Adopting and Implementing Clinical Vocabularies

Business Impact Analysis Report

Alberta
HEALTH AND WELLNESS

Final Report – March 2, 2007

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1. EXECUTIVE SUMMARY

1.1. Introduction

Alberta Health and Wellness (AHW) conducted a Business Impact Analysis (BIA) to determine the benefits, opportunities and impacts of adopting and implementing standardized clinical vocabularies within the Alberta health care system.

The BIA focused on identifying the current state and defining the desired future state of how data is, and should be, collected and used for clinical, administrative and financial purposes. It then defined recommendations to address the differences between the two states.

A structured approach was used and active stakeholder participation occurred throughout. Using stakeholder group sessions and interviews, the current state of data collection and information flows for clinical, administrative and financial uses were defined. Through research and further stakeholder review and feedback, the desired future state, gaps and recommendations were identified.

The vocabularies considered in the BIA included, but were not limited to Systemized Nomenclature of Medical Terms - Clinic Terms (SNOMED CT®), Logical Observation Identifiers Names and Codes (LOINC®), International Statistical Classification of Diseases and Related Health Problems (ICD-10-CA), Canadian Classification of Health Interventions (CCI), Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR©), International Classification for Primary Care (ICPC©) and International Classification for Nursing Practice (ICNP®).

1.2. Principles

The strategic direction must be built on a stable foundation and sustained over the long term. The following principles, which were applied as the strategic recommendations were developed, will establish and maintain this foundation:

VISION: The enablement and sustainment of the Alberta health care system will require the support of a series of integrated and interoperable electronic information systems.

GOVERNANCE: As the Alberta electronic health care system becomes integrated and interoperable, the system must be maintained and supported through a collaborative, multi-stakeholder governance approach.

DATA STEWARDSHIP: An integrated, interoperable electronic health care system will provide an increased ability by clinicians, administrators and researchers to review and

use data collected. Increased diligence will be required to ensure privacy and confidentiality is appropriately maintained.

DATA QUALITY: To support an integrated, interoperable electronic health care system, the highest quality of coded data is required. Effective data quality control must be implemented so that any issues identified are resolved in a timely manner. The key dimensions of data quality, accuracy, documentation, consistency, timeliness, relevance and accessibility, must be applied.

ALIGNMENT: To build an integrated, interoperable electronic health care system, this initiative must align with the Provincial IM/IT Strategy. Coordination and integration between this initiative and other approved IM/IT projects involving clinical vocabularies must occur.

VALUE: To demonstrate the value of an integrated, interoperable electronic health care system, the initiative must establish objective targets and baseline measures for both quantitative and qualitative indicators and provide a means of continuously monitoring value using system-wide performance measures and clinical outcomes.

EFFECTIVENESS: To work towards optimizing the collection and use of data wherever possible. Apply the principle of "collect data once – use many times" and ensure data collected at source can be used for secondary purposes through the use of mapping and aggregation.

1.3. Recommendations

The following sections outline the key strategic and tactical recommendations.

1.3.1. Key Strategic Recommendations

1. **For clinical purposes, adopt and implement SNOMED CT® and continue to use appropriate clinical vocabularies for specific care settings**

   Adopt and implement SNOMED CT® as the core standardized clinical vocabulary to support all provincial IM/IT initiatives for clinical purposes. Implement using a systematic approach while allowing for evolution and ensuring data quality. Elicit lessons learned from current implementations and validate methodology in pilot and assessment projects before a full-scale production roll-out. The primary benefit of standardized clinical vocabulary is to patient care and patient safety as a direct result of the common meaning and shared understanding of documentation exchanged among caregivers and between care settings. As such, leverage the current use of existing standardized clinical vocabularies as appropriate in specific care settings (e.g.

DSM-IV-TR for Mental Health, ICPC for Primary Care, and ICNP® for nursing) with the provision of appropriate mapping to SNOMED CT® for use in provincial IM/IT systems.

2. For administrative purposes, continue to use ICD-10-CA/CCI

Maintain the use of ICD-10-CA/CCI, while investigating potential use of alternative clinical vocabularies. In addition, work towards improving current administrative processes and reviewing reporting requirements.

3. For financial purposes, continue to use existing mechanisms such as the Schedule of Medical Benefits

Currently, a standardized vocabulary to support financial activities cannot be recommended, as financial requirements have not been agreed to at the clinical, regional, or provincial level. Therefore, existing mechanisms e.g. the Schedule of Medical Benefits will need to be continued for the medium term until a determination can be made on the best vocabulary standard(s) to support financial activities.

4. Standardize assessment protocols and other forms

To effectively share information across the health care system, collaboration is required to reach a common understanding that encompasses standardized clinical, administrative, and financial business processes, policies and forms. Initially such processes and documentation need not be automated but are required to ensure interoperability when automated. Standardization of assessment protocols and other forms will optimize clinical processes for continuity of patient care and patient safety within and across regions, sectors and care settings.

5. Enhance the current EHR Governance Structure

Given the multi-stakeholder nature of this initiative and its importance to the Provincial IM/IT Strategy, the EHR Governance should be used to provide oversight on this initiative. New bodies or amended terms of reference of existing bodies may be required to ensure standardization projects are clinician-driven with representation from affected stakeholders.

6. Foster multi-disciplinary collaboration

Establish and maintain communication channels with other standards organizations, regulatory bodies, professional associations and educational/research organizations. Develop local, provincial and national partnerships on initiatives to validate standardized clinical vocabulary mapping and incorporate clinical best practices in Alberta processes.

7. Establish a communications strategy

Establish a communications strategy that facilitates stakeholder understanding and engagement in this initiative including the coordination, consultation, education/training, integration and transition management activities. This will help ensure standardized clinical vocabularies are effectively implemented.

The strategic recommendations need to be reviewed and re-confirmed on an annual basis as the results of the tactical pilots are known and new information can be considered.

1.3.2. Tactical Recommendations

While the strategic recommendations serve to chart the way for the long term, tactical recommendations will provide a solid foundation on which to continue standardizing clinical information.

1. Establish a Coordinating Unit

Establish a Coordinating Unit to oversee all initiative related activities. Along with the responsibility for the development of strategy documents, the Unit will develop an integrated project plan to support the full coordination of pilots, studies and assessment projects and provide oversight and support to issues management and resolution, standardization methods reference and support, communications and evaluation. This project plan will identify the timetable of undertaking specific initiative related projects as well as identifying when other leveraged projects will contribute to the initiative. This plan will need to be aligned with the Provincial IM/IT strategy.

2. Develop a Communication Plan

Establish and execute a comprehensive communications plan to engage stakeholders within Alberta and at a national and international level. This communication plan must identify stakeholder groups impacted, specific messages, appropriate communication opportunities and the level of ongoing engagement – ranging from partnering in achieving objectives to remaining informed. Clear, effective, ongoing communication is essential to ensure implementation of the tactical recommendations and long-term continuity of the strategic recommendations.

3. Initiate Pilots, Studies and Assessments

Initiate pilot and proof-of-concept projects focusing on the evaluation of project goals and outcomes, which will help both manage the provincial standardization initiative and allow for participation in national and international mapping activity. Engagement depends on the readiness of the stakeholders, the current state of their standardization activity and the degree of automation.

A cross section of investigation is recommended. The table below identifies a number of pilots, studies and/or assessments that will support the strategic recommendations. It indicates the area of impact (e.g. Medical Laboratory, Diagnostic Imaging), whether its focus is clinical, administrative or financial and provides a brief description of the work to be undertaken.

Area of impact	Focus	Description	Timeframe (starting)
Terminology Services	Infrastructure	The required mapping of the recommended clinical vocabularies will require implementation of an infrastructure that supports a distributed environment, within and across related projects. The infrastructure will need to include appropriate terminology management and mapping software.	Year 1
Chronic Disease Management	Clinical	Enhance and expand the continuity of care for Chronic Disease Management by focusing on standardizing assessment forms using SNOMED CT®, and LOINC®.	Year 2
Acute Care / Continuing Care Transfer Assessment Standardization	Clinical	Evaluate the use of SNOMED CT® and LOINC® to standardize the clinical documentation used to transfer between continuing care and acute care settings to optimize the continuity of care.	Year 3
Provincial / Regional Reporting Assessment	Administrative	Evaluate the potential impact on reporting requirements from the use of standardized clinical vocabularies during clinical data capture processes and then transforming for reporting purposes. Identify opportunities to improve usefulness of data collection and impact on current acute care, continuing care, and ambulatory care reporting data streams. Focus on Acute Care initially.	Year 4
Schedule of Medical Benefits	Administrative / Financial	Examine existing claims submission record structures, SOMB codes and coding instructions to determine the embedded clinical concepts, their purpose and the business rules surrounding their use. Results of the analysis would serve as a foundation for any change to the SOMB content using standardized clinical vocabularies and associated remuneration processes.	Year 1
Community and Regional Diagnostic Imaging Services Definition	Clinical	Work with clinicians from community private clinics and hospital-based DI departments to evaluate SNOMED CT® as a potential clinical vocabulary to describe DI services in the different care settings to ensure continuity of patient care across settings.	Year 1
Mental Health Care	Clinical	Standardize clinical assessment forms across the province, using DSM-IV-TR, to optimize patient care continuity between different settings.	Year 2
Mental Health Care	Administrative	Standardize mental health reporting requirements to meet community, regional, and provincial business requirements.	Year 2
Medical Laboratory	Clinical	Adopt and implement Canada Health Infoway Lab vocabulary specifications for new vocabularies including SNOMED CT® and LOINC®.	Year 4

Area of impact	Focus	Description	Timeframe (starting)
Medical Laboratory	Administrative	Evaluate and implement CIHI laboratory workload measurements, if appropriate. Ensure LOINC codes used for clinical and administrative purposes are synchronized.	Year 3
Perinatal Care	Clinical	Evaluate the use of standardized clinical vocabularies, SNOMED CT®, and LOINC®, in the existing five standardized assessment forms. Leverage existing work with a view to introducing automation.	Year 1
Primary Care Network	Clinical	Based on lessons learned from existing clinical projects, work with a selected PCN with multiple organizations as participants and their collaborating vendors (representing more than one EMR) to demonstrate the benefits of using standardized clinical documentation to improve the continuity of care within the PCN environment. Prepare a tool-kit to assist future initiatives. Focus on the Transfer of Patients Data Set but enhance it to use LOINC® and SNOMED CT® where it is applicable.	Year 2

1.4. Summary

The BIA focused on how adopting and implementing standardized clinical vocabularies would affect data collection and related processes used within clinical, administrative and financial systems. The results of this work are recorded in this report. However, what also became clear was that to take advantage of standardized clinical vocabularies, there was a significant dependency on standardizing clinical, administrative, and financial business processes, policies, and forms. Patient care and safety benefits will accrue from standardized meaning and process; in addition, a firm foundation and readiness will be created on which standardized clinical vocabularies can be implemented.

The impact of this initiative will be far reaching and impact all provincial health care stakeholders, from AHW through health regions and clinicians to software vendors who provide EMR systems and regional clinical information systems. It will impact clinical, financial, and administrative data collection and reporting processes. It will also impact education institutions developing and delivering courses for undergraduate, graduate and certificate programs in health care and health information management. Stakeholders will need to collaborate to identify the purpose-specific standardized concepts necessary to communicate across disciplines and care settings to achieve the continuity of care.

The proposed implementation strategy is evolutionary and is expected to take up to ten years. This estimate is based on the time required to develop readiness and receptivity in the clinician communities; to develop consensus on standardized practice processes and tools; to train/retrain users; and to allow software vendors to incorporate the ability to appropriately capture structured data into their applications as part of their “normal” development cycle.

Overall, the benefit realized will be standardized and shared health information available to approved care providers across all care settings. This will improve the patient care and safety

at each transfer point in the continuum of care across the health care delivery system. Streamlined workflow at hand-off points will lead to the reduction of unnecessary tasks thereby achieving improved efficiencies.

2. INTRODUCTION

2.1. Background

Canada Health Infoway (*Infoway*) Electronic Health Record Standards Steering Committee - of which AHW is a key partner - selected the Systematised Nomenclature of Medicine - Clinical Terms (SNOMED CT®) for evaluation and piloting as the Canadian standard for the reference terminology of the pan-Canadian interoperable Electronic Health Record (iEHR) for the 27 Clinical Information Groups (CIGs) including diagnosis.

These CIGs were developed through the Canada Health Infoway 'EHR Clinical Terminology Integration (CTI)' project, initiated in February of 2005. The purpose of the project was to identify, in collaboration with all Infoway program's an integrated portfolio of clinical vocabularies to support the interoperable pan-Canadian EHR and help achieve its benefits. This cross-program coordinating project focused on business needs by program, identifying the Infoway investment program responsible for identification of domain specific clinical terminologies (e.g. labs, drugs, imaging). Participants in the project were called 'The EHR Clinical Terminology Integration pan-Canadian Standards Group'. The group consisted of clinical stakeholders representing health care professionals, and provided review and validation of pan-Canadian requirements. The group made recommendations on the adoption of various clinical terminologies core to the pan-Canadian EHR[1].

In response to *Infoway's* selection, AHW conducted this Business Impact Analysis (BIA) to determine the benefits, opportunities and impacts of adopting and implementing standardized clinical vocabularies within the Alberta health care system.

The BIA focused on identifying the current state and defining the desired future state of how data is, and should be, collected and used for clinical, administrative and financial purposes. It then defined recommendations to address the differences between the two states.

A structured approach was used and active stakeholder participation occurred throughout. Using stakeholder group sessions and interviews, the current state of data collection and information flows for clinical, administrative and financial uses were defined. Through research and further stakeholder review and feedback, the desired future state, gaps and recommendations were identified.

The vocabularies considered were SNOMED CT®, LOINC®, ICD-10-CA, CCI, DSM-IV-TR, ICPC and ICNP[2]. The results of the BIA support the adoption of SNOMED CT® as the core

[1] Canada Health Infoway, http://www.infoway-inforoute.ca/en/WhatWeDo/sgEHR.aspx

[2] For a description of these vocabularies, please refer to Appendix A – Glossary of Terms.

standardized clinical vocabulary for the Alberta health care system. SNOMED CT® was the only vocabulary that was found to be comprehensive enough to support all health care settings. The results also support the implementation of other standardized clinical vocabularies in conjunction with SNOMED CT®.

This report provides the assessment of the BIA project.

2.2. Terms Used and Implications

The definitions of three key terms are provided here as they are used throughout this report.

Term	Definition
Vocabulary	All things related to the content of an encoded field, and that reference a structured code system or scheme. This Final Report uses 'clinical vocabulary' generically to represent all types, including terminologies and classifications. Examples include: ICPC, ICNP, DSM-IV-TR
Core Standardized Clinical Vocabulary	Lowest level of unique set of organized coded concepts. The code structure must be organized coherently with no overlapping meaning in the values (where a value is a single coded concept). Examples include: SNOMED CT®, LOINC® and ICNP®. SNOMED CT® is becoming the considered core standardized clinical vocabulary that incorporates other core standardized clinical vocabularies.
Classification	A clinical vocabulary that is intended to categorize a group of instances such that any single instance falls into one and only one category. It is accompanied by encoding rules to ensure coding is consistent and comparable. Classifications have a built-in hierarchy to allow analysis of instances at different levels of specificity. Examples include ICD-10-CA© and CCI©. Core standardized clinical vocabularies, (such as SNOMED CT®) can be mapped to classifications (such as ICD-10-CA©) using specified business rules. Classifications are used to create comparable data for analytical purposes.

A complete glossary of terms used throughout this report can be found in *Appendix A - Glossary of Acronyms and Terms*. More detailed information on some of the key vocabularies including SNOMED CT®, LOINC®, ICD-10-CA, CCI and DSM-IV-TR© can be found in *Appendix B - Background Information on Clinical Vocabularies and Coding Systems*.

2.3. The Benefits of Standardization

Why would the province of Alberta want to standardize clinical vocabularies? There are many business reasons, best practices and benefits associated with standardization. Among these are:

- Capturing the data once, at source, is a best practice identified by numerous research companies and by Alberta's Health System Architecture (HSA). This practice has not been fully implemented across the province, although significant progress has been made through the efforts of HISCA (Health Information Standards Committee for Alberta);
- If the data is captured once, at source, that data needs to be captured in a standard, consistent format. For example, if a data element is captured as "an apple", it is "an

apple" regardless of where it is captured or who is capturing. It must not appear as "a Gala apple" or as "a fruit" otherwise it cannot be readily shared or understood;

- If the data element being captured relies on a clinical vocabulary (e.g. Diagnosis code), that code must be used in a consistent manner. It is well known that various coding schemes such as ICD-9 and ICD-10 have been modified over the years to meet specific needs; and
- Provincial IM/IT systems require a consistent method of recording patient information for the purposes of sharing that information along the continuum of care; amongst the various providers/clinicians. Part of that consistency is the clinical vocabulary to be applied to diagnosis, etc.

Adopting standardized clinical vocabularies will benefit Alberta stakeholders. Initial benefits will be realized through standardization of processes and more efficient information flows, for example at hand-off points, in the continuity of care. As the initiative grows, it will support the interoperability amongst the various systems used in Alberta by regions, physicians, hospitals, pharmacies and others. Over time, this will help improve Albertans' access to health care services, enhance the quality of care and make the health care system more efficient.

The adoption of viable and sustainable standards is the key to success. Establishing viable provincial standards requires careful consideration of requirements from all stakeholders; the standards must not only be responsive to the fundamental point of care clinical requirements, but also must meet the requirements for the shared health record to support the continuity of care for all Albertans.

2.4. Project Goals

The specific goals of this project were to:

- Ensure stakeholders are properly represented;
- Understand the current state of clinical vocabularies used in Alberta from a clinical, financial and administrative point of view;
- Identify current trends in eHealth, and in clinical terminology adoption and implementation;
- Identify and understand how business or service delivery types would be impacted by standardized clinical vocabularies;
- Develop a desired future state framework for standardized clinical vocabularies that aligns with provincial initiatives and national/international directions;
- Assess the impacts and gaps between the current state and the desired future state considering risks, costs, benefits, change management, training, etc.; and
- Make recommendations, and based on those recommendations, define an implementation strategy.

3. APPROACH

This BIA project was conducted in seven phases:

1. Project Initiation;
2. Current State Assessment and Environmental Scan;
3. Desired Future State;
4. Gap Analysis;
5. Recommendations;
6. Impact Assessment; and
7. Proposed Implementation Strategy.

These phases are described in more detail below.

3.1. Project Initiation

The project initiation phase provided the foundation for the rest of the project. It included: the establishment of the Alberta Clinical Vocabulary Working Group (CV WG), a stakeholder group that provided input, guidance and oversight to the project team; the identification of business and service types to be investigated; the development of a project plan and communication plan; and the development of a methodology by which to undertake the project.

3.1.1. CV WG Membership

The table that follows shows the stakeholder groups who were represented at the Clinical Vocabulary Work Group (CV WG). The CV WG was chaired by AHW.

Organizations Represented	
AHW	▪ Information Strategic Services Division ▪ Public Health Division ▪ Program Services Division ▪ Health Workforce Division ▪ Strategic Directions Division

Organizations Represented	
Regional Health Authorities	▪ Calgary Health Region ▪ Capital Health ▪ RSHIP
Alberta Medical Association	

The terms of reference for the CV WG are contained in *Appendix C – Clinical Vocabulary Working Group Terms of Reference / Vote.* This appendix also contains the CV WG's comments on the final recommendations.

3.1.2. Business and Service Delivery Types

The following table lists the business or service delivery type identified for impact assessment.

Clinical (Community and Regional focus)
▪ Laboratory Information
▪ Pharmacy Information
▪ Diagnostic Imaging
▪ Transcribed Reports
▪ Diagnosis, Intervention, Outcome (Clinical Care)
▪ Continuity of Care
▪ Public Health – Health Clinics
▪ Continuing Care
▪ Mental Health
▪ Therapeutic Devices (originally considered, but subsequently excluded)[3]
Financial
▪ Claims - e.g. physician billing other methods of payment for health care services
▪ Schedule of Medical Benefits
▪ Reciprocal billing
▪ Other billing types that might be impacted, e.g. third party liability, third party insurance, self pay and out-of-country

[3] The CV WG agreed to exclude therapeutic devices as it was deemed not to have a clinical vocabulary impact to Alberta.

Administrative (includes Reporting and Related Systems)
▪ Management Information System (MIS)
▪ Discharge Abstract Database (DAD)
▪ Morbidity and Ambulatory Care Abstract Reports (MACAR) (inpatient and ambulatory)
▪ Waitlist
▪ Provider
▪ Patient and Client
▪ Delivery Site
▪ Organization
▪ Immunizations
▪ Adverse Reaction Information
▪ Tuberculosis (TB)
▪ Sexually Transmitted Infection (STI)

3.1.3. Project Communications Plan

A timetable of CV WG meetings was established. Key project milestones, based on the RFP, were reviewed and agreed upon. A SharePoint site was established to be the repository of all project deliverables and work products. Rather than relay documents by e-mail, all project-related were posted to the SharePoint site once ready for review. To keep participants further informed a newsletter called the 'Project Update' was produced on a monthly basis.

During the course of meetings held by the CV WG, a number of key decisions were made. These decisions have been captured in *Appendix D – Decision Log*.

3.1.4. BIA Methodology

The methodology used comprised the following five steps:

1. The vocabularies (and grouper categories) currently used in Alberta were researched and identified. A list is attached in *Appendix E - Inventory of Terminologies and Groupers*.

2. The Project Team initially defined conceptual information flow models that were used in working group sessions to identify impact points along the business and health care service delivery processes selected for the impact assessment project. The information flows incorporated the Lambert *Infoway* narratives developed

through various projects. The information flow models were validated in working sessions and have been included in the companion document[4] to this final report. Within each information flow, at each impact point, current state detail were noted for:

- Who – the roles involved in the process;
- What – the current vocabularies used;
- Where – the delivery sites; where the data is stored;
- When – timing, where the impact might be significant;
- Why – the use and purpose of the information (e.g. Continuity of care, legislation); and
- How – the data is gathered – manual and automated processes.

3. A questionnaire was developed for stakeholders as a supplement to information gathered during workshops and for assessing readiness.

4. Wherever possible, the findings of the *Infoway* Clinical Terminology Integration (CTI) 27 high priority CIGs to identify impacts for service events and specific data elements related to the events were utilized.

5. Interviews with stakeholders were conducted. The purpose of these interviews was to supplement working group sessions on topics such as governance, secondary use of data, vendor initiatives and concerns, education requirements etc. A full list of interviewees is included as *Appendix F - List of Interviewees*.

3.2. Current State Assessment and Environmental Scan

This phase looked at the Alberta health care system, health care systems in other Canadian jurisdictions and international health care systems to review status and progress of adoption and implementation of standardized clinical vocabularies. For clinical, financial and administrative processes within Alberta, detailed information on strengths, challenges and opportunities was gathered through CV WG meetings and other stakeholder interviews. Environmental scanning was extended to include other Alberta health-related initiatives, and relevant Canadian and international initiatives. Methods for extended environmental scanning included interviews, health care publications and the internet.

A listing of documents, publications and internet articles reviewed by the environmental scan is included in *Appendix G Selected List of References*.

[4] Alberta Clinical Vocabulary Business Impact Analysis – Final Report Companion Document

3.3. Desired Future State

This phase developed a future state framework that describes a vision that leverages standardized clinical vocabularies, firstly to enable improved patient care and safety, and subsequently to support administrative and financial information requirements. Many benefits would be achieved through streamlined clinical processes across disciplines and care settings and the effective use of data captured during clinical care. In addition, new processes to enhance and disseminate clinical knowledge and to improve administrative and financial decision-making are essential in achieving the vision. Process models describing how new capabilities are provided were also identified.

3.4. Gap Analysis

This phase analyzed differences between the current state and proposed future state, identifying the "gap" between the two. The gap became actionable projects and tasks that can start immediately and that will be carried out over the longer term.

3.5. Recommendations

This phase detailed strategic and tactical recommendations required to remove the gap referred to in section 3.4. Initial high-level recommendations were proposed and presented to the provincial Information Management Committee (IMC), the Health Information Standards Committee for Alberta (HISCA), and the CV WG for initial comment and feedback. Once feedback was received, strategic and tactical recommendations were then detailed.

3.6. Impact Assessment

This phase identified and analyzed the impacts stakeholders will experience as the recommendations identified in the previous phase are acted upon. These impacts will affect stakeholders in many aspects including their:

- Governance;
- Communications;
- Degree of collaboration with other stakeholders;
- Organizational structures;
- Roles responsibilities;
- Scope of responsibilities;
- Processes (clinical, administrative and financial);
- Training and education;
- Application software; and
- Supporting technologies.

3.7. Implementation Strategy

Analysis of the recommendations and impacts was used to develop an implementation strategy:

The resulting implementation strategy included the following components:

- Approach;
- Project Sequencing;
- IM/IT Strategic Plan Alignment;
- Costs;
- Critical Success Factors; and
- Risk Assessment

4. CURRENT STATE

This section provides a high level analysis of the findings from the CV WG working sessions and the interviews that were conducted. The analysis identifies strengths, challenges and opportunities that could be leveraged for standardization of clinical vocabularies. The detailed results of the working sessions are in the companion document to this report. The list of interviewees is located in *Appendix F - List of Interviewees*.

4.1. Current State - Clinical

There were eight CV WG working sessions. The third working session on September 7, 2006 was the start of the detailed assessment of current state. As a starting point for discussions, a description of selected clinical vocabularies (see *Appendix B- Background on Clinical Vocabularies and Coding Systems*) and a list of Terminologies and Groupers (see *Appendix E - Inventory of Terminologies and Groupers*) were compiled by the Project Team and confirmed by the CV WG. The list has been revised to reflect vocabularies in use in Alberta as identified during the complete course of working sessions. This list may still have some omissions, but it represents - in the Working Group's view - the most common vocabularies in use.

The strengths, challenges and opportunities have been categorized as follows:

1. The EHR;
2. Clinical vocabulary and standardization; and
3. Clinical Systems/EMR software and vendors.

The summary analysis for each category follows below.

4.1.1. The EHR

STRENGTHS:

Alberta has been a leader in Canada with respect to the development of its EHR and has made considerable progress to date. Strengths include:

- EHR planning is occurring within the context of an overall Provincial IM/IT Strategy which is building upon provincial, inter-provincial and national initiatives. The Alberta strategy will align with the national model so that the overall goal of an interoperable EHR for all Canadians can be achieved.
- Alberta's approach is based on leveraging existing work including the use of *Infoway* artifacts wherever possible. This helps avoid unnecessary duplication of work or redundancy.

- Key repositories such as drug information, laboratory tests result and diagnostic imaging result repositories are either on-line or will be coming on-line in the near future.
- A provincial viewer giving all stakeholders access to EHR data will be available by summer of 2007.

CHALLENGES:

While substantial progress has been made, the EHR is still at an early stage of development. Its data is readable by humans, but does not lend itself well to analysis via decision support tools. Nor can the data be retrieved for aggregation and analysis with any degree of ease. To move the EHR to the next level would require the introduction and use of standardized clinical vocabularies that facilitate this analysis capability as well as providing a link across care settings.

The EHR is also hampered by the lack of a comprehensive and shared vision common among all stakeholders. Clarity of that vision would likely bring the need for standardized clinical vocabularies into sharper focus.

OPPORTUNITIES:

There is an opportunity to integrate and grow the EHR by using standardized clinical vocabularies. A core standardized clinical vocabulary, such as SNOMED CT®, and a terminology service are foundational infrastructure pieces that would contribute significantly to making interoperability and a shared health record a reality. SNOMED CT® is a core vocabulary providing common language that enables a consistent way of capturing, sharing and aggregating health data across specialties and sites of care[5]. SNOMED CT® is a tool that can support an integrated, interoperable electronic health care system.

4.1.2. Clinical Vocabulary and Standardization

STRENGTHS:

The province has many success stories with respect to data and clinical vocabulary standardization. There have been extensive efforts throughout the health care system to standardize patient/client demographic information. The philosophy of capturing the data once, at source (point of care) and transforming it for many purposes is supported by AHW, the health regions, professional associations as well as the clinicians and researchers who were interviewed. During the course of the interviews, support for the standardization of clinical vocabularies was also expressed.

Some of the progress being made with respect to clinical vocabularies includes:

[5] SNOMED ® international, http://www.snomed.org/snomedct/index.html

- Laboratory vocabulary standards are being addressed by *Infoway* through SNOMED CT® and LOINC®. AHW currently has plans to leverage these standards;
- Chronic Disease Management (CDM) has standardized at the integration engine level on LOINC® for clinical headers, ICD-10-CA for diagnosis and CCI© for interventions coding as it relates to its messaging capability;
- Calgary Health Region and Capital Health have experience in clinical vocabulary mapping at the interface engine level through the WHIC - CDM pilot project;
- Continuing Care (both facility and community) and Home Care are in the process of implementing interRAI[6] instruments for patient assessment;
- Planned upgrades to the Pharmaceutical Information Network (PIN) include standardizing on CeRx (the pan-Canadian standard for electronic data interchange (EDI) of clinical drug information) for pharmacy messaging. CeRx supports standardized vocabularies;
- The Alberta Cancer Board (Cancer Surgery Alberta) is in the process of implementing the Web Surgical Medical Records program (WebSMR). This new web-based tool allows surgeons to fill out a standardized electronic report post-operatively. The reports can be shared by the entire cancer care team, enabling them to make better decisions and improve the quality and safety of post-operative care for patients. WebSMR is accessible from the desk-top, using drop-down boxes that ultimately will map to a subset of SNOMED CT®. WebSMR has been piloted and implementation is now underway; and
- For Mental Health, DSM-IV-TR© is currently in use by a number of stakeholders in the province.

CHALLENGES:

Currently, the number of clinical vocabularies in the province is extensive. They range from local and/or proprietary codes to CPEL©, LOINC®, DSM-IV©, CCP, CCI, ICD-9, ICD-10-CA, ICPC, VIN, DIN, ICPN®, NOC, ICD-O, and some SNOMED CT®. However, few clinicians, physicians, or nurses make active use of a clinical vocabulary, preferring to use natural, structured language in both the manual chart and the Electronic Medical Record (EMR). The potential usefulness and interoperability of an EHR is impacted when there is no coding at the point of care. This also impacts the continuity of care at each transfer point.

The concept of 'vocabulary creep' (coding changes to meet local needs) was identified as an issue by the CV WG. Local modifications have been made to classifications such as CCI, ICD-9 and ICD-10-CA. ICD-10-CA is not used consistently between the regions and AHW. There are also local variations in the use across different care settings such as Public Health (clinic) and Continuing Care.

[6] interRAI is a collaborative network of researchers in over 20 countries committed to improving health care for persons who are elderly, frail, or disabled.

There are also a very large number of assessment tools and forms in use across the province such as interRAI (Continuing and Home Care) and CGAF (Mental Health). There are localized efforts to condense and increase standardization of assessment tools and forms. However, there is no coordinated province-wide initiative to standardize these assessment tools. Over 200 different assessment tools/forms are used by Mental Health in one region alone.

OPPORTUNITIES:

There are opportunities for collaboration on standardization efforts. The extensive experience gained by various groups can be leveraged and extended to incorporate SNOMED CT® into proof-of-concept efforts and into standardization efforts for streamlining continuity of care purposes.

The local efforts to condense and standardize assessment tools, forms and templates could be centrally coordinated to avoid duplication of effort and free up resources to work on other initiatives. The collaboration of multi-disciplinary teams could build consensus regarding standardization and implementation of tools and templates that could be shared by all providers and would contribute both to the future standardization of clinical vocabularies and the continuity of care coordination.

4.1.3. Clinical Systems/EMR Software and Vendors

STRENGTHS:

Regions are actively implementing enterprise-wide patient and community care information systems capable of supporting clinical vocabularies. Examples include:

- Calgary Health Region is using Eclipsys Corporation's Sunrise Clinical Manager™ for clinical care, in4tek's Paris™ for community-based care and Orion's Soprano™ for CDM;
- Capital Health is using EpicCare® from Epic Systems Corporation for ambulatory care and Soprano™ for CDM;
- The Regional Shared Health Information Program (RSHIP), a collaborative of the seven rural health regions in Alberta, is using Medical Information Technology Inc. health care information system (MEDITECH) for both clinical and financial purposes; and
- The University Of Calgary Department Of Medicine is using EMIS' EMR system.

Physicians are adopting EMR systems and accessing the EHR in increasing numbers. As of March 31, 2006, the Physician Office System Program had enrolled a total of 3,369 physicians. This represents about 61% of the total estimated eligible physician population. This demonstrates significant progress in automation from only 5% over a period of approximately five years.

A brief email survey of the current VCUR[7] compliant EMR vendors indicates that about 50% of them are planning to include SNOMED CT® in their products.

CHALLENGES:

Most EMRs use natural language; sometimes structured. Natural language is predominantly used throughout the continuity of care, including diagnosis and interventions. As a result, data is difficult to search and to correlate for the purpose of population-based analysis and trending. Although ICPC© is available from some EMR vendors, it is not often used.

Regional enterprise-wide patient care information systems are provided by a variety of vendors, but there are currently few inter-regional or intra-regional interfaces between them. If a patient/client crosses a regional boundary for care - as frequently happens with cancer patients who are usually referred to Alberta Cancer Board (ACB) facilities - their information is not automatically exchanged between the providers of care.

As a result of the numerous automated and manual systems in use in the province, the standardization of data required for an interoperable, province-wide EHR is difficult. Whole scale natural language processing of free text will not be supported in the future as it does not produce comparable results and could introduce a risk of misinterpretation. SNOMED CT® encoding is an opportunity to introduce the same level of information specificity that is provided with free text, but in a way that can be retrieved and processed by automated systems for analysis, research and decision-making.

OPPORTUNITIES:

The opportunity for multi-disciplinary collaboration can be extended to the eHealth software vendors. The work of the VCUR EMR vendors with initiatives such as CDM can be used to showcase results that can be achieved through collaboration. They can help lead the technology changes required for standardization. Other initiatives that will require the participation of vendors include:

- CDM is now using a patient portal which depends on a strong EHR. Standardization of clinical vocabularies will enhance the functionality of the portal. One of the opportunities of a clinical vocabulary is the provision of a “plain language” descriptor to clinical concepts that have medically-oriented preferred terms. The same EHR entry can be presented to a patient in plain language and to another clinician in the standardized clinical language.
- Calgary Health Region is implementing a community care information system using the Paris software. While SNOMED CT®is not currently supported by Paris, the vendor is

[7] Vendor Conformance & Usability Requirements (VCUR) are requirements developed by POSP which vendors must meet in order for a physician, who uses their systems, to qualify for POSP funding.

working towards integration. Paris uses DSM-IV-TR©, and currently Calgary Health Region has a cross-walk defined between ICD-10-CA and DSM-IV-TR©[8].

4.2. Current State - Financial

Through two Clinical Vocabulary Working Group sessions, and a series of direct interviews, the strengths, challenges and opportunities were identified for the financial processes and systems. They are presented in the following sections.

STRENGTHS

Currently, AHW has an experienced team, together with processes and infrastructure that support the various types of health care funding methods in the province.

The Schedule of Medical Benefits (SOMB) is the underpinning of electronically-submitted fee for service claims by physicians' for services provided to Albertans.

Alternative Relationship Programs (ARP) can also electronically submit an equivalent service record of services provided. The remuneration associated is negotiated with trilateral representation.

Furthermore, the province is positioned to make positive changes in methodologies and infrastructure to continue to support health care delivery in the province. It is through this arrangement that the EHR and clinical and clinical vocabulary standards can be successful.

CHALLENGES

Challenges identified within financial systems included:

- There is a separation of the use and purpose between data collected at the point of care and the data required for billing and financial reporting. For claims submission, clinical data is re-coded into a modified version of ICD-9-CM and CCP. While the rationale is tied to data stewardship and trusted use of data, the process is not efficient. The translation can result in less reliable data than that needed for program and business planning.
- Data coded in ICD-9-CA and ICD-10-CA is generally not collected for clinical purposes; but it is used for non-financial and financial secondary uses. For example, data collected through the claims processing system is subsequently used as an important source of data for Primary Care Network business planning and per capita funding.
- Data collected for billing is based on health service encounters, yet the definition of an encounter is not standardized and not equally understood throughout the province.
- There is inconsistent use of ICD-9 and CCP© with respect to inter-provincial billing.

[8] Information provided by the Calgary Health Region after their attendance at a Paris software conference in the UK.

- Data used for payment is abstracted and manually re-coded, often by an individual removed from the clinical service delivery with the clinician having no awareness of or responsibility for the clinical accuracy of the resulting coding. Not only is this an unnecessary manual data process, but it can also reduce the accuracy and specificity of the resulting data which are then processed for billing and for planning purposes.
- Through interviews, it was confirmed that there is a genuine need for concise and comparable data that relates clinical service delivery to financial decision-making. While regional systems have made improvements, there is still a need for continuity and consistency of data to provide comparability of information. Some specific requirements for the use of health care-related financial and statistical information include:
    - Program planning and management;
    - Budgeting and forecasting;
    - Cost analysis (e.g. activity-based costing of clinical/care pathways);
    - Enterprise-wide resource planning and management;
    - Capacity and capability planning;
    - Care delivery patterns as influenced, for example, by geographic area or patient demographics;
    - Comparability and interoperability; and
    - Research.

The diversity in Diagnostic Imaging (DI) data uses and purposes results in inefficiencies. Currently, there are two types of coding of image data - regional and community.

- Community includes public or private.
- The public provider is the current state for clinical vocabulary and workload units. In the private sector billing is done on a fee schedule and clinical vocabulary is customized as required, but in an un-coordinated manner.

The Alberta Society of Radiologists (ASR) uses what is called the X-codes, augmented with a certain number of clinical codes (approximately 200 codes) that can be used for billing. The X-codes are in the Schedule of Medical Benefits (SOMB) and were developed a long time ago for billing. Community providers do not have a standard. Each uses their own codes, and then maps them to X codes. The result is a different way of coding for each private DI service provider.

Furthermore, regions contract radiologists to do the mapping between the Common Procedures Examination List (CPEL) and the X-codes for their local radiology providers, but X-codes are not standardized. For billing, there are two types of Fee-For-Service methods. AHCIP uses Schedule of Medical Benefits, currently based on ICD-9/CPP. Direct billing (i.e. WCB claims) uses the X-codes, and is based on an older version of the Schedule of Medical Benefits.

- There is a lot of diversity in claims and billing for federal patients/clients. The vocabularies used for encoding of federal employees (e.g. RCMP and military), aboriginal populations, and inmates are variable, and depend on where the coding (mainly ICD-9-CA and DSM-IV©) is done.
- The Claims Assessment System (CLASS) has numerous weaknesses. One of the major concerns is that business rules in the invoicing process have evolved over many years. In many cases, the business rules are being applied by a coding or billing clerk in a clinician's environment or even in an off-site location using a service provided by a third-party billing company. What is actually recorded on the claim is the result of that business process, and is not necessarily relevant to, or reflective of, the specific clinical care of the patient/client.
- Since transactions are units of encounters based on service events at the provider level, there is an opportunity to collect data that is consistent and usable across the health care system. If this premise is agreed on, then standardization of data meaning is essential. There are however, concerns raised with this premise. Data stewardship issues and both the purpose and intended use of the information need to be resolved.

OPPORTUNITIES

Some of the key opportunities and the benefits of leveraging these opportunities are presented below:

1. Data could be collected once at the point of care and used in various ways for both primary and secondary purposes. While making changes in process and technology to support this will require substantial effort over a long period, reducing the data stewardship issues in the short term can create many opportunities. The immediate benefit is in the multi-disciplinary and collaborative decision-making on how data can be used for improving the continuity of care. It is through this process that a culture of trust can build and ideas and opportunities for common use of data can grow.

2. Complete the implementation of ICD-10-CA across the province. While this is a significant challenge and data stewardship issues need to be addressed, there is an opportunity to streamline the billing process through the standardization of clinical vocabularies. By using automated translation between SNOMED CT® and ICD-10-CA, claims data could be derived from point of care coding (SNOMED CT®) rather than being re-coded, as it is now.

3. There is an opportunity to use automated business rule processing. Due to technological advances, data can be collected close to the point of care. From there, data can be transformed - by incorporating business rules into the system, rather than into the codes - and moved into the billing process. The information could then be validated or approved by the billing clerk and clinician, before it is sent for payment. In addition, the claims system could also validate according to the corresponding business rules prior to issuing a payment. The greatest benefit is that business rules

can be changed independently from the information that is being collected at the clinical level (by the clinician), with less impact on the clinical setting. This would add flexibility to the claims process and introduce the ability to simulate the effects of business rule changes prior to implementation.

4. The limitations and the purpose of the operation of CLASS need to be understood, but therein lies an opportunity. Since transactions are units of encounters based on service events at the provider level, there is an opportunity to collect data that is consistent and usable across the health care system.

5. There is a perception that changes in the payment process could have a negative impact on provider remuneration. With the opportunity for more usable information, these concerns can be addressed through collaborative definition of requirements, stakeholder involvement and communication. Furthermore, there needs to be a separation between clinical information, specific to a patient/client, and financial information used for payment and funding.

Globally, the opportunity for using common data for both patient care and enterprise-wide decision-making can not be overlooked. According to a report by the Conference Board of Canada[9], there is a need to modernize financial management in government. The report lays out a roadmap for engaging stakeholders in long-term change, and drawing upon quality information. Their recommendation #8 calls for a reduction in transactions and an improvement in systems as one way to create high-quality information. This is consistent with the findings and needs identified through interviews during the course of this project.

4.3. Current State - Administrative/Reporting

It is evident that with changes in the health care system, both pending or in progress, a review of inter-organizational reporting information and processes could be beneficial to the province. Through a CV WG meeting on January 11th, 2007 and through interviews, stakeholders consistently indicated that substantial time and effort is expended on submission and receiving of reports.

There is a general need for more clarity in understanding of the sources and external uses of data and a reduction in the duplication of effort required to submit data. Several stakeholders expressed their concern that external drivers affect internal reporting efforts, but have little relevance or benefit to the internal delivery of care. The data that is collected internally for external purposes are not enough for internal needs, and the costs may be exceeding the benefits.

[9] Conference Board of Canada, "Accountability and the New Role of the CFO, Modernizing Financial Management in Government", October, 2006

Following is a listing of strengths, challenges and opportunities identified for administrative and reporting processes and systems.

STRENGTHS

- **Physician services** - use 'shadow billing' through the claims process and this is considered the best method for measurement. Leverage the work that is being done with the Claims Assessment System (CLASS) renewal initiative.
- **Support for reporting systems** - currently, there are provincial committees and AHW contacts supporting the reporting systems and for external reporting of continuing and long-term care. The intention of creating a single portal with one core team has been raised, but has not yet been addressed provincially. Going forward, consolidation and harmonization are considered essential.
- **Continuing Care Reporting** - Alberta Continuing Care Information System (ACCIS)
    1. Is a web based data collection system developed as a component of the Continuing Care Systems Project (CCSP) which falls within the Policy Branch, Strategic Directions Division, for AHW.
    2. ACCIS was designed and built to receive and validate data from health regions and long term care facilities, to prepare reports for various AHW business areas, to allow access from health regions and facilities for reports and to submit data to two pan-Canadian data collection systems (Continuing Care Reporting System and Home Care Reporting Systems) operated by the Canadian Institute for Health Information (CIHI).
    3. The CCSP business team was created to provide on going support to Regional Health Authorities (RHA's), to assist with communications between RHA's and AHW and to coordinate and monitor implementation plans.
    4. RHA's are implementing comprehensive, standardized assessments and care planning tools to support regional quality improvement and provincial reporting and accountability mechanisms. All nine RHA's have agreed to implement interRAI assessment instruments and adopt new provincial data standards for reporting to AHW.
    5. Currently, the CCSP has several working groups with RHA representation. Networking allows for discussions and working relationships to develop in order to meet the targets of implementation. Working groups share information, coordinate planning and help to develop consensus among the RHA's.
    6. The deployment of ACCIS is dependant upon the implementation of the RAI MDS 2.0 and RAI-HC (interRAI assessment tools licensed in Canada through CIHI) within the nine regions. Implementation has begun in all nine RHA's and is targeted to be complete across the province by December 2007.

CHALLENGES

- **Discharge reporting (DAD)**

  1. Is considered an administrative tool. ICD-10-CA/CCI is used for reporting, but is not useful for output measurements.

  2. CIHI requirements: it was felt these were not always consistent with Alberta requirements. For example, the continuity of care is different between the Alberta's system and what CIHI requires for reporting. Also, there are frequent changes in CIHI requirements and it is burdensome to implement them. In some cases, the business rules related to reporting requirements do not fit within the current process and are difficult to integrate. It should be noted that this challenge has been somewhat balanced with the success of standardization efforts and Alberta's representation at the national steering committee for clinical administrative databases (NCAD) where it has influence on reporting directions and decisions.

  3. For mental health reporting, there is little value if the client is retained for 100 days or more, since DAD only reports the entire episode of care at the time of discharge. Note: a project is currently underway to implement mental health inpatient interval reporting provincially which will fill this gap in information during the long stay mental health patient's hospitalization.

- **Management Information Systems (MIS) reporting** - there is a 'catch-all' component in MIS that reduces the usefulness of the information available for decision making. Also, there is a concern about the validity of the bench-marking that uses MIS data.
- **Ambulatory Care reporting** using the Ambulatory Care Classification System (ACCS):

  1. The ACCS file level is not appropriate for reporting back to clinics, and clinics are not always able to reconcile with their own records. There is not always a correlation between a visit defined in ACCS and what clinics define as a visit. Consequently, the value of this information in the clinic setting is limited.

  2. From an external perspective, there is a reporting 'stovepipe' effect. For example; home care is reported through one system, however if a home care service is done for a Primary Care Network, the service is reported separately. It was noted that that some regional staff struggle with which tool to report through.

- **Continuing Care Reporting:**

  1. Bodies such as Health Information Management Advisory Committee (HIMAC) and the Provincial Ambulatory Care Advisory Group are available for other types of care delivery services, but it is not known what is available for Continuing Care. It was indicated that some support and definition of requirements is currently missing.

  2. InterRAI use and the need for training are growing. Since it has many data elements, it is thought to have a steep learning curve.

- **Waitlist Reporting** - Currently, waitlist reporting uses a modified CCI code, with several procedures rolled together. There is a problem with this, and with the data being captured; such as with the Operating Room system. It is suggested that there is a need for consistency in reporting requirements and that Waitlist Reporting should have a standardized clinical vocabulary working in conjunction with it. Currently, Waitlist Reporting relies on three data sources, along with complexity in the data sources integration. Throughout the regions, waitlist processes and Waitlist Reporting are either completely standardized or in progress. The goal for RSHIP is to have the entire process automated and feeding EMRs at the enterprise level.
- **Mental Health Reporting** - Implementation of new requirements for mental health report submission is in progress. For inpatient, this involves a review of data elements required for DAD, and other data repositories, pertaining to mental health facilities. Inpatient reporting will be required at 90-day intervals, using service and episode data. AHW has selected a vendor to develop a portal, with the plan to implement patient interval reporting by April, 2009. There is a concern that no tool is yet available for capturing relevant data. Also a concern is the difference in reporting formats; for example, between the Continuing Care Information System (CCIS) in Calgary and MACAR for central reporting. Other concerns were raised around this type of reporting and should be followed-up.
- **AHW Data –** currently, AHW has a significant amount of clinical, administrative and financial data, but this data does not meet all the required dimensions of quality. The data may not be fully meeting business needs, and data collection costs to all stakeholders may well exceed the value derived.

OPPORTUNITIES

1. **Physician services –** As regional representatives work with the ARP Sub-Committee on issues of reporting effort and the development of measurable indicators, there is an opportunity to align with the CLASS renewal initiative through a tri-lateral collaborative arrangement.

2. **Discharge reporting (DAD)** – There is a long term opportunity for process improvement. If SNOMED CT® data is used as a reference and is mapped to ICD-10-CA/CCI© central reporting could be more automated. Health information management professionals would then be essential to validate data. Consequently, standardized data with central collection and access is viewed as an opportunity. It was suggested that DAD could be retained for the long term, but needs to be reviewed on a more regular basis.

3. **Ambulatory Care reporting** – The definition of 'episode of care' and 'encounter' should be clarified, along with the related business rules. This work can begin now, and would be re-usable in further standardization activities. Data definition requirements include the format, data-structure and the roll-up structure. Also

required is definition of the clinical vocabulary to be used. The use of Free Text should be discouraged.

4. **Reporting in the Future State** - Data collected at the point of care could also be used to fulfill external reporting requirements when submitted regionally. This assumes the use of sufficiently robust tools, data mapping and automation.

5. **Waitlist Reporting** - It was suggested that people involved with OR be interviewed for opportunities related to standardization of clinical vocabulary with a goal to consolidate to a central point and abstract what is required for external reporting.

6. **Regional Internal Reporting** - In regions various levels of reporting are required and delivered; mostly at the program level. Patient-specific reporting is done at the functional level including: clinical units (case management); clinical incident reporting; and programs e.g. midwifery. Reporting is also done at the management level such as for senior management and high level administration e.g. for planning, resource utilization and decision-making, performance measurement and evaluation, human resources and financial management. One critical area of reporting is performance measurement and quality improvement. For example, Calgary Health Region is analyzing data requirements for measuring at the care pathway level. In the long term, the use of the EHR and a standardization of data is considered valuable for this level of reporting and analysis

7. **General** - data quality and the incentive to submit are higher when the purpose for reporting is understood and there is reciprocation of information exchange. This provides value to the senders and reduces the amount of checking and correcting that is required. As with other standardization recommendations, the first steps are to acknowledge the opportunity to improve the process and coordinate the appropriate stakeholders and initiate a project.

4.4. Stakeholder Readiness Assessment

The stakeholder readiness assessment presented here is based on information gathered during the CV WG working sessions and from the interviews conducted.

4.4.1. Current Readiness

Within Alberta, readiness to implement standardized clinical vocabularies has been limited to specific projects such as Chronic Disease Management (Calgary and Capital), the ACB WebSMR and the University of Calgary's Department of Medicine. General awareness of standardized clinical vocabularies is growing throughout the health care community while some organizations are actively increasing their readiness, for example:

1. The College & Association of Registered Nurses of Alberta (CARNA) indicates that registered nurses and the nursing profession are ready and positioned to take on standardization of clinical vocabularies. There has already been a significant amount of work done across Canada to gain an understanding of how nursing information can be captured. They understand it is important for nurses to be able to retrieve and use the data collected at the point of care. Currently in Alberta, nurses in acute care settings are actively using electronic systems to access patient information at the point of care.

2. CARNA is willing to be a champion along with their various practice leaders. Their position paper[10] cites support for involvement of nurses at all stages of the life cycle of ICT in health and nursing environments: planning, development, adoption, selection, implementation and evaluation of all health information systems that have an impact of the delivery of quality client care and support for participation in data and information management within health-care systems at the local, provincial and national levels.

3. The Health Information Management Association of Alberta (HIMAA) and the Canadian Health Information Management Association (CHIMA) are actively contributing to a North America strategy for eHIM (Electronic Health Information Management). To ensure the HIM Professional is up-to-date, they anticipate that specialty courses can be prepared and ready for delivery more quickly than the three-year curriculum modification period. This will position them for reasonably quick response time to any type of implementation.

4.4.2. Readiness and Capacity Challenges

The general lack of readiness across the province and the lack of capacity in human resources are two of the greatest barriers to implementing standardized clinical vocabularies. Resources (people) are the number one barrier. AHW, the health regions and health care providers have limited capacity to undertake new projects. Other observations that have been made include:

- The priorities in the IM/IT strategy are those that were planned for 2008. However, capacity is a problem for delivery on new initiatives. Therefore, there is a need to assign a weighting factor for the prioritization of a project;
- The implementation of the EHR resulted in capacity problems for a number of organizations. Their staff is already fully utilized. It's not that they do not embrace the concepts or understand their benefits; they simply cannot handle the workload that additional projects impose on them;

[10] College & Association of Registered Nurses of Alberta – Position Statement on the Role of the Registered Nurse in Health Informatics, March 2004.

- Few people or organizations will be engaged or want to participate unless SNOMED CT® and standardized clinical vocabularies are demonstrated to have direct benefits for them;
- If the standardization of clinical vocabularies is done as a project, it will require the dedication of a significant number of people with expertise. AHW will need to hire many of these people or backfill for department staff seconded to the project. They will also need in-house SNOMED CT® and other vocabulary experts. This is also applicable to the regions and clinician participants such as nurses and physicians;
- According to CHIMA, only 20-25 health information management professionals have detailed knowledge of SNOMED CT®;
- Overall, physicians are not ready for change. However, there are some groups of them that are ready to change;
- The older provider population has difficulty with IT changes and many are reluctant to eliminate their paper records; and
- Within AHW, there is a significant amount of activity going on and it would be a challenge to add a new standardization initiative of this magnitude.

5. ENVIRONMENTAL SCAN AND RESEARCH

This section presents external information discovered during the environment scan and research phase of the project. This information influenced the recommendations and the implementation strategy of standardized clinical vocabularies presented later in this report.

Environmental scanning focuses on the identification of emerging trends, best practices, emerging issues, situations, and potential risks that may affect the outcome of the analysis. The information gathered, including the events, trends, and relationships that are external to AHW and the CV WG is provided and used to guide recommendations, decisions and plans for going forward.

A list of references used in the environmental scan is located in *Appendix G – Selected List of References. Further environmental scan information can be found in Appendix H - Environmental Scan and Research*

5.1. Clinical Vocabulary Standards

The research identified that many countries, including Canada, are proceeding with the adoption and implementation of SNOMED CT®. The rationale can be summarized as follows[11]:

5.1.1. The Rationale for SNOMED CT®

Neither a clinical vocabulary nor a classification can, by itself, serve all of the purposes for which health information is currently used or will be used in the future. Vocabularies and classifications are designed for distinctly different purposes and satisfy diverse user data requirements.

Classification systems such as ICD-9 and ICD-10-CA group together similar diseases and organize related entities for easy retrieval. They are typically used for external reporting requirements or other uses where data aggregation is advantageous, such as monitoring resource utilization or processing claims for reimbursement. Classification systems are considered “output” rather than “input” systems, and are not intended or designed for the primary documentation of clinical care. They are inadequate in a core standardized vocabulary role because they lack granularity and fail to define individual clinical concepts and their relationships. They are the most common source of clinical data today and are readily available as a by-product of the health care reimbursement process.

[11] Coordination of SNOMED CT© and ICD-10-CA: Getting the Most out of Electronic Health Record Systems by Sue Bowman, RHIA, CCS, Director of Coding Policy and Compliance, AHIMA. Perspectives in Health Information Management Spring 2005 (May 26, 2005)

Core standardized clinical vocabularies, such as SNOMED CT®, are "input" systems and codify the clinical information captured by a clinician for the EHR during the course of patient care.

Core standardized clinical vocabularies alone are inadequate for secondary uses because of their immense size, considerable granularity, complex hierarchies and lack of reporting rules. The benefits of using a clinical vocabulary such as SNOMED CT® increase exponentially if it is linked to modern, standard classification systems for the purpose of generating health information necessary for secondary uses such as statistical and epidemiological analyses, external reporting requirements, measuring quality of care, monitoring resource utilization and processing claims for reimbursement. The linkage of terms in different systems to extract information for multiple purposes is accomplished through mapping.

5.1.2. Gartner Study – "Linking Needs, Technology and Innovation"

In terms of using technology in the health care system, a research article by Gartner entitled "Linking Needs, Technology and Innovation" (February 2004), is relevant for standardization of clinical vocabularies in Alberta. There is evidence to show that the business view of emerging technologies is changing from a technology-driven "supply side" focus to a needs-driven "demand side" focus. Based on this evidence, the province should move ahead on standardization of clinical vocabularies relative to the demand by clinicians for data that they consider useful in their work. The value to clinical decision-making will drive the technology and reduce the risks of adoption in the longer term. Allowing planning teams, at all levels, to align the demand and the supply of data can enhance and support innovative methods for delivery of health care.

5.1.3. Lessons Learned - EMRs

A CIHI Partnership presentation made in 2005[12] identifies some key lessons learned from New Zealand and the US from adopting and implementing EMR software:

New Zealand: 95% of the physicians are using EMR software (75% send and receive clinical messages such as lab results, DI results, referrals, etc.); 50% are using the Internet on a regular basis including communicating with their patients; technology is used by 75% of all health care sector organizations with over 3 million messages a month exchanged with 95% of these messages in the primary health care sector.

USA: the Department of Veterans Affairs (VA) is using an integrated computer-based medical record in all one hundred and seventy-two (172) VA medical centres. It is integrated with

[12] Lessons To Be Learned from Denmark, New Zealand & USA. CIHI Partnership presentation made by Denis Protti, University of Victoria in Victoria, BC on November 17, 2005.

pharmacy, laboratory, nursing, etc. The impact has been decreased length of stay, reduced clinic visits per patient, few adverse reactions, and decrease costs per patient.

KEY LESSONS LEARNED

The key lessons include:

1. The need for user and system support does not end with the initial implementation;
2. Poor access, reliability or response time are detrimental to success (good IT support is critical);
3. Implementation and ongoing support require a broad team effort; both technology and organizational infrastructure are critical components;
4. Identify common clinical processes as early as possible and standardize computer support – it is much harder to do once systems are in place;
5. Clinical and patient needs must drive the process. Vendors must also be involved;
6. The improvement process is continued - ongoing system modification is critical in continued user acceptance. The return is worth the effort – no one would go back to a paper record; and
7. Strong governance is required to ensure progress and to ensure compliance with standards once they are implemented.

CRITICAL SUCCESS FACTORS

The critical success factors include:

- Top management support;
- Committed clinical champions – including these “in the trenches”;
- Clinicians with experience and/or training in health informatics need to lead implementation;
- Excellent infrastructure and resources;
- Well staffed knowledgeable and a clinical-application coordination support team;
- Institutional commitment and culture; and
- National networking.

5.1.4. Lessons Learned - EHRs

Canada, Australia and England now are well into the process of implementing large-scale EHR initiatives at the cross regional or provincial level. From their experience, eight lessons emerge:[13]

1. **Promote fundamental change industry wide**. A national EHR program requires transformation at all levels of the industry. To this end, Canada has brought together leaders from across government and health care; England is focusing on change management, not simply current NHS practices and Australia is actively involving both public and private sectors.

2. **Engage physicians and clinicians**. Transformation demands that end users participate and contribute their expertise. They need to be involved from the start, as done in England, helping to define requirements and being engaged as champions of change.

3. **Include the vendor community**. All stakeholders need to be involved, not only government and health care entities but also vendors. Canada and England have vendor management strategies in place, while Australia is still exploring related issues.

4. **Adopt standards for interoperability**. Although early leaders may have benefited from having a national health service or a single payor, standards are no longer the sticking point they once were. We need to make interoperability between EHRs a top priority. It will not happen just because standards are "out there."

5. **Build a critical mass of users**. A national EHR program has to offer technology solutions that meet its users' needs. Whatever the solution, its success depends on having a critical mass of users. Physicians need to have network access and computer systems in their offices - and not all physicians do.

6. **Protect privacy**. Commercially available technologies can address privacy and security, but only once requirements are set, policy is defined and legislation passed. Open discussion of issues such as patient confidentiality and unique personal identifiers is a must. There are no easy answers.

7. **Communicate.** Because national EHR programs are closely scrutinized and often politicized, every initiative needs to develop communication and knowledge-sharing approaches to keep its stakeholders informed. These can range from public web sites and newsletters to password-protected sites, online forums and workshops.

[13] Spanning the Globe: A look at EHR projects in other countries may provide a roadmap for initiatives here at home. Marion Ball, Ed.D., and Walter Wieners. From http://www.health care-informatics.com/issues/2006/04/48/ - April 2006

8. **Customize strategies**. There is tremendous variability in the use of health information technology within countries, across regions and political jurisdictions and among sectors (e.g., acute versus ambulatory). Because no single size fits all, national EHR programs must customize strategies for investment and deployment.

Two common threads run through these eight lessons. First, funding is crucial. The investments needed are large - larger than were imagined - and extend to the simplest of acts. An example is ensuring that every clinician's office has a computer and an Internet connection. Secondly, people count. Each and every one of the eight lessons-learned depends upon acknowledging and effectively managing human factors. It is important to understand behaviors and beliefs, both as individuals and as members of groups and through the perspective of both the patient/client and the care-giver. This requires careful change management strategies that engage stakeholders from every sector and actively listening to matters important to them.

Helping people that will use the EHR understand the benefit is critical in smoothing the path to its adoption.

5.2. Clinical Software

An increasing number of clinical information system vendors are moving towards supporting SNOMED CT®. The term "supporting" is sometimes used somewhat loosely, and the degree to which the SNOMED CT® is integrated within the products varies greatly; nonetheless, positive movement in this direction is clear.

The province is well positioned in this regard. Products from Eclipsys Corporation, Epic Systems Corporation, In4tek Limited, Medical Information Technology Inc. (MEDITECH) and Orion Systems Limited are playing increasingly important roles within the Calgary Health Region, Capital Health and the RSHIP health regions. All these products support SNOMED CT® to a greater or lesser degree.

From an EMR perspective, the direction is far less clear. While the internationally-based EMR vendors are responding to the direction, Canadian vendors are currently more guarded in their plans. For instance, initial information received from the EMR vendors active in Alberta indicates that they are waiting for some conditions to be in place before they will actively pursue incorporating SNOMED CT® into their products. These conditions include:

- Approval of vocabulary standards;
- Resolution of licensing issues with SNOMED CT®[14]; and

[14] Canada Health *Infoway*, as part of its Standards collaboration and co-ordination mandate, has contributed Canada's share to the establishment of an International Health Terminology Standards Development Organization (IHTSDO) and IHTSDO's acquisition of SNOMED intellectual property. *Infoway* is also expected to assume the cost for the annual fees to the IHTSDO.

- Completion of appropriate changes to VCUR requirements.

While they do not seem to believe that the updates required to their software will be a bottleneck to adoption and implementation in the province, there is clear evidence that a number of them are being increasingly challenged to maintain the development schedules provincial activities are demanding.

5.3. Health Care Financial Practices and Initiatives

This section presents some emerging financial practices in health care and identifies one of the critical financial projects being undertaken by AHW.

5.3.1. Claims Assessment System (CLASS) Renewal

The Alberta Health "Program Services - Legacy Renewal Initiative" includes a strategy and plan to develop a new version of the CLASS This system was originally designed to process payments on fee-for-service claim submissions. With the implementation of Alternate Relationship Plans (ARP) in Alberta, its use was expanded to collect shadow-billing data for reporting purposes. Recently, CLASS was formally enhanced to support Per Capita funding and business planning for Primary Care Networks (PCN).

It is evident that there is a need to better understand patient/client population demographics, service types, delivery locations, patterns and other types of information. In addition, due to its shadow-billing functionality and the request by PCNs for more reporting, CLASS is now accepting some data from Allied Providers across functions. The expanded functionality of CLASS demonstrates the growing need for the service event aggregate information it provides. Consequently, the CLASS renewal strategy is intended to address the requirement for information that will better support health care program planning, funding and decision-making, at all levels, and across practices and disciplines in the province.

The CLASS renewal initiative depends on decisions related to the scope and nature of standardization, and consequently, planning will depend on whether the recommendations in this Final Report are adopted.

5.3.2. Activity-Based Costing

Through the meetings of the working group, and through research on best practices in accounting for health care, several issues and opportunities are presented here. One key issue is the difficulty for organizational units, beyond an individual practitioner or a single facility, to determine the cost of health care activities. These organizations include PCNs, programs, regions and the province. For example, it is currently impossible to track the cost of managing an individual patient with a chronic disease. Costing of case management, health care programs and clinical care pathways is important. It provides evidence and supports funding

decisions, resource allocation, planning, budgeting and evaluation. Regional cost accounting is improving through the implementation of enterprise-wide health information systems. However, there is still an information shortage for specific health care activities or programs, spanning organizations (enterprise) and timeframes (trend). A means to capture costing data, along with standardization of clinical care process and data definitions within an EHR, is essential in the longer term.

Activity Based Costing (ABC) is an accounting methodology that could offer a solution to health care information needs. It is a method of allocating costs to products or services and is generally used as a tool for planning, monitoring and evaluation. Along with monetary costs, relevant statistical measures are tracked. Feedback is then made available to the right people on a timely and relevant basis. As a result, activity-based information is both intuitive and logical. It makes sense to those charged with the responsibility for improving outcomes. At the same time, it provides feedback on the resources consumed to achieve the outcomes. It was developed as an approach to address problems associated with traditional cost management systems that either reported inaccurate costs or information deemed to be irrelevant for operational decision-making. With these information deficiencies, managers are at risk of making ill-informed decisions. Essentially, ABC allows for a more detailed and relevant cost model by associating costs with activities, based on the resources they consume. ABC, especially when combined with value-added analysis and other tools (e.g. Balanced Scorecard), can support continuous improvement and provide better understanding of the interrelationships in the various health care activities.

In Alberta, ABC is only feasible if details of both clinical care and resources consumed are first captured consistently at a detailed person-specific level, and then aggregated for program and resource allocation decisions. Changes to accounting practice, and eventually, appropriate software would be needed. With this in place, successful evaluation of health care delivery can be retrospective or prospective. For example, both the historical cost of a service and the potential cost of a service choice could be compared. Consequently, health programs and clinical processes could be evaluated for cost-effectiveness retrospectively and with confidence. In order to change practice such that a clinical choice adds cost as a criterion, and then cost advice needs to be made available at the point of the clinical decision.

SNOMED CT® is a vocabulary that supports sufficiently detailed clinical-coded concepts that could be used for clinical activity-based costing. The following is an outline of steps that might be taken to implement ABC in Alberta:

1. Identify the information needs, such as for:
    - Evaluating the cost implications of alternative clinical pathway;.
    - Streamlining care delivery practices across the care continuum;
    - Decision-making regarding management levels and spans of control;
    - Enhancing staff utilization by time of day; and

- Resourcing consolidated departments or deployed functions.

2. Clearly define the processes for service delivery within the different health care types. For each process, define the process drivers, the inputs (e.g. time and resources), activities, outputs and expected outcomes. For each process activity, identify measures that can be tracked and associated with costs. Tie activities into the core standardized vocabulary (i.e. SNOMED CT®) concepts.

3. Design the ABC model for patient/client-specific care delivery practices. Focus on the high priority processes (80/20 principle). Include benchmarks for standards, based on different alternative care delivery approaches and scenarios. Ensure the clinicians and supporting staff understands the intent through proper communications and participate in the development process, as required.

4. Adapt the ABC model to the accounting system available

An ABC approach to costing could add value to adoption and eventual implementation of SNOMED CT®. Activity Based Costing should be investigated. On a provincial basis, it is recommended that both the IM/IT strategy and the CLASS renewal project incorporate the definition of requirements, identification of opportunities, and recommendations through their respective initiatives.

5.4. Costs and Benefits

Two studies on the topic of the economic benefits of electronic health records and eHealth solutions come from the US and a group of 10 European countries. Each study concludes that the benefits exceed the costs in the long run although not all of the benefits can be quantified in financial terms. The key findings are presented below.

5.4.1. US-based Report

The US-based report [15] provides important insight into the costs and benefits of health information technology (HIT). Although its focus is on ambulatory care and reflects health care in the U.S., it conclusions are still valid:

> "Demonstrated improvements in provider performance when clinical information management and decision support tools were made available within an EHR system, particularly when the EHRs had the capacity to store data with high fidelity, to make those data readily accessible, and to help translate them into context-specific information that can empower providers in their work."

[15] Costs and Benefits of Health Information Technology. April, 2006. Produced for the U.S. Department of Health and Human Services, Agency for Healthcare Research and Quality (AHRQ).

The report indicated that all cost-benefit analyses predicted substantial savings from the EHR implementation, including health care information exchange and interoperability. The quantifiable benefits are projected to outweigh the investment costs; however, predicted time to beak-even varied between three to 13 years. Some cost and benefit excerpts from that report include:

- Not all cost and benefits when implementing or making changes are financial.
- Many of the costs (and benefits) of EHR will change over the years, because they depend on the changing price of such factors as hardware, software, labour (employee and contract), and pharmaceuticals and medical devices. Cost relevance is a consideration.
- Private organizations, not-for-profit organizations, and government view cost vs. benefit differently. Return on Investment is different from societal cost-benefit analysis, which is often reported in clinical journals. There is a potential for a mismatch between who pays for and who accrues costs savings from health information technology use.
- Any HIT investment has immediate costs in purchase, adaptation to the local organization (implementation costs), and staff training. The easiest financial benefit to understand is the impact on costs per patient. It is assumed that HIT can reduce the waste involved in collecting information and getting it to where it is needed for better decision-making. This increase in efficiency can streamline health care and billing processes, and avoid the costs of unnecessary services, and of dealing with errors, both in patient care and in billing. An intangible benefit can be found in the high quality organizations through retention and improved motivation of health care providers.
- Funding and what expenses a health care organization can impact the level in the quality of care achieved.
- The following four components in an implementation: technical, human, project management and organizational/cultural change. Effective communication is important across all of these components; hence, the related costs must be considered.
- Costs of an EHR system can be divided into two categories: (1) cost of the system itself (hardware, software, license, maintenance and support, and (2) implementation cost (training, impact on productivity, process re-design, conversion, testing etc.). The costs vary significantly by the scale of the organization and the functionality of the EHR system.
- Implementing an EHR system requires extensive changes in the organizational processes, individual behaviours and the interactions between the two. These costs are not well understood, and are difficult to quantify.
- Both cost and benefit of attaining interoperability among EHR systems are directly proportional to the level of data exchange achieved. For example, the

cost of achieving machine-organized (Level 3) or machine-interoperable (Level 4) interoperability is the greatest, but it offers the most potential for increased efficiency, improved health care utilization and reduction of costs.

- There is some empirical evidence to support the positive economic value of an EHR system and the component parts of EHRs. However, realizing the projected benefit will require proper alignment of the health care financing (funding) system, strong leadership, effective implementation strategies, and focused efforts to successfully adapt the EHR system.

5.4.2. European Study

The European report[16] is an impact study that reinforced the benefits of information and communication technology in routine health care settings. While the costs and benefits for implementing a core standardized clinical vocabulary are not presented separately in this study, the success factors and lessons learned are useful for Alberta. Key findings include:

- **Process change and benefit realization**: Neither information and communication technology applications, nor information by itself bring benefits. The gains in all ten European sites come from changes in processes or working practices, being more substantial than merely replacing paper with an electronic document. Examples are: a different information flow; more appropriate information; less, but better focused information; faster access to the information; and a different form and structure of the presentation of the information.
- **The importance of multidisciplinary teams** – a critical success factor involves teams in planning development, implementation and operation of eHealth applications.
- **eHealth dynamic** – the successful approach to implementation is a pragmatic series of steps and developments. In the European sites, there was a clear vision of long-term goals, but usually not a fixed long-term strategy towards these goals.
- **Meeting concrete needs** – investments were focused on addressing well-defined needs, either of citizens or related to the process of health and health care provision. This comes through either problem-solving/requirement or through process optimization.
- **Project and Change Management** – For each type of site, the nature of the health application and the health care setting determine the type of change management goals. For managing the costs of implementation, it was also found that when resources were deployed over a long period of time, and were

[16] eHealth is Worth it", Karl A. Stroetmann, Tom Jones, Alexander Dobrev and Veli. N Stroetmann, an impact study financed by the European Commission, August, 2006

somewhat removed from the health care setting, more project management was required. Conversely, when solutions had considerable and direct benefit to stakeholders, the marginal cost was lower since utilization increases sharply.

- **Transferability of applications** – costs can be reduced through standardization, as knowledge is more easily shared, the benefits more easily seen and learning is quicker.

5.4.3. NEHTA Approach

A recent article[17] published by the National e-Health Transition Authority (NEHTA) of Australia presents a detailed approach on how it proposes to measure the costs and associated benefits of its national health care standardization initiative. The quantifiable benefits expected from the implementation of NEHTA's interoperability framework and services oriented architecture includes:

- Reductions in messaging costs between health care providers; and
- Reductions in the cost of implementing new shared information services, primarily due to reductions in the costs of developing interfaces between new services and legacy systems.

However, just as important are the non-quantifiable benefits, including:

- Improved reliability of message delivery (the correct message about the correct health consumer to the correct provider); and
- Improved message security, tracking and preservation of health consumer privacy.

Investment in clinical document specifications and vocabularies will result in significant benefits in the efficiency of handling referrals, medication lists and investigation orders and results. Prescription messaging and dispensing notifications back to prescribers are expected to result in significant improvement in patient adherence to prescribed medications, a major barrier to the effective use of medications.

The modeling of benefits associated with the shared electronic health record will focus primarily upon benefits associated with supported self management of chronic conditions in younger health consumers in the community setting as a substitute for 'in person' consultations and in the shared care planning of older health consumers with multiple and complex chronic illnesses who are heavy consumers of acute health care services.

[17] Paths to Benefits: NEHTA's Approach to Modelling the Benefits of Investment in National e-Health Infrastructure. Version 1.0; August, 2006.

5.4.4. Conversion to ICD-10-CA

It was hypothesized that ICD-10-CA implementations could be used as benchmarks for implementation of a core standardized clinical vocabulary. However, it was discovered that the two initiatives are different, and that caution is advised when making comparisons.

Two articles related to ICD-10-CA implementations are discussed here. The first article was written through American Health Information Management Association, and provides a checklist for ICD-10-CA conversions on a 5-year time frame, including expected costs. Following is a summary of findings from that research:

- **Year 1** - most of the costs are incurred in strategic planning and team formation, and stakeholder communication and education.
- **Year 2** - the major cost is in preparing for changes to information systems and in training of clinicians and coders.
- **Year 3** - information systems are changed, documentation practices are finalized and there is increased education to coders.
- **Year 4** - system changes are finalized, claims transactions are tested, coding accuracy is monitored and education to coders is intensified.
- **Year 5** - post implementation activities consist of monitoring coding accuracy, re-imbursement impacts, coding productivity and continuing with coder training.

The second article is the ICD-10-CA/CCI implementation in Alberta, entitled 'Cost Impact and Implementation Strategy Report'[18]. The article provides estimations, and presents an approach; however, the actual costs were not tracked making it difficult to corroborate. Also, since the step-by-step approach recommended in this Final Report is different from the "big bang" approach used in the ICD-10-CA/CCI, comparisons would be only speculative at this time.

Consequently, the best approach for the initial stages of standardization is to use a zero-base[19] approach, tied to existing Electronic Health Record or IM/IT initiatives and up to a period of approximately 1 to 3 years.

[18] Information Management Branch, Health Information and Accountability, September 13, 2000

[19] Zero-Base approach: used in reference to budgeting it means that each item in the budget must be justified and costed each time the budget is set. In terms of our thinking and our actions it means that we must constantly exercise our self-critical capacity to ensure we are on solid foundations

5.5. Change Management

Projects that change how people do their jobs have inherent change management risks. When change management is not applied, or applied ineffectively, projects do not achieve their objectives.

5.5.1. Why Change Initiatives Fail

Most organizations around the world are trying to make some kind of significant change. Some are successful many are not. Why do organizations fail in their change initiatives? The following 10 reasons[20] provide a glimpse as to why change initiatives fail. Each of these reasons must be addressed as the province moves forward with standardization:

1. There is no clear framework for this change, which involves answers to the essential questions:
   - Why is this change necessary?
   - What is at stake if we do not change? and
   - Where are we going?
2. Communication, at its best, is one-way, top-down, and likely to come in the form of memos or announcements via email, fax or letter.
3. There has been nothing done to clarify what is over and help people disengage from the old ways of doing things, get through and capitalize on the chaos and confusion, and ensure the new ways of doing things become fully engaged throughout the organization.
4. Middle and lower levels have not been adequately engaged in terms of commitment, involvement and responsibility in making this change work.
5. The senior leadership is neither on the same page, headed in the same direction, nor working in a strong, coordinated manner.
6. It is not clear exactly who is responsible for doing what, by when, in the planning and implementation of the change.
7. There is a strong old guard component in the organization that has a vested interest in keeping things as they are
8. There is no clear link between what needs to change at the micro individual level and the macro organizational level.

[20] Guiding Organizational Change in the 21st Century, ©2002. Chris Edgelow /Sundance Consulting. Based on work by William Bridges.

9. There are so many change initiatives going on at the same time, no one is quite sure which one, if any, to take seriously.

10. The organization continues to make the consistently familiar mistakes it has made in past changes because of its 'culture', 'character', or 'the unspoken way we do things around here'.

5.5.2. Critical Success Factors

Using the top ten reasons above, critical success factors can be defined for any change. The following factors are considered critical when undertaking any change:

- **Leadership** - strong executive sponsorship and commitment to the project is mandatory. The project's sponsor must encourage the project participants to be creative and think outside the box. They must be willing to consider any new idea.
- **Limits** - do not set limits. Any attempts to set limits or preserve a piece of the old system will result in failure. Everything must be on the table.
- **Performance Measures** – performance goals must be established. By establishing specific, measurable goals and measuring before and after, the project has the best opportunity for success.
- **Quick Wins** – you must show quick, tangible results or you will lose momentum and support. Stay focused, and narrow the scope if necessary in order to get results quickly. In addition, do not spend a lot of time analyzing the current situation.
- **Commitment** – the team of people dedicated to the project must be available from initiation through implementation. They must have commitment to fulfill the responsibilities assigned to them during the project.
- **Active participation** - by all members of Steering Committees and Working Teams. They must be prepared to roll up their sleeves and work.
- **Communications** – effective communications amongst all project participants and amongst the project participants and their peers in the organization.
- **Effective change management** – the project must take into consideration the personal needs of the individuals affected. The new process must offer benefit to the people involved. Transition from the old to the new must be made with great sensitivity, full support and appropriate training and career development.

Any project that does not have all of these factors in place should be assessed for its risk of failure before proceeding any further. Additional information on change and transition management may be found in *Appendix I - Change and Transition Management.*

5.5.3. The Impact of Human Factors on Success

The three human factors[21] that impact to what degree a project is successful are the speed of adoption, the ultimate utilization and the proficiency of those being impacted by the change. The expected speed of adoption, ultimate utilization and proficiency contribute to the return on investment (ROI) that the project expects to realize. Effective change management enables projects to deliver on, or even exceed, these expectations and thus contributes directly to the ROI of the project. Even if a project has a good solution and good project management, it will not meet its objectives if the people side of the change is not managed.

Speed of adoption: Speed of adoption is how **quickly** employees begin using the new process, system, technology or tools your change introduces. It is how quickly people adopt their new roles and demonstrate the new skills and behaviors required by a change.

Ultimate utilization: Ultimate utilization is like the **participation** rate - how many are engaged and practicing the 'new way of doing things' created by the project or initiative. In most changes, people can opt-out of the new way of doing things, whether you believe it or not.

Proficiency: Proficiency is the factor related to how **effective** people are when they do implement the change. It is the ongoing improvement to the organization when new processes, systems, tools, organizational structures and job roles are implemented by a project. Examples of proficiency include: the time saved to conduct a particular operation by using a new system, the amount of waste reduced by streamlining a process. Proficiency is often the basis for return on investment calculations made to support a particular change or initiative.

5.6. Environmental Scan Conclusion

The key learnings from the environmental scan and research are as follows:

1. Many countries, including the UK, Denmark, Australia and New Zealand, are proceeding with the adoption and implementation of SNOMED CT® even though there is little empirical data to support any formal financial return on investment. The work is being undertaken as an investment in the infrastructure to support the shared health record across multi-disciplinary providers.
2. Return on investment is very different for a government-sponsored social program such as health care. Not all benefits when implementing or making changes are financial.

[21] A Discussion of how change management delivers project ROI. © Prosci 2006. www.change-management.com

3. Many of the costs (and benefits) of EHR will change over the years, because they depend on the changing prices of hardware, software, labour (employee and contract), and pharmaceuticals and medical devices. Cost relevance is an important consideration.

4. Research shows that the key to end-user usefulness and adoption is taking a step-by-step approach to implementation. A gradual and incremental approach to system implementation leads to more sustainable use and leads to less tension and stress for end-users. For the adoption and implementation of SNOMED CT® or other standardized clinical vocabularies, this incremental approach will be critical for success.

5. Participation by multi-disciplinary teams, including both clinical and vendor communities, is key to collaboration, consensus-building, understanding and adoption of technologies and clinical vocabularies.

Careful attention to communication, change management and the use of multi-disciplinary advisory groups are critical to the success of adoption and implementation of clinical vocabularies and systems. These components also require a significant effort be invested throughout the implementation process – from initial consultations through to actual implementation and beyond to reinforce the standards and consistent use.

6. DESIRED FUTURE STATE

This section presents a vision for what will be fully operational and in production in 10 years. The future state means:

1. Full interoperability of systems;
2. The ability to transfer data between providers with both sender and receiver sharing a common understanding of the meaning;
3. The primary data coded to clinical terms is classified and available for secondary purposes, including finance, statistics and research;
4. The data is collected once using a clinical vocabulary at the point of care, and made available for multiple uses in a coordinated manner; and
5. Redundancy and duplication of data are eliminated.

For this vision to be realized, clinical content, process design and IT infrastructure need to converge.

6.1. Alberta's Vision for Standardization Clinical Documentation using Standardized Clinical Vocabularies – A 10-year Horizon

There is a need and an opportunity to integrate care provided by a number of health care communities through the standardization of clinical documentation using standardized clinical vocabulary. Ultimately, the goal is to develop a life-long health record that contains a summary of a patient or client's health information that can be processed by either a human or a computer. To achieve this, clinical content from all health care providers will be captured electronically. It will concisely provide the ability to produce a written record of the care provided. [22]

In the future state, clinical documentation is stored in an encoded format used to capture the conceptual representation of the clinician's findings, judgment and actions. It is machine readable and can be retrieved and converted into a format that is understood by either the provider or the patient/client receiving the care. It is necessary to capture the concepts before the knowledge can be represented. This lays the foundation for knowledge management in the longer term.

Coded clinical data, for highly complex clinical concepts, could be translated (using a terminology server) to make it available in simpler terms, and to include the patient or lay care giver (i.e. spouse or parent) as part of the care team. Patients can then provide feedback

[22] Note: in this assumption, graphics or audio information related to the patient or client's care is separate.

on their own outcomes, such as medication response and adverse reactions. The same data will be available and shared with everyone involved in the patient's record, including the patient using terms each understands.

There will be an opportunity to help clinicians gain insight or interpret variances in assessment information that facilitate diagnosis or patient outcomes. This process gives the clinician an opportunity to make a clinical judgment, and then validate against clinical practice guidelines. It still allows clinicians to override clinical practice guidelines and exercise their own judgment. This process also provides a means to provide feedback for improving guidelines.

Not only is there a need to sustain current health care capabilities, but new discoveries and practices will need to be supported. For example, recent advances in genomics are bringing about a revolution in our understanding of the mechanisms of disease cellular level, including the complex interplay of genetic and environmental factors. Genomics is also stimulating the discovery of breakthrough health care products by revealing new biological targets for drug development and by giving scientists innovative ways to design new drugs, vaccines and DNA diagnostics.

Other opportunities include:

- **Local cost savings** - due to reduction in the cost of medical records and rising cost of floor space for record storage and human resources, there is a theoretical cost saving by shifting to less paper and collecting data once. This is a benefit for merely automating locally, despite the benefit across the broader health care system. A related benefit that is difficult to quantify is the availability of information where and when it is needed by appropriate providers.
- **Self-managing skill-set development and training -** It is acknowledged that a prerequisite to standardizing clinical vocabularies is standardizing the assessment tools used. The opportunity is that by working together, subject matter experts inherently gain knowledge and expertise related to the tools, processes and new vocabularies (such as SNOMED CT®) that will be implemented in the workplace.

6.2. Different Standardized Clinical Vocabularies for Different Purposes

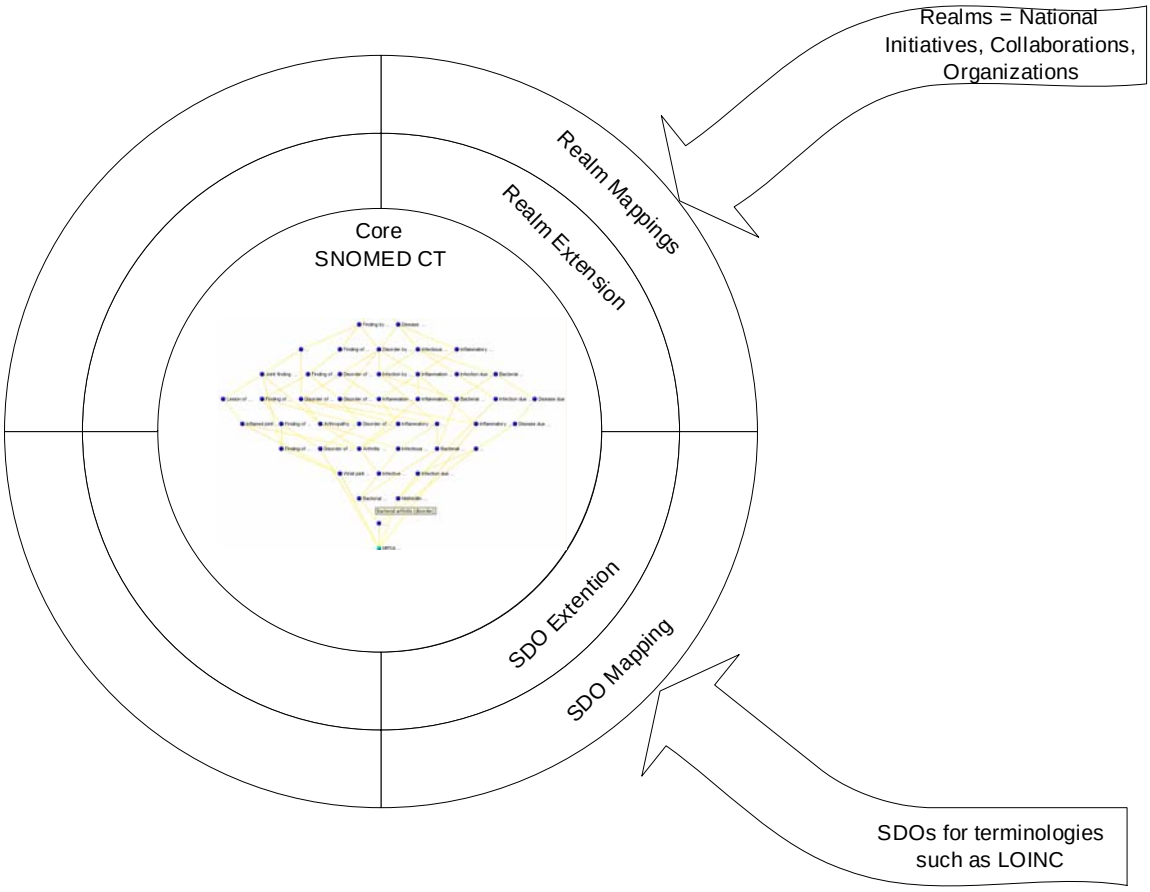
Standardized clinical vocabularies, or standardized ways to describe and share clinical information, are most effective when they are implemented for the purpose for which they were developed. A single vocabulary will not meet the needs of all users for all the various types of health care information such as clinical, financial, administrative and research. The degree of specificity of coded information required for each of these purposes is different. For example, a provincial funding formula would not be effective if it was based on 350,000 different terms typically found in a core reference clinical vocabulary; nor would a physician be able to record clinical information regarding their patient in an EHR using the very generic codes found in a Case Mix Group.

The provincial EHR vocabulary requirements are at the core reference clinical vocabulary level to meet the needs all of care providers. When providing care to patients, providers need to express clinical information at the level of detail appropriate to their discipline and setting. The same clinical topic can be expressed in general terms or in highly specific terms understood only by specialists in the field. There are varying specific subsets of terms in a core reference clinical vocabulary such as SNOMED CT® which spans all disciplines and health care settings. The Interface Vocabularies or specific subsets of the core reference vocabulary are sometimes preferred for the point of care applications, tuned to the care setting and discipline of the participating clinicians.

The challenge for Alberta will be to:

- Standardize on a small and specific suite of point of care clinical vocabularies such as ICPC©, ICNP®, LOINC® and DSM IV©; to support primary care, nursing, lab and mental health respectively;
- Use a consistent sub-set of specialty oriented concepts drawn from SNOMED CT® for specialty care settings;
- Use consistency in whichever clinical vocabulary selected. The usability of applications and the standardization of expected clinical documentation can aid in this objective; and
- Restrict local modifications to the selected standardized clinical vocabularies, but be responsive in keeping the vocabularies current. To do this, actively participating in the national and international initiatives associated with the various Standards Development Organizations that support the selected standardized clinical vocabularies.

The reason for the restriction is that each selected standardized clinical vocabulary would need to be mapped to SNOMED CT® to ensure that new concepts remain congruent with, or are included in the core standardized reference vocabulary (i.e. SNOMED CT®). Mapping initiatives are underway for many of the interface clinical vocabularies. The following figure illustrates how the various standardized clinical vocabularies are creating converging and aligned meaning.

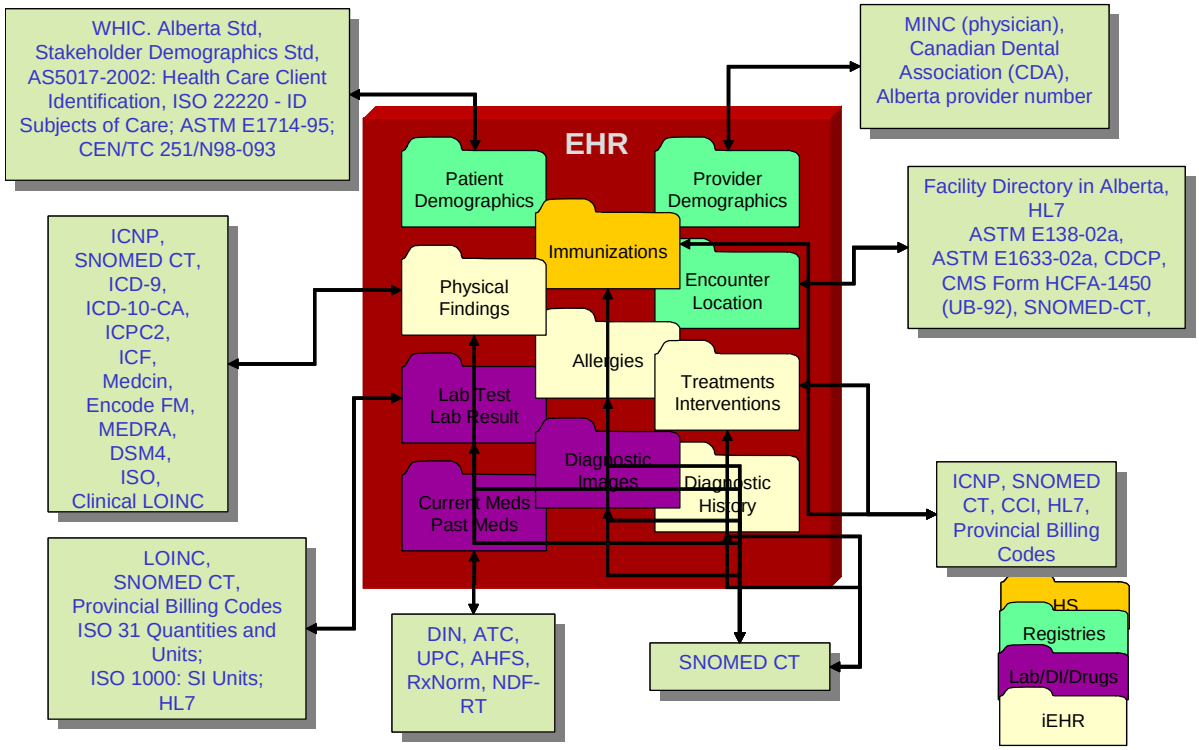


SNOMED CT® provides not only a large number of highly specialized medical concepts, but also includes the relationships among them. This allows computers to use those relationships to recognize that clinical conditions with different names are essentially variants of a single disease process or clinical concepts. The definition process used by the SNOMED CT® International requires new concepts to be rigorously defined in terms of relationships of more atomic concepts in the core SNOMED CT®. Synonyms are permitted and alterative human languages can have their terms related to the same medical concepts. It is this highly formal process that allows automated translations between properly defined SNOMED CT® terms and properly mapped codes within another standardized clinical vocabulary (i.e. ICPC, LOINC® or ICNP®)

Any conversion of additional programs or applications to ICD-10-CA without an intermediate implementation of SNOMED CT® is only postponing SNOMED CT® and increasing the resistance to move to direct clinical encoding. Introducing SNOMED CT® as a means to achieving ICD-10-CA for reporting is preferred, especially with the renewal of Claims Assessment Systems (CLASS). ICD-10-CA is currently implemented for acute care and hospital based ambulatory care through their existing reporting processes. These processes can remain in place until alternate automated processes are demonstrably successful.

6.3. Current State Model

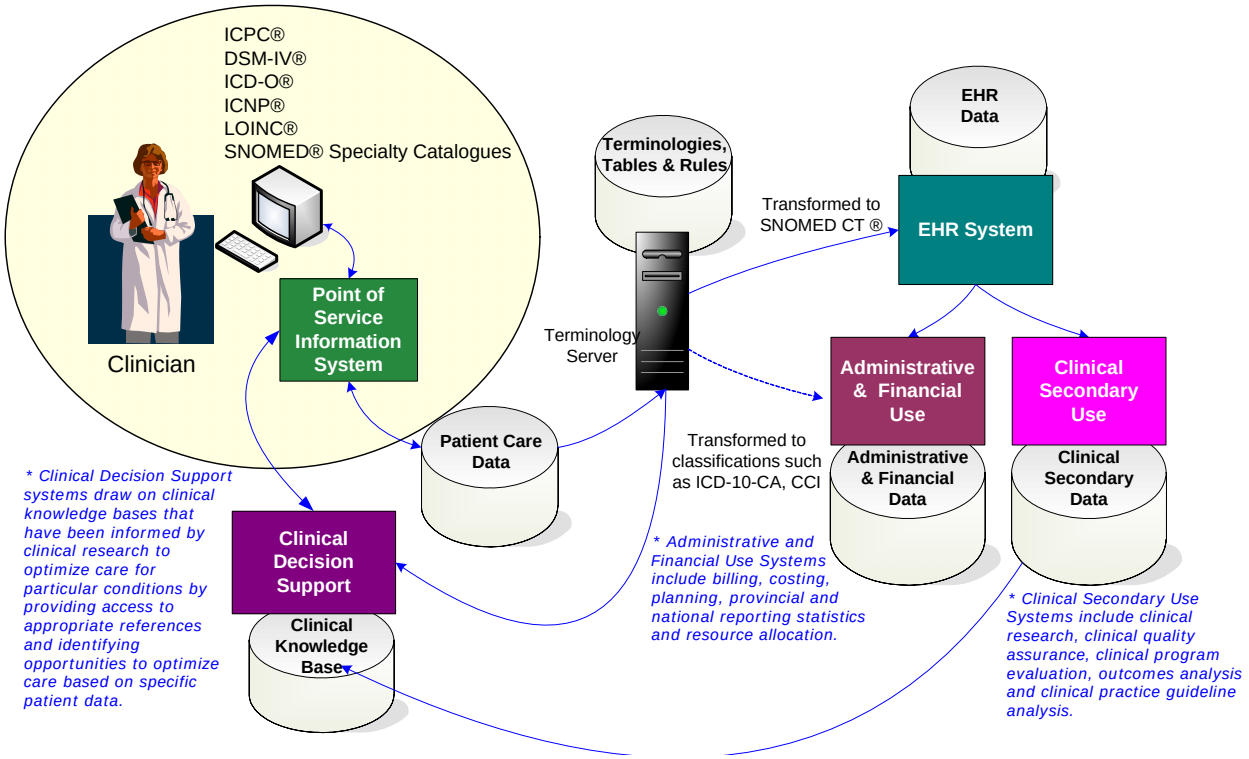
The current situation within Alberta is similar to the following illustration[23]:



[23] Canada Health Infoway http://knowledge.infoway-inforoute.ca/ar/art/artefact.aspx?id=2265478_SNOMED_CT_for_the_pan-Cdn_EHR-_Overview_20060331a[1]

6.4. Future State Model

The future state model is illustrated below:



"Transformation" is expected to be an automated function, either provided within the point of care application or by an automated interface "mapping" service in the Terminology Server. It is not expected to be a manual coding process.

Data capture at the point of care should be at a level of specificity, and in a clinical vocabulary familiar to the clinicians, for that care setting. Patients/Clients become part of the care team since appropriate views of their information can be produced in simplified medical terms, without the essential meaning being "lost in the translation". Data collected at source should be at an appropriate level of detail for the specific clinical purpose. It should use an interface vocabulary, which can be a subset of the SNOMED CT® core standardized clinical vocabulary, or a care-setting specific one (such as ICPC, DSM-IV or ICNP®) that is mapped to the core standardized clinical vocabulary. If additional data is needed to apply encoding rules for a different code system, that data should either be already available in the application or should be captured at the same time. For example, a patient's age or gender or weight is often included in documentation of a clinical activity. It is the core standardized reference vocabulary encoding that is sent to the Electronic Health Record application. It is encoded concepts specific to the patient, in the most systematic structure, which enables reliable automated translations and transformations.

For Secondary use purposes, a transformation into the appropriate classification is done using both the data captured at source and the related rules, as applicable. Secondary Use processes should have specific data stewardship agreements in place to govern further end use of the data.

Automated Clinical Decision Support applications can make the ever growing body of clinical knowledge readily available to the clinician at the point where clinical decisions are being made (i.e. point of care). Research has demonstrated that this level of application sophistication is what truly delivers the promise of improved patient outcomes. It is not the automated solution itself that produces the benefits, but also the standardization of documentation and streamlining of care workflow that contributes to the benefits[24] of improved patient care and safety. In addition to better outcomes, the dissemination of confirmed advances in knowledge can also be optimized. A recent quote is illustrative - "In the current health care system, scientific knowledge about best care is not applied systematically or expeditiously to clinical practice. An average of about 17 years is required for new knowledge generated by randomized controlled trials to be incorporated into practice, and even then application is highly uneven (Balas and Boren, 2000)"[25] This does not remove the expectation that the clinician is the most knowledgeable about the situation at hand, and is in the best position to use clinical judgment to optimize care. It does provide the opportunity to ensure the actual experience of providing care is fed back into the knowledge development process to produce an effective feedback loop.

The following three models identify the specific processes that will be needed to make this future state a reality.

[24] Electronic Healthcare Volume5 Number 3 – Sharpening the Case for Returns on Investment form Clinical Information Systems

[25] Crossing the Quality Chasm: A New Health System for the 21st Century (2001)

Figure 1 illustrates how a clinician interacts with the (1) point of care application (2) the consolidated Electronic Health Record application for clinical information sharing (3) an automated Clinical Decision Support Application and (4) the Terminology Service which mediates between the various views and specificity of language used at different points in the health care system.

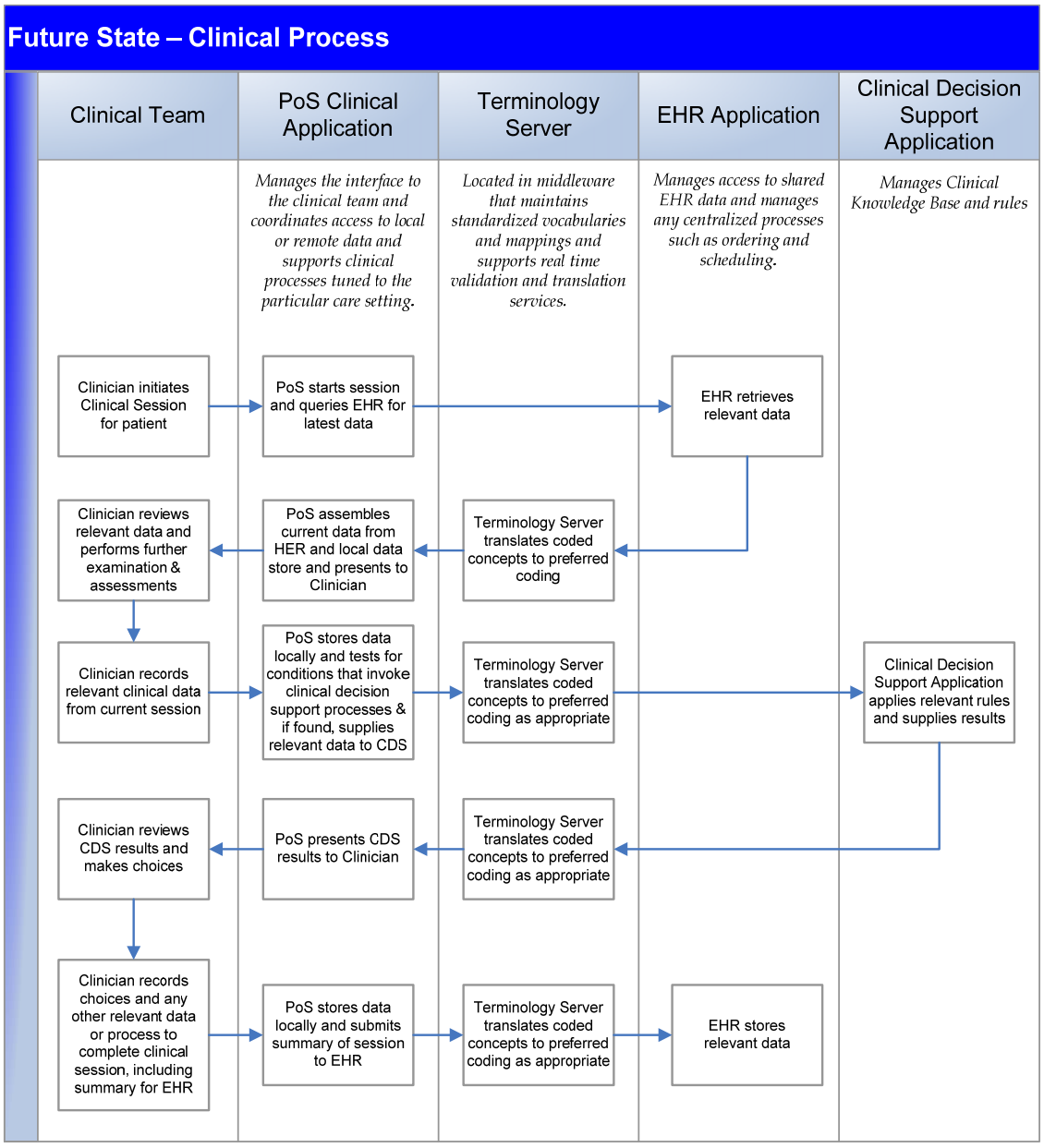


Figure 1: Clinical Process

Figure 2 illustrates how the EHR is a source of information that supports the increase of relevant clinical knowledge in a continuous improvement process, along with appropriate clinical governance oversight.

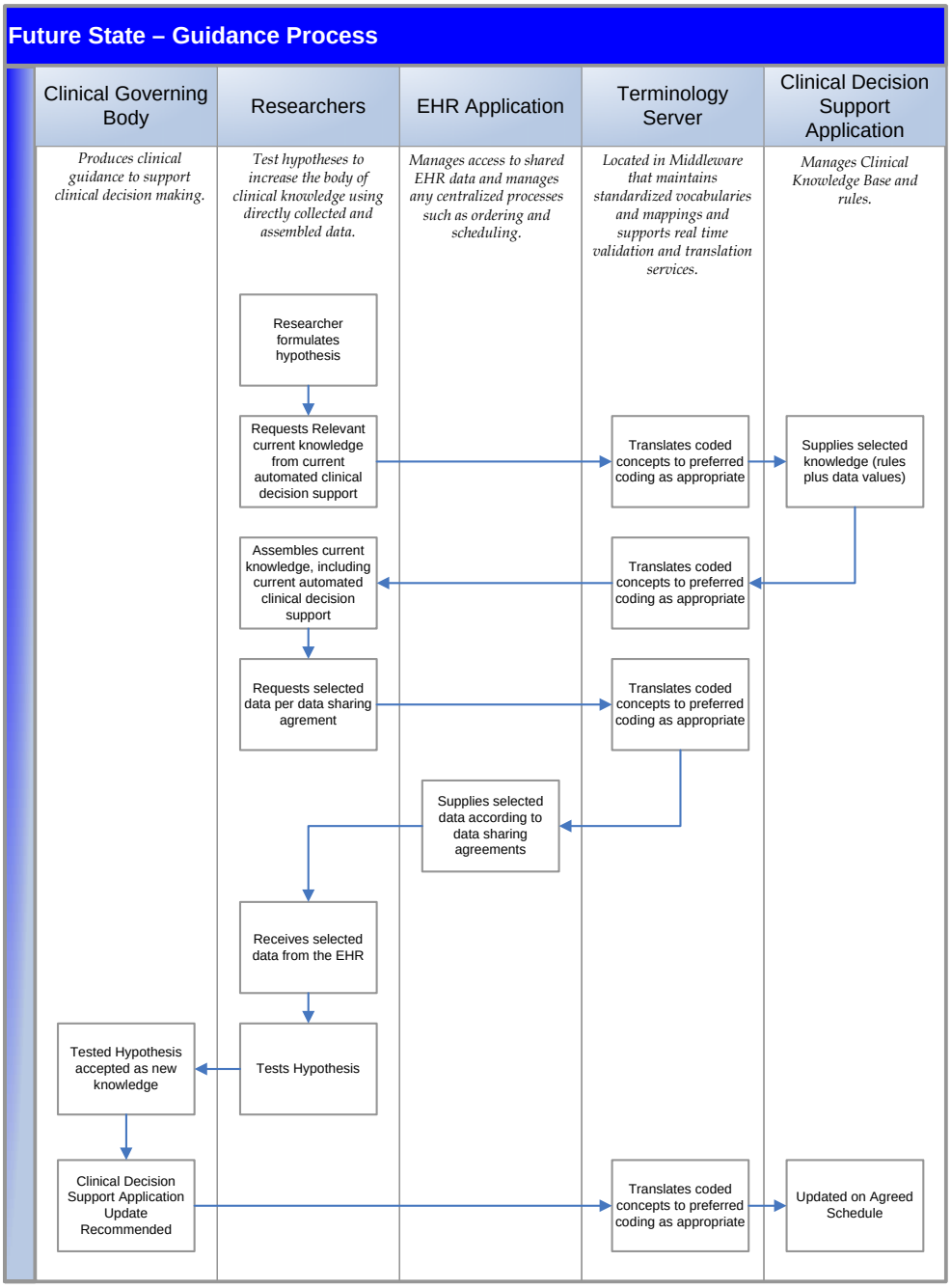


Figure 2: Guidance Process

Figure 3 illustrates how a terminology service and the EHR support the administrative secondary use processes for reporting (Administrative Data Users) and remuneration (Clinical Business Office).

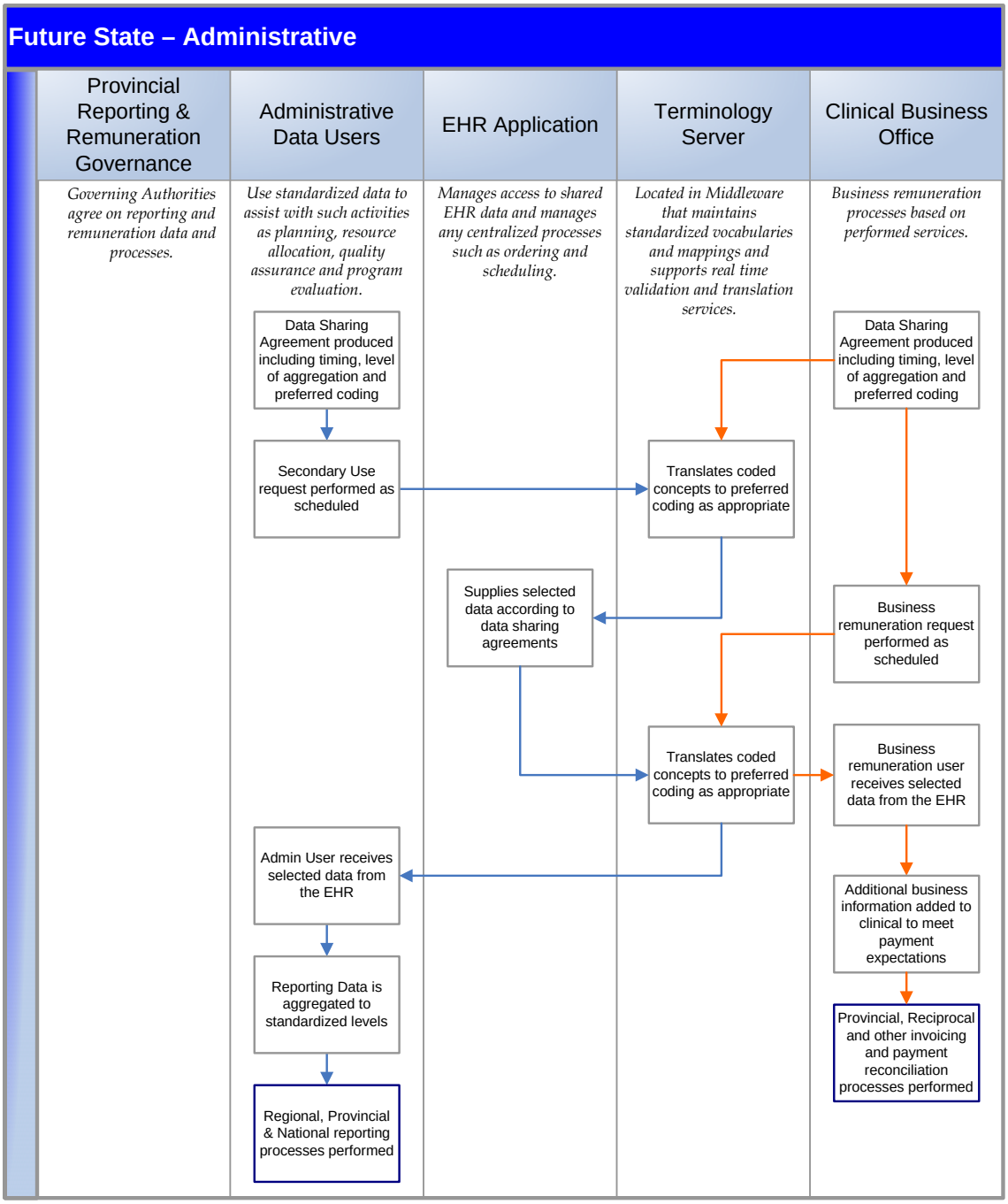


Figure 3: Administrative

In each case, human judgment is augmented, not replaced by the availability of data. At the same time, the data collection processes are streamlined. As a by-product of providing clinical care, and with appropriate data-sharing agreements in place, fully automated transformation processes take the valuable clinical data and leverage it to help streamline core processes and improve effectiveness to health care programs. It truly becomes a "capture once – use many times" data collection and processing environment. This minimizes the cost to capture and maximizes the usefulness of data as an essential health system resource.

7. GAP ANALYSIS

This section identifies the major gaps between the current state in the province and the desired future state. It defines the requirements to close the gap; to achieve the future state.

#	Gap	Requirements to close the gap
1	EHR currently does not incorporate clinical documentation beyond Lab, drugs and transcribed reports, which are intended for "human interpretation only"	▪ Establish standardized clinical vocabularies for interoperability ▪ Continue to build the value of the EHR through the various Netcare initiatives ▪ Fully implement EMRs within physician's offices ▪ Communicate the benefits of the EHR
2	Vocabularies are not fully standardized in the province	▪ Establish a standardized clinical vocabulary for interoperability ▪ Reduce and standardize the suite of clinical vocabularies used at point of care ▪ Control modifications
3	Assessment tools/instruments not standardized	▪ Establish standardized tools, templates and forms for use in intra and inter-regional patient transitions ▪ Map the concepts used in the assessment tools to the core standardized clinical vocabulary
4	Terminology service not in place	▪ Implement "Terminology Server" ▪ Implement the organizational structure to support it
5	Lack of capacity (resources)	▪ Establish a facilitated, collaborative process with participation by representatives of the professional associations, including the allied professionals ▪ Identify and secure incentive funding to recognize and encourage collaboration on standards ▪ Align with existing and planned initiatives in the Provincial IM/IT Strategy ▪ Rationalize current activities to remove duplication so resources can be redeployed to coordinated activities

#	Gap	Requirements to close the gap
6	Data stewardship and governance needs a higher profile as it relates to a standardization initiative	▪ Either revisit the EHR Data Stewardship Committee (EHRDSC) terms of reference to cover EHR legislation and policy or establish a new body with appropriate terms of reference ▪ Ensure the terms of reference addresses access to information contained in the EHR; not everyone needs access to all data contained therein ▪ Ensure the terms of reference addresses the governance with respect to secondary use of data ▪ Ensure the terms of reference addresses the transformation of clinical data for purposes of secondary use such as billing and research
7	Lack of empirical data for a SNOMED CT® business case	▪ There is currently no solid data regarding the cost benefits of implementing SNOMED CT® that could be used for a business case by the department.
8	Various interpretations of standardization	▪ Define a communications and education/training strategy ▪ Through collaboration, agree on concise definitions for terms that are used province-wide, such as 'visit'. Also, agree on essential minimum information that is required to support an EHR in the continuity of care, between providers ▪ Integrate these interpretations into communications and education/training materials to ensure all stakeholders have proper access to information
9	Need for sponsorship or funding of local standardization initiatives	▪ Identify pilot and study projects through a selection procedure, such as a letter of intent ▪ Align approved initiatives with the IM/IT strategy ▪ Utilize the grant agreement process for funding and accountability
10	Many non-contiguous health care implementation projects in progress	▪ Establish a standardization coordination group ▪ Develop a consolidated project plan incorporating projects with relevance ▪ Ensure common goals and requirements between projects are aligned through a communications strategy

8. RECOMMENDATIONS

This section of the report contains four components. The first component contains the foundational principles on which the strategic direction for standardized clinical vocabularies is built. The second component contains the strategic recommendations for achieving standardized clinical vocabularies. The strategy is initiated through the tactical recommendations that are contained in the third component. The fourth component summarizes the relationship between the strategic and tactical recommendations.

8.1. Foundational Principles

The strategic direction for the initiative related to standardized clinical vocabularies must be built on a stable province wide foundation and sustained over the long term. For standardized clinical vocabularies to enable data sharing across disciplines, sectors and jurisdictions within the health system, activities must have a provincial focus. To achieve the benefits of fully interoperable clinical data, clinical documentation methods and processes also need to be standardized.

To establish and maintain the foundation, going forward the following principles are proposed:

1. Vision;
2. Governance;
3. Data Stewardship;
4. Data Quality;
5. Alignment;
6. Value; and
7. Effectiveness.

The first four principles provide the foundation necessary before proceeding with standardization of clinical vocabularies. These are not unique to standardization of clinical vocabularies. Nevertheless, these first four principles must be clearly articulated before the initiation of any projects related to standardized clinical vocabularies. The last three principles provide the mandatory criteria that must be present with all standardized clinical vocabulary projects. If these mandatory principles are not met then a project should not be considered a standardized clinical vocabularies project. Each of the seven principles is elaborated in the sections that follow.

8.1.1. Vision

The enablement and sustainment of the Alberta health care system will require the support of a series of integrated and interoperable electronic information systems.

In the desired future state, integrated, interoperable clinical data has commonly understood meaning and can be shared across disciplines, sectors and jurisdictions within the health system for multiple purposes. This desired future state is achieved by aligning the use of standardized clinical vocabularies throughout the provincial IM/IT systems. This will impact regional clinical information systems, administrative information systems throughout the province, information systems in physicians' offices and pharmacies as well as the provincial shared inter-operable EHR. The Provincial IM/IT Strategy mandates uniform health information standards, one of which must be standardized clinical vocabularies. The vision has been elaborated in Section 6, Desired Future State. It is essential that all stakeholders share a common vision for standardization of clinical vocabularies.

8.1.2. Governance

As the Alberta electronic health care system becomes integrated and interoperable, the system must be maintained and supported through a collaborative, multi-stakeholder governance approach.

The introduction of standardized clinical vocabularies impacts many stakeholders and therefore must have a governance approach that is as inclusive as possible. Strong and consistent governance is required to ensure progress towards the establishment of standardized clinical vocabularies and compliance with clinical vocabulary standards once they are adopted. The existing governance framework for the EHR provides an appropriate structure on which to build. Governance also encompasses a sphere beyond Alberta. There is a continued need for Alberta to collaborate with other jurisdictions. Indeed, governance needs to take account of, collaborate with and align to international directions being set in relation to standardized clinical vocabularies by such international organizations as ISO TC 215, SNOMED®, SDO, and HL7.

8.1.3. Data Stewardship

An integrated, interoperable electronic health care system will provide an increased ability by clinicians, administrators and researchers to review and use data collected. Increased diligence will be required to ensure privacy and confidentiality is appropriately maintained.

Caregivers must have an active role in developing the data stewardship process(es), appropriate data stewardship methods and agreements to ensure the necessary trust of caregivers with regard to what happens to data after it leaves their hands.

8.1.4. Data Quality

To support an integrated, interoperable electronic health care system, the highest quality of data is required. Effective data quality control must be implemented, as close to the source data capture as possible, so that any data quality issues that are identified are resolved in a timely manner. The dimensions of data quality to be applied are accuracy, documentation, consistency, timeliness, relevance and accessibility. Similarly, the related concept of data integrity must ensure that the data are protected from malicious or accidental corruption.

8.1.5. Alignment

To build an integrated, interoperable electronic health care system, this initiative must align with the Provincial IM/IT Strategy. Coordination and integration between this initiative and other approved IM/IT projects involving clinical vocabularies must occur.

The fundamental principle is to identify and leverage opportunities for alignment with other health business initiatives, such as continuing care and primary care, and with other health IM/IT initiatives including the claims system renewal. The extent of alignment of its standardized clinical vocabularies component should influence the priority ranking of an IM/IT initiative. Conversely, the extent of its alignment to an IM/IT initiative should influence the priority of a standardized clinical vocabularies initiative.

In addition, opportunities for partnerships need be sought with related national initiatives, educational institutions, and regulating bodies. In similar standardization initiatives, collaborative working relationships are confirmed as a “best practice”. Furthermore, the standardization of clinical vocabularies in Alberta needs to be aligned externally with related national and international standard setting organizations.

8.1.6. Value

To demonstrate the value of an integrated, interoperable electronic health care system, the initiative must establish objective targets and baseline measures for both quantitative and qualitative indicators and provide a means of continuously monitoring value using system-wide performance measures and clinical outcomes.

The initial value of standardized clinical vocabularies is the shared meaning and understanding between caregivers across settings and regions. Shared meaning and understanding of clinical data among care providers is a fundamental component of patient safety. It will provide the confidence that the caregiver needs to hand off a patient for care by another clinician in such circumstances as referrals, multidisciplinary clinical practice, or transfer from one care setting to another (e.g. acute care to home care). In addition, standardized clinical vocabularies facilitate comparable data from across health care settings and regions. Comparable clinical

data create value beyond the clinical use for which it is originally gathered as documentation of patient care. Secondary use of comparable clinical data establishes objectivity in measuring value to health care stakeholders through the use of a methodology such as Activity Based Costing and Balanced Scorecard. Such methods pre-define targets and baseline measures for both quantitative and qualitative outcomes associated with health indicators and provide means for monitoring value continuously. The extent to which its standardized clinical vocabularies component creates additional value should influence the priority ranking of an IM/IT initiative. Similarly, the priority will be greater for a standardized clinical vocabularies initiative that adds value through the secondary use of the clinical data.

8.1.7. Effectiveness

To optimize the collection and use of data it is important to apply the principle of "collect data once – use many times" wherever possible. This will ensure data collected at source can be used for secondary purposes through mapping and aggregation. This principle becomes a primary criterion to be used in establishing the dependencies among initiatives as well as the sequence and priority in which initiatives related to standardized clinical vocabularies should be undertaken. Reporting at the regional, provincial and national levels must be uniform and automated as much as possible. Finally, ensure that submitted data can be reciprocated as useful information to submitting organizations.

8.2. Strategic Recommendations

8.2.1. For Clinical Purposes, Adopt and Implement SNOMED CT® and Continue to use Appropriate Clinical Vocabularies for Specific Care Settings

Adopt and implement SNOMED CT® as the core standardized clinical vocabulary to support the Provincial IM/IT Strategy. While it is widely acknowledged that SNOMED CT® needs to mature considerably, it is recognized as being the most advanced and comprehensive clinical vocabulary available today[26]. Also, there are now nine countries actively working towards the imminent establishment of an international standards development organization (SDO) that will lead to the ongoing evolution of SNOMED CT®[27]. Moreover, several other international standardized clinical vocabularies (e.g. ICPC, ICNP) are actively working collaboratively with SNOMED® International towards convergence with SNOMED CT®. Adoption and use of SNOMED CT® will foster the Alberta vision of integrated, interoperable clinical data, which has

[26] SNOMED® International Collaborating To Create International Standards Development Organization, January 15, 2007 http://www.snomed.org/news/documents/snomed_sdo.pdf accessed February 9, 2007

[27] Prospective charter members countries of the SDO include Australia, Canada, Denmark, Lithuania, The Netherlands, New Zealand, Sweden, the United Kingdom and the United States. SNOMED International Collaborating To Create International Standards Development Organization, January 15, 2007 http://www.snomed.org/news/documents/snomed_sdo.pdf accessed February 9, 2007

commonly understood meaning and can be shared across disciplines, sectors and jurisdictions within the health system for multiple purposes.

The collection of clinical data as closely as possible to the point of care requires clinician familiarity with the clinical vocabulary being used at the point of care. There are a number of standardized clinical vocabularies (e.g. ICPC, ICNP®, DSM-IV-TR®) already in use in by specific disciplines in particular care settings. It is not appropriate to expect retraining of large numbers of professionals and require them to learn a new clinical vocabulary or use a vocabulary that is not specific to the care setting in which they practice.

The best approach is to leverage the current use of existing standardized clinical vocabularies as appropriate in specific care settings (e.g. DSM-IV-TR for Mental Health, ICPC for Primary Care, and ICNP® for nursing) with the provision of appropriate mapping to SNOMED CT® for use in provincial systems or for secondary data use.

As yet, there is no clear preference for a standardized vocabulary to support financial activities through the secondary use of data. Therefore, existing mechanisms e.g. the Schedule of Medical Benefits will need to be continued for the medium term until a determination can be made on the best vocabulary standard(s) to support financial activities.

8.2.2. For Administrative Purposes, Continue to use ICD-10-CA/CCI

Data used for administrative purposes is often a secondary use of clinical data. Therefore, further progress on the standardization of clinical data needs to be achieved before any significant changes are made in the administrative area.

It is anticipated that ICD-10-CA/CCI will be required as a standardized clinical vocabulary in the future state, so it should continue to be used.

In the interim, continued investigation should occur on the potential use of alternative clinical vocabularies to support administrative purposes; and work should continue in improving administrative processes and reviewing reporting requirements.

8.2.3. For Financial Purposes, Continue to use Existing Mechanisms such as the Schedule of Medical Benefits

At this time, a standardized vocabulary to support financial activities cannot be recommended, as financial requirements have not been agreed to at the clinical, regional, or provincial level. Therefore, existing mechanisms e.g. the Schedule of Medical Benefits will need to be continued for the medium term until a determination can be made on the best vocabulary standard(s) to support financial activities.

8.2.4. Standardize Assessment Protocols and other Forms

The effective sharing of information across clinical settings requires collaboration to reach a common understanding that encompasses standardized clinical documentation processes, policies and forms that use standardized clinical vocabulary to ensure common meaning. Initially such standardized processes and documentation need not be automated but are required to ensure interoperability when automated. In fact, agreement on standardized documentation processes, policies and forms is essential preparation for automated sharing of information. Standardization of assessment protocols and other forms will optimize clinical processes for continuity of patient care and patient safety within and across regions, sectors and care settings even in the absence of automation. Simultaneously, it can increase efficiency of administrative and financial processes in manual environments.

8.2.5. Enhance the current EHR Governance Structure

Given the multi-stakeholder nature of standardized clinical vocabularies and their importance to the Provincial IM/IT Strategy, the EHR governance structure should be used to provide strategy, direction, policy and oversight with regard to the standardization of clinical vocabularies in Alberta. Moreover, the successful adoption of standardized clinical vocabularies requires that the governance structure act to alert AHW to policy and legislation issues discovered by standardized clinical vocabularies initiatives. In addition, the governance structure must ensure that initiatives associated with standardized clinical vocabularies are aligned with current policy and legislation, specifically those related to data privacy, confidentiality and security.

New bodies or amended terms of reference of existing bodies may be required to ensure projects influencing or impacting the standardization of clinical vocabularies are clinician driven with representation from affected stakeholders. Specifically, a Coordinating Unit with representation of clinical stakeholders is essential to ensure collaboration, coordination and alignment of standardized clinical vocabularies consistently among all initiatives. Such a group is required to ensure the success of the standardized clinical vocabularies initiative. The focus of this Coordinating Unit would be on the business drivers and the business value, not on the technology. This group could report through the governance framework established for the Provincial IM/IT Strategy to ensure alignment with other planned Provincial IM/IT initiatives, coordination with national initiatives and ongoing communication with all stakeholders. A clinical advisory group for the Alberta Netcare Portal 2006 is currently being established. This group may be a candidate for the appropriate coordination and focus necessary for standardized clinical vocabulary initiatives.

As stated previously, the vision for standardized clinical vocabularies is integrated, interoperable clinical data that has commonly understood meaning and can be shared across disciplines, sectors and jurisdictions within the health system for multiple purposes. Data stewardship is a foundational responsibility of governance that must be in place before data

sharing occurs. It is integral to continued progress on the Provincial IM/IT Strategy and standardization, specifically standardized clinical vocabularies, as well as development of the EHR. In addition, data stewardship also requires a means for collaborative input and consensus building among the all of the effected stakeholders. The collaborative, consensus building approach to data stewardship may take longer, but it is imperative for engaging clinicians and building the participation, commitment and trust that will foster sharing of data. Data sharing agreements and the review process associated with their development and implementation need to be in place before clinicians will share data. To achieve this stewardship, either the EHR Data Stewardship Committee's terms of reference will need to be modified or a new body with new terms of reference will need to be created.

In addition to data stewardship, data quality and integrity are foundational principles that will need to be subscribed to and applied consistently by the governance structure. The Provincial Data Quality Plan will provide guidance for this aspect of the work of the governance structure.

As noted previously, governance also encompasses a sphere beyond Alberta. There is a need for Alberta to continue to collaborate with other provinces, perhaps through WHIC, CIHI, Infoway and other cross-jurisdictional projects. Indeed, governance needs to take account of, collaborate with, and align to international directions being set in relation to standardized clinical vocabularies by such international organizations as ISO TC 215, SNOMED® SDO, HL7 term INFO.

8.2.6. Foster Multi-disciplinary Collaboration

Promote Alberta stakeholder engagement in the standardization of clinical vocabularies and take steps to ensure collaboration, coordination, consultation, education/training, as well as integration and transition management. Successful achievement of goals related to standardized clinical vocabularies will require the active participation of multi-disciplined collaboration between all provincial health system stakeholders, including the health regions, health care providers, educators, professional associations, as well as AHW. Above all, to be successful, standardization of clinical vocabularies must be clinician driven, and based on clinical emphasis on patient or client care. It is imperative to establish and maintain collaborative relationships with and among the professional associations and educational organizations to develop partnerships in support of initiatives to validate standardized clinical vocabulary mapping and incorporate clinical best practices in Alberta. This will help ensure standardized clinical vocabularies are effectively implemented consistently with the Provincial IM/IT Strategy. Every opportunity must be taken to foster collaboration to achieve consensus. Such a strategy may take longer but inevitably it will build commitment and ownership among stakeholders. Value added return will accrue from the secondary use of data gathered in the course of clinical care delivery.

8.2.7. Establish a Communications Strategy

Establish a communications strategy that supports stakeholder collaboration. The strategy will be a vehicle to promote stakeholder awareness, understanding and engagement. It will encompass dissemination of information, education/training and promotion of user uptake. It will enable collaboration, coordination and consultation, as well as integration and transition management activities. Furthermore, the importance of communications to change management and to provincial stakeholders is critical to success of clinical vocabularies standardization and ultimately to the success of the Provincial IM/IT Strategy.

8.3. Tactical Recommendations

The following tactical recommendations are concrete steps that can be taken in the near term to further the strategic recommendations. These recommendations follow the principle of incremental introduction of significant change and will yield benefits as they are completed. A number are expected to continue beyond the first phases identified. Each tactical recommendation is elaborated further in *Appendix J - Tactical Project Descriptions*

Recommendations were selected to enable significant change in multiple sectors. Most initiatives recommend establishing standardized clinical documentation at the provincial level with participation from many of the affected stakeholders. To remain a manageable working group, designated representatives will need to be authorized to act on behalf of their group and may need support in maintaining communication channels to ensure the affected stakeholders' views are considered. While the process may take longer, the benefits are considerable, since it is actually the alignment of processes and policies which yields many of the benefits of standardizing clinical documentation.

To remain faithful to the principle of "collect data once – use many times", standardization of clinical documentation should precede revision of reporting or financial secondary data use processes. Incremental steps are introduced that suggest detailed analysis precede committing to radical change in processes. In all cases, introduction of change needs to consider the resource constraints in both financial and human time so that incremental change is supported through appropriate communication and other change management considerations.

The first two recommendations are foundational and are needed before embarking on standardization assessments and pilots. The pilot and assessment projects are prudent first steps in implementing standardized clinical vocabularies.

8.3.1. Establish a Coordinating Unit

Establish a Coordinating Unit to oversee all initiative related activities. Along with the responsibility for the development of strategy documents, the Unit will develop an integrated project plan to support the full coordination of pilots, studies and assessment projects and

provide oversight and support to issues management and resolution, standardization methods reference and support, communications and evaluation. This project plan will identify the timetable of undertaking specific initiative related projects as well as identifying when other leveraged projects will contribute to the initiative. This plan will need to be aligned with the Provincial IM/IT strategy.

8.3.2. Develop a Communications Plan

A comprehensive communications plan will identify which stakeholders within Alberta should be engaged and what the most effective communications mechanisms would be. In some cases stakeholders will include groups at the national or international level. The communication plan must identify stakeholder groups impacted, specific messages, appropriate communication opportunities and the level of ongoing engagement – ranging from partnering in achieving objectives to remaining informed. This is essential to ensure implementation of the tactical recommendations and long-term continuity of the strategic recommendations. Subsequent phases involve the execution of the resulting communications plan, including providing opportunities for appropriate education and training.

8.3.3. Initiate Assessment and Pilot Projects

Initiating pilots and proof-of-concept projects focused on the evaluation of clinical outcomes will manage the provincial standardization initiative and allow for participation in national and international mapping activity. Engagement will depend on the readiness of the stakeholder and the current state of their standardization activity and degree of automation. However, much of the clinical benefits accrue from aligning processes and standardizing clinical documentation at points of transition between disciplines and care settings. The inclusion of such standardized forms and assessments in the EHR will make clinical documentation readily available wherever a person presents for care. Implementation of standardized paper forms can precede automation.

#	Project	Description	Timeframe (starting)

#	Project	Description	Timeframe (starting)
3.1	Implement Terminology Services - Infrastructure	The mapping of the recommended clinical vocabularies will require the implementation of terminology services. This project can be considered in multiple phases. ▪ The initial necessary infrastructure component provides the capability to manage clinical vocabulary versions over time and supports mapping between vocabularies. ▪ A further phase can consider leveraging the existing integration environment to validate standardized clinical vocabularies in message instances and transform from one clinical vocabulary to another are more sophisticated capabilities required for production roll-out. This enhanced capability could be implemented as part of the pHIE project. As increased clinical documentation standardization occurs, active participation in national and international mapping efforts will be necessary and is included in this project.	Year 1
3.2	Chronic Disease Management - Clinical	Enhance and expand the continuity of care for Chronic Disease Management by focusing on standardizing the associated assessment forms used for transitions between care settings and disciplines at a provincial level using SNOMED CT® and LOINC. Starting with the WHIC Chronic Disease Management framework, collaborative multi-discipline clinical advisory groups will design appropriate assessment forms to identify patients with a selected chronic disease requiring consistent management. Each chronic disease selected should form a sub-project, with the initial sub-project establishing the methodology for streamlining clinical processes and designing assessment forms using SNOMED CT® to ensure consistent meaning. Subsequent sub-projects can continue to re-use and enhance both elements of the standardized clinical documentation and harmonized clinical processes that improve the continuity of care and safety for patients with chronic diseases..	Year 2
3.3	Acute Care / Continuing Care Assessment Standardization - Clinical	Evaluate the use of standardized clinical vocabularies SNOMED CT® and LOINC® to standardize the clinical documentation used to transfer between continuing care and acute care settings to optimize the continuity of care. Transfer of care between continuing care settings and ambulatory care outpatient or community clinics are potential future phases. Standardizing and implementing newly designed forms as paper forms can yield some benefits until appropriate automation becomes available.	Year 3
3.4	Provincial / Regional Reporting Assessment - Administrative	Evaluate the potential impact on reporting requirements from the use of standardized clinical vocabularies during clinical data capture processes and then transforming for reporting purposes. Identify opportunities to improve usefulness of data collection and impact on current acute care, continuing care, and ambulatory care reporting data streams. Focus on Acute Care initially.	Year 4

#	Project	Description	Timeframe (starting)
3.5	Schedule of Medical Benefits – Administrative/ Financial	Examine existing claims submission record structures, SOMB codes and coding instructions to determine the embedded clinical concepts, their purpose and the business rules surrounding their use. Results of the analysis would serve as a foundation for any change to the SOMB content using standardized clinical vocabularies and associated remuneration processes.	Year 1
3.6	Community & Regional Diagnostic Imaging Services - Clinical	Work with clinicians from community private clinics and hospital-based DI departments to evaluate SNOMED CT® as a potential clinical vocabulary to describe DI services in the different care settings to ensure continuity of patient care across settings.	Year 1
3.7	Mental Health - Clinical	Standardize clinical assessment forms across the province, using DSM-IV-TR, to optimize patient care continuity between different settings.	Year 2
3.8	Mental Health - Administrative	Standardize mental health reporting requirements to meet local, regional, and provincial business requirements.	Year 2
3.9	Medical Laboratory - Clinical	Adopt and implement Canada Health Infoway Lab specifications for new vocabularies including SNOMED CT® and LOINC®.	Year 4
3.10	Medical Laboratory - Administrative	Evaluate and implement CIHI laboratory workload measurements, if appropriate. Ensure LOINC® used for clinical and administrative purposes are synchronized.	Year 3
3.11	Perinatal Care - Clinical	Evaluate the use of standardized clinical vocabularies, SNOMED CT® and LOINC® in the existing five standardized assessment forms. Leverage existing work with a view to introducing automation.	Year 1
3.12	Primary Care Network - Clinical	Based on lessons learned from existing clinical projects, work with a selected PCN with multiple organizations as participants and their collaborating vendors (representing more than one EMR) to demonstrate the benefits of using standardized clinical documentation to improve the continuity of care within the PCN environment. Prepare a tool-kit to assist future initiatives. Focus on the Transfer of Patients Data Set but enhance to use LOINC and SNOMED CT © where it is applicable.	Year 2

8.4. Other Recommendations

Throughout this report, a number of recommendations and proposed future activities have been identified that have not been specifically captured in this "Recommendations" section. These recommendations and proposed future activities have been summarized in *Appendix K – Other Recommendations and Proposed Activities.*

9. IMPACT ASSESSMENT

This section of the report summarizes the impact of adopting and implementing standard clinical vocabularies and implementing SNOMED CT® as the core standardized clinical vocabulary. The following table details impacts by stakeholder type, indicating what is impacted, how it might be impacted, and approximately when the impacts might be experienced.

Who	What	How is it impacted	When (approximate)
AHW IM/IT staff	Increased coordination and broadened scope of activity around the EHR and standardization of clinical vocabularies	▪ Implementation of clinical vocabulary standards for all AHW initiatives province-wide ▪ Implementation of clinical vocabulary standards for the EHR ▪ Implementation of clinical vocabulary standards in respect to information used in the continuity of care ▪ More systematic coordination between AHW business initiatives impacting health services and activities around the EHR ▪ Alignment with the IM/IT strategy ▪ Alignment with HSA ▪ Implementation of health data standards for the EHR and access to care ▪ Implementation of messaging standards in respect to information used in the continuity of care ▪ Implementation of a terminology service ▪ Collaboration on vocabulary mapping and standardization activities ▪ Increased business focus, including policy and process around clinical, financial and administrative activities ▪ Facilitate development of training materials to be shared across regions ▪ Identify sources of funding to assist the regions to deliver training associated with implementation of standardized clinical vocabularies and standardization of assessment instruments (i.e. backfill of staff)	▪ Immediately, through standardization initiatives and pilot projects ▪ Major impact when Terminology Services implementation

Who	What	How is it impacted	When (approximate)
EHR Data Stewardship Committee (EHRDSC) or alternative	Scope of Committee	▪ Modification of Terms of Reference to reflect adoption and implementation of standardized clinical vocabularies, in terms of policy, rules and procedures. including process and technology reflect adoption and implementation of standardized clinical vocabularies ▪ Data sharing agreements to use clinical data for secondary use	▪ Within 1 year – scope reviewed and Terms of Reference adjusted as required ▪ 1-3 years, involvement in policy development ▪ 3-5 years policy implementation
HISCA	Scope expanded	▪ To ensure interoperability between providers and across jurisdictions, in support of the continuity of care ▪ Addition of standardized clinical vocabularies ▪ Managing templates of standardized clinical documentation ▪ Dissemination of new implementation guides for messages and clinical documentation	▪ Immediately, through standardization initiatives ▪ Longer-term, in its regulatory role
Regions	Access to care through the EHR, including roles and processes	▪ Clinical processes will become aligned across care settings and regions ▪ Roles will change to accommodate coordination responsibility ▪ Implementation of clinical vocabulary standards, including SNOMED CT® ▪ Implementation of messaging standards ▪ Involvement in vocabulary mapping at a provincial and national level ▪ Collaboration and alignment at a provincial level on activities in support of improved continuity of care, including standardization of assessment protocols etc.	▪ Immediately through standardization initiatives and pilot projects

Who	What	How is it impacted	When (approximate)
Regions	Clinical Systems	▪ Upgrade of software, both locally and at the enterprise level ▪ Transformation of processes of technology use for coding at point of care to support clinical activity and the continuity of care, including the use of data decision support ▪ Expansion of training	▪ Immediately through standardization initiatives and pilot projects
Clinicians	Standardization in clinical documentation for continuity of care	▪ Collaboration in optimization of information flow, by providing feedback or by participation in pilot projects ▪ Integration of standardized processes and vocabularies into local practice ▪ Additional training on requirements for standardized information used in continuity of care ▪ Solicitation of patient/client involvement in improving continuity of care processes; the patient/client's role in the care team is enhanced	▪ Immediate involvement in standardization initiatives and pilot projects ▪ Impact is gradual and over the longer term
Clinicians	EMR software	▪ Upgrade or revision of software, as required to meet new standards ▪ Additional training and time needed for adoption of "point of care" coding	▪ Impact is gradual and over the longer term. ▪ For the general clinician population, little or no impact is expected in the first two years
Clinicians	Diagnosis & procedure coding	▪ Transformation, by reducing or eliminating text-based systems and integrating more standardization ▪ Elimination of local codes/ modifiers ▪ Added training and initially required time to implement standardized coding at the "point of care" ▪ Added effort to integrate standardization across the continuum of care, including primary care and linkage to specialists	▪ Depends on availability of software and readiness of clinicians using the software

Who	What	How is it impacted	When (approximate)
EMR vendors,	EMR software and Clinical Systems	▪ "Usability" becomes a principal design criterion; screen navigation and choice selection of standardized clinical vocabulary must be tuned to the discipline and care setting during implementation ▪ Recognition of the use of standardized clinical documentation templates ▪ Cost of integrating "point of care" coding or interface vocabulary into systems ▪ Updates to VCUR standards, to incorporate standards in vocabulary and related data ▪ Reduction or elimination of proprietary coding schemes ▪ Time and effort required in developing interfaces to enterprise-wide systems and central Terminology Services ▪ Time and effort to understand the data structures that support the more complex data mapping ▪ Costs of implementing SNOMED CT® licenses	▪ Little or no immediate impact ▪ Approximately 1 year – standards announced ▪ 1-3 years – systems integration ▪ 3+ years implementation depending on local readiness
Health Information Management (HIM) Professional	Roles	▪ Changing or new operational roles, by introducing more 'auditing' and reducing 'coding' ▪ HIM Professionals will provide more support concurrent to care provision ▪ Increased involvement in mapping initiatives, through testing and validating ▪ Will need to provide support for coordinated clinical documentation exchange for continuity of care	▪ Immediate – awareness building ▪ 1-3 years – role definition ▪ 3+ years process training and integration of new roles into local settings

Who	What	How is it impacted	When (approximate)
Educational Institutions	Curriculum: ▪ Diagnosis and procedure coding ▪ Access to care through EHR	▪ Affecting all practices, changes are required to incorporate standardization of clinical documentation and availability of the EHR as a means to share clinical documents for improved continuity of care. This includes changes to education material related to coding at "point of care", privacy, EHR processes, decision-support, measurable outcomes, etc. ▪ Addition of specialty certification courses to ensure concurrency with standardization initiatives ▪ Longer-terms changes to basic curriculum, reflecting the increased use of standardization of information flow and the use of the EHR ▪ Requirement for institutions across Canada, who currently provide programs for health care professionals, to support new knowledge requirements ▪ Optimize the "research to practice" dissemination process by collaborating with clinical governing bodies to increase the automation of clinical guidance	▪ Evolutionary ▪ Estimated 2-3 years to raise awareness, evaluate impact and piloting ▪ 3-5 years to include in regular curriculum

10. IMPLEMENTATION STRATEGY

10.1. Approach

The full implementation of standardized clinical vocabularies in Alberta could take up to ten years to achieve. Introducing standardized clinical vocabularies will not produce real benefits to the health system unless a number of prerequisites are in place. The process is transformative. Also, it needs to be evolutionary to maximize benefits and avoid disruption of current health service delivery.

The factors that will impact the overall implementation timeframe include:

- Coordination of activities to avoid duplication of effort and exceeding capacity to effectively absorb change;
- Appropriate governance, including data stewardship activities to determine appropriate data sharing agreements;
- Readiness of clinicians in all sectors to standardize clinical documentation and streamline processes in the interests of continuity of care;
- Availability of appropriate software that makes effective use of standardized clinical vocabulary to both enhance usability at the interface and enable semantic consistency for messaging, information retrieval and automated clinical decision support;
- Demonstrated effectiveness of transforming standardized clinical vocabulary to secondary uses; and
- Continuous improvement in all aspects to harvest lessons learned through implementation experience. Also, improvement of the standardized clinical vocabularies themselves, including the mapping between them.

For clinicians currently using an EMR that supports the use of codified data, initial benefits can be achieved in a three-year time-frame[28]. The benefits, however, might only be felt at the local level. Isolated, individual implementations could even lead to inconsistent application, such that the objective of optimizing the experience of patients across specialties, disciplines and care-settings could be more difficult to achieve and actually take longer. Nevertheless, early implementations should be promoted in order to gain experience with introducing and using standardized clinical vocabularies. It is important that early implementations be coordinated to avoid inconsistency. It is equally, important that these early initiatives are leveraged to a provincial level whenever possible. Overall, using a systematic, incremental approach is acknowledged, by the health and information industries, to be best practice that is most likely to result in success in the longer term.

[28] From an interview with Dr. Steve Edworthy at the University of Calgary's Department of Medicine

The approach presented here is built to consider best practices, funding constraints and sensitivity to the resource capacity issues in all sectors of health care in the province. While implementation is coordinated and focused, it is also evolutionary. All impacted stakeholders including vendors of health care software products need to be involved throughout.

10.1.1. Coordination of Activities

Initially, a Coordinating Unit should be established, and begin by identifying all activities required to implement this report's tactical recommendations for implementing standardized clinical vocabularies in Alberta. This Group should engage stakeholders, first by considering the lessons learned in projects already in progress within Alberta. Subsequently, the broader health care provider groups within the province are engaged through forums and communications. Contact is made with similar projects in other provinces, and national organizations supporting health care, in order to identify opportunities for knowledge-sharing. The Group also provides oversight to the following activities:

1. Development of a communications plan. This includes a roll-out strategy with input from stakeholders, and with a time-line based on priority and readiness. As part of communications, a change management and support strategy is developed. Also, a reporting relationship is established with the existing EHR governance framework.

2. Development of an integrated project plan. This identifies all the interdependencies between the projects identified as tactical recommendations for standardization of clinical vocabularies, current projects already underway or planned through the provincial IM/IT Strategy, and new activities to strengthen communication, alignment and realization of benefits.

3. Pilot project results assessment. As each tactical project is completed, the results of the project and its impact on the overall initiative will be evaluated.

4. Re-assessment of the strategic recommendations. On an annual basis, the strategic recommendations will be reviewed and reconfirmed as appropriate. Consideration will be given to the results of the tactical pilots as well as any new information that may be available.

5. Provision of input in development of provincial Terminology Services. This includes alignment with, or coordination of, provincial initiatives for mapping and translations between the currently used standardized vocabularies (e.g. LOINC, ICPC, ICNP, DSM-IV) and the reference terminology, i.e. SNOMED CT®.

6. Guiding consensus building related to reducing and standardizing the number of standardized point-of-service (interface) terminologies.

7. Development of a full risk assessment plan and the appropriate mitigation strategies.

8. Oversight on issues management as it affects the standardization initiative.

10.1.2.Vendor Engagement Strategy

The software vendor community is already undergoing significant challenges and change. The introduction of standardized clinical vocabularies to increase the specificity of clinical documentation will add to those challenges. The vendor community should be considered as a distinct stakeholder group in the communications plan and appropriate opportunities sought to enhance the engagement of vendors throughout the entire change management process.

10.1.3.Fostering Readiness as a Prerequisite for Implementation

Managing readiness prerequisites, along with communications and education, are important in integrating changes. These are ongoing activities throughout the life of the standardization initiative, and beyond. Given the current amount of change and the high demand on health care resources, any implementation of standardized clinical vocabularies must clearly acknowledge the objectives of supporting patient care and patient safety and must be planned to minimize disruption in clinical environments.

One of the early tasks recommended for the Coordinating Unit is to harvest industry best practices, and lessons learned from early experiences, to develop a Readiness Checklist. This serves as a guide to implementation, and would include recommended approaches for communications planning and delivery, along with education and training.

10.1.4.Continuous Improvement

Improvement in the approach to the clinical vocabularies standardization initiative needs to evolve continuously, through the coordinated application of methodologies, and the sharing of knowledge. Again, the Coordinating Unit should manage the continuous improvement of the approach. A potential model to follow may be that used for the Diabetes Disease Management[29] implementation at Capital Health. Key lessons learned included:

- Pay attention to all impacts, especially for the users; define factors impacting their ability to work within the new system;
- Technology needs to operate within complex health care environments;
- Train the trainer approach works; ensure adequate time for training;
- Ensure users are supported; there is a learning curve. Have a “point person” with on-site technical support;
- Involve stakeholders throughout the process, from design to implementation;
- Pay attention to management of stakeholder expectations;

[29] From a presentation made by Capital Health at the e-Health 2006 Conference held in Victoria, BC in May 2006

- Know there will be multiple iterations before it is done right; and
- Presence of a clinician champion is essential to garner buy-in; to serve as an advocate, and make things happen.

Furthermore, the Coordinating Unit should work closely with the Colleges and professional associations to collaborate on the approach to their members as well as on the identification of clinical champions.

10.1.5. Standardization of Clinical Documentation Activity

Several tactical recommendations in this report involve standardization of clinical documentation within the areas of medical laboratory, mental health, acute and continuing care, chronic disease and perinatal care. This implementation strategy was chosen to provide focused opportunities to create direct care benefits while learning how to effectively introduce standardized clinical vocabularies. Feedback from project participants identified that inconsistency in documentation accompanying the patient/client at points of transition within the health care system (e.g. physician referrals, acute care to continuing care) was a particular risk and also an opportunity for improvement. An outcome of these projects will be improved working relationships among the various caregiver organizations, along with streamlined clinical transfer processes.

Best practices suggest that unless the difficult work of alignment occurs, introducing standardized clinical vocabularies does not yield the benefits expected - and may even be counter-productive. Secondary use, such as for program planning and continuous quality improvement, should also be considered when streamlining clinical processes. The effort to align clinical and administrative processes will generate benefits regardless of whether standardized clinical vocabularies are implemented or not.

Standardization requires agreement, along with sufficient time to participate. Also important, is the necessary investigation and documentation of current practice and the consideration of impact. It is important that participating personnel have back-up/backfill when in training, or when involved in collaborative standardization work. A lack of back-up was cited through working sessions as one reason for added stress in the workplace.

Standardization of processes and enabling capabilities will be incomplete without consensus in the clinical community around the practice. Some groups may be further ahead due to their participation in other initiatives. However, standardizing clinical documentation that enhances continuity of care is best performed at the provincial level, with active representatives that can speak on behalf of their constituents. Agreement is needed both within and across organizations.

Benefits are also achieved by implementing standardized paper based documentation. In circumstances where software is not available, the use of standardized forms, designed to be

encoded with a standardized clinical vocabulary (but completed on paper) can help to ensure capture of consistent information. Electronic data capture can be introduced at a later date.

10.1.6. Transforming Clinical Information for Administrative Purposes

The data principle of "capture once – use many times" refers to capturing clinical data electronically at the "point of care", using the appropriate level of specificity to meet clinical process needs, and then using automated transformation to aggregate data to meet administrative requirements. Administrative use of data includes planning, quality assurance, resource allocation and other value-added purposes. The steps in achieving this goal include:

- Developing data sharing agreements with affected clinical representatives to confirm expected use of clinical data for secondary use;
- Clarifying the data requirements for each administrative purpose. Attention to such aspects as specific definitions, expectations of precision, timeliness, accuracy, completeness, comprehensiveness and relevance will be needed;
- Consulting with representatives from the "point of care" to confirm desired data can be derived from clinical data without disruption;
- Identifying all data source elements and their necessary aggregation or other derivation processes needed to transform clinical information to desired secondary data elements;
- Developing the automated processes;
- Testing and verifying the resulting information is suitable for the expected purpose; and
- Implementing the tested processes in production by including extract schedules.

To ensure suitability of a proposed secondary data purpose, evaluation of each expected data source will be required because the desired data may not be available or it may not be possible to collect the level of specificity required if the data element is not needed for clinical purposes. Data may be captured with a standardized clinical vocabulary that is different from the one expected to be used for administrative purposes. A mapping between the vocabulary in use and the one desired must be available to appropriately transform clinical data to secondary use data.

Evaluation of existing administrative data sources should be undertaken to determine the suitability of existing mapping and what automated business rules are needed to transform clinical data to appropriate administrative purposes. Opportunities to improve secondary data reporting processes, to increase data quality can be undertaken while the clinical standardization process is being developed and implemented. Until the level of implementation satisfies the coverage expectations for regional, provincial and national reporting purposes, both current practice and automated transformation processes can be expected to co-exist in the health system.

10.1.7. Transforming Clinical Information for Financial Purposes

This standardization initiative presents opportunities for better use of clinical data to support financial uses, such as budgeting, funding and evaluation. Implementation of a unified vocabulary, along with methodologies such as Activity Based Costing and Balanced Scorecard, is based on stakeholder needs for reporting on monetary and statistical information. Consequently, the first step is to define financial use requirements, including reporting needs. A needs-assessment on reporting compares what is needed with what is available. This step should be done independently of any decision to implement a clinical vocabulary that would best support financial use. In fact, it is a prerequisite.

Currently, Activity Based Costing and Balanced Scorecard is not a standard approach in the health care system in Alberta; however, there are local initiatives that can be leveraged, and should be investigated[30]. Also, this methodology is currently used within the Ontario health care system.

10.1.8. Transforming Clinical Information for Value-add Clinical Purposes (research, clinical practice guidelines)

The steps to achieve the use of data captured for clinical purposes and transformed for secondary clinical processes can continue in parallel with the implementation of standardized clinical documentation. Researchers can assist with the process of continuous improvement. Every opportunity to encourage benchmarking research and evaluation of effectiveness should be taken. The cost of clinical outcomes and efficacy research can be expected to be reduced as more detailed clinically encoded data becomes available and appropriate data utilization agreements come into place.

Essentially the same basic steps need to be performed for clinical research secondary data use as for administrative data use. Readers are referred to the administrative data use section above.

Once sufficient research is available, the professional practice clinical governance bodies can validate research conclusions, and recommend incorporation into clinical guidance. This in turn can be incorporated into applications implemented at the “point of care”. These knowledge-based applications are already emerging, and are expected to become more prevalent. They may be specialized applications shared across many care settings, or specialized modules incorporated directly into “point of care” applications. In either case, processes will be needed to maintain the currency of information.

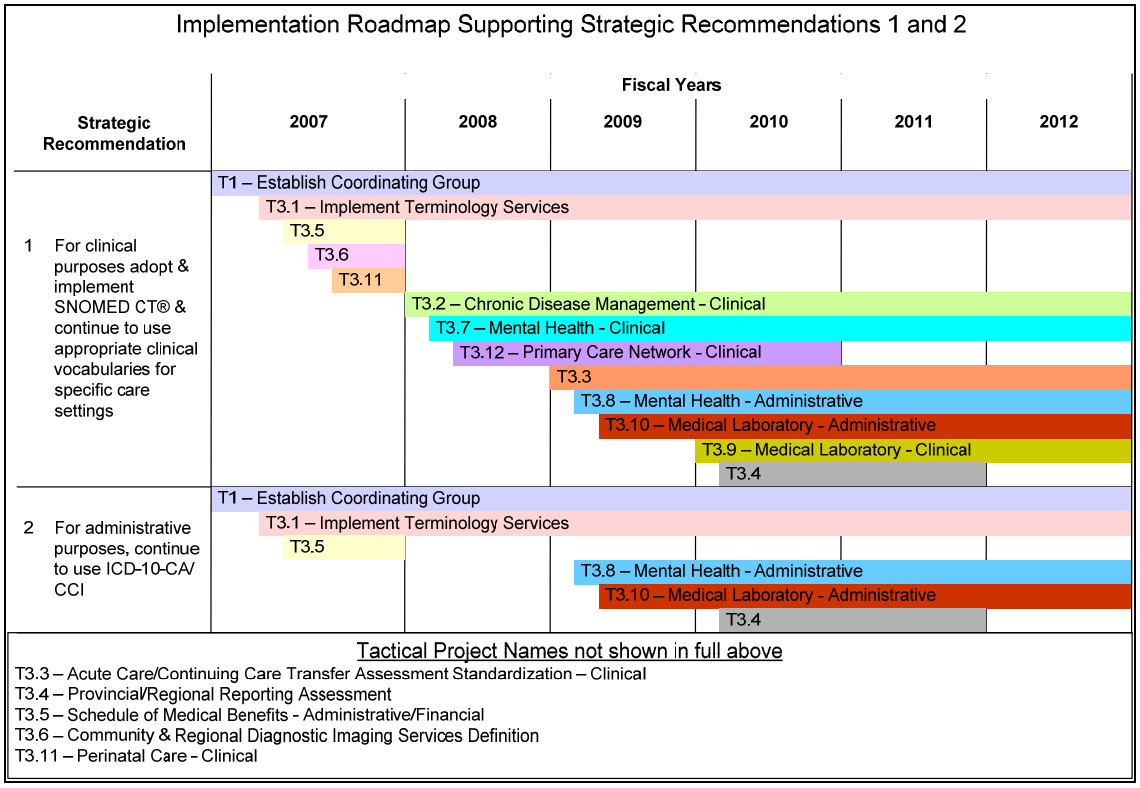
[30] Angela Downey, University of Lethbridge, “Improving the Health Care Pulse”, http://www.managementmag.com/index.cfm/ci_id/2903/la_id/1

Continuous improvement of health services delivery will require the integration of captured information having similar meanings. Through diligence, and planning for change, the benefits of implementing standardized clinical vocabularies will be optimized in a virtual cycle.

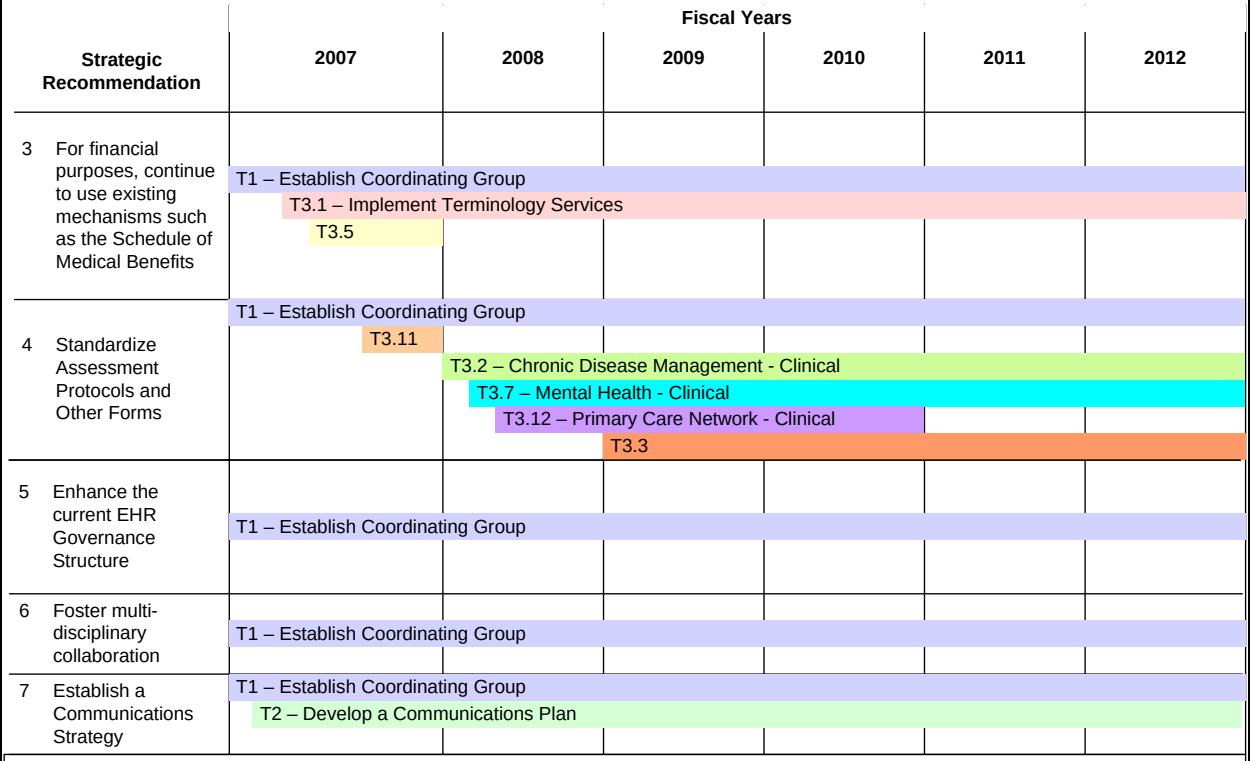
10.2. Project Sequencing

An initial sequencing of projects, described in the Recommendations section, is shown in the following diagrams. In developing this sequencing, the following principles were used:

- Time spent getting organized and planning will pay off in increased effectiveness later;
- Everyone will be impacted and therefore communication must be planned to appropriately engage everyone;
- The right tools are needed to do the job;
- Do not overload people who are already overcommitted; and
- Clinical information needs to be standardized before considering secondary data use.



Implementation Roadmap Supporting Strategic Recommendations 3 through 7



Tactical Project Names not shown in full above

T3.3 – Acute Care/Continuing Care Transfer Assessment Standardization – Clinical
T3.4 – Provincial/Regional Reporting Assessment
T3.5 – Schedule of Medical Benefits - Administrative/Financial
T3.6 – Community & Regional Diagnostic Imaging Services Definition
T3.11 – Perinatal Care - Clinical

10.2.1.IM/IT Strategic Plan Alignment

The 2004-07 IM/IT plan was established in 2005 as part of the Premier's announcement that everyone would have an Electronic Health Record by 2008. The plan was refreshed in 2006-07 and is still evolving. Active IM/IT initiatives should continue as planned but future initiatives need to be aligned with and encompass the standardization of clinical vocabularies initiative.

The specific IM/IT initiatives and potential opportunities for alignment with the clinical vocabularies initiative are contained in *Appendix L – IM/IT Initiatives to Standardization Alignment.* These potential opportunities need to be reviewed by the provincial IM/IT strategy development team.

The IM/IT Strategy is driven by requirements and solutions defined through efforts to streamline processes and use common data for multiple uses – most importantly, to support the delivery of health care to patients and clients. The IM/IT Strategy and clinical vocabulary

standardization have complementary objectives, with mutual benefit. The clinical vocabularies standardization initiative engages clinicians and the users of data, while the IM/IT Strategy supports health care service delivery through technology.

10.3. Costs

In this impact assessment, only costs associated with the approach recommended are presented. It is important to note that the cost of maintaining current practice (i.e. doing nothing) has not been calculated. The costing for the recommended approach is sub-divided into (1) estimated costs of implementing the tactical recommendations, and (2) other cost considerations.

Costing of tactical recommendations is intended to provide a high level guide for expenditure planning. Each recommendation is itemized by activity involving human effort, deemed to be the most significant cost factor in this initiative. Estimates for each recommendation are shown in a six-year time frame, although some recommendations are expected to continue beyond that. Also, to provide a fiscal estimate, start and completion dates are applied to each recommendation and applied to the respective fiscal years.

Other cost considerations are presented, as they have implications, but are not easily quantified. Since the term 'cost' is generic, there are different views, and when asking "how much will it cost", the meaning of 'cost' needs to be defined. There are different views to consider, for example:

- Fiscal expenditure that requires funding – as presented in the Tactical Recommendation cost estimate;
- Overall cost to the Alberta healthcare system – in conjunction with other initiatives, such as with the EHR and implementation of ICD-10-CA/CCI;
- Cost implications of changing software to support standardization; and
- Human cost – patient safety, quality of care and provider burden, which is almost impossible to quantify.

The section on other 'cost considerations' includes:

- Costs and Benefits to the Alberta Health Care System;
- ICD-10-CA implementation as a cost comparison; and
- Cost implications in changing software.

10.3.1. Estimated Costs of Implementing Tactical Recommendations

This section provides an estimate of the costs, at a provincial level, needed to implement the tactical recommendations, assuming a start date of April, 2007. The most significant cost in the tactical recommendations is expected to be human effort required, either through

contracted services or wages of seconded personnel used specifically for the implementation strategy. Cost estimates do not include materials and technology, of which the Terminology Server is the most significant, and is addressed separately through the Provincial IM/IT Strategy. Detailed estimates for each tactical recommendation are tabulated in *Appendix M – Tactical Recommendation Cost Estimates.* Included, are summaries by project, where a project is tied to a tactical recommendation, and by fiscal year. Cost projections are for a period of six years, although many of the recommendations are likely to continue for a longer period of time. Detailed working papers providing background information related to the summary tables provided in Appendix M are part of the Companion Document delivered separately.

In preparing these costs, the following assumptions have been made:

- The estimates are based on the incremental effort required to implement the tactical recommendations, using the implementation strategy, outlined in the Final Report;
- Costs for people performing activities that need to be done regardless of standardization activities are not included in the estimate; this is an incremental view only and assumes a coordinated approach to produce the standardized outputs for processes, data set, and data content definitions;
- The projects are tied to the tactical recommendations, and are both inter-dependent and cumulative in terms of gaining benefit from applied effort;
- Human effort is focused on both prerequisite projects, such as in facilitated stakeholder working sessions on forms standardization, and on operational/ongoing work, such as with coordination and communication;
- Measures are in terms of 'effort' in person-days using an average of $1000/person-day, (based on a range of $700 to $1600 per person-day). This builds in some allowance for travel within the province. Where international travel is involved, such as for involvement in mapping exercises, the daily rate is increased by $250/person/day where it applies;
- The choice between currently employed staff and contractor could affect the cost per person-day. For currently employed staff, seconded to this initiative, the cost estimate considers the need for back-filling; and
- Some recommendations identify subsequent phases. Estimates in this report are based on the primary phase over a time period of 6 years or the life of the project, whichever is shorter. In some cases, completion of the first phase is necessary in order to provide estimates for subsequent phases.

In terms of the licensing cost of SNOMED CT®, the model is still evolving. At the time of writing, the services offering and membership model for a new national Standards Collaborative have been approved by the Standards Collaborative Strategic Committee. This collaborative would see the coming together under one umbrella of organisations such as HL7 Canada, Infoway Partnership on Health Informatics, IHE, CSA Technical Committee on Health Informatics Z295, DICOM, LOINC, and SNOMED-CT®. A license to use SNOMED CT®will be available to members of the Standards Collaborative as a benefit of membership in the Collaborative. Membership will be available to Ministries of Health, Health Regions, vendors

and others. Membership will provide members' employees with access to and use of SNOMED CT®.

The cost of membership is currently being discussed. Costs to Federal, Provincial and Territorial jurisdictions will be based on some form of per capita fee. The costs for service deliverers such as Health Regions and hospitals will be based on their overall operating expenditures. Other rates will exist for professional associations, vendors, consultants and individuals. In all cases, the proposed cost of membership in the Standards Collaborative would be less than the current combination of Infoway Partnership, HL7 and SNOMED CT® fees.

In addition, there will be fees for training materials etc. To give some sense of what these fees may be, the current cost schedule from SNOMED International has been included as *Appendix N - SNOMED® International Current Cost Schedule.*

The final fee structure is expected to be announced in March 2007 with implementation on April 1, 2007.

10.3.2. Other Cost Considerations

COSTS AND BENEFITS TO THE ALBERTA HEALTH CARE SYSTEM

In the private sector, 'cost' is incurred either through normal operations or through investment, resulting in both sustainability and profitability of the organization. The desire is a positive return on investment and payback within a reasonable time period. Health care in a public setting is different, although sustainability is critical due to resource constraints. Investment is not measured purely in terms of economics. The challenge is that while immediate costs are more visible, the intermediate and longer term benefits are less quantifiable.

It is acknowledged that a complete EHR requires a core standardized clinical vocabulary for interoperability and consistency. While the economic cost-benefit for either of the EHR and core standardized clinical vocabulary is not easily determined, effectiveness could be measured through outcomes in more localized care settings. For example, patient/clients' clinical outcomes should be measured using methodologies such as Balanced Scorecard and Activity-Based Accounting. Coincidentally, the use of standardized clinical vocabulary could, in theory, support better measurement of costs and benefits. Consequently, as standardization expands so will the ability to measure its effectiveness.

ICD-10-CA IMPLEMENTATION AS A COST COMPARISON

It was suggested that the ICD-10 implementation could be used as a benchmark for implementation of a core standardized clinical vocabulary, such as SNOMED CT®. However, this initiative was focused on replacing classifications - ICD-9 with ICD-10-CA and CCI. The

recommendations on implementing SNOMED CT® as the core standardized clinical vocabulary are different than the approach used to implement ICD-10-CA. One key difference is that SNOMED CT® implementation is not replacing an existing vocabulary. Another difference is in the best practice approach recommended for SNOMED CT® implementation that allows for incremental integration and evolution. These initiatives are very different, and caution is advised when making comparisons. For further information, refer to section 5.4.4.

COST IMPLICATIONS IN CHANGING SOFTWARE

With the recommendation of using SNOMED CT® as the core standardized clinical vocabulary, clinical systems such as EMR systems will need to support the standard or communicate to the translation services server. This assumes that at the "point of care", the local system would be able to do either one of the following:

- Capture SNOMED CT® data; and
- Capture other types of data using an acceptable interface vocabulary.

The costs for each of the supporting capabilities are different. However, developing each would follow a similar three-stage process:

1. Identify the requirements and design the specification for local capture of data and messaging (to either a vocabulary server or to a data hub);
2. Identify the requirements and design the specifications for a central vocabulary server, including the management of incoming and outgoing messages. Outgoing messages would go to a data hub; and
3. Invite vendor participation to set up an end-to-end configuration.

Staging allows for validation along the way, which reduces the risk. It is a least-cost approach, resulting in the least disruption to care providers and allows for other foundational standardization development to happen in parallel. This is an evolutionary approach.

10.4. Critical Success Factors

Critical to the success of this implementation strategy are the following factors:

- At all times, the approach is to use small steps and build awareness using local pilots. There is a need to demonstrate the local value and benefits to the clinician in their practice and in decision-making. Local pilots will also mitigate or contain the risk of a pilot failure have serious impact on the rest of the health system.
- The driver is the business and the business value to the delivery of health care and to the overall success of interoperable IM/IT systems that support patient/client care. Therefore, a clinical advisory group composed of multi-disciplinary representatives from the professional organizations and representatives from the vendor is recommended.

1. Communications and change management is also critical to success. There is a need to highlight the differences between now and the future; that is, what are the limitations with what has been accomplished so far with provincial IM/IT systems and what is expected with standardizing clinical vocabularies.

2. The province needs to coordinate the efforts for standardization to avoid duplication of effort and to support the facilitation/consensus building process and implementation efforts. AHW needs to be a focal point for this coordination effort for purposes of securing funding from Infoway.

3. Long term success will depend on the support/maintenance of the standards.

10.5. Risk Assessment

Based on the proposed approach for implementation, this section identifies some potential risks and mitigation strategies. A full Risk Management Plan is out of scope for this impact assessment but should be developed under the auspices of the Coordinating Unit.

Lack of "continuity of care" - the lack of a standard reference vocabulary across care settings is a risk to patient safety and care at each transfer point in the care continuum.

> *Mitigation Strategy:* establish a standard reference vocabulary for the province. SNOMED CT® is recommended. Ensure this is incorporated into the IM/IT Strategy.

POSP is no longer funded – there is a significant risk to the value of the EHR if the POSP program does not continue to be supported and funded. The uptake of EMR systems is critical to the overall success of the EHR.

> *Mitigation Strategy:* continue the POSP program and its funding. Ensure that SNOMED CT® is incorporated into the requirements for the next VCUR RFP.

SNOMED CT® is an "unproven" standard – there are concerns that the province not establish standards for standards-sake, nor are standards established unless they are proven (e.g. ICD-10). However, the lack of a standard reference clinical vocabulary will continue to limit the value of the EHR. Infoway has established SNOMED CT® as the reference clinical vocabulary for the interoperable EHR. In addition, there are many countries world-wide that are establishing SNOMED CT® as their reference vocabulary for shared health records. This should be sufficient "proof" that SNOMED CT® should be the reference clinical vocabulary standard.

> *Mitigation Strategy:* the province closely monitors the results of national and international pilots and implementations. In addition, the province should become directly involved with establishing the necessary refinements to SNOMED CT® that will develop in the future.

Lack of multi-disciplinary involvement/collaborative process – multi-disciplinary participation is critical to the success of the adoption and implementation of standardized clinical vocabularies. This has been established as a best practice and is proven to expedite the adoption of standardized clinical vocabularies. However, resource capacity issues could be a significant barrier to participation.

> *Mitigation Strategy:* provide funding incentives to recognize the contribution to standardization of clinical vocabularies that these multi-disciplinary groups provide; support their endeavours through constant communication throughout the province.

Lack of dedicated resources for Readiness, Communication and Education – a critical success factor is dedicated resources for the coordination of the standardization initiatives and the communication and education tasks. It has been proven that progress in any initiative is severely impeded if resources are not dedicated to managing it and "doing" it.

> *Mitigation Strategy*: Establish a Coordinating Unit it that is resourced and funded for at least the first three years of this initiative.

Inappropriate access to the EHR – there are some concerns in the physician community regarding what information is going into the shared record and who has access to it. The risk is that the receiving provider may not have the skill set to counsel patients when, for example, if there is a diagnosis of malignancy or when prescribing medications based on lab results.

> *Mitigation Strategy:* Strong data stewardship through the EHRDSC or other body is required along with a means for input and consensus from the appropriate stakeholders. A potential model to use is the Primary Care Initiative that uses 'forums' throughout the province to engage a wider audience than is typical.

Lack of coordination for developing best practices for patient care - there is a different strategy for other stakeholders (nurse practitioners, case managers etc) that are developing best practices for patient care in a variety of settings. This should be done through focus-groups consisting of subject matter experts from a specific care setting, or standing working groups with terms of reference. The professional associations should also be included in this activity. This is cross-regional and provides input into program planning, facilitates the process of making this concrete and real to an audience that is business/ clinical driven. This type of work was acknowledged as being eligible to be incorporated into the IM/IT Strategy.

> *Mitigation Strategy*: include this work into the IM/IT Strategy and obtain endorsement by the IMC. Identify funding incentives to recognize these focus groups.

Licensing fees may be cost prohibitive – licensing cost information is still being developed as part of the establishment of a national Standards Collaborative. It is expected that a costing structure can be established that reduces the present high cost of implementing SNOMED CT® at a jurisdictional or Health Region level, but that still needs to be confirmed.

There may also be a risk that SNOMED CT® license costs may be a barrier to software vendors including SNOMED CT® within their products. However, it is thought that this risk is low given the likely existence of cross-mapping to other less costly standardized clinical vocabularies.

> *Mitigation Strategy*: Alberta should continue to be actively involved with the establishment of the Standards Collaborative.

Lack of coordinated action between provincial, national and international standards organizations on cross- mapping may lead to local solutions – Unless jurisdictions and standards organizations act speedily and in a coordinated fashion to develop cross mapping between the major clinical vocabularies, vendors and/or others may develop cross mapping solutions that resolve local issues but do not support provincial or national interoperability.

> *Mitigation Strategy:* AHW needs to actively work with other jurisdictions and standards organizations to ensure that the required coordination and timeframes for these cross mapping activities are achieved.

Lack of Tools to support standardized clinical vocabularies may delay implementation or lead to local solutions - Tools needed to support translation, implementation, training and operations of standardized clinical vocabularies such as online help, online training, etc. are not yet commonly available. As the need for standardization activities accelerates, progress may be impeded by the lack of such tools. Unacceptable delays or the development of local (non-interoperable) tools may result.

> *Mitigation Strategy:* Jurisdictions and Standards organizations need to collaborate on defining the functional requirements that these tools need to support and publicise these requirements to the vendor community.