualitative and quantitative) of interest to the key stakeholders within the health system.

Though the HIF begins the process of using common information concepts across the various jurisdictions and stakeholder organizations, more precision is required to identify what data needs to be collected to produce the information of interest. In particular, the HIF cited the need for the information framework and related classifications to be “turned into a data model that can be linked to a health information systems architecture and a specific view of the architecture—the comprehensive health record.”

The Health Information Framework needs to be extended to the next step, a health data model, to be useful in the development of systems that capture and analyze data.

### 2.4 What is a Health Data Model?

“Information” and “data” are terms that are often used interchangeably. The two concepts are tightly related and data can be transformed into information or information can be captured as data. The following definitions distinguish these two concepts.

- **Information** is a set of data that has been collated, interpreted and presented to be meaningful to a particular audience for a particular purpose. Information for one purpose can be recorded and/or transformed to become data used as input into a new process to create information for a different purpose. Transformation processes may be automated or be the result of human judgement.

- **Data** are facts, observations, measures or conclusions recorded about a subject of interest (often termed a unit of observation), at a particular place through a particular process for a particular purpose. Each fact can be termed a data element and is meaningless unless the context in which it was recorded is known.
An information model then, is a means of classifying information topics of interest. A data model defines the specific subjects and the facts about them. The same data can be used to produce many different pieces of information. The Canadian Conceptual Data model does not identify or define any topics that are essentially derived by any transformation process.

A data model is a means of categorizing and grouping data items (persons, places, objects, processes) of interest. However, in a data model, a single piece of data should be identified only once and be associated with the specific subject it describes. This level of discipline is required to appropriately specify requirements for information systems. Information systems have a structure just as buildings and bridges do. Therefore, they must be constructed with the same attention to design to achieve the same high degree of quality and reliability that is expected of physical structures.

3. The Health Data Model Project

3.1 Objectives

The Data Model Project (initially known as Working Group 1.2) was organized in April 1997. The mandate was to produce a data model for health. Subsequent discussion with group members identified three specific objectives.

- Produce a Conceptual Health Data Model to cover the scope of the Health Information Framework.
- Develop and test model alignment techniques.
- Develop a process to maintain and refine the Canadian model and to align with and influence international health data models.

3.2 Purposes of a Conceptual Health Data Model

During the process of developing the national data model, the following uses were identified or discovered for this tool.

- The model describes the data that need to be collected with common definitions to meet the information needs of key stakeholders in the Canadian health system.
- Developing the model identified areas for improvement or refinement in the Health Information Framework.
- The model supports the development of automated information systems that can capture and exchange data with the same meaning. Common meaning produces consistent results, whether data are used operationally or as input to a data transformation process.
• The model allows each jurisdiction to align their own data models to the national model, identifying the extent to which the data definitions are the same as, more specific, or more general than those used nationally.

• The model can be used as a navigational aid to cross-reference to specific data elements, their definitions, and where they are used in data sharing agreements or data collections.

• The model can be used when specifying requirements for health application software.

As experience is gained with developing and using the Conceptual Health Data Model, more uses will likely be identified.

3.3 Definitions and Scope

A data model is a representation of subjects and their characteristics within a particular scope of interest. It is neither a knowledge representation model nor a model representing processes. It is a model identifying data to be captured. Different types of data models have different purposes and express progressively more detail. Figure 1 shows the relationship between the contextual, conceptual, logical, and physical levels of data models.

![FIGURE 1](image)

A Contextual Level Data Model identifies the scope of interest and shows the major subjects and their relationships. This level hides complexity and is primarily used to locate the subjects that are of broadest interest and therefore need to be identified and defined consistently even though they may be used in very different ways.

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1 Different terminology is sometimes used to express the “unit of observation” and the “facts” of interest, depending on the modelling technique used. The terms Subject and Entity are used when referring to an Entity/Relationship model. Classes and Instances are used when referring to an Object model. In this document, the Entity/Relationship terminology is used, although the same information could have been expressed as objects.
A Conceptual Level Data Model refines the subjects in the contextual data model, adding relationships to other entities that are required to fully understand each subject. The purpose of this level is to clarify the relationships among the major entities and to add enough qualifying detail to be able to distinguish each entity from all others. The data models of most organizations start at this level since the context of the organization is assumed.

The Logical Level Data Model is the most detailed level. The full complexity of data entities and all their relationships are expressed. It is this level of detail that is necessary to specify information systems. All entities should be fully described with all their characteristics. The permissible values of all attributes (characteristics) should also be defined and all relationships expressed.

The Physical Level Data Model contains the same level of detail as the logical level, but has been transformed to show how the data would be stored within an information system. Information exchange structures and formats (messages) are also defined at the physical level.

The Data Model Project intends to develop the Health Data Model only at the Contextual and Conceptual levels, since the intent is to be detailed enough to identify and define key shared information of broad interest in the health system, but not to completely specify information systems.

3.4 Development Approach

The following process for the development of the Conceptual Health Data Model was agreed upon and presented at the Partnership Working Group Meetings in October 1997.

1. Start with the Health Level Seven (HL7) Reference Information Model (RIM) and examine its scope of coverage against the Canadian Health Information Framework to determine where the model is inadequate to express Canadian information requirements or where it has information not required in the Canadian setting. (The rationale for selecting the HL7 RIM as the starting point is documented in Appendix A).

2. Compare other proposed models (provincial, national, or other models that aim to cover the entire health system) to the Canadian Health Information Framework to discover the candidate model "fragments" to address the inadequacies of the HL7 RIM.

3. Harmonize the models by examining definitions and relationships expressed in the various models and selecting or synthesizing those that are the most inclusive of the expressed information requirements.

4. For those domain components of the Canadian Health Information Framework not represented in any of the candidate models, develop draft model components representing at least the most obvious information requirements from the various scenarios solicited from interested participants. Some scenarios were developed at the
October 1997 Partnership meetings. Others were created subsequently. To date, 17 scenarios have been documented. A short discussion of scenarios appears in Appendix C.

5. Present the resulting draft model in an easy to understand way (similar to the Australian Model template) to Working Group 1, the Partnership and beyond. At the same time, communicate proposed enhancements to HL7 through the HL7 Canada process co-ordinated by the Canadian Institute for Health Information (CIHI). This will begin the harmonization process to allow the Conceptual Health Data Model to actively influence emerging international standards.

3.5 Mapping, Modeling and the Conceptual Health Data Models

The following individuals, many of whom had mapped models from their jurisdictions to the Health Information Framework, participated in some or all of the detailed data modeling sessions.

- Barry Chatwin – Alberta Health and Wellness*
- Betty Alexander—CIHI
- Bill Bradley—Health Canada*
- Bob Giles—CIHI
- Bob Tate—Health Canada
- Claudia Guajardo-Yeo—Ontario Ministry of Health*
- David Coppard—Health Canada
- Don Newsham—Alberta well/net, WG 1 Chair
- George Rudelich—Alberta well/net
- Greg Sherman—Health Canada
- Jamie Hockin—Health Canada
- Jane Curry—Alberta Health, Health Data Model Project Chair
- Jenny Karim—CIHI
- Jim Phillips—Nova Scotia Department of Health and Social Services
- John Kufuor-Boakye—Alberta well/net
- Krishan Saxena—BC Ministry of Health*
- Melanie Kerr—Ontario Ministry of Health
- Patricia Tully—Health Canada
- Ron Parker, Siemens Medical Systems*
- Sandra Mitchell—CIHI
- Stephen Brown—CIHI
- Susan Cournoyer—CIHI
- Sylvia Kenyon – CIHI*
- Trevor Hodge—Sierra Systems, WG 1 Co-Chair

(Individuals with an * are current project participants.)
An initial modelling session was held in Edmonton in February 1998 to develop the first draft of the Conceptual Health Data Model. During the modelling session, the HL7 Reference Information Model (RIM) was examined and several key entities were identified to be included in the Canadian National Health Information Data Model. However, since the HL7 RIM had been developed from existing acute care health information exchange messages, much of the RIM content was deemed to be too detailed for inclusion.

Other models were also examined (see Appendix B for a description of the mapping process) and key entities were defined. These entities were then used to construct a contextual level model. Subsequently, a portion of the contextual model was examined and a conceptual level model view was produced from an available model. It was this initial draft model that was documented as Version 1.

Since April of 1998, additional data modelling sessions were held in July, September, and December 1998 and in March 1999. The September session was held with additional Health Canada participants to model “policy.” Each session continued the process of refining the conceptual level model and definitions and revisiting the context model to ensure consistency.

An early version of the conceptual model was presented to the Partnership Working Group 1 in October 1998 and was received with interest and suggestions for improvements. The sessions following the October WG meetings acted on the suggestions and continued the refinement.

In addition, the model was tested with a number of audiences representing different interests and jurisdictions in the health system across the country. Some of the concepts and language expressed in the conceptual data model are already being found in the data models in some jurisdictions, although none have “adopted” the model as a whole.

In 1999, the continued development of the Conceptual Health Data Model was formalized as one of the Roadmap projects for the National Health Infostructure. In 2000, work continues on refining the data model and developing tools for mapping the conceptual model to new or existing data models.

4. Contextual Health Data Model

The Contextual Health Data Model is illustrated in Figure 2. The graphical depiction is followed by a list of major entities and their definitions.
FIGURE 2

Contextual Health Data Model

EVENTS

Environment Events
Health System Environment Events

People Events
Health Service Recipient Events

Governance Events
Health System Governance Events

Health System Resource Events
Resource Events

Affected By

PEOPLE

Person
Group
Participant Roles

Affected By

ENVIRONMENT

Place

Affected By

Health System

Affected By

Resources

Governance

Event Linkage
4.1 Major Entities and Definitions

The following definitions refer to the major entities presented in the Contextual Health Data Model. Examples and further definitions are provided in this section for completeness and coherence. The refined concepts are depicted in the diagram views of the Conceptual Health Data Model presented in Section 4.

People

Persons, groups, and their characteristics that are of interest to the health system. These characteristics describe individual persons, groups of interest, organizations, or populations. All people interact with the Health Care system in some defined Role. Examples of these roles include: recipient of services, stakeholder in the provision of services, provider of services, administrator of services, informal support, and many others.

- **Individual**—a human being, alive or not, having physical, social, mental and spiritual characteristics of human beings. Individuals may have Skills that may be part of recognized capability to act as a Resource to the Health Care system.

- **Group**—a formal or informal group of people with common characteristics that may be organizational, political, geographic, demographic, socio-cultural, socio-economic or other classes of characteristics. Characteristics collected would be dependent on the purpose for which a group is defined. A person may be a member of more than one group (they may or may not even be aware that they are considered a member of someone’s group of interest). Group includes three sub-classes:
  - **Organization**—a formalized group of people with a common purpose. A person would have a recognized relationship to an organization. Examples of organization include corporations, limited partnerships, governments and non-profit organisations.
  - **Community**—a group of people with a persistent identity and sufficient interaction that they form an entity that is more than the sum of the individual members. An Individual must self-identify with the Community in order to be considered a member of it. Unlike a Population, membership or non-membership in a Community does not make any statement about an Individual’s characteristics. For example, an Individual may or may not self-identify with a particular nationality-based Community regardless of their actual genetic or racial origins. A family is a special kind of community.
  - **Population**—a formal or informal group of people with common characteristics that may be geographic, demographic or other. An Individual’s membership in a
Population is determined by the state of their characteristics (e.g., age, sex, health status, marital status, location of residence, etc.) and may change over time unless the defining characteristics of the Population is specified in terms of the value(s) of the Individual’s characteristic(s) at a specific point in time.

Characteristics of people (either as individuals or groups) fall into the following categories. Each state is observed at a specific point in time.

- **Health status**—information about perceived health status, diagnoses, impairments, disabilities, and handicaps
- **Demographic status**—information about name, address, age, gender and family membership
- **Biological status**—information about genetic disposition and immune response
- **Socio-economic status**—information about income, education and occupation
- **Psycho-social status**—information about feelings, mood, personal efficacy, coping skills, and acculturation
- **Cognitive status**—information about knowledge, attitudes, beliefs and temperament
- **Behavioral status**—information about risk taking, substance use, physical activity, eating and sleeping. For a population this is reflected as behavioral norms.

**People Event**

Events that change the state of persons or groups.

**Person examples**

- **Vital events**—birth, death, marriage, adoption, divorce.
- **Education**—receiving a diploma, taking a course, dropping out of high school.
- **Employment**—gaining a job, changing jobs, losing a job.
- **Exposure**—coming into contact with a health-affecting agent (micro-organism, radiation).
- **People activities**—eating, sleeping, communicating.... or not.

**Group examples**

- **Mergers and acquisitions.**
- **A community gaining/losing new businesses.**
• Advertising campaign.

• Common exposure to a health-affecting agent.

**Health Service Recipient Event** is an act of providing a specific service to a service recipient by a service provider at a place during a time period. This same definition has been applied to the name **Service Event**—but in this model an event is named, not for the activity, but for the object it affects. A **Health Service Recipient Event** is a specialized type of people event which intends to affect the health of a person or group (the service recipient).

**Participant Roles**

Recognized roles for people who participate in events affecting the health of people. People and organizations can have many roles at the same time and often play different roles at different times. Some examples follow.

• **Provider** – a person or organization when they are providing goods or services in the health system.

• **Governor** – a person or organization when they are making decisions.

• **Advisor** – a person or group providing advice to a Governor.

• **Manager** – a person or organization when they are allocating resources to get work done.

• **Recipient** – a person or group when they are receiving goods or services from the health system.

• **Researcher** – a person or group when they are testing hypotheses to further the state of knowledge about any aspect of the health system.

• **Educator** – a person or group when they are increasing the skills of people.

• **Volunteer** – a person or group when they are providing services without monetary compensation.

• **Family Member** – a person who is related to other people in a family (by whatever definition).

• **Supporter** – a person who acts in a support role relative to another, such as a translator.
**Stakeholders** are persons and groups with a “stake” in a particular objective when considered from a particular perspective. Until the purpose and perspective is understood, the persons or groups that are to be stakeholders cannot be determined.

**Place**

A named physical geographic location. A named place can be referenced by a set of co-ordinates that constitute its boundary. A place can also contain other named places. A place can be a specific site or a political or administrative area.

Every named Place exists within some kind of Boundary. Boundaries can be described using many different methods, such as Latitude-longitude, or geo-political definitions. Some Places have boundaries that can shift over time. By separating Boundary as a distinct entity, we can record changes in the Boundaries that define a Place without changing the definition of the Place itself. Boundary also makes it possible to name and define a physical location in such a way that is readily recognizable to those who wish to have multiple Places within a single named boundary.

**Environment**

The set of characteristics of a named place. These characteristics can reference the whole place or any component within the place and may range from topographical characteristics to characteristics of organisms or to man-made physical objects.

Only physio-chemical characteristics of environments are directly observable and measurable in a data capture sense. Socio-cultural and economic environmental determinants of health are derived from the characteristics of people that live in a place and the resources available there.

**Environment Event**

Events which affect the state of any of the characteristics of the environment. Environment events can be spontaneous, for example:

- **Weather events**—ice storm, floods
- **Collisions**—motor vehicle
- **Construction**—building roads, housing, noise barriers
- **Introduction of an infectious agent/toxin**—to air, food or water

Environment events can also be planned events that are undertaken to change the state of the environment in order to affect the health state of people.
Health System

People in specific Participant Roles and the Governance and Resources applied to affect the health of targeted persons or groups in identified Places. People’s roles, the Environment, Governance and Resources also extend beyond the health system and my have an effect on the health of people.

*The scope of the health system at any point in time is dependent on the specific policy and jurisdiction in force. A population health orientation extends the boundaries of the health system well beyond the traditional health care system.*

The scope of authority of the group making the rules can vary from an individual making choices that affect their own health, to a family, a municipality, a region, a province, a country or to the global community.

Governance

Any aspect of defining the structure that compels or constrains the behaviour of people.

- **Health Subject Definition** – data about data. This is an information repository that defines normative (or standardized) representations of data as applied in the jurisdiction the model represents. Health subject definitions may be used uniformly across jurisdictions (as in a National Standard) or shared with other jurisdictions as a means of finding ‘equivalent data’ in dissimilar data models. Health subject definitions have many uses, including the formatting of data, declaration of valid value lists (code lists, vocabulary), and the definitions of data structures.

- **Jurisdiction**—the boundary and scope of authority of the person or group. May be bound by a geographical boundary and/or a specific domain of influence.

- **Mission/Purpose**—what a group’s reason for being is.

- **Organization Structure**—the structure of a group in relation to other groups that it may be a part of or that may be part of it.

- **Accountability**—specification of what a person or group is responsible for and to which person or group it is accountable. Any contract, agreement or other statement that formalizes the relationship. Defining roles may be one way of expressing the responsibilities a person or group is accountable for.

- **Goals/Objectives**—what the person or group is attempting to accomplish.

- **Strategies/Tactics**—what activities are intended to move toward the goals and objectives in the short term and the longer term.
• **Value** – a principle or foundation belief that constrains (informs or advises) the strategy chosen to achieve the Goals of an organization.

• **Core Businesses**—what functions, processes and organizational mechanisms does the person or group perform to achieve its purpose.

• **Policies**—A statement of principle, direction or intent that compels or constrains the behaviour of specified people.

  Includes, but not limited to legislation, regulations, guidelines, standards, rules and protocols.

• **Programs**—defined collections of potential services that:
  • seek to achieve specific goals and objectives;
  • are delivered by one or more delivery organizations;
  • have resources allocated;
  • ideally, are measured against a set of standards; and
  • are directed toward specific targeted groups of people.

• **Services**

  Activities by people which consume resources and are intended to directly or indirectly affect an identified population: includes administrative services and support services, as well as direct intervention services.

**Governance Event**

An event that intends to formulate, establish, change, or retire any element of governance. A governance event is also used when scheduling future events or changing the characteristics of a planned event. Examples of governance events include:

• Changing the eligibility criteria for employment insurance.

• Designing a new health promotion program.

• Establishing a business arrangement to share information.

**Specialized Health System Governance Events** include:

• **Health Monitoring/Surveillance**—observing the state of characteristics for people, environment and resources to identify changes that may be considered opportunities or issues affecting the health of people. Monitoring the environment might include such activities as air quality testing, water sampling, or radiation dosimeter readings. The information acquired from these activities will be used to
initiate triggers which are derived from human health data (or possibly animal or micro-organisms). Ozone monitoring is one example. It takes place in many locations, in real time, i.e. every hour of every day. Concentrations above a certain threshold trigger a response regardless of whether any person or any thing (e.g. bean crop) is actually affected

Health monitoring includes public health surveillance. These activities are conducted for the purpose of detecting effects on a defined population that are at potential risk.

- **Health Research**—investigation into the causes and effects of a subject of interest. These activities are not on-going, rather they are ad-hoc and one-time. Research studies may be repeated and/or replicated but each one can only be done once. The focus of research activities is with testing hypotheses and establishing causal relationships. Research can be linked back to public health surveillance. For example: the realization that too many children were being diagnosed with *Salmonella enteritidis* in the ‘Lunchables’ outbreak, was a health surveillance activity. The investigation of the outbreak was a research activity.

- **Consultation**—gathering input from participants affected by, or influencing a change in governance.

- **Diagnosis**—drawing a conclusion about a specific health condition on the basis of available evidence.

- **Health System Design and Definition**—determining the structure, scope or intended effect of an element of governance.

- **Health System Decision**—the determination of what action is to be taken

**Resources**

A thing of value. The value may be measurable in monetary terms (equipment, buildings, bank accounts, investments), or non-monetary (information). Resource characteristics include both capability (what can be done), capacity (how much can be done) and availability (when the resource can be used). Some examples follow:

- **Human Resources** – people (both Individuals and Groups) whose skill, knowledge and time are used to perform various activities. Governance can define a specific subset of skills as being necessary for a person to act in a particular Role. For example, a person may require a very specific set of nursing skills to qualify as an ICU Nurse (see Resource Capability). It is important to note that not all Skills possessed by a person are used in their typical roles, but we still want to record this information.
• **Financial** – monetary assets.

• **Equipment** – durable assets.

• **Supplies** – consumable goods.

• **Information** – collections of data that have a given context and that cannot be decomposed or broken apart without losing the value or meaning of that context. Usually the result of some process (manual or automated) that takes data and derives, summarizes, consolidates, or groups information that is relevant only for a specific time period and for a specific context. For example a document written by an author that contains the results of an analysis of various contributing factors in the rejection of donor organs might be an information observation in this context. E-mail, written doctors orders, and other information that must retain its context may be other forms of information.

• **Physical Structures** – buildings.

• **Facility** – an enabling capability that assembles the resources required to provide services. Facilities are administered by an organization. Very often, the name of a facility and the name of an organization are synonymous. For example, the Victoria General Hospital in Halifax was seen as a building, a facility, and an organization. However, it is important that we differentiate these things, as one organization may have multiple facilities. In the same context, we must distinguish between buildings and facilities. Facilities may be specialized or multi-purpose. They may include multiple physical buildings, rooms, or may be mobile structures. The organization that administers a facility may change over time, as can the types of services that will be provided in a given facility.

**Health System Resources** are those resources made available to the persons and groups accountable for any aspect of the health system, whether public or private. Health system resources are used to achieve the objectives of the health system.

**Resource Capability**

A Resource Capability is a defined set of attributes of a resource that is recognized as providing a specific capability that is required by the Health system. Governance defines these sets of attributes and associates them with a particular role. For example, in order for a room in a facility to be used as an OR, it requires certain features and functionality before it can be used for that purpose.

The Resource Capability of Human Resources are the Skills required for a particular role or function. For example, when scheduling a Surgical Event, you go to the Governance Health Subject Definition to identify all of the Resource and Roles required for the Event to take place. For each Role, there is a predefined capability required.
Using Resource Capability, you can find all of the Human Resources with the requisite Skills, assess their availability, and then allocate them for that pending Event. Again using Resource Capability, you find an OR with the requisite attributes, assess its availability, and, if available, you then allocate it to the pending Event. The location of the OR is fixed, so that is where all of the ‘movable’ Resources go when the Event actually takes place.

**Resource Event**

Events that increase or decrease the capability and capacity of the “inventory” of any of the resources available for use.

This includes transforming one resource to another (e.g. decreasing money to increase equipment) or transferring resources from one jurisdiction to another.

Health System Resource Events are those events that increase or decrease the resources available to the health system. Resources allocated to the Health System diminish the resources available for other purposes regardless of whether a resource is considered public or private.

**Event Linkage**

An explicit acknowledgement that two or more events are related to each other. The relationships may be causal, occurring concurrently, occurring in a predefined sequence, or one event may trigger or initiate other events. Event linkages can be predefined, retroactively recognized or explicitly acknowledged during a related event.

Wherever a change in jurisdiction is required, an event linkage can be used to recognize the nature of the transfer of control. Event linkages can be constrained by the state of the governance in effect at the time the linkage occurs.

**5. Conceptual Health Data Model**

The Conceptual Health Data Model follows the pattern set by the Contextual Health Data Model but adds detail and clarifies relationships between and among the major entities. Again, the emphasis is on recognizing the entities and their relationships that need to be captured in order to supply the data necessary to effectively produce the range of information the health system needs to meet objectives over time.

The Conceptual Health Data Model is presented in five diagrams, an overview of the entire Conceptual Health Data Model, and one view from the perspective of each of the four major entities. To provide clarity, these models are presented one to a page, following the introduction and explanation of all of the views. The diagrams use the following meaningful conventions:
Each entity in our model is represented by a rectangle with rounded corners. Each of these “boxes” represents something about which we capture data.

For example, Environment is represented by a green box. If we were able to look inside that box we would see all of the various physio-chemical characteristics or “attributes” of the environment that we capture, such as pollen-count, ozone-concentration. Each attribute of Environment ends up as a data element in a database.

Every entity in our model has a relationship with one or more other entities. We represent these relationships between entities as lines with text that helps explain the nature of the relationship.

For example, the line between Governance and Resource Event is labelled “constrains”. The relationship is that Governance constrains or limits what happens in a Resource event. All relationships can be read two ways: Governance “constrains” Resource Events, and conversely a Resource event “is constrained by” Governance.

Each relationship line ends with special symbols where the line connects each entity. These symbols are useful in describing how many occurrences of each entity could exist in the relationship. We use many possible combinations of relationships, but the most common are:

- Zero
- One
- Many
- Zero to Many
- One to Many

One or more Environments are affected by one or more Environment events. This is called a many-to-many relationship.
An Environment Event is executed by People in one or more Participant Roles. A Participant Role could exist without an environment event, or it could exist in many Environment Events. This is called a zero-to-many relationship.

A Resource is affected by many Resource Events. A Resource Event, however, affects only one Resource at a time. This is a one-to-many relationship.

For the purposes of this document, the relationship lines and their labels are all you really need to see the connections between the entities in the model. Having provided a basic explanation of the symbols you will find, you should now be able to review the diagrams and be able to follow the example scenarios.

5.1 The Conceptual Health Data Model Overview

The Conceptual Health Data Model presents the same Entities that are present in the Contextual Health Data Model and adds the significant relationships among them.

The four major entities, People, Environment, Governance and Resources are each affected by the corresponding events, People Events, Environment Events, Governance Events and Resource Events. Multiple events are inter-connected using Event-Linkage. This linkage allows us to plan for or reconstruct situations from all of the events that are involved.

5.2 Common Enabling Concepts

The following concepts are common to each of the views of the CHDM to be presented. These concepts are also fundamental enabling mechanisms that allow the CHDM to represent a fluid and constantly changing world.

5.2.1 Governance

Every jurisdiction has Governance that constrains the events that occur within that jurisdiction at any particular time and place. For example, an organization may require that a surgery be cancelled and rescheduled if an anaesthetist is not available at the last minute. These kinds of rules exist at all levels in the Health system. It is of tremendous value to explicitly record how these rules (or Governance) are applied in real world situations.

Knowing not just what happened in an event, but why (Governance Event) things happen is essential in demonstrating accountability. If we only record the service provided and the resources used, we cannot demonstrate accountability. Making Governance explicit in our data model allows us to solve this problem. As a result Governance plays a fundamental role in the usefulness and flexibility of the CHDM.
5.2.2 Participant Roles

People act in events in specific Participant Roles. A person or organization acting in a governance role defines the roles, i.e. a specific Governance Event may define the responsibilities of a particular Participant Role.

5.2.3 Event Linkage

Events occur at one or more Places and any event has explicit time duration characteristics. Events locate the change of state of People, Environment, Governance and Resources in time and place. With Event Linkage these state-changing events enable the Conceptual Health Data Model to represent a dynamic and ever-evolving health system interacting with a dynamic and ever-evolving broader world.

Event Linkage explicitly acknowledges the inter-relationship among events. At one place, during one specific timeframe, a number of concurrent events may be active. For example, the use of resources while providing a service are separate events, one type reducing the inventory of resources available for other purposes and one type intending to affect the health of a person or a population. Event Linkage explicitly recognizes the dependency of the resources used to the capability of providing the service. This linkage allows us to distinguish the resources required by the service delivery from those that were used coincidentally at the same time and place. Event linkage also allows us to schedule the resources needed for a future event.

Event Linkage also is a powerful enabling mechanism for the sharing of data between different jurisdictions. Governance can be defined to allow the linkage of events in one jurisdiction to events in another jurisdiction. Using this mechanism, a request for data from an outside jurisdiction can be handled by Event Linkage, Governance applied to adjudicate the request for privacy and confidentiality restrictions, and the requested data provided.

*Figure 3* depicts the interaction across jurisdictions through Event Linkage.

FIGURE 3
The overview diagram emphasizes the interaction among the major entities. Other significant themes of the Conceptual Health Data Model are introduced in the following entity specific views, to allow more focus without the distraction of the event interactions.

### 5.3 People View of the Conceptual Health Data Model

Two sub-types, Individual and Group represent the People entity. Groups can be further refined to identify Organizations, or groups that have been formalized to become, literally, their own singular body. Groups that are explicitly recognized but may be more informally constituted include populations, families, neighbourhoods, or communities of interest.

The CHDM represents people as both individuals and as groups of people. All people, whether as individuals or as a group, are involved in Participant Roles that can be characterized either as active (service provider, decision maker) or as passive (service recipient, study participant).

The following scenario is provided to illustrate the People view of the CHDM. It is recommended that you refer to the People view diagram while following the scenario described here. For emphasis, references to entities and relationships are in a different font. Also note that People Event is also referred to as Person Event to assist in the readability of the scenario.

<table>
<thead>
<tr>
<th>Service Recipient Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eleanor contacts the facility where she has her renal dialysis done and schedules her next treatment (Governance Event).</td>
</tr>
<tr>
<td>The person taking the appointment verifies that the necessary room and equipment are available and allocates them in the schedule.</td>
</tr>
</tbody>
</table>
(Resource Events update the state of those Resources marking them as required for a specific time and Place).

When scheduling staff to perform the procedure, it is required to check the availability of only those people who have the required skill set to perform the dialysis. (Governance constrains the Resource Event to only check the People with the required Skills).

Once available skilled staff is found, they are scheduled for the procedure (Resource Event updates the availability of the inventory of staff with skills, the human Resources).

On the scheduled date and time the procedure is performed by the staff, using the reserved equipment, and consumable supplies. (Staff Persons acting in a Provider Participant Role perform the procedure as a Person Event using the reserved Resources and updating the availability and quantity of the Resources by a series of Resource Events).

Eleanor receives the dialysis, and monitoring during the procedure demonstrates the desired affect on her health was achieved (Eleanor as a Person in a Recipient Participant Role has her health status changed by a Person Event.) The Governance Event of Monitoring her condition is Constrained by the Governance for the procedure to ensure the appropriate thresholds are met.

This scenario illustrates the way in which the People view of the CHDM captures data about things that occur in the real world environment. The way in which the data has been captured, and the events recorded, allows all of the activity of this scenario to be reconstructed as an episode of service by using Event Linkage.

The degree of detail captured, and manner in which it is represented allows tremendous flexibility in analysis of the data to produce multiple set of meaningful information from one set of data.

This method of walking through the CHDM diagram works equally well when considering people as groups, either as organizations or as populations.

Populations are groups of people that form an informal, but recognizable whole. A specific population may live or work in a particular place, influenced by and influencing each other. These populations affect their environment and are affected by the cumulative effects of living and/or working in the particular places.

Still other groups may have, as members, individuals that share common characteristics but who may remain unaware that they are included in such a group of interest. Age/sex
cohorts or individuals with selected health conditions are examples of what might be
termed analysis groups. An example of the observation of a group might be Health
Canada initiating a Governance Event to monitor the incidence of diabetes in a native
community. The information resulting from the monitoring over time becomes a Resource
used by individuals acting in a “researcher” Participant Role.

People, as individual persons or populations, have characteristics that are of interest to the
health system and which change over time. The states suggested in the definition section
are examples.

People also possess skills and knowledge that may be useful to the health system. When
considered from this perspective, People become the human resources required by the
health system to reach the desired objectives. Regardless of the compensation mechanism
(representing a linkage to a different type of resource, and the associated governance
business arrangements) the health system is dependent on the availability of people with
sufficient time, and the appropriate skills and knowledge, to deliver health services. A
significant proportion of the constraints on both the capability and the capacity of the
health system are represented by the scarcity of sufficient human resources.

5.4 Environment View of the Conceptual Health Data Model

Place is closely associated with Environment, in that a specific environment is a subset of
the characteristics of that particular Place. The only characteristics of a place that can be
directly observed and measured are those of the Physio-Chemical variety. For example, a
river adjacent to a pulp-and paper mill would have its Ph levels, the levels of heavy metals
and other contaminants recorded as the characteristics of that location. The effects of
this particular environment on a population could be identified by evaluating the observed
health characteristics of People located adjacent to or downstream from that named Place.
The resulting information might result in Governance to reduce the level of toxins through
a series of Environment Events.

The Health Information Framework identified two other environmental components, socio-
cultural and economic. In the Conceptual Health Data Model, these environments are
derived after-the-fact from the aggregation of detailed data captured on People,
Governance and Resources within the boundaries of a particular place. As derived
information, they are not represented directly in the CHDM data capture model. The
derived information that constitutes these entities would be more accurately represented
in a model representing data transformation and analysis.

5.5 Governance View of the Conceptual Health Data Model

The Overview model introduced the part Governance plays in defining Participant Roles
and constraining Events as well as being affected by Governance Events. The definitions
in Section 3.1 provide examples of the types of governance that provide the implicit
context within which most health services are provided.
Governance represents a store of data (mostly business rules) that is the result of decisions made by each jurisdiction on how the Health system must operate. In its essence, when you look at the CHDM overview diagram, the whole diagram is a conceptual representation of one particular jurisdiction, be it personal, departmental, organizational, regional, provincial, or federal. Governance determines the boundary of responsibility and accountability within each jurisdiction.

The most fundamental use of Governance in the CHDM is its use to define the other entities (such as the Environment, People, and Resources), to cause changes in the structure of those entities, and to constrain the things that can be done with, and to, the other entities. In the CHDM model, every time an event occurs it first accesses the relevant data in Governance to determine what the event can and cannot do to change the state of the entity it is associated with.

Additionally, building Governance into our information systems provides a means to alter the rules resulting from program policy and process changes without having to rebuild the information systems that implement those rules.

It is important to recognize that the incorporation of Governance data into the CHDM represents a significant change from traditional approaches to modelling the Health system. This innovation allows the building of mechanisms to support accountability for the use of data, and for the processes that use the data. This is fundamentally important when considering the need to access Health data across organizational and jurisdictional boundaries. Without a built-in governance capability, the process of determining rights for access to and the use of data would be prohibitively difficult.

In the CHDM, Event Linkage allows the management of the transfer of data between jurisdictions. The Governance for each jurisdiction determines how and when the data can be accessed.

A specialized type of Governance Event, Monitoring, Surveillance, and Research is emphasized in the Governance view. The health system needs to be alert to the nature of the changing world around it. Research into what works, what doesn’t and what works just as well but costs less is an ongoing activity.

One aspect of the health system is being alert to changing conditions in the Environment and in specific populations and sub-populations with the intent to act rapidly to avoid or mitigate causes of ill health. The systematic collection and analysis of information about each of the major entities is Health Surveillance. Monitoring the effectiveness of the health system requires collecting information on the state of populations as well as the state of the health system itself in order to design appropriate health programs and anticipate changing requirements for health resources.
Because the health of people is affected by much more than the actions of the health system, it is equally important to monitor the state of the Environment and to be aware of the state of Governance and Resources beyond the health system.

5.6 Resources View of the Conceptual Health Data Model

Resources represent the things of value that can be applied to meeting the goals, including those of improving human health. The resources may be part of the formal health system, and as such represent the capability and capacity of the health system to provide services and programs intended to directly or indirectly affect health. But the characteristics of Resources are not limited to the health system. Resources are finite and must be well managed to provide the greatest benefit.

The CHDM illustrates the interaction of Resources in the Health system. Resource events are used to change the state of a Resource. This could be the increasing of the number of Resources in an inventory, or the moving of a resource from one place to another.

Acquiring appropriate Resources often has long lead times and a balance is required between using Resources to achieve immediate benefits or investing Resources to acquire future capability or capacity. Unanticipated demand leads to inadequate capability and/or capacity. There are continual trade-offs in optimally using Resources, for a choice to use a Resource in one way makes that Resource unavailable for other uses.

The Event Linkage relationship to Resource Event represents not only the processes of acquisition, maintenance, use and "disposal" of specific types of Resources but also the transformation of one type of Resource to another. Event Linkage also enables the explicit recognition of the transfer of Resources across jurisdictions—from one health jurisdiction to another or from non-health system sources to the health system—or vice versa.
6. Implementation Considerations

Many of the questions and concerns expressed about the Conceptual Health Data Model were about the implications of actually implementing these concepts. The following sections address a few of the concerns mentioned.

6.1 The Privacy Challenge

Information privacy is, in essence, the ability of individuals to control what specific information is collected about them, how that information is used and to whom that information is disclosed. Health information is often extremely sensitive. Inappropriate or unauthorized collection, use or disclosure is simply unacceptable. Individuals with privacy concerns are not only the people receiving health services, but may also be service providers or the various organizations participating in many different roles in the health system.

The Conceptual Health Data Model indicates the kind of data to be collected to meet the health information needs of the Canadian health system (including all persons in Canada). It does not identify how this data would be collected, stored, transformed and used, nor by whom or for what purposes. Further work is required to specify the implementation approaches to meet the information expressed in the Health Information Framework.

However, the CHDM project team did take the management of health information as one of the more significant scenarios to test the model’s completeness, validity and usefulness. The scenario included the specific authorization of what data may be collected, for what purposes the data can then be used, whether or not the information can be further disclosed and under what circumstances (see the following Privacy Scenario as an example). All these actions are accommodated by the concepts covered by the Canadian Conceptual Health Data Model. If the full functionality of the CCHDM were implemented, information could be more completely secured, and accountability for information could be more transparent than it is today in a paper document-based environment.

These are the key concepts.

- **Information is a resource** and could and should be managed as such. Accountability for information is as important as accountability for financial resources.

- **Collection, access, use and disclosure rules** can be explicitly specified and then enforced by automated information systems.

- Each individual or organization has a particular *jurisdiction of control*. When information is transferred from one individual’s jurisdiction to another jurisdiction, *the terms and conditions* of that transfer can be mutually agreed upon, and then automatically enforced. The specific conditions can be enforced either:
- prospectively—only agreed on actions are permitted to take place; or
- retroactively—audits of what was done can be reviewed to ensure inappropriate action did not take place.

### 6.1.1 Privacy Scenario

<table>
<thead>
<tr>
<th>Step in Scenario:</th>
<th>Activity: (Event type)</th>
<th>Associated Object: (Entity Type)</th>
</tr>
</thead>
</table>
| 1. Federal and provincial Legislatures pass health information legislation. | Governance Event  
- Establish health information legislation. | Governance  
- The roles, terms and conditions constraining the collection, use and disclosure of personal health information.  
Governance  
- Canadian constitution, rules of the legislature, etc. |
| 2. Sally Smith visits Dr. Jones and asks him to be her primary care physician, as she has just moved into his area. | People Event  
- Establish relationship instance between two previously defined roles. | Stakeholder to Stakeholder Relationship  
- Relationship between two roles—Patient and Primary Care Provider. |
| 3. As part of the visit, Sally Smith authorizes Dr. Jones to be her information management delegate regarding disclosure of her health information to other care providers for the purposes of providing continuity of care. | Governance Event  
- Delegate accountability for health information management. | Governance  
- Terms and conditions of Dr. Jones authority regarding Sally’s Health Information (pre-authorized consent to disclose information). |
| 4. Sally Smith asks Dr. Brown, her previous primary care physician, to forward her health information to Dr. Jones. | Governance Event  
- Authorize information disclosure from Dr. Brown to Dr. Jones | Resource Event  
- Pending transfer of health records. |
| 5. Dr. Brown forwards a copy of Sally Smith’s health information to Dr. Jones. | Resource Event  
- Send information. | Resource (Information)  
- Copy Sally Smith health information to Dr. Jones.  
Governance  
- Authorization to release information |
<table>
<thead>
<tr>
<th>Step in Scenario:</th>
<th>Activity: (Event type)</th>
<th>Associated Object: (Entity Type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Dr. Jones spends 30 minutes to do a complete health exam on Sally Smith.</td>
<td>People Event</td>
<td>People / Role (Service Provider)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Dr. Jones’ time and skills</td>
</tr>
<tr>
<td></td>
<td></td>
<td>People / Role (Service Recipient)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sally Smith</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Resource (Facility)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Dr. Jones’ office &amp; equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Resource (Information)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sally Smith’s health records</td>
</tr>
<tr>
<td></td>
<td>Governance</td>
<td>• Standards of care, etc.</td>
</tr>
<tr>
<td>7. Dr. Jones requires additional expertise in interpreting some of the measures. He sends copies of the relevant health measures to Dr. White.</td>
<td>Resource Event</td>
<td>Resource (Information)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sally Smith’s health measures.</td>
</tr>
<tr>
<td></td>
<td>Event Linkage</td>
<td>Governance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Terms and conditions of Dr. Jones authority regarding Sally’s Health Information (pre-authorized consent to disclose information).</td>
</tr>
<tr>
<td>8. Dr. White assesses the state of health indicated by Sally Smith’s health measures.</td>
<td>People Event</td>
<td>People / Role (Service Provider)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Dr. White’s time and skills</td>
</tr>
<tr>
<td></td>
<td>Event Linkage</td>
<td>Governance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Standards of care, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Resource</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sally Smith’s health information in Dr. White’s records.</td>
</tr>
<tr>
<td>9. Dr. White provides a copy of his conclusions about Sally Smith to Dr. Jones.</td>
<td>Resource Event</td>
<td>Resource (Information)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Dr. White’s conclusions about Sally’s state of health.</td>
</tr>
<tr>
<td></td>
<td>Event Linkage</td>
<td>Governance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Terms and conditions of Dr. Jones authority regarding Sally’s Health Information</td>
</tr>
</tbody>
</table>
6.2 A Common Conceptual Data Model is Necessary—But Not Sufficient

The Conceptual Health Data Model is a model of the data concepts that must be captured to meet the information needs of the health system. The CHDM is not a model that specifies how to store data in databases, nor how to turn data into the information required. Common understanding is a necessary first step, but is not sufficient in and of itself to define an integrated health information system that supports integrated health services delivery and produces evidence to support decision-making.

The term ‘model’ refers to a simplified representation of some aspect of the real world. There are knowledge representation models that identify the relationships among the terms and concepts expressed in a body of knowledge. There are models that represent the processes performed to do work. Various information system development, business process re-engineering, and knowledge management methodologies have developed models to express the essentials of their understanding of the real world in diagrammatic representations. Data models can be aligned with and inform these other types of models to add coherence to the overall integration of health information systems.

The CHDM Project team tested out a model mapping exercise with the HL7 Reference Information Model (version .88). The results of the mapping are documented in Appendix D. By examining the definitions and relationships of entities of the different models, a conclusion can be reached as to whether there are comparable concepts in the two models and whether an entity is more general (a more inclusive definition) or more specific (a more restrictive definition).

More work remains to be done to refine the conceptual model by adding attributes to entities and further defining the relationships with and between the concepts contained within the major entities. It is highly desirable to work collaboratively with data modeling work being undertaken by various jurisdictions within Canada and around the world. The co-ordination of modelling processes will ensure the data models resulting from these collective efforts not only represent the perspective of the various jurisdictions, but also support information integration and exchange across jurisdictions. Data collected with common definitions can be transformed into comprehensive information that is comparable across jurisdictions and over time.

6.3 Data Model as a Basis for Knowledge Management

The health system of any jurisdiction is extremely information intensive and requires highly knowledgeable people communicating with each other across organizations, disciplines, geography and time. The amount of knowledge contained in the health system is expanding at a rate beyond the ability of any single person, or group of persons, to integrate and use effectively. There are tremendous strides being made in the ability to organize, navigate, synthesize and disseminate knowledge. Common definitions for data that are captured throughout the health system (indeed, well beyond the health system) becomes the basis for integrating data between the disciplines, organizations and
jurisdictions to produce the information which informs people who make decisions. And the process never-ends, since new information requirements from decision-makers triggers new data to be collected (and may suggest where currently collected data are not needed). Figure 4 depicts the inter-relationships between data, information, knowledge, insight, understanding, judgement and decision making.
FIGURE 4

KNOWLEDGE ACQUISITION FOR GOVERNANCE

Organizations, Stovepipes, Data Entities

INFORMATION REQUIREMENT

DATA

INFORMATION

KNOWLEDGE

INSIGHT, UNDERSTANDING

JUDGEMENT

DECISION ACTION

Planning
Gathering
Selection
Analysis
Interpretation
Synthesis
Careful Weighting
Synthesis Valuation

Direct Transformation
Feedback

• Adapted from: Bradley, Bill and Silins, John. Building a Virtual Information Warehouse Through Standards, Cooperation and Partnerships in Proceedings of Statistics Canada Symposium ’95—From Data to Information Methods and Systems; Statistics Canada, 1996
6.4 **Who's going to collect all that data?**

One initial reaction of many audiences when the Conceptual Health Data Model is presented is the assumption that the conceptual model will compel everyone to record every last detail about everything all of the time. This is clearly unrealistic and is not even desirable. In fact, the implementation of the ideas presented in the CHDM may result in only truly effective data being collected, data that is demonstrably used to create value at the point of collection as well as all “downstream” uses.

Today, in a paper document driven world, if information isn’t readily accessible, it is collected again and stored again and shared again and disposed of again, leading not only to increased costs but also to inconsistency and error. Most of the data suggested by the CHDM is already collected somewhere by someone in some media (usually paper, or rigid local information systems) according to their own local definitions.

A common conceptual data model does not require all imaginable data to be collected, but it does enable data to be collected consistently when it is collected. Some data may be collected during normal administrative processes, some may be collected by survey, but most should be collected as a by-product of just getting the job done.

A major advantage of the CHDM is the recognition of the events that change the state of the things of interest. If most information were shared as required, instead of re-collected, only notification of changes that had occurred would be required to maintain consistency. There may indeed end up being more records (units of observation), but they would tend to be smaller, more focused records with processes for transforming them to yield useful information for various purposes. As importantly, when there was a question about the validity of information, it would be possible to trace back and identify what data had been used. This would provide evidence of information accountability in action.

The long term potential is significant, but even in the short term, a common conceptual data model allows for comparison of currently collected data to determine where definition differences emerge between data collectors.

6.5 **Alignment to the HL7 RIM & Other International Modeling Efforts**

The Conceptual Health Data Model was introduced to the HL7 International Committee in the January 1999 Working Group Meetings. The concepts expressed generated significant interest and requests for more details. HL7 International liaison members were asked to communicate with other groups conducting health information modeling to initiate a process to co-ordinate and potentially collaborate to develop a globally validated common conceptual model with the specific intent of making the RIM more capable of reflecting International information concepts. The patient administration and financial management portions of the RIM were specifically noted to be oriented toward US business processes.
In parallel, a letter was received from the UK National Health Service modeling group expressing interest in establishing closer working relationships among groups modeling the health care environment with the objective to collaborate on a common global health information model.

At the ISO level, a Working Group on Information Models has been established with representation from the Partnership Working Group 1.

It is too soon to determine the exact nature of the alignment and harmonization processes that will be established to allow collaborative modelling in health to continue. There is evidence to indicate that significant interest exists and various formal and informal processes are emerging.

7. Conclusion

The Conceptual Health Data Model Project Team had three objectives.

- Produce a Conceptual Health Data Model to cover the scope of the Health Information Framework at both the contextual and the conceptual levels.

- Develop and test model alignment techniques.

- Develop a process to maintain and refine the Canadian model and to align with and influence international health data models.

These objectives have been met, at least as a first draft or are in initial development stages. In addition, the opportunity to provide a foundation for a knowledge management process has been discovered.

A feedback process is now essential to validate the working assumptions expressed in this document and to develop the working relationships to enable model refinement. Feedback will also help align this work with the work of other Partnership Working Groups, provincial and regional information system initiatives, and modeling efforts occurring in both Canadian jurisdictions and the international health information standards arena.
Appendix A: Rationale for Selecting the HL7 RIM as the Starting Model
Rationale for Selecting the HL7 Reference Information Model (RIM) as the Starting Model
December 1997 Statement

At the beginning of the process of developing a Conceptual Health Data Model, it was decided to use the Health Level Seven (HL7) Reference Information Model (RIM) as the starting point for modelling efforts. The version of the RIM that was current at that time was Version .84. The latest version of the RIM is available through the HL7 web server (http://www.hl7.org/).

The primary reason that the HL7 RIM was chosen as the starting model is that it is already a de facto standard. Many commercial software vendors actively orient their product development efforts to this model and several international standard development organizations are using it to harmonize their standardization efforts.

Starting with the HL7 RIM and then enhancing with Canadian content produces not only a validated Conceptual Health Data Model that represents the information requirements for the way the health system works in Canada, but also becomes an active process to continuously influence the international standards. A Canadian model explicitly aligned with international models indirectly improves the likelihood of commercial software products being developed which are a more "natural fit" and, not incidentally, allows Canadian software developers to develop software with a larger target market as more purchasers world-wide begin to require HL7 compliance.

Canadians have an opportunity to participate, through HL7 Canada, in the de facto standards development process by offering suggested improvements to the existing HL7 model, expressed in their standard nomenclature and notation. This should encourage software developers to accommodate Canadian information requirements in their product offerings. HL7 has recently become more aware of, and open to being influenced by, international perspectives and there are new active relationships with many jurisdictions being developed, including Australia.

Other models are more compatible with how the Canadian Health System works than the HL7 RIM. For example, the Australian National Data Model is better presented than the RIM, with a "drill down" capability that gives a better sense of the levels in the model and specific relationships to "data agreements" which tie the elements of the model to actual processes in use. It is an excellent template of what a National Health Data model should look like and how a model can be used to encourage the various jurisdictions to actively use common definitions.

There is much to be learned from the Australian and similar models, both in presentation, organization, some content, and especially the relationships to active data sharing agreements between jurisdictions on a national scale. However, if we ignore the emerging international models that are plugged into the commercial software development process, we run the risk of developing an elegant model customized to the Canadian scene that is simply irrelevant. People buy software products—not standards. If we want the benefits
of competitively priced commercial software products that are designed for the open systems technical environment, we need to be part of the process. Otherwise, the Canadian model will continue to support only local "custom built" solutions with their inherent resistance to rapidly changing circumstances.
Appendix B: Mapping the Health Information Framework to a Data Model
MAPPING THE HEALTH INFORMATION FRAMEWORK TO A CONCEPTUAL OR LOGICAL DATA MODEL

The Health Information Framework (HIF) can be thought of as a way to organize a set of information topics of interest from a broad health perspective. Data models usually depict a structured set of information representing the interests of a specific jurisdiction. Whether at a conceptual level (representing the major subject areas and the primary relationships between one another) or a logical level (those same subject areas broken down into more specific entities with all their relationships and attributes specified), a particular data model is constrained by the scope of control of the enterprise that "owns" it. Therefore, a health service institution will have a different scope of interest than would a provincial governance organization. These differences are reflected in the degree of specificity or generality that are represented in the subjects being modelled. For example, a hospital may represent a "patient" and a provincial governance organization may represent a "health service recipient," while the HIF sees a "person." Each concept is related, with the broadest scope of interest having the most generic definition.

These relationships are the key to mapping models. Mapping means a rough comparison of something to a standard. In this case mapping a model to the Health Information Framework means finding each domain/sub-domain in the HIF that corresponds to a particular subject/entity/class in the proposed model. Aligning is a harmonization of definitions and characteristics and often means changing both the thing being compared and that to which it is compared. The following mapping process is recommended.

1. Read the Health Information Framework and become familiar with the basic concepts of domains, sub-domains and components. Another basic concept is to see how the primary domains of people, the health system, and the environment interact through various events contained in the process domain. The primary domains can be thought of as being "master files" with the process domain containing "transactions."

2. Create a cross-reference table with domain/sub-domain/component in one column and the corresponding model element in the other (the elements can be either entities/relationships or classes/connections, depending on the modeling notation used). A “comments” column is useful to note exceptions, ambiguities or questions to pursue.

3. Pick a domain/sub-domain/component in one of the primary domains and think about what entities and relationships in the model's scope of interest may be connected. If there are many items that might be tenuously connected, identify entities and their relationships that have the most generic definitions. Add the name of the entity(s) and if necessary their relevant relationship to the model element column for that domain/sub-domain/component.

4. Work through each domain/sub-domain/component in like fashion, noting possible alternative "homes" for model elements if too much ambiguity exists in the
definitions. Do the primary domains first and then the process domain. Expect to find duplicate "homes" for the same model elements in both the process and primary domains. Note: Most "Event" type entities should only belong in the process domain. If the model to be mapped is at a logical level and contains more than 30 to 40 entities, concentrate on the primary entities which have the most generic definitions.

5. Once the initial mapping has been completed, review the result with an eye toward reducing ambiguity when one model element has more than one home. Usually there is stronger affinity with one of the possibilities. Note in the cross reference comment. Also, at this stage, low level or dependent entities may be removed if a more generic entity completely represents the information topic in the domain/sub-domain/component and the dependent entities only add more detail.
Appendix C: Scenarios
SCENARIOS

7.1.1 What are Scenarios?
A “scenario” is a real world example of using information to get work done. The work may be obtaining an answer to a question required to make a decision; gathering information from a respondent and making a record (persistent storage) of the information for later reference; responding to a change of state of something in the real world which requires a change in behaviour somewhere else; or many other types of information use and interchange. Like any descriptive story, the 5Ws and an H (Who did What (possibly to Whom), Where, When, Why and How) should be present. Usually the story is about a complete event of importance which is triggered by some external influence and involves a series of actions taken by “actors” (which may be human or automated systems) with an expected or typical result. The story should be specific enough to deduce what information is required by each actor at each step, with special emphasis on what information is exchanged between actors or stored for later use. Scenarios can be connected to other scenarios that continue the story or explore an exceptional condition, depending on the importance. Often, subsequent scenarios are added as refinements during further analysis.

7.1.2 Why are they important?
A scenario represents a real-life information requirement from the perspective of the actual information user. They are excellent communication vehicles because they are described in the language (local dialect) of the specific information users. Scenarios have all the necessary elements to serve as the starting place for data analysis and retain their value over time.

7.1.3 How are they used?
Scenarios tie information to processes, to people, or to their automated system substitutes, identifying for what purposes the information is required. They also serve as sources for information characteristics in terms of accuracy, specificity, and timeliness. Collections of scenarios serve as examples to various groups describing the multiple purposes for the same information and helping to refine definitions to serve the "greatest good." Scenarios are used to initiate and validate data models, identify opportunities for information sharing, and are actively used in various phases of information system development, implementation, and enhancement. They are also the necessary first step to develop standardized message structures by the various international message development organizations.
7.1.4 Example of a scenario and format template for recording a scenario

**Scenario Identifier:** Usually a number uniquely referring to this particular scenario, especially to store in a database.

**Scenario Name:** A short, descriptive name (e.g. Public Health Nurse Immunization of an Elementary School Class).

**Submission Date:** Date scenario first submitted.

**Version:** Number representing which version of this particular scenario is represented, since scenarios are often enhanced and refined over time to add more detail or greater clarity.

**Revision Date:** Date of revision.

**Submitted by:** Person/Organization that sponsors the scenario and is prepared to provide more information about the whats, whys, details and consequences.

**Revised by:** Same as “Submitted by” but may be different than original submitter.

**Scenario Trigger:** What causes the scenario to start "running", usually a specific time, a duration of time from a particular start point or a change in the state of something important.

In this example, the scenario trigger might be a schedule for immunization, mutually agreed upon by the public health organization and the school.

**Scenario Description:** The actual story. In this example:

A public health nurse contacts a school for the class list of a class to be immunized. The school provides the class list. The public health nurse checks the names on the class list against the immunization records for that age group for the type of immunization planned and produces a set of permission slips for those children without current immunization to the specific agent. The public health nurse sends the permission slips to the school, which then hands them out to the students to take home to their parents. The students return the signed slips to the classroom. The public health nurse goes to the school on the planned date and immunizes all the students with signed permission slips. The immunization record for each student is updated for the students to take home to their parents. The public health nurse updates the public health centralized immunization records.

**Related Scenarios:** (usually referenced by number) Subsequent scenarios might involve the occurrence of adverse reactions with corresponding records of the specific incidents. In this example, further refinements might involve screening out students for subsequent immunizations who had adverse reactions or following up with those students who had not returned signed permission slips.
Appendix D: A Mapping Exercise: CHDM → HL7 RIM
This mapping exercise was a follow-up to an original mapping exercise conducted March 17-18, 1999. That constituted a mapping of the Canadian Conceptual Health Data Model to selected Classes of the HL7 RIM v-088 1999 with the purpose of:

- establishing a template and process for such mappings;
- validating the Entities represented in the Conceptual Model against the RIM, based on clear evidence; and
- testing the scope of the Conceptual Model.

The original exercise mapped existing CHDM entities to major classes of version 0088 of the RIM. The subsequent mapping exercise matched all of the classes of v0096 of the RIM to the CHDM. This was a much more thorough treatment of the topic, and was very successful in illustrating the use of the CHDM to assist in understanding another data model at a more detailed level.

The Conceptual Health Data Model is a natural evolution of its predecessor documents, the Health Information Framework (HIF) and the Contextual Health Data Model. The HIF defines the over-arching scope of health information in a Canadian context by organizing and describing information of interest to key players within the health system. The natural translation of the HIF to a Data Model (first Contextual, then Conceptual) provides increasing clarification of scope, subject areas, definitions, and relationships. The Conceptual Data Model should represent a proof of concept, on which the exacting Logical and Physical Data Models can readily be deduced.

The Conceptual Data Model is a data collection model, and may not contain concepts where are derived rather than observed.

Criteria for proof of concept for the Canadian Conceptual Health Data Model include validation of the model by all areas concerned with the health of Canadians, from the health provider, to the health surveillance agency, to social services, to the Canadian family or individual. Such validation further ensures that the Conceptual Model is fully in alignment with the HIF, and proves the requirement that the Model be jurisdiction neutral. Activities related to full validation are underway.

Jurisdiction independence also assures that the Model is applicable wherever health information is a concern and, as such, the Model is essentially international. The Health Data Model should align at a conceptual level with international health models that have
been broadly adopted as standards, in particular with the HL7 (logical) Reference Information Model.

(Note: the structure and definitions in the following examples reflect the state of the two models at the time of mapping. The intent of this appendix is to demonstrate a technique.)

June 1st and 2nd Mapping Meeting in Edmonton

The HL7 RIM / CHDM mapping exercise was an opportunity for participants in both HL7 Canada and National Data Model expert working groups to further their respective goals. The intent of this exercise was to demonstrate value to both groups by exploring the correlation between the RIM and the CHDM.

The HL7 Canada expert group is attempting to identify HL7 messages to support the National Health Infostructure (NHI) – but it has become clear that without applying the lessons of the CHDM model, the current RIM will not support the requirements of the NHI.

Conversely, by mapping the attributes of a model that actually represents current working systems (the RIM and HL7 messages) to our conceptual model, we can identify opportunities for extending the CHDM to better represent real-world requirements.

Considering the time constraints of the exercise, we needed to be as efficient as possible in our analysis and mapping across the data models. To facilitate this, we established the basic assumptions that drove the exercise.

The Basic Assumptions

1. The CHDM and RIM are models that are expressed at very different levels of detail (conceptual and physical) and that serve very different purposes. To be productive we need to understand the differences and the constraints they impose on us.

2. Because the CHDM is a conceptual model of broad scope, we assume that all of the subject areas and entities (or classes) in the RIM can be located somewhere within the CHDM. Another way of saying this is that the RIM’s scope of interest is completely contained inside the dotted line representing “The Health System” in our Contextual Model.

   The CHDM perspective is about the capture of data on ALL things that affect the health of people.

3. Entities in the RIM may require that they exist in the CHDM as a sub-entity (or sub-class) of one of the primary entities. As part of the mapping we will identify where this has value to the CHDM and we may incorporate the sub-entity in our model.
4. The CHDM is intended to represent a “data-capture model” of the entities we care about in affecting the health of Canadians. What this means to our exercise is that the CHDM represents the primary data that can be directly observed about each entity. The CHDM focus is on the capture of data at the most fundamental level, making it available for subsequent incorporation into information. The value of the resulting information is dependant on the context of the data and the particular perspective used to consolidate it.

5. However, the RIM represents a “data transfer model” intended to support communication between Health application systems. There are many derived data elements in the RIM that are used in HL7 messages. Each time we identify this derived data, we will attempt to map the source data in the CHDM from which this information could be derived.

   HL7 has an implicit scope (that has never been declared) that is limited to administrative, diagnostic, and pure clinical. Concepts that are considered on the fringe of the HL7 RIM are foundation concepts to CHDM.

6. Not all entities in the RIM need to be mapped to the CHDM. There may be some entities of an associative or financial nature that don’t bring value to the CHDM.

7. The RIM does not include concepts from the CHDM (yet). In order to influence the RIM we must demonstrate both business case and use-case scenarios for incorporating it.

   We will not ‘manipulate’ constructs in the RIM to meet CHDM or Canadian HL7 objectives. If the construct does not exist, or is not clearly met in RIM definitions, then we must be prepared to define these constructs.

8. Each of the participants in the mapping exercise brings some background in either Health information technology or in the delivery of services (administrative, operational, or direct patient care).

9. We will rely on this first hand experience to test the validity of our mapping. For example, our participants are likely interested in clearly identifying how an ‘Episode of Care’ is represented in the CHDM.

10. To provide further validation, we hope to apply a detailed real-world example of processes (lab orders and results) that can be applied to both models to help illustrate their differences, strengths, and weaknesses.

The Objectives

The specific objectives of the exercise were to:
a. Test and refine a basic methodology for mapping the CHDM at a conceptual level to other data models that are expressed at another level of detail (logical or physical data model).

b. Test the level of decomposition of the CHDM to see if it is sufficient to represent the entities and relationships necessary for working scenarios

c. To derive from the RIM attributes that may be useful in uniquely identifying entities within the CHDM

d. To differentiate between simple and derived data in the RIM, isolating those derived elements for consideration in the building of a conceptual information model.

e. Define what changes to the RIM are necessary to build HL7 transactions that represent real-world interchanges in information that are relevant to the Canadian experience. We need a list of transaction definitions (or groups of transactions) that Canadian systems require.

**Mapping Methodology**

For each class identified in the RIM:

- Review its basic definition and its role in the RIM

- Using the basic entity definitions from the CHDM and the RIM, we define direct 1:1 relationships between CHDM entities and RIM classes.

- Once the relationships are defined we map primary-key and/or unique identifying attributes from the RIM to the corresponding CHDM entity. If sub-entities are required in the CHDM to properly represent this concept, then we will consider this and incorporate them as appropriate. Unique identifying attributes can be considered as those things that clearly differentiate it from other ‘entities’ on the same or adjoining model.

  If the mapping is between one CHDM entity and a subject area, we aggregate the attributes from the multiple entities that comprise the subject area and apply them to the CHDM entity as appropriate. We map observable characteristics (simple data) only. Derived data must be identified and separated from the model.

- If the CHDM entity or the processes and relationships surrounding it cannot be readily mapped to the RIM, we propose changes or additions to the RIM that would suit this purpose.

- For each entity we exercise working scenarios to test for appropriate ‘fit’ of attribution in the CHDM. These scenarios help illustrate the working relationships between entities. As we exercise the working relationships, we should be able to
identify typical business rules that constrain the behaviour of these relationships. These rules are captured as examples of how Governance can be applied.

- Identify what components of the RIM are not necessary for representation in the CHDM or do not bring value to it from a mapping perspective.

To facilitate the mapping process, a preliminary mapping by subject area was provided in the form of a spreadsheet. We walked through the spreadsheet entity by entity, exercising our mapping methodology iteratively until we had covered all the RIM classes. The results of the mapping are provided here.
<table>
<thead>
<tr>
<th>Definition / Classes</th>
<th>CHDM Type</th>
<th>CHDM Sub-Type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access</td>
<td>Resource Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accident_information_source</td>
<td>Participant Role</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acknowledgement</td>
<td>new</td>
<td></td>
<td>Communication event - we have to extend the CHDM to deal with this type of event, either as a sub-type or a new class of event</td>
</tr>
<tr>
<td>Administer</td>
<td>Medication</td>
<td>Service Event</td>
<td>People + Resource</td>
</tr>
<tr>
<td>Administrative_birth_event</td>
<td>People Event</td>
<td>Individual</td>
<td></td>
</tr>
<tr>
<td>Administrative_patient_accident</td>
<td>Person Event</td>
<td></td>
<td>Recorded after the fact. In our model this is part of the longitudinal health record, used by the clinician for subsequent decision making. The word 'administrative' is entirely misleading.</td>
</tr>
<tr>
<td>Administrative_patient_death</td>
<td>Person Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appointment</td>
<td>Event Linkage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appointment_request</td>
<td>Communication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attention_line</td>
<td>new</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Authentication</td>
<td>Resource Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bad_debt_billing_account</td>
<td>Resource</td>
<td>Financial</td>
<td></td>
</tr>
<tr>
<td>Bad_debt_collection_agency</td>
<td>Participant Role</td>
<td>Organization</td>
<td></td>
</tr>
<tr>
<td>Batch</td>
<td>new</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Billing_information_item</td>
<td>Resource</td>
<td>Financial</td>
<td>The Canadian equivalent is: medicare claiming</td>
</tr>
<tr>
<td>Certification_additional_opinion</td>
<td>Governance Event</td>
<td></td>
<td>Providing this opinion is a governance event - requiring this opinion is a governance constraint.</td>
</tr>
</tbody>
</table>

Conceptual Health Data Model v2.3
Canadian Institute for Health Information

March 2001 D-7
<table>
<thead>
<tr>
<th>Definition / Classes</th>
<th>CHDM Type</th>
<th>CHDM Sub-Type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Champus_coverage</td>
<td>Governance</td>
<td>Business Arrangement</td>
<td>This class is very specific to the U.S. health care model. The group felt this is just over-specification as a result of overwhelming requirement. However, we should expect this type of specialization to occur in a Canadian environment. We just wouldn't explicitly name it by the specific plan.</td>
</tr>
<tr>
<td>Clinical_document</td>
<td>Resource</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clinical_document_header</td>
<td>Resource</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition_node</td>
<td>Person Event</td>
<td></td>
<td>Part of an Episode of Condition - ‘condition thread’</td>
</tr>
<tr>
<td>Consent</td>
<td>Governance Event</td>
<td></td>
<td>The consent form is a data resource, the signing of the consent is a governance event affecting a business arrangement (which is a sub-type of accountability).</td>
</tr>
<tr>
<td>Consent form</td>
<td>Resource</td>
<td>Information</td>
<td>This entity added to define the difference between the consent document and the action of obtaining consent.</td>
</tr>
<tr>
<td>Contact_person</td>
<td>Participant Role</td>
<td></td>
<td>An associative entity</td>
</tr>
<tr>
<td>Container</td>
<td>Resource</td>
<td>Material</td>
<td></td>
</tr>
<tr>
<td>Device</td>
<td>Resource</td>
<td>Material</td>
<td></td>
</tr>
<tr>
<td>Device_group</td>
<td>Resource Capability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device_request</td>
<td>Communication Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Device_slot</td>
<td>Resource Event</td>
<td></td>
<td>Scheduling / appointment / treatment - slot has a duration - begin-end that are booked contiguously.</td>
</tr>
<tr>
<td>Diagnostic_related_group</td>
<td>Governance</td>
<td>Rule</td>
<td>Defines how you do the grouping</td>
</tr>
<tr>
<td>Diet service</td>
<td>Event Linkage</td>
<td>Service + Resource + Individual</td>
<td></td>
</tr>
</tbody>
</table>

Conceptual Health Data Model v2.3
Canadian Institute for Health Information

March 2001
<table>
<thead>
<tr>
<th>Definition / Classes</th>
<th>CHDM Type</th>
<th>CHDM Sub-Type</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disability</td>
<td>Individual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Document_recipient</td>
<td>Participant Role</td>
<td></td>
<td>Participant in a resource event</td>
</tr>
<tr>
<td>Document_service</td>
<td>new</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Electronic Health Record Request</strong></td>
<td>Event Linkage Type</td>
<td></td>
<td>We must store the parameters for the request as well as the actors, recipients, and a record of the resources retrieved. Pull this out to another subject area as this is electronic, not paper. If we can't find this equivalent elsewhere in the RIM, we should make this recommendation and use the CHDM to illustrate how to implement it.</td>
</tr>
<tr>
<td>Employee</td>
<td>Participant Role</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encounter_drg</td>
<td>derived</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Encounter_practitioner</td>
<td>Participant Role</td>
<td></td>
<td>Participant in a person event</td>
</tr>
<tr>
<td>Entering_person</td>
<td>Participant Role</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Episode</td>
<td>Event Linkage</td>
<td>Service Episode</td>
<td></td>
</tr>
<tr>
<td>Episode_of_care</td>
<td>Event Linkage</td>
<td></td>
<td>Includes many events (grouping of encounters) Service event with recursive relationship. Start and end of episode is determined by Governance and accountability for a particular jurisdiction. For example surgical waitlists are a grouping of assessment results/events.</td>
</tr>
<tr>
<td>Episode_of_condition</td>
<td>Event Linkage</td>
<td>Person events</td>
<td>A collector of service events where we measure health status progress. How do we identify the ‘start point’ of the condition (date of onset). Episode of condition is by definition outside of assessment and treatment events.</td>
</tr>
<tr>
<td>Definition / Classes</td>
<td>CHDM Type</td>
<td>CHDM Sub-Type</td>
<td>Notes</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>--------------------</td>
<td>---------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Financial_transaction</td>
<td>Resource Event</td>
<td></td>
<td>Affects Resource:Financial. This event is constrained by the Governance: Business Arrangement</td>
</tr>
<tr>
<td>Food</td>
<td>Resource</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guarantor</td>
<td>Participant Role</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guarantor_contract</td>
<td>Governance</td>
<td>Business Arrangement</td>
<td></td>
</tr>
<tr>
<td>Health_chart</td>
<td>Resource</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health_chart_deficiency</td>
<td>Resource Event</td>
<td>Information</td>
<td>Records an assessment of the chart that could result in both an event and resource record</td>
</tr>
<tr>
<td>Healthcare_benefit_coverage_item</td>
<td>Governance</td>
<td>Business Arrangement</td>
<td></td>
</tr>
<tr>
<td>Healthcare_benefit_product_purchaser</td>
<td>Participant Role</td>
<td></td>
<td>This is an implied relationship that is involved with Business Arrangement. May be a role in a Governance Event / Resource Event</td>
</tr>
<tr>
<td>Healthcare_document_authenticator</td>
<td>Participant Role</td>
<td>Governor</td>
<td>Participant in a governance event</td>
</tr>
<tr>
<td>Healthcare_provider_organization</td>
<td>Participant Role</td>
<td></td>
<td>Participant in all types of events</td>
</tr>
<tr>
<td>Healthcare_service_provider</td>
<td>Participant Role</td>
<td></td>
<td>Participant in all types of events</td>
</tr>
<tr>
<td>Individual_healthcare_practitioner</td>
<td>Participant Role</td>
<td></td>
<td>Participant in all types of events</td>
</tr>
<tr>
<td>Individual_healthcare_practitioner_pool</td>
<td>Resource Capability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual_healthcare_practitioner_pool</td>
<td>Resource Capability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual_healthcare_practitioner_request</td>
<td>Communication Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual_healthcare_practitioner_slot</td>
<td>Resource Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inpatient_encounter</td>
<td>Event Linkage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance_certification</td>
<td>Governance</td>
<td>Business Arrangement</td>
<td></td>
</tr>
<tr>
<td>Insurance_certification_contact</td>
<td>Participant Role</td>
<td></td>
<td>HL7 definition has an issue with ambiguity in this concept. Consider the CHDM relationship</td>
</tr>
<tr>
<td>Definition / Classes</td>
<td>CHDM Type</td>
<td>CHDM Sub-Type</td>
<td>Notes</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------</td>
<td>---------------</td>
<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Insurer</td>
<td>Participant Role</td>
<td>Service Payer</td>
<td>Representation as bringing value to this discussion.</td>
</tr>
<tr>
<td>Language</td>
<td>People</td>
<td>Individual</td>
<td></td>
</tr>
<tr>
<td>Language_ability</td>
<td>Resource</td>
<td>Skill</td>
<td></td>
</tr>
<tr>
<td>Living_subject</td>
<td>new</td>
<td></td>
<td>The original discussion with Health Canada was that ‘specimens’ or ‘non-human’ subjects were part of our Environment. This should be reviewed with consideration to emerging developments with the RIM regarding the concept of ‘Entity’</td>
</tr>
<tr>
<td>Location_encounter_role</td>
<td>new</td>
<td></td>
<td>We need to disassemble this and come up with a better solution - and perhaps a recommendation to HL7</td>
</tr>
<tr>
<td>Master_healthcare_benefit_product</td>
<td>Governance</td>
<td>Business Arrangement</td>
<td></td>
</tr>
<tr>
<td>Master_patient_service_location</td>
<td>Place</td>
<td></td>
<td>This also needs to be disassembled, it has elements of place, event, resource. Let’s create a better representation for this.</td>
</tr>
<tr>
<td>Material</td>
<td>Resource</td>
<td>Material</td>
<td></td>
</tr>
<tr>
<td>Material_relationship</td>
<td>Resource</td>
<td></td>
<td>Collection or super-type of resources or resource relationships to each other.</td>
</tr>
<tr>
<td>Message</td>
<td>new</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notary_public</td>
<td>Participant Role</td>
<td>Governor</td>
<td></td>
</tr>
<tr>
<td>Observation</td>
<td>Service Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization</td>
<td>People</td>
<td>Organization</td>
<td></td>
</tr>
<tr>
<td>Originator</td>
<td>Participant Role</td>
<td></td>
<td>Participant in a resource event</td>
</tr>
<tr>
<td>Patient</td>
<td>Participant Role</td>
<td>Individual</td>
<td>This should be reviewed as part of the review</td>
</tr>
<tr>
<td>Definition / Classes</td>
<td>CHDM Type</td>
<td>CHDM Sub-Type</td>
<td>Notes</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------</td>
<td>---------------</td>
<td>-------</td>
</tr>
<tr>
<td>Patient_appointment_request</td>
<td>Communication Event</td>
<td></td>
<td>of &quot;living subject&quot;</td>
</tr>
<tr>
<td>Patient_billing_account</td>
<td>Resource</td>
<td>Financial</td>
<td></td>
</tr>
<tr>
<td>Patient_encounter</td>
<td>People Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient_information_disclosure</td>
<td>Governance Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient_information_recipient</td>
<td>Participant Role</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient_provider_association</td>
<td>new</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient_service_location_group</td>
<td>Resource Capability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient_service_location_request</td>
<td>Communication Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient_service_location_slot</td>
<td>Resource Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient_slot</td>
<td>Resource Event</td>
<td></td>
<td>Patient time is really the resource</td>
</tr>
<tr>
<td>Person</td>
<td>Individual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person_employment</td>
<td>Participant Role</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Person_name</td>
<td>Individual</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preauthorization</td>
<td>Governance Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferred_provider_participation</td>
<td>Governance</td>
<td>Business Arrangement</td>
<td>Constrains who is eligible or required in the provider role</td>
</tr>
<tr>
<td>Procedure</td>
<td>Service Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Referral</td>
<td>Event Linkage</td>
<td>Comm Event + Governance</td>
<td></td>
</tr>
<tr>
<td>Requirement for Certification_additional_opinion</td>
<td>Governance</td>
<td>Rule</td>
<td></td>
</tr>
<tr>
<td>Resource_request</td>
<td>Communication Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource_slot</td>
<td>Resource Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Definition / Classes</td>
<td>CHDM Type</td>
<td>CHDM Sub-Type</td>
<td>Notes</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>----------------</td>
<td>---------------</td>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>Responsibility</td>
<td>Governance</td>
<td>Accountability</td>
<td>Associated with or triggered by a person event.</td>
</tr>
<tr>
<td>Risk_management_incident</td>
<td>Governance Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schedule</td>
<td>Event Linkage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schedule</td>
<td>Event Linkage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service</td>
<td>Event Linkage</td>
<td></td>
<td>Applies at all levels of granularity (can be Service Episode, Encounter, Service Event). This needs to be decomposed in the CHDM to illustrate all of the events and entities associated with service provision.</td>
</tr>
<tr>
<td>Service_actor</td>
<td>Participant Role</td>
<td></td>
<td>This needs to be decomposed in the CHDM.</td>
</tr>
<tr>
<td>Service_list</td>
<td>Event Linkage</td>
<td></td>
<td>Associated with Governance</td>
</tr>
<tr>
<td>Service_list_item</td>
<td>Event</td>
<td></td>
<td>Component of Service_list event linkage</td>
</tr>
<tr>
<td>Service_relationship</td>
<td>Event Linkage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service_scheduling_request</td>
<td>Event Linkage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service_target</td>
<td>Event Linkage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specimen</td>
<td>Resource</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stakeholder</td>
<td>People</td>
<td>Super-type</td>
<td></td>
</tr>
<tr>
<td>Stakeholder_affiliate</td>
<td>Participant Role</td>
<td></td>
<td>Associative entity - consider as a recursive relationship for 'People'</td>
</tr>
<tr>
<td>Stakeholder_affiliation</td>
<td>Participant Role</td>
<td></td>
<td>Role-to-role relationship that links two persons in a persistent manner. This may require an additional associative entity in the CHDM.</td>
</tr>
<tr>
<td>Supply</td>
<td>Resource Event</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Therapeutic_agent</td>
<td>Resource</td>
<td>Material</td>
<td></td>
</tr>
<tr>
<td>Transcriptionist</td>
<td>Participant Role</td>
<td></td>
<td>Participant in a resource event</td>
</tr>
<tr>
<td>Definition / Classes</td>
<td>CHDM Type</td>
<td>CHDM Sub-Type</td>
<td>Notes</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------</td>
<td>---------------</td>
<td>-------</td>
</tr>
<tr>
<td>Transportation</td>
<td>Service Event</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>