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Ontario Oncology Information System Standards: Defining its Meaningful Use

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Surgical Oncology, Radiation Treatment, Systemic Treatment,

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External Reviewers:

Regional Cancer Programs: Regional Vice Presidents, Regional Directors, Medical Oncologist, Radiation Oncologist, Surgical Oncologist, Regional Leads for Systemic and Radiation, Quality Lead for Systemic Treatment, Pharmacy, Psychosocial / Allied Health, Nursing, Primary Care Physicians, Patient Advisor Lead, Patient Education

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EXECUTIVE SUMMARY

(i) Project Background

To optimize the consistent collection and management of cancer care information for quality reporting and to support optimal integrated patient care, within and across Regional Cancer Centres (RCC), Cancer Care Ontario (CCO) with funding from eHealth Ontario, developed Oncology Ambulatory Electronic Medical Record (aEMR) functional requirements as well as capturing end user information standard concepts through the CCO led Oncology Information Standards Project (Project). To address the data collection and submission challenges, the Oncology aEMR Extraction Standard provides a concept for a potential future singular method of data submission using an interface between Oncology aEMRs and CCO.

(ii) Project Scope

The initiation of an Oncology aEMR requires an understanding of clinical processes, end user needs, local, regional and provincial assets - many that are unique to Ontario or a Canadian environment. A consistent Ontario-based approach will align the work underway at CCO and hospitals that will be applicable to end users, clinical disciplines, informatics, hospital administrators, and CCO programs. As the focus of the project was the Oncology aEMR, issues related to non-Oncology aEMR were not addressed, nor were requirements for inpatient settings.

(iii) End User Consultation and Engagement

A multi-faceted approach was applied with the aim of optimizing end user and stakeholder engagement, as well as alignment with current and projected future provincial initiatives. Two onsite focus groups were held at each of the 13 participating Provincial Regional Cancer Programs (RCP) with distinct areas of foci: Clinical versus Operational. A total of 141 participants, representing physicians, inter-professional clinical team members, administrators, and health information specialists participated in the onsite focus groups. A total of 1598 ideas were generated (Clinical = 997, Operational = 601) from the 26 focus groups sessions.

(iv) Overview of the project work streams:

This document provides guidance on the key features, functionalities and components of an Oncology aEMR which are required to support integrated cancer care and treatment. The core document is comprised of three distinct, yet interconnected chapters which can be used as stand-alone resources or in conjunction with the information contained throughout the documents. The chapters are:

- Information Standards: Describes the results of provincial consultations to identify the information standards required by end users in an Oncology aEMR to support decision making and day to day management of the patient.
- Functional Requirements and Usability: Inclusive of the functionality statements which describe what an Oncology aEMR should have the "ability to do" in terms providing safe and effective care and concurrently collecting and disseminating of information required to support the provision of integrated cancer care. A focus on usability is highlighted.
- Oncology aEMR Extraction Standard : The Oncology aEMR Extraction Standard supports the transmission of Activity Level Reporting (ALR) data derived from patient-level records within the cancer system that pertain to radiation treatment, systemic therapy (chemotherapy) services and outpatient oncology clinic visits. The standard is based on HL7 version 3 (v3).

(v) Intended Audience and Use

The purpose of this document is to provide evidence-based recommendations that can be used to guide the design, selection, implementation, sustainability and/or evaluation of an Oncology aEMRs system. This document can be used by clinicians, program and operational leadership, health information technology professionals, clinical informatics, and health system planners, as they determine the necessary system features and functionalities to support the provision of cancer care in the ambulatory setting.

(vi) Overview of Project Deliverables

a. Information Standards

As a result of extensive consultation and data collection process, systematic content review, and consensus via a modified Delphi process, a total of 37 information standard (IS) concepts have been identified. The IS were classified into three categories: complete (e.g. required data elements for an indicator currently existing within CCO/Data Book); partial (e.g. required data elements are not standardized, primarily located/collected at RCP level and not currently being submitted to or collected by CCO); and future-focused (e.g. data elements with no consistent definition, standardization, consistency being collected at RCP level, nor being reported to CCO).

Based on the review of the 13 complete IS, six (6) were validated as pre-existing indicators already collected by CCO and included in existing internal and external quality reporting. In consultation with CCO Clinical Programs and Quality Initiatives, seven (7) new IS have been developed. For these "net new" IS concepts, Informatics has created DRAFT methodology files to illustrate how these concepts could be reported using data already collected from RCPs.

Information Standards with supported data elements	New / Potential Information Standards
1.Wait times from surgery to treatment. 2.Wait time: Referral to Palliative Care to Access Services. 3.Time of receipt of referral to consult (first clinic visit). 4.Wait time from referral to intake with PSO/ Support Care Services. 5.Wait time: Consult (first clinic visit) and first treatment. 6.Market share report of intra-LHIN and inter-LHIN treatment patterns.	7.Timing between first clinic visit (referral) and treatment decision (decision to treat). 8.Appropriate use of supportive medications with systemic treatment i.e. Neupogen/Neulasta, anti-emetics (Care Pathway). 9.Number and type of disease of patients per radiation treatment unit. 10. Uninsured report or percentage of patients that are not insured. 11. Number of patients on oral chemotherapy vs systemic. 12. Radiation-LINAC Utilization: 1. Number of cobalt/LINAC treated cases per machine. 13. Radiation-LINAC Utilization: 2. Reporting of the number of treatment fractions by LINAC.

b. Functional Requirements and Usability

This section represents the first version of Ontario's functional requirements for an Oncology aEMR. It is designed to outline high level functionality that can be updated as best practice guidelines/standards/requirements are released from appropriate professional, government, and jurisdictional agencies including Cancer Care Ontario.

The functional requirements outlined in this section can be used as a guideline to support detailing specifications for a new Oncology aEMR system or identifying areas for improvement/enhancements of existing systems. Collaboration among key stakeholders such as informatics experts, clinical application specialists, clinicians, and administrators is essential in determining the additional functionality that will work best with a facility's systems architecture and clinical/business processes. The importance of usability as it relates to the aEMR and how to evaluate usability is highlighted.

The tables below detail the essential and desired functional requirements formatted along the Cancer Journey. Functional requirements have been listed where they first appear in the journey although they may be applicable in a different stage as per the workflow of an organization. The template below provides an example of how the functional requirements are described.

Cancer Journey Phase: e.g. Diagnosis			
Action Item: *(if applicable)* Clinical, patient or business event(s) that require functionality in the form of a functional requirement statement.			
ID # Statement reference number	**Functional Requirement Statement** Functional requirements are statements that describe what your system must be able to do. In detail, they support the model of a longitudinal medical record within an Oncology aEMR across the patient journey. These statements promote adherence to documented best practice, and principles, such as responsive, equitable patient care and facilitate improvements to interoperability and communication.	**Priority Level** E = Essential D = Desired	**Source** Requesting organization, supporting sources.

c. Oncology aEMR Extraction Standard

To address the data collection and submission challenges, the Oncology aEMR Extraction Standard provides a concept for a potential future singular method of data submission using an interface between Oncology aEMRs and CCO. It is anticipated that the standard will address challenges ranging from collecting and reporting multi-source data to submitting data to CCO in various formats. The Oncology aEMR Extraction Standard supports the transmission of ALR data derived from patient-level records within the cancer system that pertain to radiation treatment, systemic therapy (chemotherapy) services, and outpatient oncology clinic visits. The standard is based on HL7 v3.

HL7 v3 was chosen as a desirable future migration path for ALR because it is strongly favoured at the federal and provincial levels. Canada Health Infoway and provincial and regional health agencies, like eHealth Ontario, are adopting HL7 v3 as the data standard of choice to promote healthcare interoperability.

On September 19th, 2013, the Ontario EHR Interoperability Standards Strategic Committee (SC) endorsed the Cancer Care Ontario Ambulatory Cancer EMR Extraction Standard as a standard that conducted appropriate stakeholder engagement, followed the Ontario EHR Interoperability Standards (OEIS) governance decision making processes, and achieved the desired outcomes of improving the overall quality of the standard and increasing awareness.

d. Conclusion

After completion of the standards framework, next steps will include a consultative planning process to identify priorities and develop the future strategy to enable and support the implementation of the Oncology Information System Standards with Regional Cancer Programs across Ontario.

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CHAPTER 1: INTRODUCTION

1.1 Project Background

Canada Health Infoway (CHI) funded four Regional Cancer Centres (RCCs) to implement Ambulatory Oncology Electronic Medical Records (Oncology aEMRs) in Ontario. To optimize the consistent collection and management of cancer care information within and across Regional Cancer Centres, Cancer Care Ontario (CCO), with funding support from eHealth Ontario undertook research, analysis and extensive stakeholder engagement and input to produce core functionality and information standard concepts for an Oncology aEMR. Additionally, to optimize alignment of the Oncology aEMRs deployments to identified current and future provincial assets, a HL7 v3 interface specification concept was established to support the future transmission of Activity Level Reporting (ALR) data derived from patient-level records within the cancer system.

1.2 Project Scope and Outputs

The initiation of Oncology aEMRs requires an understanding of clinical processes, end user needs, local, regional and provincial assets - many that are unique to Ontario or a Canadian environment. A consistent Ontario-based approach will align the work underway at CCO and hospitals that will be applicable to end users, clinical disciplines, informatics, hospital administrators, and CCO programs. The focus of the CHI funding to individual RCC's related to successful implementation of Oncology aEMRs but did not include evaluating issues around information standards (quality indicators), associated data standards and most importantly, the functional requirements required to gather them. Therefore, an evaluation of these aspects related to the Oncology aEMRs is essential for benefits realization.

Hence, additional work included in this Project was undertaken to articulate the core functionality of Oncology aEMRs in Ontario by addressing clinical functional requirements, information and data standards, and data extraction specifications. To support this work, the integrated patient Cancer Journey was used as the foundational framework. These specifications may be used to build and deploy the relevant interfaces between Oncology aEMRs and selected Ontario CCO provincial information assets (initially CCO eClaims and Data Book Activity Level Reporting). As the focus of the project was the Oncology aEMRs, issues related to non-Oncology aEMRs

were not addressed, nor were requirements for inpatient settings; yet it is recognized that many of the findings here could be applicable to these areas. Additionally, deployment of Oncology aEMRs and implementation of information and data standards are out of scope for this project.

Project Outputs

1. Documentation describing the required core functionality of Oncology aEMRs.
2. Identification of stakeholder driven Oncology aEMRs information standards.
3. Data extraction interface specifications to optimize alignment of the Oncology aEMRs deployments to identified current and future provincial assets.

It is important to note that all Project outputs are interrelated to help ensure that quality care and improved performance are achieved. Figure 1 below illustrates the relationship among the project components. As the required information is gathered and identified, data standards are then formulated and ensure the required functionalities supporting the needed data are clearly stated as functional requirements of the Oncology aEMRs. Lastly, the transmission standards or the interface specification facilitates the data to be interoperable across multiple systems.

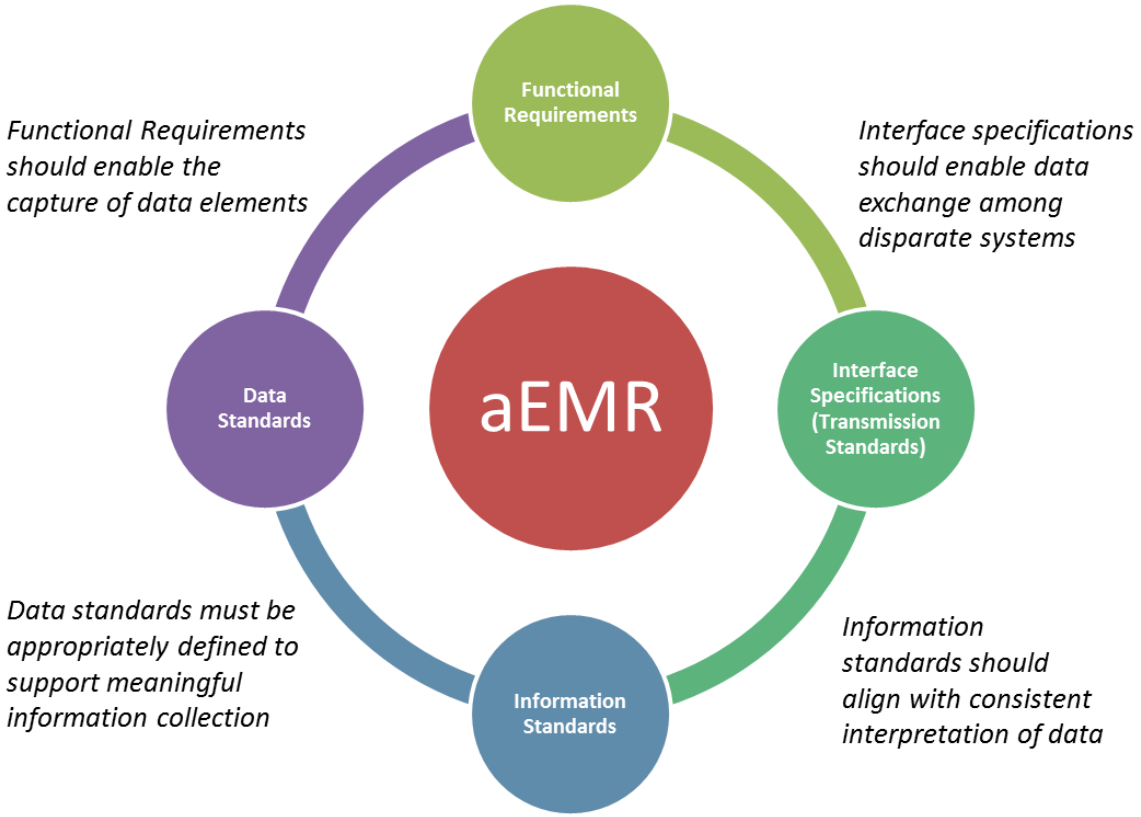


Figure 1: Project components.

1.3 Development Framework

The following components were used to guide the design of the various project outputs generated:

A. Scoping Review: Core Functions/Components of Oncology aEMRs.

To examine what has been accomplished to date in other jurisdictions with regards to Oncology aEMRs, a scoping review was conducted by the CCO Evidence Search and Review Service (ESRS). The overall research question to be addressed by the review was:

What are the required features, functionalities, and components of an ambulatory oncology electronic medical record required to support the information collection, decision support, and reporting needs of oncologists providing patient-centered care in ambulatory oncology settings?

Within the overall research question, two objectives were identified:

1. Identify the features and functionalities of an ambulatory oncology electronic medical record required to support physicians delivering safe, high quality care for cancer patients.
2. Identify and describe the components and outcomes associated with ambulatory oncology electronic medical records.

Due to the nature of the topic, and the anticipated paucity of research, a scoping review was deemed appropriate to enable a fulsome review of the existing literature as well as industry standards specific to electronic medical records. An iterative search strategy was used to identify relevant literature, resulting in the inclusion of a total of 106 sources (94 pertaining to EMR in general and 12 specific to Oncology aEMRs). For the complete list of citations reviewed, see Appendix A: Scoping Review Reference List. The information obtained through the scoping review was reviewed with all project outputs in mind and used to support the relevant project components.

Based on the review of the literature obtained, common themes or descriptions of the core functions of Oncology aEMRs were identified. As an overarching framework much of the published works referred to the Institute of Medicine's (IOM) eight core

functions of an EMR required to support patient safety. The core functions identified by the IOM report are: Health information and data, results management, order management, decision support, electronic communication and connectivity, patient support, administrative processes, and reporting. These areas were also highlighted in the literature specific to Oncology aEMRs with areas such as family history data (Sweet et al 2002; Orlando et al, 2011), results management (Poon et al, 2010; Henkelman, 2003), clinical decision support (Bernerd, 2012; Baker et al, 2009; Kralj et al, 2003), order entry and medication management (Rogers, 2009), and error identification (Hayden et al, 2008) being described as essential functions to support ambulatory oncology cancer care.

B. Cancer Care Ontario's Patient Cancer Journey

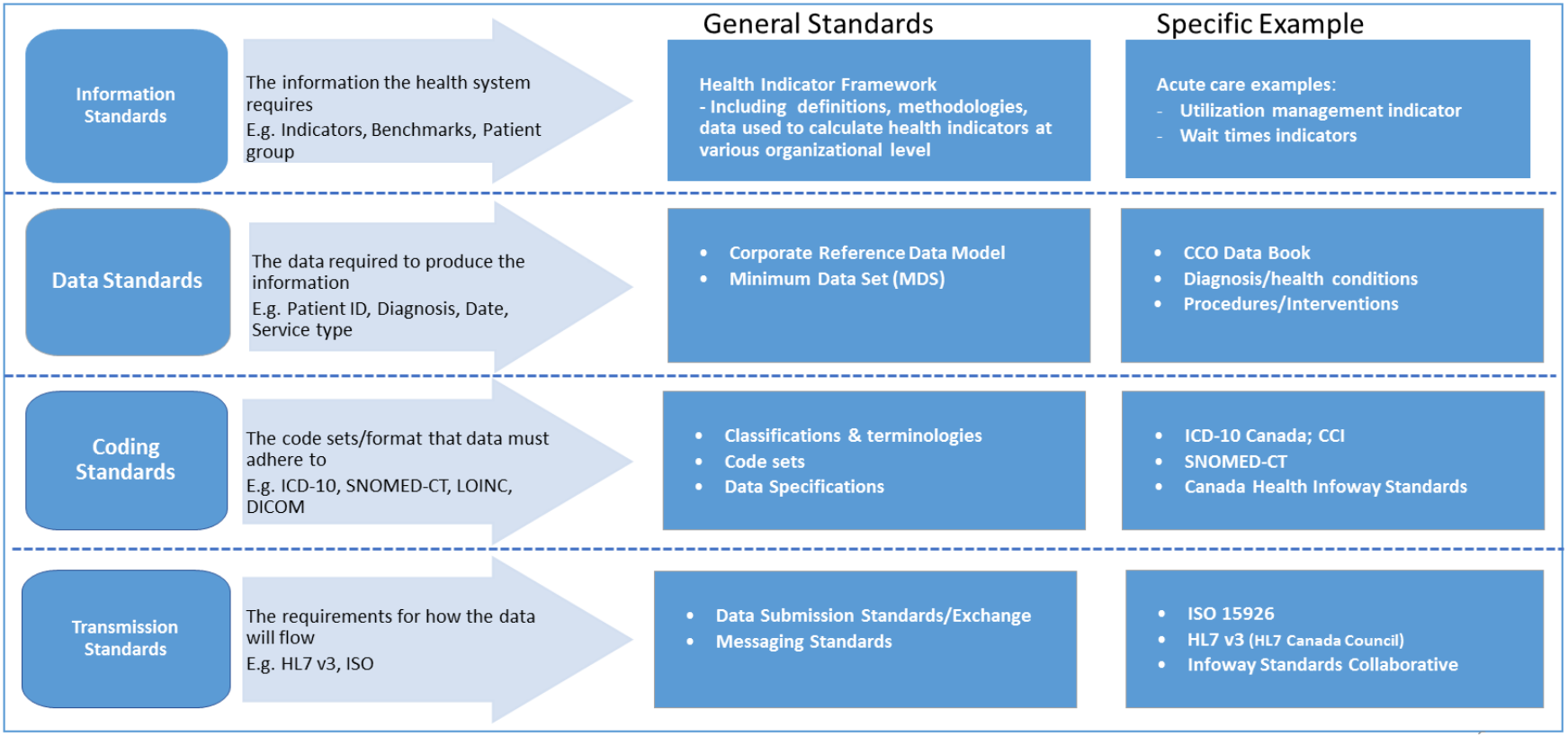
One of the goals contained in the Ontario Care Plan refers to 'improving the patient experience along every step of the cancer journey." Figure 2 below depicts the various stages of the cancer journey beginning with prevention and screening, and later phases involving recovery or end of life care. Although the scope of the Ontario Oncology Information Systems Standards project is focused on the Ambulatory Oncology setting, where the primary focus is on diagnosis and treatment, there is recognition of the value in consideration of the entire patient cancer journey when designing an oncology EMR, as the patient will often cycle through ambulatory setting for various aspects of care and treatment, and returning to the primary care provider in the community. As such, the importance of having timely access to complete information across the various phases of the cancer journey was considered in the identification of information standards and associated functional requirements.

Figure 2: The Cancer Journey.

C. Canadian Institute for Health Information (CIHI) Standards Framework.

The CIHI Standards Framework (2010) provides a schematic for the relationship between information, data, coding and transmission standards specific to a health care system. The framework provides examples of each component, as well as the relationship between the various standards. Information standards is the information required by the health system with data standards defined as the data

required to produce the information. Coding and transmission standards address the "functional requirements" of the EMR system (what it should do) and how the data will flow. See Figure 3: CIHI Standards Framework.



Source: Canadian Institute for Health Information, Standards Framework, June 2010

Figure 3: CIHI Standards Framework.

D. *Cancer Quality Council of Ontario: Quality Dimensions.*

The Cancer Quality Council of Ontario (CQCO) advises Cancer Care Ontario and the Ministry of Health and Long-Term Care in their efforts to improve the quality of cancer care in the province. The seven dimensions of quality used to guide the monitoring and evaluation of performance indicators are: safety, effectiveness, accessibility, equity, integration, efficiency, and responsiveness. Cancer Care Ontario has adopted these quality dimensions in the monitoring and reporting of cancer system performance. The indicators reported through the Cancer Services Quality Index (CSQI) are mapped according to quality dimension and the patient journey. See Figure 4 below.

Figure 4: Ontario Quality Council of Ontario - Quality Dimensions.

1.4 Anticipated Project Benefits

The CHI funding of Oncology aEMRs in Ontario Regional Cancer Programs will provide important benefits. Programs that implement Oncology aEMRs will experience a number of direct patient care related benefits including: improved quality of care, enhanced patient safety, improved workflow and efficiencies for staff, more effective resource management, and an increased ability to support and facilitate research.

A second category of benefits that can be realized with the deployment of Oncology aEMRs in the Regional Cancer Programs is an improved ability to manage the system of oncology care across the province. To accomplish this goal requires more than simply installing new applications in the Regional Cancer Programs. This project will create the standards - both information and data - along with the integration specifications which all of these implementations will need to comply with. Once all RCPs have implemented their Oncology aEMRs and comply with the standards and integration specifications identified by this project, the province will be capable of a new level of performance management and integration of the oncology care provided in Ontario.

1.4.1 Overview of the Ambulatory Cancer Care Information Standards and Functional Requirements Document:

This document provides guidance on the key features, functionalities, and components of Oncology aEMRs which are required to support cancer care and treatment. The complete document is comprised of four distinct, yet interconnected chapters which can be used as stand-alone resources or in conjunction with the information contained throughout the documents. The chapters are:

1. Information Standards: Describes the results of provincial consultations to identify the information standards required in an Ambulatory EMR
2. Functional Requirements: Inclusive of the functionality statements which describe what an Ambulatory EMR should have the "ability to do" in terms of the collection and dissemination of information required to support the provision of cancer care.

3. Ambulatory Cancer EMR Extraction Standard : The Oncology aEMRs Extraction standard supports the transmission of ALR data derived from patient-level records within the cancer system that pertain to radiation treatment, systemic therapy (chemotherapy) services and outpatient oncology clinic visits. The standard is based on HL7 version 3 (v3).
4. Conclusions: Synthesis of the key findings and recommendations from the previous chapters, along with considerations for practice, policy, research and future innovations.

1.4.2 Intended Audience and Use

The purpose of this document is to provide evidence-based recommendations that can be used to guide the design, selection, implementation, sustainability and/or evaluation of an Oncology aEMR system. This document can be used by clinicians, program and operational leadership, health information technology professionals, clinical informatics, and health system planners, as they determine the necessary system features and functionalities to support the provision of cancer care in the ambulatory setting.

The information contained here can be used to guide the design, selection, implementation and/or evaluation of an Oncology aEMR system and is based on the best available information, existing standards, and supporting literature. The unique needs of the organization, patient population clinicians, practice patterns and workflow processes should be considered in order to determine the degree of customization required to meet the unique needs at the point of care.

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1.6 Appendix A: Literature Scoping Review Reference List.

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CHAPTER 2: INFORMATION STANDARDS

2.1 Introduction

As per the CIHI Standards Framework (2010), a health information standard is defined as the amount and type of information that is necessary to be collected, processed, and provided to healthcare stakeholders (e.g. Wait time, treatment patterns). Information standards, which are derived or calculated from multiple sources of data, are generally targeted at the population level rather than the individual level and are used to understand overall performance. Examples of information standards are indicators, benchmarks, and patient groupings.

A data standard is the data required to produce the information (e.g. patient ID, diagnosis, date of consult) and is therefore more granular in nature. Data standards also ensure the format of the data, the definition of the data element including the timing of its collection, the purpose of collection, and the valid values are clearly outlined within the standard. A data element is actually what is recorded or captured in the Oncology aEMRs system, e.g. number of immunizations or the date of first clinic visit. Creating a data standard then ensures that comparison of any information derived from the data is processed similarly, is acceptable, and consistent.

> When applied to a cooking analogy, an information standard is like *the recipe* for a particular meal or dish, whereas the data standards are the equivalent to *the ingredients* required in creating the recipe.

Information, generated from multiple sources of data, contributes to knowledge about a particular phenomenon of interest, which is used by health care providers and/or health system planners to support decision making and eventually, action. Figure 1 illustrates this intimate connection between information and data standards, knowledge generation, and how action becomes a consequence or outcome of data.

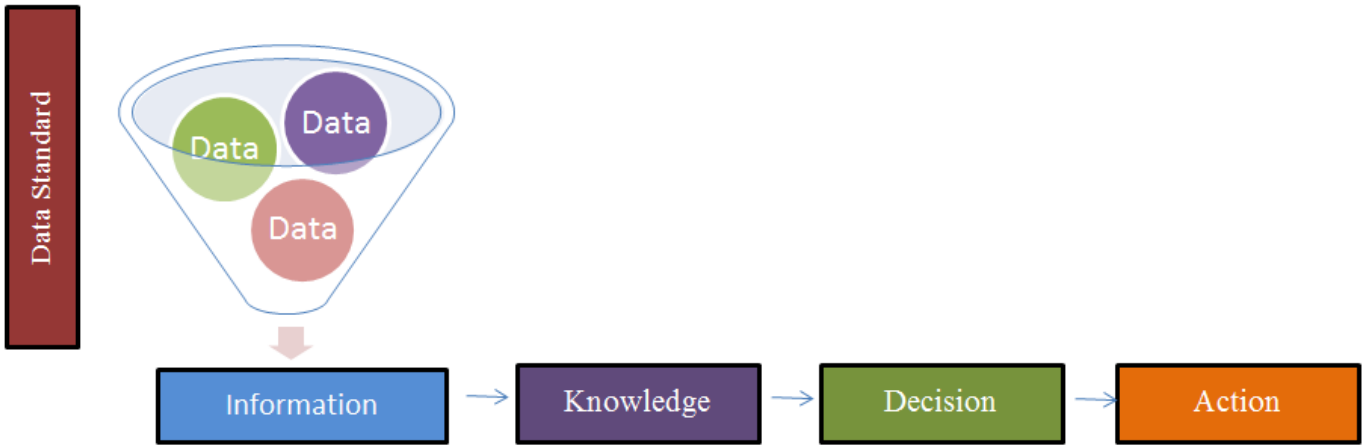

Figure 1: Data to Action Flow.

The California Healthcare Foundation (2004) states that the "benefit of encoding clinical data standards in software applications is that once they are developed and adopted, they can be followed reliably with a low error rate - allowing automation of repetitive processes and consistency across application. Thus, clinical information can have the same meaning and usability in a wide range of settings. The ability to provide reliable and valid data standards will potentially decrease variability in reporting and provide more accurate outcome measurements.

1.2 Methodology

In order to determine the information standards that should be applied to the Oncology aEMRs, a multi-faceted approach was applied with the aim of optimizing end user and stakeholder engagement, as well as alignment with current and projected future provincial initiatives.

2.3 End User Consultations

Two onsite focus groups were held at each of the 13 Provincial Regional Cancer Programs (RCP) with distinct areas of foci: Clinical versus Operational; and facilitated by members of the Project Team including the Clinical Lead. Each RCP was charged with identifying members of the inter-professional clinical team to attend the clinical session and the managers/administrators for the operational session. At both of the sessions, the participants were asked to identify their information needs as they relate to oncology cancer care and the information standards they would like incorporated within the Oncology aEMRs systems within Ontario. Information concepts generated through the brainstorming exercise were then shared, clarifying as required, discussed, and then mapped to the relevant phase of the integrated cancer patient journey. All concepts generated at each session were documented and collected for further review and analysis. At the end of each session participant feedback was also obtained regarding the overall process and relevance. A summary of results from each site was provided after the session to allow for validation of information and/or additions.

In addition to the onsite focus groups, an online survey was also used to allow for optimal engagement and participation by any interested person who could not attend the focus groups. The items on the confidential online survey mirrored the process used in the face-to-face focus group sessions.

2.3.1 Content Review, Synthesis and Internal Mapping

Multiple phases of conventional content analysis (Hseigh & Shannon, 2005; Vaismoradi, Turunen & Bondas, 2011) were utilized to review the information concepts generated from the 26 focus groups conducted at the RCPs in order to identify the most meaningful, relevant, and feasible indicators. In Phase 1, each individual concept was individually reviewed by members of the project team, clustered, and coded to identify themes or patterns. Criteria were established for elimination of concepts, which included: duplicates of same concept, functional requirements (e.g. I would like the EMR to do…."), statistical in nature (e.g. would like to be able to determine the impact of X on Y), information located in another existing source (e.g. pathology reports, lab results), and very "niche" concepts (e.g. those mentioned at one RCP only, very specific to a unique patient population). Clinical concepts generated from the Operational focus groups were matched to items generated from Clinical focus groups for duplicates and vice versa for any Operational concepts generated from Clinical focus groups.

In Phase 2 the concepts were compared to the information and data currently being submitted to CCO through Activity Level Reporting (ALR). ALR data represents the basic set of data elements required to produce the quality, cost, and performance indicators for the cancer system. The data elements constitute patient level activity within the cancer system focused on radiation and systemic therapy services, and outpatient oncology clinic visits. Concepts were also compared to the information standards within Data Book. Data Book is a guide to the clinical, operational, and financial reporting relationship between Cancer Care Ontario, Regional Cancer Centres, and other healthcare organizations. Information concepts that were already included within either ALR or Data Book were removed from the overall list of potential information concepts.

In Phase 3 the remaining concepts were classified according to relevance (e.g. degree to which it reflects important health issue/system functioning and/or ability to influence action), and feasibility (e.g. extent of standardization, degree of quality and accessibility). Each concept was classified along the scale of high – medium – low.

2.3.2 Delphi Approach - Reaching consensus

In order to determine the degree of consensus on the "vital few" information concepts, content experts from within and external to CCO were invited to participate in an online Delphi exercise to determine their level of agreement on whether the information (represented by the indicator concepts in the survey) is required to support effective care of cancer patients and/or effective program planning, and evaluation in the oncology ambulatory setting. The Delphi technique is a structured process that allows for content

experts, from a wide variety of roles, and geographic regions, to independently review the proposed concepts against pre-determined criteria in order to determine the degree of consensus on the items to be included in the final product/document (Krzyzanowska et al, 2011; Boulkedid et al, 2011). Participants for the CCO internal Delphi included both clinical and operational leadership roles within the Clinical Programs (e.g. Systemic Treatment, Radiation Treatment, and Disease Pathway Management). The external Delphi was targeted toward the similar participants that had contributed to the initial end user focus groups at each of the RCPs (e.g. RVPs, physician leadership, operational leadership, nurses). This would allow the consultation process to come full circle and re-engage end users in the final validation and consensus step.

The Delphi exercise consisted of the final set of information concepts that were retained as part of the content analysis phases described in the previous section. Using a 4 point Likert scale, the participants were asked to review each of the items and indicate their level of agreement (1= Strongly disagree; 4= Strongly Agree) with the following statements:

a. Information required to support the *effective care of cancer patients* in the oncology ambulatory setting.

b. Information required for *program planning and evaluation* of clinical care in the oncology ambulatory setting.

Consensus was determined based on the percentage of respondents' level of agreement, with the threshold of 75 % agreement established a priori (e.g. combined results for Agree + Strongly Agree OR combined score for Strongly disagree + Disagree).

2.4 Results

2.4.1 End User Consultations

A total of 141 participants, representing physicians, inter-professional clinical team members, administrators, and health information specialists participated in the onsite focus groups, with an additional 194 participants completing the online survey. The online survey proved useful in enabling input from nursing staff, with 40% of the online participants from nursing, whereas nursing participation in the focus groups was only 4%. See Table 1: Participants - End User Consultation. A total of 1598 ideas were generated (Clinical = 997, Operational = 601) from the 26 focus groups sessions.

Session feedback results indicated that participants of both the clinical and operational session felt the session was valuable, with mean scores of 3.75 (Clinical) and 3.85 (Operational) – based on a 5 point Likert scale with 1= Not At All Valuable; 5= Very Valuable). The written comments included feedback regarding meeting process (e.g. providing more information prior to the actual meeting), expressed appreciation for the consultation process and opportunity to contribute at the early stage of the project, and requesting assurance that the outcomes of the meeting will be implemented.

Table 1: Participants - End User Consultation.

	Clinical	Operational	Online Survey
Number of sites	13	13	NA
Number of participants	135	106	194
Participant / Type	Physician (35%) Managers (39%) Allied professions (14%) Nursing (4%)	Manager / Admin (68%) IT Professional (14%)	Nursing (40%) Physicians (24%) Other (30%): Allied, Managers…

2.4.2 Content Review, Synthesis and Internal Mapping

Multiple rounds of content analysis were used to eliminate duplicates, identify common themes, and distill the wealth of information down to the "vital few" discrete information requirements that should be included in the oncology EMR. Clinical concepts generated from the Operational focus groups were matched to items generated from Clinical focus groups for duplicates and vice versa for any Operational concepts generated from Clinical focus groups. As a result, 37 concepts (16 clinical and 21 operational) were identified and retained as having been deemed to support clinical care as well as operational planning and system evaluation. See Figure 2: The Vital Few: Results from concept review.

For the concepts that were deemed to be statistical in nature, it was determined that they would better addressed as part of the reporting feature within the functional requirements (See Functional Requirements Appendix 2.1.3). Other concepts relating to primary care providers and patient-related outcomes were set aside as being out of scope for the project, yet all information has been documented and retained, with the intent of sharing the outcomes of the end user consultations with the relevant CCO programs (e.g. Patient experience, Psychosocial oncology, Primary Care).

Clinical Session Output	
Exclusion Category	*Total*
Statistics	284
Duplicate	202
Not applicable (e.g. Information located in another existing system)	147
Functionality	98
Comments	84
Patient related outcomes (PRO)	84
Operational in nature	16
Other	19
Subtotal	*934*
Concepts Included	***63***
Total Clinical Concepts	*997*

Operational Session Outtput	
Exclusion Category	*Total*
Clinical	197
Comments	29
Functionality	44
Niche concept	14
Not applicable (found in other system; not part of ambulatory record)	230
Statistics	48
Subtotal	*562*
Concepts Included	**55**
Total Operational Concepts	*601**

Final Consolidation : Number of concepts for validation	Total
Total Combined (Operational & Clinical)	118
Removed as effect of re-wording	24
Moved to Statistics	1
Concepts classified as Data, Not applicable and blanks	29
Concepts deemed collected already or in the current inventory (including partial and needs clarification)	9
Concepts re-merged and /or has complex data elements & not easily available	18
Current Total	**37**

Figure 2: The Vital Few: Results from concept review.

2.4.3 Delphi Exercise

Fifty-eight individuals participated in the Delphi exercise (18 Internal and 40 External to CCO) with consensus reached based on the a priori criteria. There was high levels of agreement that all 37 information concepts were viewed as being required to support effective care of cancer patients in the oncology ambulatory setting and/or program planning, and evaluation of clinical care in the oncology ambulatory setting, therefore all 37 items were retained.

2.4.4 Information Standards

As a result of extensive consultation, data collection process, systematic content review, and consensus via Delphi process, a total of 37 information standard (IS) concepts have been identified. The IS were classified into three categories: complete (e.g. required data elements currently exist within CCO/Data Book), partial (e.g. required data elements are not standardized, primarily located/collected at RCP level and not currently being submitted to or collected by CCO) and future focused (e.g. data elements with no consistent definition, not standardized, not consistently being collected as RCP level, not being reported to CCO level).

Based on the review, of the 13 complete Information Standards, six were validated as pre-existing indicators already collected by CCO and included in existing internal and external quality reporting. In consultation with CCO Clinical Programs, seven (7) new information standards have been developed. For these "net new" information standard concepts, Informatics has created DRAFT methodology files to illustrate how these concepts could be reported using data already collected from RCPs. These new methodology files should undergo a more complete development phase (consultation and review) to validate/update the objectives, considerations, and inclusion criteria ahead of broader distribution. See Appendix A: Information standard concepts and indicator methodology files.

2.4.5 Indicator Validation and Development Process

The extensive consultation process with clinical and operational end users provided a wealth of information regarding the current and projected information and data desired at the local, regional and provincial levels. For those information concepts, where no existing standard definition exists, or where the required data elements are not well established or standardized, future consultations between CCO and end users will be required to ensure the validity and reliability of any future information and data standards.

Informatics within Cancer Care Ontario follows a well-established program evaluation framework to formalize new information and data standards. First, stakeholders are consulted to confirm the business objectives of the information standard ('what do we want to measure and why?'). Stakeholders also provide the business understanding of what should be included and excluded from the population of interest. Informatics then reviews its current data holdings to assess if the necessary data is available. If new data standards are required, Informatics consults with stakeholders to specify the data definitions, values, format, and business rules. These new data standards are added to the CCO Data Book specification for collection and submission by care facilities. Informatics drafts a technical methodology of how the data will be aggregated and computed and confirms this with the stakeholders. After processing the data, Informatics shares the results with the stakeholders to confirm that they meet the needs of the business objective. The methodology is considered a formal information standard (or indicator) after the stakeholders have consulted broadly and ascertained that it is a good metric for monitoring and guiding performance.

2.5 Conclusion

The Project employed significant consultation to merge end user and existing provincial quality measurement needs in order to define the Ontario Oncology aEMRs. A full spectrum of quality indicators identified through these processes will inform the future provincial priorities for information standards and quality monitoring that will be facilitated by a standardized Oncology aEMRs.

Results from the site visits showed the same preponderance of ideas in the diagnosis and treatment part of the Cancer Journey when compared to the initial indicator inventory performed by the project team in December 2012. This can also be explained by the fact that the main business of the Regional Cancer Centre focuses on those parts of the journey.

The processes and outcomes of this Project highlights the importance of the alignment between local/regional and provincial assets and initiates the process of aligning work streams across CCO programs with the future development of Oncology aEMRs in Ontario. In essence, this provides an initial framework for aligning the aEMR within oncology as a tool to support important cancer systems needs such as quality evaluation and reporting, to optimize clinical practice and program planning. This process is reflective of a rapid learning system, where data collected through ambulatory EMR systems are used to generate quality indicators on a real time basis as a driver for quality improvement and practice change (Abernethy et al, 2010).

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2.7 Appendix A: Information Standard concepts.

Note* the concepts noted below will require formal consultation, development and reviews as per existing CCO procedures.

New Potential Indicator Concepts	
No.	**Name**
1	Timing between first clinic visit (referral) and treatment decision (decision to treat)
2	Appropriate use of supportive medications with systemic treatment i.e. Neupogen/Neulasta, anti-emetics (Care Pathway)
3	Number and type of disease of patients per radiation treatment unit.
4	Uninsured report or percentage of patients that are uninsured
5	Number of patients on oral chemotherapy vs systemic
6	Radiation-LINAC Utilization : 1.Number of cobalt/LINAC treated cases per machine
7	Radiation-LINAC Utilization : 2.Reporting of the number of treatment fractions by LINAC

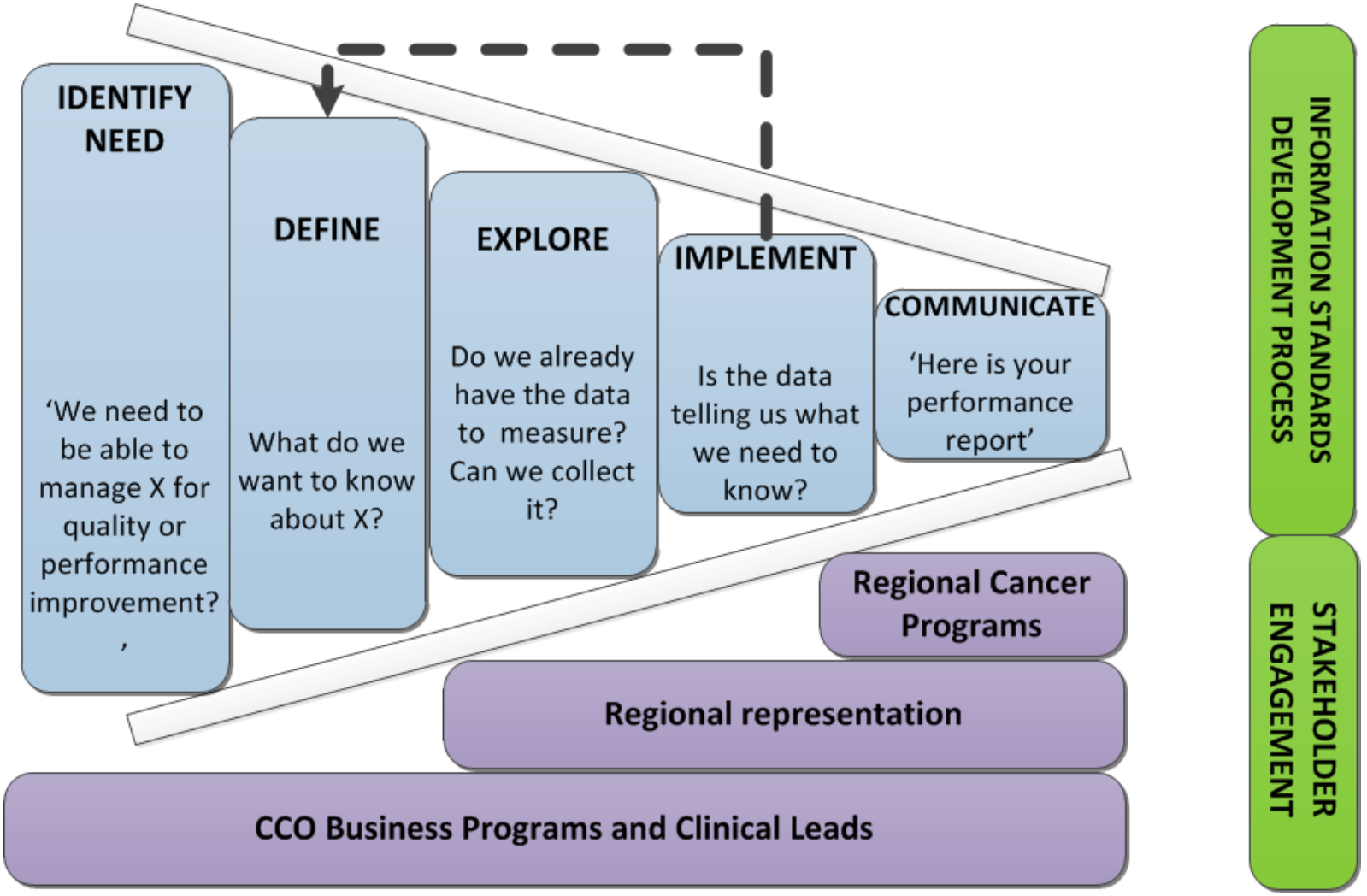
Information Concepts with supported data elements	
No.	**Name**
1	Wait times from surgery to treatment
2	Wait time: Referral to Palliative care to access services
3	Time of receipt of referral to consult (1st clinic visit)
4	Wait time from referral to intake with PSO/ Support Care Services
5	Wait time: Consult (1st clinic visit) and 1st treatment
6	Market share report of intra-LHIN and inter-LHIN treatment patterns

Data standards are the foundation for information standards which are used to measure compliance, performance and quality. System-level management and improvement using information standards is made possible by collecting the same data from care delivery facilities. CCO has developed a standardized set of data that is used to monitor and manage performance across the Ontario cancer system.

The concept for an information standard evolves from a business need. This may be related to clinical or administrative processes, such as wait times for care activities, or clinical quality, such as 'the number of patients that have been treated according to a treatment guideline'. Stakeholders are consulted to refine the concept so that it is closely reflects the actual activities occurring within the cancer system in a manner that is actionable. They also raise any considerations regarding the interpretation of the information standard that should be reflected. Finally, inclusion and exclusion criteria are defined to specify the population that is being measured.

CCO then follows the 'adopt, adapt, develop' approach for determining data standards to support information standards. Where feasible, CCO will adopt existing data standards that will support the measurement of the information standard. In some cases, an existing data standard can be adapted (e.g. changing its set of valid values). Where these are not possible, CCO will develop a new data standard in consultation with stakeholders. This approach minimizes the change impact to the facilities submitting the data.

There is typically a trial period in which data standards are assessed whether they are fit for purpose. During the initial data submissions, the initial measurements may yield unexpected results. Alternatively, new considerations or needs may need to be incorporated in the data standards to enable the information standard to be a reliable measure of system behaviour. CCO works together with stakeholders to finalize the definition and specifications of the data standard.


IDENTIFY NEED
'We need to be able to manage X for quality or performance improvement?
,
DEFINE
What do we want to know about X?
EXPLORE
Do we already have the data to measure? Can we collect it?
IMPLEMENT
Is the data telling us what we need to know?
COMMUNICATE
'Here is your performance report'
Regional Cancer Programs
Regional representation
CCO Business Programs and Clinical Leads
INFORMATION STANDARDS DEVELOPMENT PROCESS
STAKEHOLDER ENGAGEMENT

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CHAPTER 3: ONCOLOGY aEMR FUNCTIONAL REQUIRENTS AND USABILITY

3.1 Introduction

The two key factors that are driving Electronic Medical Record (EMR) adoption for oncology care are opportunities for improvements to the quality and efficiency of patient care, and better care coordination among providers (Jacobs, 2009). Based on a literature scan, it was determined that there is no single document available for Ontario's Regional Cancer Programs that addresses the functionalities required in an Ambulatory Oncology Electronic Medical Record (Oncology aEMRs). This section represents the first version of Ontario's functional requirements for an Oncology aEMRs. It is designed to outline high level functionality that can be updated as best practice guidelines/standards/requirements are released from appropriate professional, government and jurisdictional agencies including Cancer Care Ontario.

An Oncology aEMRs is a computer-based medical record specific to a clinician, practice or organization. It is the patient specific record and details patient demographics, medical and drug history, treatment, and diagnostic information such as laboratory results and findings from diagnostic imaging as well as the various health care providers involved in the delivery of patient care. It is often integrated with other software that manages activities such as scheduling (Canada Health Infoway, 2013). Oncology aEMRs in Ontario are typically deployed in Regional Cancer Centres and community hospital cancer clinic outpatient settings.

An Oncology aEMRs facilitates the improvement of provider outcomes, patient care quality and patient satisfaction by enabling efficiencies in health care delivery. Electronic health records are tools that can actively assist in the delivery of more efficient and higher quality health care through the provision of comprehensive information / effective timely communication between front line clinicians and patients (Yu, 2011). Although the acquisition of an Oncology aEMRs is not a guarantee of such success, the integration and alignment of functionality to work flow and communication among stakeholders is crucial before realization of benefits can be expected (Givens, 2013). The ability of Oncology aEMRs to improve information completeness, process standardization, clinician practice and error identification make this highly desirable and applicable in an ambulatory setting (Blayney, 2009).

Typically, the system is designed to facilitate effective, automated work processes based on functional requirement statements. A functional requirement is expressed through the lens of the end-user and it details how the end-user wants to use the system rather than how the system is designed to perform. These requirements can then be expressed to potential Oncology aEMRs vendors. As well, functional requirement statements are often presented in terms of priority (mandatory, essential, desired) to align with organizational fundamentals such as expected quality, patient safety and user satisfaction. Consideration must also be given to legislative and regulatory requirements (e.g. privacy, provider status) as well as requirements outside of the organization that align with information exchange, and strategic partnerships.

Access to the correct and accurate information delivered to the right place at the right time, providing the right level of quality of care, and within existing financial resources, are the challenges faced by many healthcare institutions (Boucher, Eberle, & Yeo, 2006). Despite substantial government investments in health information technology (HIT) in North America, health care delivery still remains fragmented from an information exchange and care standards perspective. Unlike other industries such as financial, healthcare lags behind when it comes to the use and integration of technology - partially due to inconsistencies of standards (Boucher, Eberle, & Yeo, 2006).

Oncology aEMRs built on clear, well defined functional requirements can address many issues within an ambulatory setting such as: an increasing volume of data to capture, disjointed clinical documentation and inability to provide immediate access to a patient's most up-to-date medical history (Eastmen, 2011). An Oncology aEMRs can enhance overall patient safety by adhering to documented protocols for best practice regarding treatment and medication management. As well, functional requirements can also increase usability by grouping functions into desirable features that are designed to match workflow and information sharing to optimize navigation by the user. (Rogers, 2009).

3.2 Purpose

The functional requirements outlined in this section can be used as a guideline to support detailing specifications for a new Oncology aEMRs system or identifying areas for improvement / enhancements of existing systems. Collaboration among key stakeholders such as informatics experts, clinical application specialists, clinicians and administrators, is essential in determining the additional functionality that will work best with a facility's systems architecture and clinical/business processes.

If a centre is considering acquisition of a new Oncology aEMRs or enhancing an existing system, the functional requirements in this section may be used as the basis for creating a request for proposal (RFP) or prioritizing enhancements. Each centre should review and confirm the priority ranking, (i.e. Essential vs. Desired) for each functional requirement and add additional requirements as needed to ensure alignment with local needs and priorities.

The intended audiences for the functional requirements are as follows:

- Clinical and administrative leadership at the Regional Cancer Centres.
- Clinical and administrative leadership of the Regional Cancer Programs in Ontario.

(Regional Cancer Programs are the networks of stakeholders, healthcare professionals and organizations involved in cancer prevention and care within each of the province's 14 Local Health Integration Networks. Each program is led by a Cancer Care Ontario Regional Vice President.)

- Hospital IT leadership involved in supporting IM/IT initiatives for the Regional Cancer Centres.
- Hospital/technical staff members participating in the selection process of an Oncology aEMRs
- Vendors involved in ambulatory Oncology aEMRs
- Experts and organizations involved in standards development

(ie, eHealth Ontario, Canada Health Infoway, OntarioMD, Canadian Partnership Against Cancer (CPAC), etc…)

3.3 Methodology

The Oncology aEMRs functional requirements were developed based on findings from a literature scoping review conducted by CCO's Evidence Search and Review Service (ESRS). The ESRS identified two documents which were used as primary inputs to create a first draft of the Oncology aEMRs functional requirements: (1) Health Level Seven's Electronic Health Record System (EHR-S) Oncology Profile (Health Level Seven International, 2007) and (2) American Society of Clinical Oncology (ASCO) Clinical Oncology Requirements for the EHR (CORE) Project (American Society of Clinical Oncology and National Cancer Institute, 2009).

In addition, the Ontario-specific functional requirements were informed by input from Regional Cancer Centres and CCO stakeholder informants. Usability and features from the Systemic Therapy CPOE Best Practice Guidelines were incorporated as well as applicable requirements from a recent CCO Radiation Oncology Information Systems RFP (CCO, 2010). Requirements to integrate the Oncology aEMRs with provincial assets within and outside of CCO were also included to promote health information exchange across the Cancer Journey as illustrated in Figure 2.

All Oncology aEMRs functional requirements were compiled, analyzed and organized into sections according to CCO's Cancer Journey phases, as illustrated in Figure 2. Internal and external stakeholders were asked to review and provide input on the first iteration which was finalized thereafter. See section Appendix for a list of participating informants.

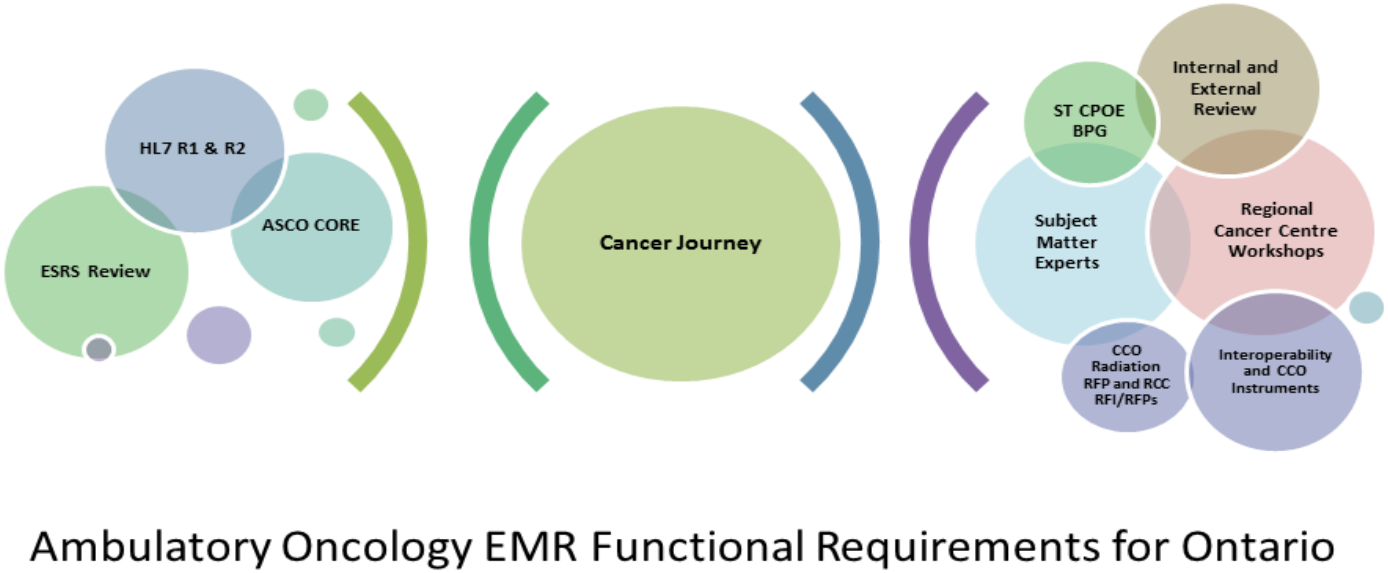

Figure 1: aEMR Functional Requirements.

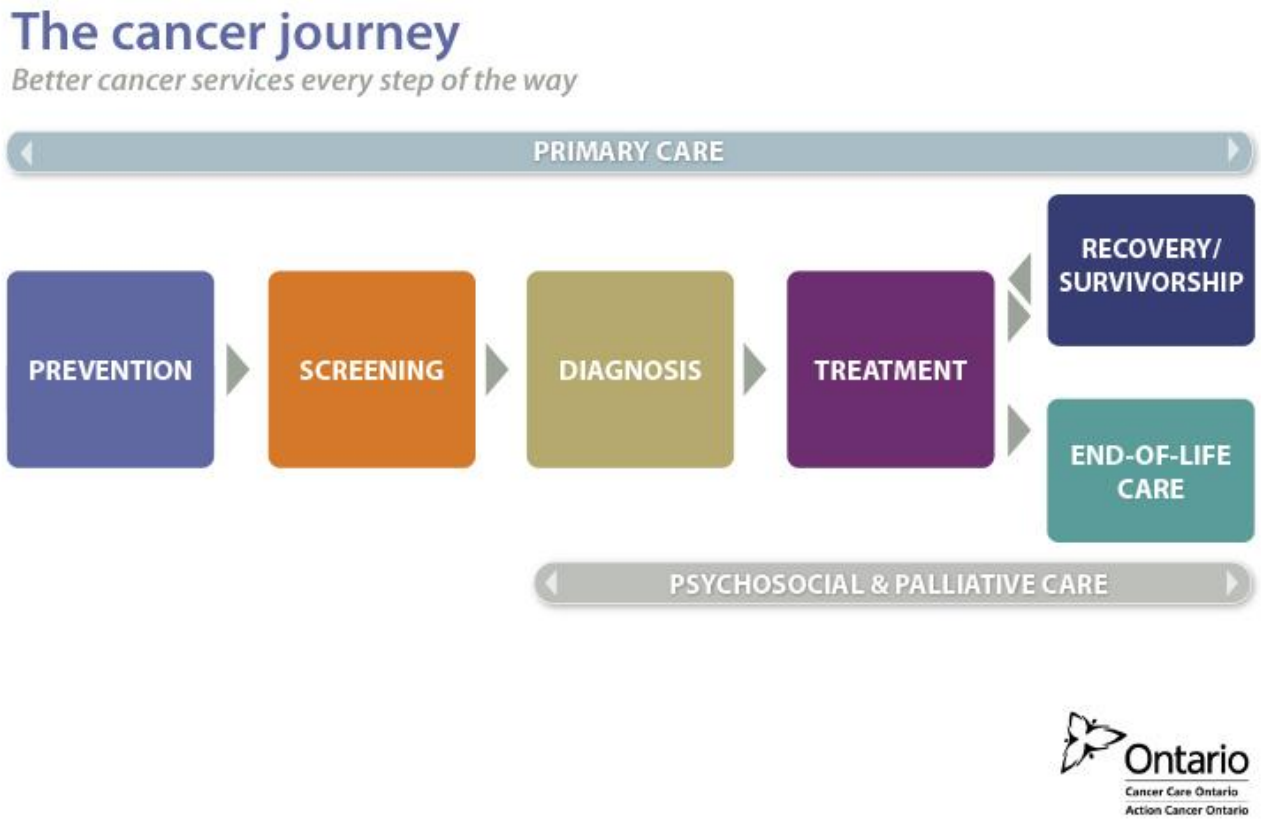

Figure 2: Cancer Journey.

3.4 Introduction to Functional Requirements

A functional requirement is a statement that supports the model of a longitudinal medical record within an Oncology aEMRs across the patient journey. The statement promotes adherence to documented best practice, and principles, such as responsive, equitable patient care and facilitates improvements to interoperability and communication, therefore functionality statements were written based on the action "Ability to". This language was chosen to provide flexibility to both Regional Cancer Centres and technical developers.

Oncology aEMRs are comprised of components which are designed to facilitate clinical operations within a healthcare facility, and these components are variable based on the type and purpose. Based on the review of literature conducted by the CCO ESRS, the general Oncology aEMRs is comprised of components that address Family History Data, Results Management, Clinical Decision Support (CDS), Order Entry/Medication Management, Care Plans, Multidisciplinary Care, and Error Identification.

A group of functional requirements combined together based on end user preference is a feature. These components are developed based on clearly defined functional requirement statements that would enable features such as, clinicians having timely access to problems, current and historical treatment plans, diagnosis and laboratory test results, medical history in one place and integration of an Oncology aEMRs with hospital information systems to view a complete 'patient story'.

Alternatively, a feature is what something has, and a function is what something can do.

Examples:

i. The function of a car is to transport people and goods by consuming energy. If a car has anti-lock brakes, thus improving its safety, that would be a feature. The brakes are a function.

ii. In the example of a camera, the function is to take pictures and features include the megapixel or zoom specifications.

For this section, only functional requirements are included.

3.4.1 Functional Requirement Template:

- Some statements refer to Information Technology requirements in terms of security, privacy and compatibility.
- Some statements affect more than one aspect of the Cancer Journey and may be included in multiple sections.
- Priority rankings for each statement, (ie. Essential vs Desired) are recommendations and should be reviewed by each centre to ensure alignment with local needs and priorities, which may change over time.

3.4.2 Template Structure:

Cancer Journey Phase: E.g. Diagnosis			
Action Item: *(if applicable)* Clinical, patient or business event(s) that require functionality in the form of a functional requirement statements.			
ID # Statement reference number	**Functional Requirement Statement** Functional requirements are statements that describe what your system must be able to do. In detail, they support the model of a longitudinal medical record within an Oncology aEMRs across the patient journey. These statements promote adherence to documented best practice, and principles, such as responsive, equitable patient care and facilitate improvements to interoperability and communication.	**Priority Level** E = Essential D = Desired *(detailed below)*	**Source** Requesting organization, supporting sources.

Priority Level Definitions: To enable optimal utilization of the functional requirement in considering the design and implementation of an Oncology aEMRs, the statements have been categorized according to the following criteria: Essential (E) or Desired (D).

Essential recommendations should be included in the design/implementation of the system in order to achieve patient safety, expected quality, and user satisfaction.

Desired requirements are those that not absolutely necessary for success and/or may be considered for future updates. Inclusion would increase usability and/or achieve significant gains in quality and patient safety.

3.4.3 Ambulatory Oncology Functional Requirement Statements

The following tables in sub-sections 1 through 10 detail the essential and desired functional requirements formatted in the Cancer Journey. Functional requirements have been listed where they first appear in the journey although they may be applicable in a different stage as per the work flow of an organization.

Functional Requirements - General

General statements are those that apply to multiple phases of the patient journey. The functional requirements that are reflective of specific aspects of care are within their respective distinct phase of the cancer patient journey.

ID #	Functional Requirements - General	Priority Level E= Essential, D= Desired	Source
Alerts			
G.1	Ability to record the percent of alerts that fire and number of alerts ignored or overridden.	E	ST CPOE BPG
G.2	Ability to present alerts, notifications and reminders. For example, alerts for preventive services and patient wellness.	E	HL7 DC.2.5.1
G.3	Ability to customize alerts based on clinician preferences; for example, based on critical values of diagnostic test results as per best practice guidelines, outcome of appropriate assessment tools and/or other needs.	E	RCC
G.4	Ability to prompt workflow and time relevant alerts. For example Alert reminder for patient consent before MD orders drug regimen	E	ST CPOE BPG

Audit Logs and Monitoring of Workarounds			
G.5	Ability to audit records through audit trails that include the following information: date and time recorded for each entry, any change or updating in recorded information.	E	HL7 IN.2.2, ST CPOE BPG
G.6	Ability to have an audit trail printed separately from the recorded information.	E	ST CPOE BPG
G.7	Ability to ensure that logging is turned on by default in the software application.	E	ST CPOE BPG
G.8	Ability to aggregate log data to provide meaningful information. Regular review and analysis of log data should be done to identify system performance, trends and identify issues early so they can be addressed.	E	ST CPOE BPG
G.9	Ability to apply appropriate permissions for access to audit log information and reports.	E	ST CPOE BPG
Authentication, Authorization, Access Control and Identification			
G.10	Ability to control system authentication, authorization and access by role or individual that is consistent with organizational policy and/or professional scope of practice.	E	ST CPOE BPG, HL7 IN.1.1/2/3
G.11	Ability to allow the patient to be uniquely identified across the continuum of care. The patient identifier must be unique (only one in the system), exclusive (only used for this patient) and eternal (never reused) and ideally a unique identifier that will work across all systems in a jurisdiction.	E	ST CPOE BPG UHN Human era
G.12	Allows the unique identification for the healthcare service provider. Demographic information includes name, role, regulatory college license number and the locations that the provider delivers their service.	E	ST CPOE BPG
G.13	Ability to use provincial access mechanisms. For example eHealth's One ID	D	ST CPOE BPG

G.14	Ability to support data retention (keep, update and merge a record), and prevent destruction.	E	HL7 IN.2.1, RCC
Clinical Tasks and Communication			
G.15	Ability to link and track clinical task assignment and routing. For example ability to color code tasks that are completed, currently under process or re-assign or refer appropriately, ideally based on common standards across a jurisdiction.	E	HL7 DC.3.1.1 UHN Human Era
G.16	Ability to provide support for inter-provider written communications. For example ability to document in the patient record verbal/telephone/telehealth communication between providers or communicate using secured real-time messaging.	D	HL7 DC.3.2.1/2, RCC
G.17	Ability to provide support for communication between provider and patient. For example easy navigation to patient's contact information allowing provider to call or email patient if necessary.	E	HL7 DC.3.2.3
Indicator Reporting and CCO's Data Book			
G.18	Ability to view multiple levels of data (For example log view versus readable view using categories selected).	D	HL7 CP.1.1.9
G.19	Ability to provide patient and/or population outcome data or query results to appropriate organizations (e.g., CCO, CIHI, MOHLTC)	D	CCO, HL7 POP 6.1.9
G.20	Ability to determine indicators for ongoing quality monitoring. For example ability to flag or combine number of medication errors with the numbers of alerts ignored or bypassed produced in a viewable and printable form.	D	RCC, ST CPOE BPG
G.21	Ability to capture and maintain multiple data sets required for health care quality and performance measures.	E	HL7 POP 6.2.2
G.22	Ability to have data fields for capturing information as outlined in professional and Ontario (jurisdictional) standards (e.g. ASCO/ONS complete order standards and CCO Data Book systemic treatment file)	E	ST CPOE BPG

G.23	Ability to present patient and/or population health care quality and performance measures data in a report format that can be displayed, transmitted electronically through a secure data service or printed.	D	HL7 POP 6.2.3/4
G.24	Ability to determine and render patient and/or population health care quality and performance measures in real-time, near real-time or just-in-time according to scope of practice, organizational policy and/or jurisdictional law.	D	HL7 POP 6.2.5
G.25	Ability to determine and render to multiple hospital information systems the formula used for measuring patient and/or population health care quality and performance, according to scope of practice, organizational policy and/or jurisdictional law.	D	HL7 POP 6.2.6
G.26	Ability to manage data using established standard terminologies (for example SNOMED-CT, ICD, CCO Data Book) to preserve the semantics of coded data over time, ideally aligned to common standards across a jurisdiction.	D	HL7 OV.1.20 UHN Human era
G.27	Ability to capture data-validation rules for vital records data according to scope of practice, organizational policy and/or jurisdictional law.	D	HL7 AS2.1.7
G.28	Ability to run data quality indicators for specific data set as required by a CCO clinical program. For example, timeliness of data: performance in data collection within 2 business days- Total surgical wait list entries entered within 2 business days of the decision to treat date (open cases) divided by total surgical wait list entries entered	D	RCC
G.29	Ability to identify new patients, patients with recurrences or separate/new diagnosis for secondary malignancies as new cases for Data Book submission. For example providing a tick box in the background information for new cancer diagnosis and recurrence as well as date of diagnosis.	E	RCC
G.30	Ability to analyze the data quality of vital records information (e.g. day of birth or month of death) and extracted data (for missing data, logic	E	HL7 AS2.1.6, RCC

	checks, submission errors, 'negative' wait times) prior to Data Book submission.		
G.31	Ability to check extracted data to be used for secondary purpose for missing data fields or provide appropriate audit trail for deletions or changes in the data fields.	E	RCC
Integration			
G.32	Ability to integrate with a Radiation Oncology EMR that is in accordance with the established standards outlined in the, Integrating the Healthcare Enterprise – Radiation Oncology (IHE-RO) Technical Framework (American Society for Radiation Oncology (ASTRO), 2007).	D	CCO
G.33	Ability to integrate with CCO eClaims.	D	CCO
G.34	Ability to send alerts, notifications and reminders via email or SMS. and ability to to record these alerts and to get acknowledgment from the recipient that the alert was delivered successfully. For example vital communications sent to clinicians that are away from the Oncology aEMRs.	E	CCO UHN Human era
G.35	The ability to integrate with the Hospital Information System (HIS), and/or Clinical Information System (CIS), to access hospital information (i.e., registration and scheduling information, lab results) provincial assets (i.e., OLIS, DI Common Services) and other registries and databases.	E	CCO, RCC
G.36	Ability to integrate secure communication/messaging service for users of the EMR to facilitate collaboration/cooperation.	E	RCC
G.37	Ability to synchronize patient demographic, scheduling and resource utilization information across multiple systems. When an update of information is made in one system then the corresponding table in the second system is automatically updated. For example, when the admission–discharge–transfer (ADT) system updates its ―patient demographics for a person who is also a patient of the Cancer Centre, an	E	RCC, ST CPOE BPG

	HL7 message is transmitted to the Oncology Information System to initiate an immediate update as well.		
G.38	Ability to access, manage and store patient laboratory orders and results through a jurisdictional laboratory information system.	D	ST CPOE BPG
G.39	Ability to provide clinicians an improved capability to manage complete medication profiles through a jurisdictional drug information system.	D	ST CPOE BPG
G.40	Ability to allow sharing of relevant clinical information through a jurisdictional shared health information repository or internal and external registries to support timely clinical decision-making and continuity of care.	E	ST CPOE BPG, RCC, HL7 S.1.1
G.41	Ability to allow order details from the CPOE system to flow automatically into the pharmacy system.	E	ST CPOE BPG
G.42	Ability to match medications ordered on the CPOE system to products listed in the pharmacy system.	E	ST CPOE BPG
G.43	Ability to integrate telemedicine documentation and utilization.	D	RCC
G.44	Ability to flag oncology patients that were seen in the emergency department.	E	RCC
G.45	Ability to view emergency department multidisciplinary consultation/synoptic notes for oncology patients	D	RCC
G.46	Ability to flag activity not funded. For example, prescribing an oral chemotherapy not covered by the New Drug Funding Program (NDFP).	D	RCC
G.47	Ability to present information collected from medical devices as part of the medical record as appropriate. i.e. glucose monitor	E	HL7 DC.3.2.5
G.48	Ability to support secure data exchange and routing. For example sending data over a secured connection to	E	HL7 IN.1.6 /7
G.49	Ability to support data authorship and digital signatures.	E	HL7 IN.1.8
G.50	Ability to support data interchange standards.	E	HL7 IN.2.3
G.51	Ability to support presentation of self-reported patient symptoms and outcomes.	D	RCC

G.52	Ability to support patient portal and presentation of patient data.	D	RCC
G.53	Ability to access patient educational information from external sources.	D	HL7 DC.2.7.2
G.54	Ability to email/mail applicable educational materials to a patient or patient representative.	D	HL7 DC.3.2.4
G.55	Ability to identify and view patient data that is clinically authored and authenticated and differentiate it from other data sources such as patient authored, administrative, financial etc.	D	HL7 DC.1.1.3.3
G.56	Ability to accept or view data and documentation from a patient originated source.	D	HL7 DC.1.1.3.2, RCC
G.57	Ability to access and integrate standards, protocols and best practice documentation from external sources.	E	CCO, RCC
Interface			
G.58	Ability to integrate with HL7 v2X and v3 interfaces.	D	CCO, RCC
Personal Health Information, Patient Privacy and Confidentiality			
G.59	Ability to control access to personal health information to comply with information safety and jurisdictional, security, and privacy legislation including the use of electronic signatures and secure passwords.	E	RCC, ST CPOE BPG
G.60	Ability to demonstrate the purposes of data collection and inter-operability with other systems using system rules that have clear rationales. For example, collection of additional personal information as part of clinical trials must provide explanatory statements for the collection of such in the user screen which the clinician can immediately access.	E	ST CPOE BPG
G.61	Ability to support patient privacy, confidentiality and log privacy breach for internal monitoring and evaluation.	E	HL7 IN.1.9, ST CPOE BPG
Portability			
G.62	Ability to allow a patient access to view and export their personal health information including treatment plans.	D	HL7 IN.1.4, RCC

G.63	Ability to import and export patient information from a personal health record (pHR) or patient portal. For example Sunnybrook's myChart, Hamilton's myOSCAR.	D	RCC
Reporting			
G.64	Ability to list all clinicians and/or providers directory or registry within and outside the centre for transmitting or mailing of notes/clinical summary.	E	HL7 S.1.3.2/3, HL7 S.1.3.5/7, RCC
G.65	Ability to allow usage of multiple tools or report writers (e.g. Excel, Crystal Reports, ETL tools) to extract data.	D	ST CPOE BPG
G.66	Ability for reporting tools to enable end-users to query relevant tables and data elements. For example, using built-in reporting tool to access a table in the database rather than using SQL.	D	ST CPOE BPG
G.67	Ability to demonstrate flexibility of built-in reporting tool from writing simple queries to constructing complex reports.	D	ST CPOE BPG
G.68	Ability to share and incorporate prebuilt reports or report templates if available.	D	ST CPOE BPG
G.69	The system must have reports for auditing and monitoring functionality such as interfaces or alert generation or printing log files. For example ability to print medication error log files.	E	ST CPOE BPG
Terminology			
G.70	Ability to manage standard terminologies and terminology models, maintenance and versioning of standard terminologies and terminology mapping that are consistent with organizational and professional descriptions. For example SNOMED-CT, ICD, CCO Data Book, Canadian Classification of Health Interventions (CCI), ideally aligned to common standards across a jurisdiction.	E	HL7 IN.4.1/2/3, ST CPOE BPG UHN Human era
Usability			
G.71	Ability to view required information in a logical sequence, without	E	ST CPOE BPG

	requiring the user to recall‖ information from previous screens or process.		
G.72	Ability to minimize the number of steps or mouse clicks required to complete the task (e.g. use of auto-tabbing, default values, organization of information).	E	ST CPOE BPG
G.73	Ability to prompt feedback to the user about the steps they are about to take and/or actions that have had the desired effect (e.g. warning message before deleting or changing information).	E	ST CPOE BPG
G.74	Ability to keep screen changes and visual interruptions to a minimum during the completion of the task and ensure pop-up boxes does not obscure vital information.	E	ST CPOE BPG
G.75	Ability to view changes immediately without having to refresh the screen.	E	ST CPOE BPG
G.76	Ability to display version and subversion numbers for any system embedded information (TMN pathology diagnosis, staging)	E	ST CPOE BPG
G.77	Ability to integrate documentation that follows guidelines from relevant health professional organizations and/or regulatory bodies (e.g. ASCO/ONS/RANO/CONC practice guidelines)	E	ST CPOE BPG
G.78	Ability to ensure important information stands out from surrounding information (e.g. bolded, highlighted, larger font); with all relevant information within one screenshot.	E	ST CPOE BPG
G.79	Ability to organize data at the summary level before drilling down to more details; control density through font size, character count and screen resolution and avoid displaying too much information on a single screen.	E	ST CPOE BPG
G.80	Ability to use colour to convey meaning to the user in a consistent way throughout (e.g. red = warning/alert; yellow = highlight important information; green = proceed, normal), ideally based on common standards across a jurisdiction. Where practical, the color scheme should match common conventions used in the physical world.	E	ST CPOE BPG UHN Human era

Functional Requirements - Primary Care

As health systems evolve, there is increasing recognition that primary care is the foundation of a high-performing healthcare delivery system. Primary Care most often refers a patient into the Cancer Centre, and later is again entrusted the patient's care at the end of cancer treatment.

ID #	Functional Requirements – Primary Care	Priority Level E= Essential, D= Desired	Source
PC.1	Ability to capture, document and update the patient's physician primary care provider(s) details (name and contact information) to facilitate continuity of care.	D	RCC
PC.2	Ability to receive and update either electronically from primary care EMR or manually (via scanning) patient clinical information shared by the primary care provider.	D	CCO
PC.3	Ability to develop implement and disseminate evidence based guidelines and standards to support patients transition from prevention through survivorship	D	RCC
PC.4	Ability to identify from documented sources the need to introduce palliative care earlier in the illness trajectory by utilizing common valid and reliable tools, such as ESAS, PPS, SMG's .	D	RCC

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Functional Requirements - Prevention

Prevention can involve behaviours and physical conditions that can lower a person's risk of cancer. It includes healthy eating and active living, as well as through regular cancer screening and the implementation of health-promoting policies.

ID #	Functional Requirements - Prevention	Priority Level E= Essential, D= Desired	Source
P.1	Ability to enter prevention data and documentation and link it to a unique patient identifier (for example smoking status).	E	CCO
P.2	Ability to accept prevention data and documentation from an external source.	D	CCO
P.3	Ability to present alerts, notifications and reminders for preventive services and patient wellness.	D	HL7 DC.2.5.1

Functional Requirements - Screening

Cancer screening refers to tests done on people without cancer symptoms (i.e., who are asymptomatic) to detect any pre-cancerous changes, or cancers at an early stage.

ID #	Functional Requirements - Screening	Priority Level E= Essential, D= Desired	Source
S.1	Ability to enter screening data and documentation (for example, smoking status) and link it to a unique patient identifier.	E	RCC
S.2	Ability to accept screening data and documentation from an external source (i.e. primary care EMR).	D	RCC

Functional Requirements - Diagnosis

The diagnosis is when cancer is first identified. Staging determines how much cancer there is and the location of the cancer and it helps the oncologist determine the best course of treatment for a patient.

ID #	Functional Requirements - Diagnosis	Priority Level E= Essential, D= Desired	Source
Manage Referrals to and from Regional Cancer Centres and Programs - Diagnostic Assessment Program (DAP) - Receive and acknowledge referral - Sort prior to scheduling - Generate a patient summary			
D.1	Ability to incorporate and integrate patient clinical data and documentation for referral from external sources (i.e., primary care EMRs).	E	HL7 DC.1.1.3.1, RCC
D.2	Ability to track documentation that has been received prior to initial visit.	E	RCC
D.3	Ability to identify referring physician or specialist by a unique identifier code.	E	CCO
D.4	Ability to send a referral acknowledgement to the referring physician's EMR and/or office.	E	RCC
D.5	Ability to capture patient chart summary from primary care EMR.	D	RCC
D.6	Ability to integrate with diagnostic assessment program (DAP).	D	CCO
D.7	Ability to track referral dates for all programs as based on multiple disease sites, patient acuity, and geographic locations.	D	RCC
D.8	Ability to document and refer a patient within a Regional Cancer Centre.	E	CCO

D.9	Ability to capture a referral request, sort and prioritize a patient's referral prior to scheduling.	D	HL7 DC.1.1.3.1.3, RCC
D.10	Ability to view a summary sheet (sample in appendix) for a patient using referral information.	D	RCC
Appointment Scheduling - Register a patient in an Oncology aEMRs and create patient chart - Schedule and confirm appointment with a patient - Confirm appointment with referring Physician			
D.11	Ability to create a patient chart, identify and maintain a unique patient record.	E	HL7 DC.1.1.1
D.12	Ability to capture patient demographics and unique identifiers, and import and manage patient demographic.	E	HL7 DC.1.1.2, RCC
D.13	Ability to integrate with a hospital wide scheduling system to import patient demographics.	E	RCC
D.14	Ability to merge patient records and all associated information.	E	RCC
D.15	Ability to create additional patient demographic fields such as nationality, cultural specificity, educational status, cultural considerations, language, geographic location, insurance information, tobacco use; past, current, cessation education.	E	RCC
D.16	Ability to generate bar coded patient labels and identification band or card.	D	RCC
D.17	Ability to allow patient self-check-in via touch screen or barcode reader.	D	RCC
D.18	Ability to schedule and view multiple associated resources for single or multiple departments. For example, linking clinic visit to lab visit, radiation treatment to return visit.	E	RCC
D.19	Ability to manage scheduling information between multiple facilities regardless of MOHLTC identifier.	D	RCC
D.20	Ability to schedule and arrive groups of patients.	D	RCC

D.21	Ability to import and view scheduling summary from a radiation oncology system.	E	CCO
D.22	Ability to search for next available appointment based on physician and resourcing.	D	RCC
D.23	Ability to see the entire course of the patient's treatments and appointments that are scheduled by day/month/year based on user preference.	D	RCC
D.24	Ability to keep a history of changed appointments including cancellations.	E	RCC
D.25	Ability to flag appointment requirements. For example, provide information related to the appointment such as the need to be fasting pre a blood test or for an abdominal ultra sound, the need for contrast medium with having a CT scan.	D	RCC
D.26	Ability to generate automatically a workload list based on clinician, physician, program and appointment type.	D	RCC
D.27	Ability to send a scheduling notification to Patient via voicemail and/or email and/or patient portal and/or mail.	E	RCC
D.28	Ability to send a scheduling notification to referring physicians EMR and/or office.	E	RCC
D.29	Ability to add comments to a record to explain scheduling delays.	E	RCC
D.30	Ability to track multiple patient waiting times, from arrival to completion of treatment or by disease pathway phase.	D	RCC
D.31	Ability to view updated scheduling information on the patient summary sheet.	D	RCC
Chart Assessment - Chart completeness - Review surgical consult (if applicable) - Review all relevant diagnostics: pathology, diagnostic imaging reports, etc.			
D.32	Ability to incorporate external clinical data and documentation with	E	HL7

	source identification and display information with locally captured data.		DC.1.1.3.1.1
D.33	Ability to display original supportive patient diagnosis documentation from external clinical sources.	E	RCC
D.34	Ability to display, review, and receive updated synoptic reporting from an external source.	D	RCC
D.35	Ability to view surgical consult notes.	E	RCC
D.36	Ability to enter a confirmed diagnosis and co-morbid conditions.	E	RCC
D.37	Ability to enter relevant disease staging information, at both the clinical and pathology level, and also key prognostic level ie: ER/PR receptors, HER2neu, Gleason scores.	E	RCC
D.38	Ability to validate disease specific data. For example, gender specific treatment, allowed age ranges, invalid site/histology combinations.	E	RCC
D.39	Ability to maintain and update best practice guidelines for imaging standards such as PET scanning, chest x-rays, and bone scans.	E	RCC
D.40	Ability to display and highlight molecular profiles and support personalized medicine.	D	CCO, RCC
D.41	Ability to provide support for accurate specimen collection. For example to verify correct patient information matches the labeling of the specimen.	E	HL7 DC.2.4.5.2
D.42	Ability to highlight changes to the patient chart since last log-on such as new note, new diagnostics report, and schedule changes and alert the user. Alerts should be customizable based on clinician's preferences.	E	RCC
D.43	Ability to create order sets. For example labs and radiology bundled together for diagnosis.	E	CCO
Patient Experience & Education			
D.44	Ability to record patient and family preferences regarding language, religion, spiritual practices and culture as related to the delivery of care.	D	HL7 DC.1.3.1
D.45	Ability to integrate with online knowledge databases.	D	RCC
D.46	Ability to generate a patient specific educational material list.	D	RCC

Ontario
Cancer Care Ontario
Action Cancer Ontario

Functional Requirements - Treatment

The course of treatment is determined not only by the type and stage of cancer, but also by what treatments and services the patient chooses. The three main ways to treat cancer are through surgery, radiation, and chemotherapy. Sometimes a combination of all three is used.

ID #	Functional Requirements - Treatment	Priority Level E= Essential, D= Desired	Source
Patient Consultations - Record relevant medical history - Determine Treatment Plan (Chemo, Radiation, Surgery) - Present case to Multidiscipline Cancer Council (MCC) to determine Treatment Plan (if applicable) - Discuss Treatment Plan with Patient and Caregivers. - Discuss Care Plan with Patient and Caregivers. - Patient Consent and Assessment - Patient prescribed non-chemo medication - Clinical Note Dictation - Clinical Note sent to GP/Specialist			
T.1	Ability to have a customizable view (chronologically, by diagnosis, by physician, etc.) of a patient's chart and filter, search and sort based on that view.	D	HL7 DC.1.1.5
T.2	Ability to capture and maintain current and past medical clinical history.	E	HL7 DC.1.2, RCC
T.3	Ability to generate and maintain allergy history, intolerance and adverse reaction list including side effects.	E	HL7 DC.1.4.1, RCC
T.4	Ability to generate and maintain an immunization list.	E	HL7 DC.1.4.4

T.5	Ability to generate and maintain an acute and chronic problem list.	E	HL7 DC.1.4.3
T.6	Ability to provide support for result interpretation. For example reference ranges.	E	HL7 DC.2.4.3
T.7	Ability to display, create, and import context sensitive guidelines, care plans, and protocols pertaining to patient advance directives and provide access to all members of the multidisciplinary team to support patient care.	E	CCO, HL7 DC.1.3.2, DC.1.6.1, DC.2.2.1.1, RCC
T.8	Ability to access evidenced-based clinical decision support resource documentation appropriate for the care provider to render a timely judgment. For example drug formulary, Uptodate.com	E	HL7 DC.2.7.1
T.9	Ability to manage patient assessment as per guidelines and support consistent healthcare management of patient groups or populations. For example, the use of appropriate standard care plans specific to a disease site.	E	HL7 DC 1.5, DC.2.2.2
T.10	Ability to create and maintain a patient consent for treatment.	E	HL7 DC.1.3.3
T.11	Ability to create order set templates.	E	HL7 DC.2.4.1
T.12	Ability to support the development and use of regimen templates including ability to link to specific diagnosis group.	E	ST CPOE BPG
T.13	Ability to support the medication ordering, verification, dispensing and administration process, including performance status capture.	E	ST CPOE BPG
T.14	Ability to generate and maintain medication list including start, modification and end dates.	E	HL7 DC.1.4.2, RCC
T.15	Ability to link disease progression to treatment plan and to alert the oncologist of need to review care plan.	D	CCO
T.16	Ability to produce a summary of care at the end of a patient consultation and manage patient-specific care summaries and treatment plans.	D	HL7 DC.1.6.2, HL7 DC.1.1.4
T.17	Ability to append a summary from a patient consultation to the patient summary sheet.	D	RCC

T.18	Ability to generate and transmit patient treatment summary information to a primary care physician or specialist.	E	RCC
T.19	Ability to link and utilize synoptic reporting from external sources. For example with Regional Systemic Treatment Program.	D	CCO
T.20	Ability to create, manage and send referrals within a Regional Cancer Centre including non-medication patient care orders (i.e. home oxygen, CPAP) and diagnostic tests (i.e. EMG, PFT).	E	HL7 DC.1.7.2.4, HL7 DC.2.4.4.1, HL7 DC.2.4.2, RCC
Radiation Oncology			
T.21	Ability to import and view real time update on radiation treatment delivery information. Ability to integrate with a hospital wide scheduling system to import patient demographics.	E	CCO
T.22	Ability to import and view radiation schedule such as historical schedule, treatment, clinic visits.	D	CCO
T.23	Ability to import and view radiation treatment planning summary from the treatment planning systems.	D	CCO
T.24	Ability to import and view radiation treatment site and prescription.	E	CCO
T.25	Ability to import and view radiation toxicity documentation.	E	CCO
T.26	Ability to create, import and view radiation treatment patient care notes.	E	CCO
Clinical Trials			
T.27	Ability to identify and record information about patients that are eligible for a clinical trial.	D	RCC
T.28	Ability to maintain and capture medical history for clinical trials and research.	E	HL7 DC.1.2.2, RCC
T.29	Ability to support research protocols including regimen templates relative	E	HL7 DC.2.2.3,

	to individual patient care.		ST CPOE BPG
T.30	Ability to monitor patient entrance/exit screening processes. For example, capture the patient's status in the clinical trial such as active, off-trial, etc...	E	RCC, ST CPOE BPG
Schedule Treatment - Document patient status - Schedule Systemic treatment and Radiation Treatment			
T.31	Ability to schedule systemic treatment in order to maximize drug utilization. For example patients that are prescribed Abraxane for breast cancer or Azacitidine for Myelodysplastic syndromes (MDS).	D	RCC
T.32	Ability to schedule and view activity of patients receiving concurrent care. Ability to integrate with a hospital wide scheduling system to import patient demographics.	E	RCC
T.33	Ability to add comments to a record to explain scheduling delays for treatment.	D	RCC
Determine Drug Protocol			
T.34	Ability to support Canadian requirements for drug identification number (DIN)	E	RCC
T.35	Ability to e-Prescribe through CPOE systems including ability to send script to pharmacy.	E	RCC, ST CPOE BPG
T.36	Ability to support the development and use of regimen templates.	E	ST CPOE BPG
T.37	Building of Protocols and Regimens Pre-loaded starter sets from the Provincial Formulary of modifiable regimen templates that will assist in the building of a final version by the user.	E	ST CPOE BPG
T.38	Flexibility to allow for therapeutic options during regimen builds (e.g. different routes of administration, selection of anti-emetic agents within a drug class)	E	ST CPOE BPG
T.39	Ability to support medication recommendations. For example to identify	D	HL7 DC.2.3.1.3

	the most appropriate practice standard based on cost, formularies and or protocols that are disease specific.		
T.40	Ability to make use of dose calculation built into ordering system (e.g. pre-built dosing formulas, dose checking, optimal dosing logic and dose rounding)	E	ST CPOE BPG
T.41	Ability to incorporate text instructions or recommendations within order sets (e.g. items that do not fit typical categories or templates such as dietary or fluid restrictions)	E	ST CPOE BPG
T.42	Ability to capture proper sequencing of treatment (e.g. multi-modality therapy, linked order, sequencing of regimens within a treatment plan or medications within an order)	E	ST CPOE BPG
T.43	Ability to incorporate logic for determining cycle scheduling and treatment duration (days between cycles and total number of cycles)	E	ST CPOE BPG
T.44	Ability to support drug interaction checking, test drug to drug interactions for high sensitivity and determine if medication interactions will alert with clinical significance.	E	HL7 DC.2.3.1.1, ST CPOE BPG
T.45	Ability to support patient specific dosing and warnings.	E	HL7 DC.2.3.1.2
T.46	Ability to set alert sensitivities and clinician review of medication order alerts.	E	ST CPOE BPG
T.47	Ability to categorize alerts into groups and assign action to the alert based on severity and risk.	E	ST CPOE BPG
T.48	Ability to customize rules for decision support tools and specific warnings (e.g. lab parameters displayed to trigger decision support)	E	ST CPOE BPG
T.49	Ability to provide a clear method for building, maintaining, and implementing the parent/child relationship for medication data.	E	ST CPOE BPG
T.50	Ability to identify patients that have been prescribed oral chemotherapy drugs.	E	RCC
Verify Drug Funding			

T.51	Ability to support the drug eligibility process.	D	ST CPOE BPG
T.52	Ability to identify patients that have been referred to a drug funding specialist.	D	RCC
T.53	Ability to identify and document treatment delays due to drug funding.	D	RCC
T.54	Ability to identify patients on oral chemotherapy medications.	D	RCC
Patient Assessment			
T.55	Ability to support identification of potential problems and trends based on patient assessment.	D	HL7 DC.2.1.3
T.56	Ability to support standard and patient context driven assessments. For example the reporting and assessing of cardiac function results from MUGA scans or Cardiac Echograms for those patients receiving Herceptin.	E	ST CPOE BPG
T.57	Ability to manage patient clinical measurements. For example the recording of vital signs, BSA and ECOG.	E	HL7 DC.1.8.4, RCC
T.58	Ability to manage clinical documents and notes. For example the recording and documenting by all members of the multidisciplinary team.	E	HL7 DC.1.8.5, RCC
T.59	Ability to manage documentation of clinician's response to prompts and alerts.	E	HL7 DC.1.8.6
Prepare Medication			
T.60	Ability to display information in a clear and organized manner to prevent the clinician from making juxtaposition errors. For example tall man lettering.	E	ST CPOE BPG
T.61	Ability to perform order locking post order verification.	E	ST CPOE BPG
T.62	Ability to integrate barcoding for medication preparation and administration.	D	ST CPOE BPG
Chemotherapy Administration and Support - Verify medication			

- Receive and check chemotherapy medication - Administer chemotherapy medication - Document patient status: pre, post, during - Symptom management - Allied consult if required - Book appointment for next cycle			
T.63	Ability to support the medication ordering, verification, dispensing and administration process, including independent double check, co-signature and administration checklists.	E	HL7 DC.1.7.1, ST CPOE BPG
T.64	Ability to manage medication and immunization administration.	E	HL7 DC.1.8.1/2
T.65	Ability to link directly to the Medication Administration Record (MAR) and manage medication administration.	E	HL7 DC.1.8.3, ST CPOE BPG
T.66	Ability to allow screens for the entry of changes in chemotherapy treatment including reasons for modification.	E	ST CPOE BPG
T.67	Ability to set minimum and maximum dose levels, dose ceilings and rounding values.	E	ST CPOE BPG
T.68	Ability to provide support for safe blood administration. For example to be able to verify the correct patient, correct blood product number and time of administration	E	HL7 DC.2.4.5.1
Patient Education			
T.69	Ability to document counseling provided to a patients.	E	RCC
T.70	Ability to import and view radiation patient education documentation.	D	CCO
T.71	Ability to generate and record patient-specific instructions and patient specific educational material list.	D	HL7 DC.1.9, RCC

Functional Requirements - Psychosocial and Palliative Care

Palliative care focuses on improving the management of the symptoms of cancer while caring for patients' psychosocial needs. Its goal is to ensure the best quality of life for patients at all stages in the cancer journey.

ID #	Functional Requirements – Psychosocial and Palliative Care	Priority Level E= Essential, D= Desired	Source
PP.1	Ability to document and maintain mental health, substance use, social and family history.	E	HL7 DC.1.2, RCC
PP.2	Ability to identify and document patients who require psychosocial or allied health services based on best practice guidelines and/or on outcome of appropriate assessment tools.	E	RCC
PP.3	Ability to integrate with Ambulatory Oncology Patient Satisfaction Survey (AOPSS) or another similar application to capture patient experience or patient satisfaction information.	D	CCO
PP.4	Ability to document notes from patient encounter and support related activities in a viewable format for the entire care team.	E	RCC

Functional Requirements - Recovery and Survivorship

There are a variety of different ways of looking at recovery and cancer survivorship. For many, it is the part of the cancer journey following treatment.

ID #	Functional Requirements – Recovery and Survivorship	Priority Level E= Essential, D= Desired	Source
Development of Transition Plan and Discharge Summary - Patient Follow-up with Primary Care - Patient Follow-up with Oncologist - Referral to community resources as required (e.g. CCAC, CCS support groups,…..)			
RS.1	Ability to incorporate standard follow up disease specific practice guidelines. For example: the annual scheduling of mammography post breast cancer treatment.	D	RCC
RS.2	Ability to export patient record summary and survivorship care plan for patient by printing or electronically sending discharge summary to primary care provider's EMR.	E	RCC
RS.3	Ability to generate and record patient specific instructions, educational materials and provide a discharge statement that contains treatment outcome and community resources that the patient has accessed.	D	HL7 DC.1.9, RCC
RS.4	Ability to export a survivorship care plan from the Oncology aEMRs to an external source such as a Primary Care EMR.	D	CCO, RCC
Patient Experience & Education			
RS.5	Ability to document quality of life of patients.	E	RCC

Functional Requirements - End of Life Care

End of Life Care focuses on improving the management of the symptoms of cancer while caring for patients' psychosocial needs.

ID #	Functional Requirements – End of Life Care	Priority Level E= Essential, D= Desired	Source
Development of Transition Plan and Discharge Summary - Referrals to Palliative Care Physician; Allied Health; Community Programs			
ELC .1	Ability to create an integrated end of life care plan and print or electronically send to primary care EMR or an external source such as a patient portal.	D	CCO, RCC
ELC .2	Ability to integrate with the defined level of palliative care required at either the Primary, Secondary or Tertiary level. For example: that a Primary level of care is available in every care setting and that there is a basic understanding of palliative care. The Secondary Level of care is required in all care settings, and that the care providers have had basic training in managing symptoms. In Tertiary level of care there is specialized knowledge to support most complex palliative cases.	D	CCO
ELC .3	Ability to access and integrate standards, protocols and best practice documentation from external sources. For example from the Provincial Palliative Care Programs.	D	CCO
Patient Experience			
ELC .4	Ability to identify and document that end of life discussion had taken place, included substitute decision makers, and care plan had been reevaluated as the patient moves from stable to transitional to end of life.	D	CCO, RCC

3.5 How to Make Technology a Team Player

Implementing new technologies in the workplace changes existing procedures and may cause disruption. In order to have the technology fit the workforce we need to look beyond the list of features. We have to study the technology's future users, and the way they are going to use this new technology. We have to dedicate resources to study the new technology's usability and implement necessary changes based on these usability testing.

The new technology has different type of users, each with different needs and priorities. The implementation process should capture all the requirements, and together with the IT administrators make sure they all compromise to get to the optimal solution. Having an interdisciplinary integration team that will involve both IT managers and the users that will actually use the system, will ensure better balance between the requirements and all participants' concerns. It is recommended that a human factors specialist will be involve in the process, analyzing the system and suggesting possible solutions to conflicts that might evolve, but even without a human factors specialist, the direct communication between IT and clinicians will guarantee better outcomes. We should start the process by collecting users' requirements, and we have to keep them involve in the implementation process. The following section of this document highlights important usability principals.

3.6 Usability

Aspects of system usability related to Human Computer Interaction (HCI) should also be considered in all software specifications and requirements within and across systems.

The following highlights some of the design principles that should be followed in order to maximize the user experience with a system (user interface for the system), These HCI design principles were adopted from previous published work on usability (Nielsen, Jakob, 2013)

1. **Consistency** - Consistency and standards. Users should not have to wonder whether different words, situations, or actions mean the same thing. Standards and conventions in product design should be followed.

2. **Match** - Match between system and world. The image of the system perceived by users should match the model the users have.
3. **Visibility** - Visibility of system state. Users should always be informed what is going on with the system through appropriate feedback and display of information.
4. **Display** - font type, font size, line length, line spacing and the contrast between text and background colors should be taken into consideration based on the screen size, screen resolution and the expected working environment.
5. **Structure** - System structure (i.e. menu trees) should reflect the system nature and its purpose. Number of menu-items should be limited to form an organized structure.
6. **Minimalist** - Minimalist. Any extraneous information is a distraction and a slowdown.
7. **Memory** - Minimize memory load. Users should not be required to memorize a lot of information to carry out tasks. Memory load reduces users' capacity to carry out the main tasks.
8. **Feedback** - Informative feedback. Users should be given prompt and informative feedback about their actions.
9. **Flexibility** - Flexibility and efficiency. Users always learn and users are always different. Give users the flexibility of creating customization and shortcuts to accelerate their performance.
10. **Disabilities** - Special care should be paid to users with disabilities. This should include all aspects of input and output methods. Relevant accessibility standards should be followed. (It is recommended that the software will be compatible with standards like the W3C Web Accessibility Initiative).
11. **Error** - Prevent errors. It is always better to design interfaces that prevent errors from happening in the first place.
12. **Message** - Good error messages. The messages should be informative enough such that users can understand the nature of errors, learn from errors, and recover from errors.
13. **Undo** - Reversible actions Users should be allowed to recover from errors. Reversible actions also encourage exploratory learning.
14. **Closure** - Clear closure. Every task has a beginning and an end. Users should be clearly notified about the completion of a task.
15. **Language** - Use users' language. The language should be always presented in a form understandable by the intended users.
16. **Control** - Users in control. Don't give users the impression that they are controlled by the systems.

17. **Alerts** - Alerts and notifications. System view and design of (1) the priority of the different type of alerts, (2) who should see each type of alert, (3) when to display it, and (4) how. This should also include standard for how to mark important information so it will stands out from surrounding information (See functional requirement G.78).
18. **Document** - Help and documentation. Always provide help when needed.

In many organizations people (the users of the system) might also move back and forth between systems. The following provides usability recommendations to ensure consistency across systems at the "user interface level".

- **Consistent User Interface features** - The main issue we need to handle is consistent user interface features across the different systems. Like the need for consistency within the system, users achieve better performance and do their tasks faster and more accurately when their working interface in consistent even when they work on another system. Because users might use more than one system or they might move from one clinic to another, it is important that consistency will be achieved not only within one system but also across systems. Consistency is a safety feature that also improves performance. When the interaction with the system is not consistent it might cause the users to err.

In particular, consideration should be given to facilitate consistency across all systems in a jurisdiction for the following:

- **Date and Time format** - It is recommended that all users will use the same Date and Time format across all systems. This will reduce the chances for misinterpretation of orders etc. Therefore, the aEMR should be able to set the date and time format for all its screens and applications, including all printed orders and reports that the aEMR generate. It is recommended that the format will follow the guidelines for medication orders - date that include the month name (in letters not in numbers) and the year in 4 digits, and time in 4 digits.
- **Abbreviations** - The use of abbreviations is not recommended in any healthcare system. This issue becomes even more important when considering consistency across systems. The chances for misunderstanding that the same abbreviations may have a different meaning in different organizations are greater.
- **Color coding** - Users use the color cues as one of their tools to cooperate with systems coding scheme should be set and consistent across a jurisdiction. The selected color scheme should also match the scheme that is in use in the physical world.

• **Alerts and notifications** - The necessity of the alert and notification is clear - the system identifies a hazardous situation to draw user attention to this event. However, many studies have shown that users develop alarm fatigue - behavior that ignores alarms - when they are working with a system that generates many false alarms or alarms that they should not, or cannot handle. These alarms generate an unjustified interruption to the users' work, and the users learn to ignore them. The result of this phenomena is that users miss true alarms that are hidden among the false alarms. To overcome this problem, special care should be taken for all alerts and notifications. Therefore system configuration tools should be able to define: (1) the priority for the different type of alerts, (2) who should see each type of alert, (3) when to display the alert, and (4) how to display it. The capability to prioritize the alerts, and to control who will see the alert, when and how the alert will be displayed need to be part of the system capabilities. It should be clear who will set these definitions in the system, and what would be the process of maintaining these settings as part of the system maintenance. Managing and customizing the alerts and notifications should not only be conducted within one system, but across systems.

3.6.1 Human Factors Informed Procurement Process

This part is a recommendation for a human factors informed procurement process for selecting and implementing an aEMR system in clinics. Although this is only a high level guidance, it can assist clinics that do not have a human factor engineer as part of their procurement and implementation team, to generate human factors informed procurement process, utilizing human factors tools and methods for selecting the right aEMR system for their users.

3.6.2 The User Centric Approach

Systems work best when all their components work harmoniously with each other. Our system has two main components - the user and the aEMR. Since we cannot change the way people operate, we need to make the necessary adjustments to the technology, in order to make it a good fit for our users. In our case, we need to know all our users' needs, before we select the aEMR for them.

There are many reports of breakdowns and problematic implementations of EMR systems across all healthcare areas. Most of these cases would be eliminated if the end users had better influence on the process of selecting and implementing the EMR in the organization. The user centric approach we present here will ensure that the selected EMR will result in better user performance.

It is important to note that each clinic has its own unique features, based on the special care it provides, the patients it support, its location and its users. Therefore the selected aEMR, based on this user centric approach, might be different for each clinic.

The user centric approach described here starts with specifying the users' needs, continues with a method that evaluates the actual fit between the user and the proposed EMR, and ends with recommendations for how to implement the aEMR system, including tailored training that will cover the gaps we expect to have between the users and the aEMR we select.

Step 1 - User Requirements for the RFP

1. **Users' Committee** - The first step would be to form a 'users' committee' that will bring the users' point-of-view through the selection process. This multidisciplinary committee should include potential users from different departments (Physicians, nurses, administrative), as well as people from IT, HR and other stakeholders.
2. **Collect needs and requirements from the Users** - The users' committee first mission will be to collect information about needs and requirements from the actual users. This users' requirement list will demonstrate the users' needs and priorities for features and behaviors they expect form the new system. As mention before, this list will be unique to each clinic, based on the unique clinics' characteristics.
3. **Surveyed Users** - The users committee will have to define the users that will be surveyed. While it might be very beneficial to approach all the users in the clinic, sometimes you will be able to approach only limit number of users. In this case it is important that these selected users will cover all departments in the clinic.
4. **Tools and Methods** - The users committee will have to select the tools they will use to collect the information from the users. There are few methods to collect this information from the users that include observations, task analysis, workflow diagrams, surveys and more. It is recommended that the data collection will be done by a 3rd party that is not involved in the day-to-day work. However, if the clinic chose to do this task without consulting Human Factors specialists, we recommend using Surveys - Questionnaires, Interviews and Focus Groups (more information about Surveys at appendix C).

5. **Users' Requirements Addendum** - Based on the information collected in the survey, a list of users' requirements should be developed. A map or a diagram that represent the process might also help in organizing the information in a form that will be easy to use. This list will be an addendum to the technical requirements document.

6. **Set Priorities** - The users committee will have to set the priorities for each of the items in the users' requirements document. The users' requirement addendum should be sent to the vendors together with the technical requirement document, to verify that everyone look at the same process.

Step 2 - Evaluating the Vendors' Proposals - the user performance side

This section will present the process of evaluating and selecting the aEMR based on the users' performance with the aEMR. The evaluation will be guided by the requirement document. Other evaluation of the vendor proposal, such as the finance aspects, should be evaluated separately.

The evaluation process should also follow these guidelines:

- The evaluation will be done as independent as possible from any stakeholders, preferably by the 3rd party that is not involved in the day-to-day operations.
- Vendors will not be present during these evaluations.
- During these evaluations the product will not be used as part of the operational system.
- Vendors will be required to provide training to the evaluators.
- Where necessary, vendors must customize their product to support the evaluation.

This section has two parts - (1) Evaluating the product and (2) selecting the product:

1. Evaluate the Product - There are few methods that can be applied to evaluate the proposed products. These methods will identify issues that could eliminate a product from undergoing further evaluation. Ideally, multiple experts should independently evaluate each product.

It is recommended to include a human factors expert to run the evaluation and select the best evaluation methods. We will present here few methods that can be implemented by the clinic, in case they choose to run these studies by themselves.

a. Defining the scenarios that will be tested - The users' committee will define user groups and the main scenarios that will be tested. It is important that these scenarios will be specific for each of the main user groups - physicians, pharmacist and nurses. For example, the physicians' scenarios will require tasks such as entering a diagnosis, ordering a treatment plan, and signing off on a medication order. The pharmacists' scenarios will require to review orders, make dose adjustments as necessary, and build a chemotherapy regimen. Finally, the nursing scenarios, will include tasks such as documenting medication administration, ordering a medication, and entering a verbal order. Additionally, all users can be required to search for their patients' charts and review them as they normally would in their clinical practice. It is important to include scenario that the clinic expect to be problematic. For example, it is known that in many EMR systems, the process of registering a new patient (new patient admission - D.11-15) takes very long time. The clinics should define how long this initial process should take, and then make sure that the process they have in the EMR meet their standards.

b. The evaluation tool - Usability testing, usability heuristics, cognitive walkthrough are just few of the methods that can be applied for evaluating the user performance using a software product. For clinics that run these evaluations without support from a human factor specialist, we recommend to use usability testing. Usability testing is a human factors method for evaluating how people interact with a system in a simulated environment. We use this method to identify as many issues as possible that could be encountered in a real clinical setting without impacting patient care.

The evaluations are done based on usability scenarios/scripts that describe processes the user has to do in real-life scenarios. These evaluations will be performed by group of uses from different departments. A minimum of 3-5 users from each group is necessary in order to identify most of the issues the scenario cover. For more information on usability testing of medical devices see Weinger MB, Wiklund ME, Gardner-Bonneau DJ: Handbook of human factors in medical device design: Taylor & Francis US; 2010.

Usability testing sample scenarios can be found in section 3.9.

It is important that these studies will be done only after the participants get training on the specific systems they are going to try.

These studies should focus the evaluation on parameters you can measure like process time and number of mistakes, and not on general statements like "I like it". The quantitative data from the usability tests will be collected, together with the number of usability issues that were uncovered, and the user satisfaction. Section 3.10 illustrates a sample table for comparing systems after the Usability Testing.

Some EMRs are designed with the ability to customize the settings to the most appropriate values for each clinic. It is essential that the settings will be customized to the meet the clinic's needs, before performing the usability testing.

2. Select the Product - The final decision should weigh all relevant data sources, including the human factors evaluation results, technical evaluation results, cost, required preventative maintenance, and availability of sales and service representatives. The product selected must meet all high priority needs established at the outset of the evaluation process, and pose no serious safety and/or usability issues.

After the vendor is selected, the results of the studies and the compatibility with the requirements will be used to mark the gaps between the requirements and the actual product. This will be the baseline for the implementation.

Step 3 - Implementation

In this section we will highlight few human factors issues that are related to the process of implementing aEMR in the clinic.

1. Design the Training - It is recommended that the training for how to use the new aEMR will be tailored made to the clinic, and not the standard training the vendor offer. The training session should highlight the key differences between the current system and the new aEMR system (how to do in the new systems tasks you use to do in the old system). The training should also cover the gaps that were found during the usability testing between the requirements that were specified in the requirement document and the user performance.

2. Prepare Support Team - One of the key issues in the success of a new technology is the confidence the users have in the new system. The users can gain a lot of confidence in the system if they will know that there is someone that will support them in case they will encounter any difficulty in operating the new system. A good and accessible support team is an important part in the implementation process.

3. Prepare plan B - All technology components fail to operate from time to time. When this happen, the system have only the human operators to continue provide the service. These operators need to know how to do the critical tasks they are responsible for, without the technology part of the system. Preparing ahead of time for system malfunction will help crossing these crises when things happen.

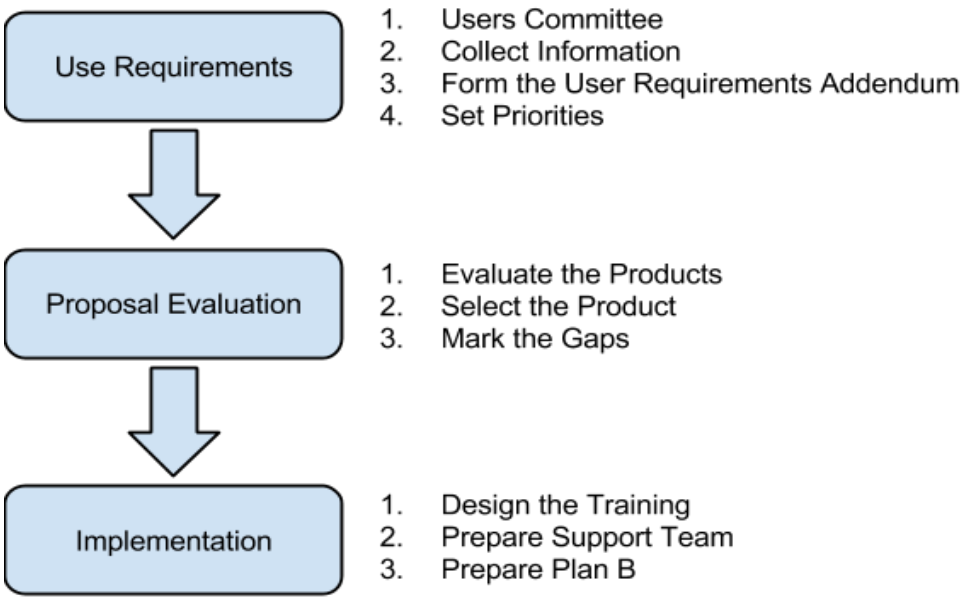

Figure 3: The human factors-informed Procurement and Implementation process diagram.

3.7 Terminology for Usability Section

1. **EMR** - We refer to all type of computer based systems that handle patient records as EMR. For the purposes of this document, this definition will also include other information systems in healthcare like Hospital Information System (HIS), Clinical Information System (CIS) etc.

2. **Clinics** - We refer to all the organizations that purchase and use the EMR as clinics. That will include both small local clinics and regional cancer centers, as well as bigger health centers and hospitals.

3. **Users** - We refer to all the people that use the system and work directly with its interface as users / end-users. That will include physicians, nurses, administrative personnel, pharmacists etc. Under this definition, IT administrators are not considered users of this system.

4. **Vendors** - We refer to all the software providers, IT integrators and local IT resellers / distributors as vendors. For the purpose of this document, the vendor is the one that responsible for all external support, customization and external training, although parts of the above tasks can be done by an internal IT group.

3.8 Surveys: Questionnaires, Interviews and Focus Groups

Surveys are an approach to getting information about reality by directly asking people questions. There are many methods of conducting surveys such as paper-based or online questionnaires, telephone interviews, in person interviews, and focus groups.

Surveys have the benefit of being efficient since the questions are planned in advance and, depending on the method, may not require any scheduling or coordination with those completing the survey. They have the advantage of being able to capture information in a standardized way that allows for comparison and, sometimes, quantification and statistical analysis. They are also cost effective since a survey can reach many people easily. Surveys can also be more comfortable for participants since they can be completed anonymously and participants can take time to reflect on their responses before responding. They are a useful tool for asking questions with limited responses such as ‘have you used this feature on the technology?’ or for understanding things at a general levels such as how a unit is

staffed, they type of equipment used, the roles and responsibilities of each type of staff on a unit, the main tasks of each user type, and issues and past problems related to technology that a clinical engineer can help to address.

Surveys are not good for answering general 'how' or 'why' questions such as how people behave or why people do what they do. When asked to recall why we do something, people will usually formulate an answer based on rational thought, but the rational answer is not always consistent with reality. Additionally, emotions, habits, and environmental factors play a strong role in how we behave and are not captured systematically in a survey.

3.9 Sample Usability Testing Scenarios

Usability – Nursing – Scenario #1

Katrina Patientone (MRN 2244554) is in the unit and is ready to receive her chemotherapy treatment.

1. Tell us:
    i. Her diagnosis
    ii. Her treatment plan name and the cycle/day she is here to receive
    iii. Her allergies
    iv. Her height and weight
2. Document:
    i. That she struggles with physically strenuous activity but can do light housework
    ii. Is constipated even though she uses Senokot regularly
3. Document that you administered all of today's medications:
    i. Granisetron 6:00 a.m.
    ii. Dexamethasone 6:00 a.m.
    iii. Diphenhydramine 6:15 a.m.
    iv. Ranitidine 6:35 a.m.
    v. Paclitaxel 7:00 a.m.
    vi. Carboplatin 10:00 a.m.

4. Document that Katrina got her take home post-med prescriptions.
5. Katrina did not experience any reactions during treatment so she went home when you were finished.

Usability - Pharmacist - Scenario #2

Imagine you are in the pharmacy and are ready to address orders that have been placed by the physician.

1. Tell us how orders are prioritized
2. Open Jasmine Patient's chart and tell us:
    a. Her diagnosis
    b. Her treatment plan name and the cycle/day she is here to receive
    c. Her allergies
    d. What weight is being used for drug dose calculations
3. Make the appropriate changes to the order based on the information that is available about the patient
4. Sign off on the order so it can be dispensed or queue the order for the physician to sign off on, whichever you think is appropriate.

Usability - Medical Oncology - Scenario #3

Imagine some time has passed and Kim Patientone2 (MRN 2244553) has returned for cycle #4 of her paclitaxel/carboplatin treatment.

1. Document that:
    a. The patient complains of having difficulty buttoning her blouse and of numbness in her fingers
    b. She has experienced complete hair loss
    c. Is constipated even though she uses Senokot regularly
2. Order:
    a. Cycle #4 of her chemotherapy
3. Make sure all doses are appropriate and delay her treatment by 3 days because she is going out of town

3.10 Sample table for comparing systems after the Usability Testing

Metric	Device A	Device B	Q
Performance Metrics			
Scenario Performance Index**	62%	85%	
Scenario Completion Time*	20.5 min	16 min	
Number of Critical Severity Usability Issues	13	1	
Number of High Severity Usability Issues	13	8	
User Perception Metrics			
Perceived Ease of Use, Satisfaction and Patient Safety Ratings**	3.5 out of 7	5.2 out of 7	
System Preference Selection**	2 out of 27 users	20 out of 27 users	

1. Performance Metrics focused on how successful participants were at completing the scenarios with each system. Their success was measured by four parameters:

(i) Scenario Performance Index.

(ii) Scenario Completion Time.

(iii) Number of Critical Severity Issues.

(iv) Number of High Severity Issues.

2. User Perception Metrics focused on what the participants thought of each system based on their test session. Their opinion was measured in two ways:

(i) Perceived Ease of Use, Satisfaction, and Patient Safety Ratings and (ii)

(ii) System Preference Selection.

3.11 Categorizing Usability Issues

Through observation of users performing scenarios with the systems, issues with efficiency and patient safety are identified and categorized, according to their degree of impact on patient safety and likelihood of occurrence. Each usability issue should be categorized into 1 of 3 levels of usability issue severity:

 Critical Severity Issues	Directly jeopardize patient safety and have a high likelihood of occurrence
 High Severity Issues	Impact efficiency with possible patient safety implications and have a high likelihood of occurrence
 Medium Severity Issues	Impact efficiency with possible patient safety implications and have a medium likelihood of occurrence.

3.12 Sample Post-test Questionnaire

For the following questions, please indicate your selection on the following scale:

a) Strongly agree
b) Agree
c) Neither agree nor disagree
d) Disagree
e) Strongly disagree

1. My first experience using the program was a positive one.
2. The organization of the program does not match what I would expect.
3. The program has all the necessary features and functions I would need.
4. It is difficult to navigate around the program.
5. It is easy to complete the tasks I want to do with the program.
6. The aesthetics of the program are not pleasing.
7. The headings, titles and terms in the program match the terminology I know.
8. The program works poorly within the context of my usual interaction with a patient.
9. It takes too much time to complete my tasks with this program.
10. The program helps me complete my tasks with minimal effort.
11. Considering all the aspects of your experience with the application, please rate your satisfaction.
    a) Strongly satisfied
    b) Somewhat satisfied
    c) Neither satisfied nor dissatisfied
    d) Somewhat dissatisfied
    e) Strongly dissatisfied

12. Please check all items that apply. To learn to use the software program, I would find the following helpful:
    a) Online help
    b) Online tutorial
    c) Formal training
    d) Nothing. It is intuitive to use.
    e) Other (please specify)

13. Please indicate up to 3 things you do NOT like about the program, and why.
a)
b)
c)

14. Please indicate up to 3 things that you do like about the program, and why.
a)
b)
a)

15. Do you have any other comments on your experience with this program you would like to share?

3.13 Interoperability

Interoperability is the ability of different information systems and software applications including electronic medical records (EMR) and the hospital information system (HIS) to work together within and across organizational boundaries to communicate, exchange data, and use the information that has been exchanged (Health Information Management Systems Society (HIMSS), 2005). Furthermore, interoperability describes the extent to which systems and devices can exchange data, and interpret that shared data. For two systems to be interoperable, they must be able to exchange data and subsequently present that data such that it can be understood by a user.

Cancer care requires multidisciplinary coordination between medical specialties, primary care, and allied health professionals to achieve optimal outcomes and efficiencies (Yu, 2011). To do so, data exchange standards and design should permit data to be shared across ambulatory settings, including emergency rooms, labs, pharmacy(s), clinicians and patients regardless of the application or application vendor.

In order to advance the effective delivery of healthcare for individuals and communities, HIMSS recognizes the following three levels of health information technology interoperability: foundational, structural, and semantic (Health Information Management Systems Society (HIMSS), 2005).

Foundational interoperability is the most basic level of interoperability. It allows data exchange from one information technology system to be received by another and does not require the ability for the receiving information technology system to interpret the data.

Structural interoperability is an intermediate level that defines the structure or format of data exchange (i.e., the message format standards) where there is uniform movement of healthcare data from one system to another such that the clinical or operational purpose and meaning of the data is preserved and unaltered. Structural interoperability defines the syntax of the data exchange. It ensures that data exchanges between information technology systems can be interpreted at the data field level.

Semantic interoperability is the highest level allowing two or more systems to exchange and use information. It takes advantage of both the structuring of the data exchange and the codification of the data including vocabulary so that the receiving information technology systems can interpret the data. This level of interoperability supports the electronic exchange of patient summary information among caregivers and other authorized parties via potentially disparate electronic medical records and/or hospital information systems.

3.14 Ontario's Oncology aEMRs Need for Interoperability

Ontario has an Integrated Cancer System, where multiservice Regional Cancer Centres are complemented by smaller centres that provide focused services. The tools and technology that are used should reflect this model of care by enabling health information exchange across the Cancer Journey to improve the delivery of cancer care and the patient experience throughout their journey. To accomplish this goal, creating and maintaining interoperability between products and people is essential in the delivery of excellent health care as it improves communication among patients and provides, clinical and administrative wait time and experience within the cancer system.

Additionally, eHealth Ontario is the leader for developing EHR Interoperability Standards for Ontario. Their mandate is to transform healthcare in the province by way of standards development to ensure that information is designed in a way that is readily exchangeable and understood by care providers. The eHealth Ontario EHR Interoperability Standards entity works closely with health care providers, hospitals, government bodies and vendors to develop and maintain the best solutions for Ontarians. Their standards are integrated with national and international initiatives to ensure the benefit of industry innovation and best practices (eHealth Ontario). The review, recognition and consideration of adherence to these standards should be integral to any planning activities around integration within and between Regional Cancer Centre Oncology aEMRs systems.

The Oncology aEMRs that supports oncology must take into account key areas of practice that differentiate oncology from other specialties. Accurate tumor staging, flow sheets, the need for multidisciplinary workflow documentation, integration of laboratory and imaging reporting, and dealing with chemotherapy ordering and toxicities are some of these unique demands. Particularly demanding is the ordering, documentation, and management of chemotherapy and ancillary medications (Lawrence N. Shulman, 2008). As a result, there has been increased development of oncology-focused Oncology aEMRs by various vendors.

Ontario
Cancer Care Ontario
Action Cancer Ontario

Recognizing the complexity of cancer care delivery and challenges with the existing IT solutions, Regional Cancer Programs are in various stages of adopting oncology-specific aEMRs. In an effort to improve the quality, safety and efficiency of cancer services, the ultimate goal is full, seamless integration between Oncology aEMRs and the host hospital's electronic medical record. However, specific needs of oncology make it difficult for institutions to choose an EMR system that will work institution wide. To support oncology care delivery, organizations have chosen different approaches:

- Adoption of a hospital wide EHR with a customized module for ambulatory oncology-specific needs, plus additional integration with Radiation Oncology systems.
- An integrated Systemic and Radiation Oncology aEMRs supported by a Hospital Information System.
- A "best-of-breed" approach - which is the acquisition of an oncology-focused CPOE system and integration with multiple systems, registries and databases plus a Radiation Oncology EMR and substantial customization to provide the appearance of one seamless aEMR.

Each approach has its advantages and disadvantages; however the core functional requirements are consistent across these systems. It is the strategic vision of the individual organization that will decide which approach to an Oncology aEMRs is the best fit for the current and future needs of their institution.

The ideal state of interoperability enables health information exchange with provincial and regional data sources to promote the accessibility of robust and comprehensive patient information in the delivery of cancer care. As well, application integration should be vendor neutral and not limited to products developed and maintained by Cancer Care Ontario. Figure 3, illustrates a high level architectural representation of the three models described above and how an Oncology aEMRs is connected to the Hospital Information System. While the Oncology aEMRs is directly connected to Cancer Care Ontario's eClaims and Data Book, it may also derive key data through a secondary connection with the Health Information Access Layer (HIAL) for laboratory data, provider information and a master patient index managed by Enterprise Master Patient Index (EMPI).

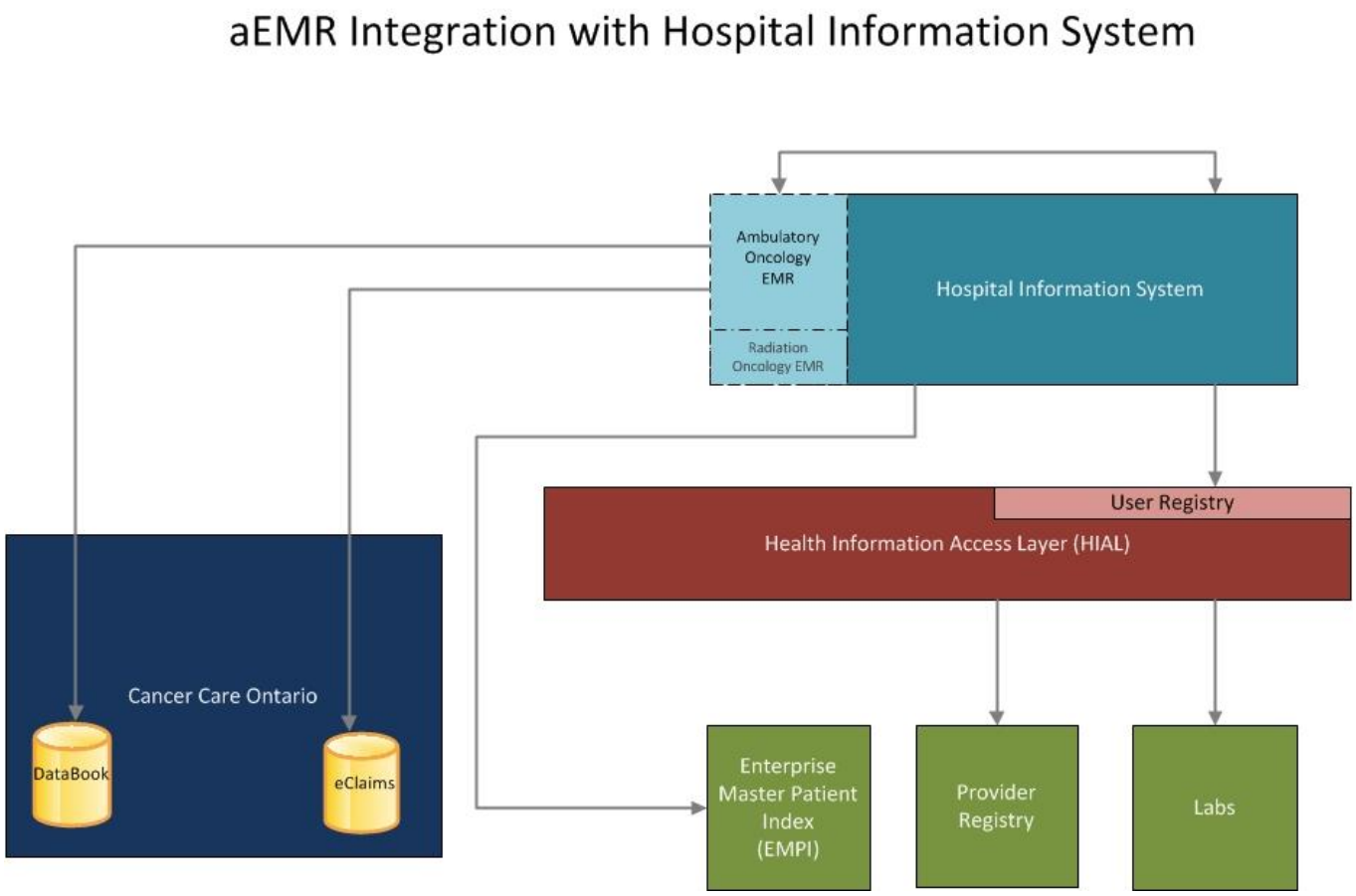

Figure 4: Oncology aEMRs Integration with Hospital Information System.

3.14.1 Certification

Canada Health Infoway offers certification services to assess health information technology compliance with the pan-Canadian standards and best practices in functional, privacy, security, interoperability and management. To date, Canada Health Infoway has yet to develop oncology-specific standards, however, it is likely that there is some overlap with the standards they have developed, which include: client registry standards; provider registry standards; laboratory standards; diagnostic imaging standards; drug standards, interoperable EHR standards; public health surveillance standards; national e-claims standards; transport level interoperability standards, and security standards. In addition to the 'internally' developed standards, Canada Health Infoway also supports a number of international Standards Development Organizations (SDOs).

3.15 Alignment with CCO Assets

CCO has developed numerous tools and software applications that support the cancer system delivery. Priorities and feasibility of integrating CCO assets with Oncology aEMRs still need to be determined and will be undertaken as a follow-up to this Project. As well, CCO will need to consider Oncology aEMRs integration implications when designing any new tools in the future. The end user engagement process identified the need for fully integrated IT tools and systems.

Access to the entire patient story would enable clinicians to have a better understanding of the patient experience. Furthermore, it will enable timely access to data and avoid unnecessary administrative and clinical delays, thus improving operational efficiencies at the cancer centre and clinical efficiencies through the provision of the right data at the right time.

The following table provides details of CCO's tools and applications that currently exist. The possibility of integration with an Oncology aEMRs will still need to be assessed as a follow-up to this Project.

CCO Assets	Description
Prevention Related	
Ontario Cancer Risk Assessment Tool	The tool allows all Ontarians to receive a personalized cancer risk profile and link them to local resources that they can use to reduce their risk.
Screening Related	
Cervical Screening App	Free information-only resource phone application that provides healthcare providers with a summary of CCO's cervical cancer screening cytology guidelines.
Colonoscopy Interim Reporting Tool (CIRT)	Facilitates reporting of colonoscopies by participating hospitals.
Integrated Client Management System (ICMS)	Provides operational and reporting support to the Ontario Breast Screening Program.
InScreen	An information management/information technology solution which integrates and links disparate data sets to create screening records for Ontarians, enabling the ability to track their progress for purposes of invitation, result notification, recalls, reminders and reporting.
LRT	Laboratory Reporting Tool
SAR	Screening Activity Report
Diagnosis Related	
Diagnostic Assessment Program Electronic Pathway Solution tool (DAP-EPS)	Interactive website that provides patients, DAP staff and healthcare providers with shared information and support as a patient progresses from the suspicion of cancer to a definitive cancer or non-cancer diagnosis.

Treatment Related	
Brachytherapy tool	Stores patient and treatment information about prostate cancer patients at RCC hospitals, for which reimbursement is being sought.
CCO eClaims	A web-based application that supports drug reimbursement for both OPIS and non OPIS sites.
i-Port™	Web based analytic tool that provides provincial and LHIN level cancer information. One window access to reliable information that follows the patient journey from prevention to palliation
Interactive Symptom Assessment Collection (ISAAC)	Used to capture information on patient reported symptoms or outcomes using the Edmonton Symptom Assessment System (ESAS); tracks the functional status using the Palliative Performance Scale (PPS) and other scales.
CCO ST CPOE System (OPIS)	Computerized prescriber order entry (CPOE) systems reduce the risk of chemotherapy errors compared with paper-based systems. Systemic treatment (chemotherapy) is complex to manage; if the dosage is too low the patient will not get the benefits of the treatment; if the dosage is too high it may cause harm. OPIS supports approximately 70% of chemotherapy visits in the province.
Specialized Services Oversight (SSO) tool	Hospitals submit data and the SSO program is able to generate reports specific to patient needs, point-of-care, Quality of Life across the continuum
Symptom Management Guides app	Free clinical phone application that uses an algorithm to guide care providers through clinical assessment and care planning based on symptom severity. Recommendations include both medication-related and non-medication-related interventions. Recommendation that patients should be screened first using the Edmonton Symptom Assessment System (ESAS).
CCO Drug Formulary	An information-only resource for Ontario cancer drug and regimen monographs and symptom management information.
Drug Formulary (mobile app)	Free clinical smartphone and iPad application that includes monographs for drugs and regimens used in systemic cancer treatment, and symptom management information used in the care of cancer patients in Ontario.

Psychosocial and Palliative Care Related	
Ambulatory Oncology Patient Satisfaction Survey	Survey that gauges a patient's satisfaction on several dimensions: emotional support, continuity and coordination of their care, respect for their preferences, their physical comfort, how well they feel they have been informed, educated and communicated with, and how well they were able to access their care.

3.16 Conclusion

This functional requirements section will inform Ontario's Regional Cancer Programs of functionality that should be available to support integrated cancer care. Extensive research and consultation have resulted in a comprehensive framework, yet it is acknowledged that it remains to be further developed. The Project received many valuable suggestions from stakeholders across Ontario that could not be incorporated at this time, as the concepts were either too facility-specific or conceptually under-developed. As well, this framework needs to expand to include functionality such as clinical and patient pathways management, as well as administrative workflow management. Finally, this framework will need to evolve as clinical and business needs and technology change over time. CCO will continue to socialize this work and reflect on how this section can evolve into the future.

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3.18 Appendices

Participating hospitals who participated in the external Functional Requirement review:

Trillium Health Partnership -Credit Valley	Southlake Regional Health Centre
Hamilton Health Sciences	Kingston General Hospital
Sudbury Regional Hospital	London Health Sciences Centre
Lakeridge Health Corporation	Thunder Bay Regional Health Sciences Centre
The Ottawa Hospital	Princess Margaret Hospital
Royal Victoria Hospital	Windsor Regional Hospital

The following appendices are being provided in this section to illustrate examples of the most sought after and mentioned features from the feedback collected at the Regional Cancer Centre workshops. The elements of these features are also a reflection of the survey conducted as part of the Information Standards work stream that highlighted the need for such features and elicited the content of the same. These features are covered by the functional requirements statements above. Below is a sample summary sheet that can be used as a guide for those who may want to implement it as centres may have varying requirements and/or workflow influencing their own development of the feature.

3.18.1 Oncology Patient Profile Summary Sheet

The patient summary sheet is a feature that draws out multiple functionalities of the Oncology aEMRs to provide a specific purpose and facilitate or enhance patient care. There are two kinds of patient summary sheets featured in this section: the Patient Executive Summary (PES) and Patient Information Care Summary (PICS).

Definitions

Patient Executive Summary (PES)

A summary of care record that provides clinicians an overview of single or multiple episodes of care from the start time the patient was diagnosed up to the current time. The purpose of the document is to assist clinicians who are to take over (either temporarily or permanently) in the care of patients and acquire information quickly from the chart that is clinically relevant to ensure continuity of care and safe management. The PES consists of the following major components:

a) Patient Demographics
   (may include patient email address)
b) Relevant Past Medical History
   -Includes surgical history
   -Hospitalization dates and diagnoses
c) Relevant Family History
d) Predisposing conditions/risk factors
e) Major co-morbid conditions
f) Diagnosis details
   - Type/location

- Diagnosis date
- Type/histology/grade
- Staging (TNM)
- Tumor markers
- Stage at diagnosis
- New or recurrence
- Location of metastasis or recurrence (if applicable)

g) Treatment History and Plan

- Chemotherapy treatment details and plan
- Radiation treatment details and plan
- Summary of other treatment (non-chemotherapeutic, allied medical health treatment plan i.e. SLP, PT, OT)

h) Follow-up plan/Transition Plan/Survivorship Care

- Follow-up consults, lab tests and imaging
- Other allied health consults (dietician, smoking cessation counselor, genetic counselor, psychiatrist, psychologist, social worker, fertility specialist, and others)

i) Advance Care Plan Details

- DNR status
- Next of kin or substitute decision maker or power of attorney
- Preferred place of death

Patient Information Care Summary (PICS)

A summary of care record that provides clinicians in an acute (urgent/emergent) care setting an overview of a single episode of care of a patient in active treatment in order to ensure safe management of complications. It primarily aims to assist clinicians' access to the relevant and up-to-date care information in order to quickly manage patient problems or issues arising from their current treatment i.e. chemotherapy, radiotherapy, or both. The PICS consists of the following major components:

a) Patient Information (Name, ID/MRN, DOB) and Contact (phone)
b) Third Party Insurance Information
c) Primary Care Provider Name & Contact
d) Most Responsible Oncologist & Contact
e) Background Information
    1.) Last ESAS Score and Date
    2.) Major co-morbid conditions
    3.) Cancer type/location
    4.) Diagnosis Date
    5.) Location of metastasis (if any)
    6.) Allergy list
f) Latest Investigational Results and Date
    1.) Hematology and blood chemistry (if any)
    2.) Imaging (if any)
    3.) Culture studies (if any)
g) Treatment status
    1.) Height and latest weight and date taken.
    2.) Name of chemotherapy regimen
    3.) Treatment on clinical trial.

4.) Chemotherapy start date and end date (if applicable)
5.) Chemotherapy intent
6.) Drug details (route, dose and schedule) and dose reduction (if applicable)
7.) Number of cycles
8.) Other medications
9.) Radiation Therapy Intent (If applicable)
10) Region treated and dose
11) Radiation therapy date initiated and completed (if applicable)

h) Follow up details
- Closest referral (by date) to any clinician or allied medical health
- Next lab test or imaging work up

i) Potential late effects expected from treatment to watch out for.

j) Advance Care Plan details (if Applicable)
- DNR status
- Next of kin or substitute decision maker or power of attorney

3.18.3 Sample Sheet - PICS

Ontario
Cancer Care Ontario
Action Cancer Ontario

CCO Patient Information Care Summary v4.0 08/28

[Insert Regional Cancer Centre Name/Info Here]

The Patient Information Care Summary (PICS) is a brief record of the patient's major aspects of cancer treatment. This is not a complete patient history or comprehensive record of intended therapies.

Patient name:	
Patient ID/MRN:	
Patient D.O.B:	(YYYYMMDD)
Patient phone:	
Patient cell number:	
Patient email:	
Primary Care Physician (PCP):	
Medical Oncologist name:	
Medical Oncologist phone:	
Rad./Surg. Oncologist name:	
Rad./Surg. Oncologist phone:	
Third Party Insurance Info:	

Background Information

Major co-morbid conditions:			
Latest ESAS Score		Date:	(____/__/__)
Cancer type/location:		Diagnosis date:	(____/__/__)
Location(s) of metastasis or recurrence (if applicable):			
List of Allergies (if any)			

Recent History of Clinic Visit

Date	Activity

Latest Key Investigational Results

Study	Date	Findings

Treatment Status

Height:		Current weight (lb/kg):	
Calculated BSA:		Treatment on clinical trial:	☐ Yes ☐ No
Name of chemotherapy regimen:			
Chemotherapy start date:	(____/__/__)	Chemotherapy end date:	(____/__/__)
Chemotherapy intent:	☐ Curative ☐ Adjuvant	☐ Neoadjuvant	☐ Palliative Care

Chemotherapy Drug Name	Route	Dose mg/m²	Schedule	Dose reduction	# of cycles admin
				☐ Yes ___% ☐ No	
				☐ Yes ___% ☐ No	
				☐ Yes ___% ☐ No	
				☐ Yes ___% ☐ No	
				☐ Yes ___% ☐ No	

Major side effects of this regimen: ☐ Hair loss ☐ Nausea/Vomiting ☐ Neuropathy ☐ Low blood count ☐ Fatigue ☐ Menopause symptoms ☐ Cardiac ☐ Other_____

Non-chemotherapeutic Agents	Route	Purpose/Goal	Comments

Hospitalization for toxicity during treatment: ☐ Yes ☐ No

Serious toxicities during treatment (list all):

Radiation therapy: ☐ Planned ☐ Not planned ☐ Administered
Intent: ☐ Curative ☐ Adjuvant ☐ Neoadjuvant ☐ Palliative Care
Region treated: _____ Radiation dose: _____
Date initiated: (___/___/___) Date completed: (___/___/___)

Other Oncology Team Member Contacts		Survivorship Care Member Contacts	
Provider:		Provider:	
Name:		Name:	
Contact Info:		Contact Info:	
Provider:		Provider:	
Name:		Name:	
Contact Info:		Contact Info:	

Follow-Up and Survivorship Care

Follow up care	When/How Often?	Coordinating Provider
Med oncology visits		
Lab tests		
Imaging		

Advance Care Plan (if Applicable)

DNR status signed: ☐ Yes ☐ No Date signed: (___/__/__)

Next of kin/substitute decision maker/power of attorney: ☐ Yes ☐ No Date: (___/__/__)

Name: Contact Info:

Comments

3.18.4 Reporting

The reporting feature is a major and integral component of an Oncology aEMRs and many systems have built-in self-reporting tools. The functional requirement statements above were formulated to support the reporting feature. As well, complex reporting may be covered by more than one statement and/or combinations of functional requirements as highlighted in the table below.

Statistics Categories	Example Reporting Concepts	Possible Functional Requirement Statement Coverage
Diagnostic Assessment Program (DAP)	Market Share: % of patients diagnosed with cancer through a Diagnostic Assessment Program (DAP), drilled down by city and then by provider	Ability to track referral dates for all programs as based on multiple disease sites, patient acuity, and geographic locations. Ability to integrate with Ambulatory Oncology Patient Satisfaction Survey (AOPSS) to capture patient satisfaction information.
	Percentage of lung cancer patients navigated through a DAP and associated patient wait times and satisfaction for both streams.	
	Percentage of colorectal Colon Cancer Check (CCC) patients who have been diagnosed through a DAP and associated patient satisfaction and wait times for both streams.	
Diagnosis	Number of patients with secondary or more malignancies (not metastatic disease)	Ability to identify patients with recurrences or separate/new diagnosis for secondary malignancies as new cases for Data Book submission. For example providing a tick box in the background information for new cancer diagnosis and recurrence as well as date of diagnosis.

Statistics Categories	Example Reporting Concepts	Possible Functional Requirement Statement Coverage
Discharge	Percentage of patients with discharge packages from the Regional Cancer Programs	Ability to provide and share information such as patient clinical data, unique patient issues, long-term sequelae and recommended follow-up to support primary care physicians in receiving patients discharged from RCCs.
	Percentage of unattached (to a primary care provider) patients at time of discharge	Ability to capture, document and update the patient's physician or primary care provider's details (name and contact information) to facilitate continuity of care.
	Percentage of patients in specific disease site who received discharge protocols/care plan developed using evidence-based guidelines.	Ability to incorporate standard follow up disease specific practice guidelines. For example: the annual scheduling of mammography post breast cancer treatment. Ability to export (includes printed) patient record summary. For example printing a discharge summary. Ability to generate and record patient specific instructions, educational materials and provide a discharge statement that contains treatment outcome and community resources that the patient has accessed.
Education/Counselling	Proportion of patients counseled by a pharmacist on chemo (IV or PO) regimens	The ability to document counseling provided to a patient.
	Percentage of patients attending chemotherapy class	Ability to generate and record patient-specific instructions and patient specific educational material list.

Statistics Categories	Example Reporting Concepts	Possible Functional Requirement Statement Coverage
	Percentage of patients that receive a medical treatment summary	Ability to produce a summary of care at the end of a patient consultation and manage patient-specific care summaries and treatment plans. Ability to append a summary from a patient consultation to the patient summary sheet. Ability to generate and transmit patient treatment summary information to a primary care physician or specialist.
Follow-up	Percentage of patients that received 'well follow-up' care guidelines after treatment	Ability to incorporate standard follow up disease specific practice guidelines. For example: the annual scheduling of mammography post breast cancer treatment.
Human Health Resource (HHR)	How many health professionals seen by patients who are SW/PT/OT/SLP/Dietician?	Ability to document notes from patient encounter and support related activities.
Hospital/Readmission	Percentage of patients that are admitted to the hospital during treatment course. %/stats of patients requiring access to palliative care; community based vs. hospital readmission % of avoidable ER visits / hospitalization (Time of ER visits in terms of access to resources in relation to treatment cycle, time of day- noon vs. midnight) Unplanned hospitalization, ER visits for patients on chemotherapy/radiation.	The ability to integrate with the Hospital Information System (HIS), and/or Clinical Information System (CIS), to access Provincial and other registries and databases. The ability to view emergency department consultation notes for oncology patients.

Statistics Categories	Example Reporting Concepts	Possible Functional Requirement Statement Coverage
Multi-Disciplinary Cancer Conference (MCC)	Percentage of cases reviewed at MCC.	Ability to manage clinical documents and notes. For example the recording and documenting by all members of the multidisciplinary team.
Palliative (End-of-life)	Percentage of palliative patients who have a family physician (There is a need to find strategies to deal with lack of family MDs) Stage that patients are accessing palliative care (by disease, by level of symptoms, by disease burden etc.) with intent to bring them in sooner.	Ability to create an integrated end of life care plan. Ability to integrate with the defined level of palliative care required at either the Primary, Secondary or Tertiary level. For example: that a Primary level of care is available in every care setting and that there is a basic understanding of palliative care. The Secondary Level of care is required in all care settings, and that the care providers have had basic training in managing symptoms. In Tertiary level of care there is specialized knowledge to support most complex palliative cases. Ability to integrate with the Provincial Palliative Care Programs. Ability to access and integrate standards from external sources. For example Provincial Palliative Care Programs.
Plan of care	How many visits were required to decide a treatment plan?	Ability to create and maintain a patient consent for treatment.

Statistics Categories	Example Reporting Concepts	Possible Functional Requirement Statement Coverage
Psycho-social Oncology (PSO)	What PSO support was delivered? When, where, how and why? Percentage of patients who are referred to PSO later in the journey #/% of patients who have follow-up appointments to the PSO	Ability to identify and document patients who require psychosocial or allied health services based on best practice guidelines and/or on outcome of appropriate assessment tools. Ability to integrate with Ambulatory Oncology Patient Satisfaction Survey (AOPSS) to capture patient satisfaction information. Ability to document notes from patient encounter and support related activities.
Resources	Percentage of patients that require and are able to access patient assistance funds	Ability to identify patients that have been referred to a drug funding specialist. Ability to identify and document treatment delays due to drug funding.
Screening	Percentage of cancer survivors that undergo appropriate cancer screening Quantify how many are changing/screening captured in Prostate Cancer Screening % of patient in high risk screening programs overall and by region; Treatment variability per region	Ability to enter screening data and documentation and link it to a unique patient identifier. Ability to accept screening data and documentation from an external source. Ability to incorporate standard follow up disease specific practice guidelines. For example: the annual scheduling of mammography post breast cancer treatment.
Smoking	Percentage of patients who have used tobacco last 60 days.-	Ability to identify smokers before, during and after treatment.

Statistics Categories	Example Reporting Concepts	Possible Functional Requirement Statement Coverage
Survival/Survivorship	Percentage of patients receiving support in the community in survivorship (What resources, any workshops, support groups)	Ability to generate and record patient specific instructions, educational materials and provide a discharge statement that contains treatment outcome and community resources that the patient has accessed. The ability to integrate with the Hospital Information System (HIS), and/or Clinical Information System (CIS), to access Provincial and other registries and databases.
Time	What is the average wait time for radiation treatments for each disease site	Ability to track multiple patient waiting times, from arrival to completion of treatment.

Statistics Categories	Example Reporting Concepts	Possible Functional Requirement Statement Coverage
Treatment	Percentage of early stage cancers receiving adjuvant treatment (is it appropriate) What % of patients received adjuvant, curative, or palliative treatment, how is treatment intent documented? What is the % of protocols prescribed that are following guideline concordance specific to diagnosis, stage, grade.	Building of Protocols and Regimens Pre-loaded starter sets from the Provincial Formulary of modifiable regimen templates that will assist in the building of a final version by the user. Flexibility to allow for therapeutic options during regimen builds (e.g. different routes of administration, selection of anti-emetic agents within a drug class) Ability to support medication recommendations. For example to identify the most appropriate practice standard based on cost, formularies and or protocols that are disease specific. Dose calculation built into ordering system (e.g. pre-built dosing formulas, dose checking, optimal dosing logic and dose rounding) Ability to incorporate text instructions or recommendations within order sets (e.g. items that do not fit typical categories or templates such as dietary or fluid restrictions) Capturing proper sequencing of treatment (e.g. multi-modality therapy, linked order, sequencing of regimens within a treatment plan or medications within an order) Ability to incorporate logic for determining cycle scheduling and treatment duration (days between cycles and total number of cycles)

3.18.5 Functional Requirement for Information Standards Indicator Concepts

Indicator concepts (n=37) have been mapped to functional requirement statements within this section. Concepts have been linked to themes that cover functionality that would be necessary to capture the data required for the indicator. When an indicator concept becomes a measureable indicator in the cancer system, detailed functional requirement statements are necessary to ensure that data is captured in the appropriate format and time along the cancer journey by front-line clinicians. A future direction of this work on functional requirements may require a more granular definition of the functional requirements to help better support of indicatory data element capture.

	Information Standard Concept	Functional Requirement Statements
1	Duration of tube feeding post-radiation and chemotherapy (Head and Neck)	(G.47) Ability to present information collected from medical devices as part of the medical record as appropriate. (T.9) Ability to manage patient assessment as per guidelines and support consistent healthcare management of patient groups or populations. For example, the use of appropriate standard care plans specific to a disease site. (T.16) Ability to produce a summary of care at the end of a patient consultation and manage patient-specific care summaries and treatment plans.
2	Wait times from surgery to treatment	(T.33) Ability to add comments to a record to explain scheduling delays for treatment.
3	Central line complications-non infective e.g. a) clotting b) use of alteplase c) Placement challenges d) Interventional Radiology practices. This info would drive practice changes provincially.	(T.5) Ability to generate and maintain an acute and chronic problem list. (T.9) Ability to manage patient assessment as per guidelines and support consistent healthcare management of patient groups or populations. For example, the use of appropriate standard care plans specific to a disease site.

4	Treatment side effects	(T.16) Ability to produce a summary of care at the end of a patient consultation and manage patient-specific care summaries and treatment plans. (T. 55) Ability to support identification of potential problems and trends based on patient assessment.
5	Pharmacist-driven Best Possible Medication History (BPMH) ; Medication Reconciliation completed,	(G.39) Ability to provide clinicians an improved capability to manage complete medication profiles through a jurisdictional drug information system. (T.14) Ability to generate and maintain medication list including start, modification and end dates.
6	Wait time: Referral to palliative care to access services.	(PP.2) Ability to identify and document patients who require psychosocial or allied health services based on best practice guidelines and/or on outcome of appropriate assessment tools.
7	Wait time: Scheduled appointment start time and actual start time.	(T.33) Ability to add comments to a record to explain scheduling delays for treatment.
8	Time of receipt of referral to consult (1st clinic visit)	(D.7) Ability to track referral dates for all programs as based on multiple disease sites, patient acuity, and geographic locations. (D.30) Ability to track multiple patient waiting times, from arrival to completion of treatment or by disease pathway phase. (T.33) Ability to add comments to a record to explain scheduling delays for treatment.
9	Wait time from referral to intake with PSO/ Support Care Services	(D.30) Ability to track multiple patient waiting times, from arrival to completion of treatment or by disease pathway phase. (PP.2) Ability to identify and document patients who require psychosocial or allied health services based on best practice guidelines and/or on outcome of appropriate assessment tools.
10	Timing between first clinic visit (referral) and treatment decision (decision to treat)	(D.30) Ability to track multiple patient waiting times, from arrival to completion of treatment or by disease pathway phase. (T.33) Ability to add comments to a record to explain scheduling delays for treatment.

11	Wait time: Consult (1st clinic visit) and 1st treatment	(D.30) Ability to track multiple patient waiting times, from arrival to completion of treatment or by disease pathway phase. (T.33) Ability to add comments to a record to explain scheduling delays for treatment.
12	Smoking cessation : completion of education/course and outcome	(G.53) Ability to access patient educational information from external sources. (P.1) Ability to enter prevention data and documentation and link it to a unique patient identifier (for example smoking status). (D.15) Ability to create additional patient demographic fields such as nationality, cultural specificity, educational status, cultural considerations, language, geographic location, insurance information, tobacco use; past, current, cessation education.
13	MCCs: Number of case presented and discussion outcome	(T.7) Ability to display, create, and import context sensitive guidelines, care plans, and protocols pertaining to patient advance directives and provide access to all members of the multidisciplinary team to support patient care. (T.16) Ability to produce a summary of care at the end of a patient consultation and manage patient-specific care summaries and treatment plans.
14	Appropriate use of supportive medications with systemic treatment i.e. Neupogen/Neulasta, anti-emetics (Care Pathway)	(T.13) Ability to support the medication ordering, verification, dispensing and administration process, including performance status capture. (T.55) Ability to support identification of potential problems and trends based on patient assessment.
15	# Radiation retreats per year	(T.22) Ability to import and view radiation schedule such as historical schedule, treatment, clinic visits. (T.26) Ability to create, import and view radiation treatment patient care notes.
16	Patients who have a family history associated with increased risk for other "co-morbidities"	(T.2) Ability to capture and maintain current and past medical clinical history. (PP.1) Ability to document and maintain mental health, substance use, social and family history.

17	Number and type of disease of patients per radiation treatment unit.	(T.24) Ability to import and view radiation treatment site and prescription. (D.33) Ability to display original supportive patient diagnosis documentation from external clinical sources.
18	% of radiation treatment therapy versus machine treatment hours days.	(G.32) Ability to integrate with a Radiation Oncology EMR that is in accordance with the established standards outlined in the, Integrating the Healthcare Enterprise – Radiation Oncology (IHE-RO) Technical Framework. (D.21) Ability to import and view scheduling summary from a radiation oncology system.
19	Treatment delays	(D.24) Ability to keep a history of changed appointments including cancellations. (D.29) Ability to add comments to a record to explain scheduling delays. (T.33) Ability to add comments to a record to explain scheduling delays for treatment.
20	Medication incidents related to systemic therapy treatment	(T.44) Ability to support drug interaction checking, test drug to drug interactions for high sensitivity and determine if medication interactions will alert with clinical significance (T.45) Ability to support patient specific dosing and warnings. (T.16) Ability to produce a summary of care at the end of a patient consultation and manage patient-specific care summaries and treatment plans.
21	Adverse drug reactions to systemic therapy and incidence by drug	(G.20) Ability to determine indicators for ongoing quality monitoring. For example ability to flag or combine number of medication errors with the numbers of alerts ignored or bypassed produced in a viewable and printable form. (T.3) Ability to generate and maintain allergy history, intolerance and adverse reaction list including side effects. (T.16) Ability to produce a summary of care at the end of a patient consultation and manage patient-specific care summaries and treatment plans.
22	Adverse events such as falls, infection rates	(T.16) Ability to produce a summary of care at the end of a patient consultation and manage patient-specific care summaries and treatment plans. (G.35) The ability to integrate with the Hospital Information System (HIS), and/or Clinical Information System (CIS), to access hospital information (i.e., registration information, lab results) provincial assets (i.e., OLIS, DI Common Services) and other registries and databases.

23	Symptom management reporting and outcomes	(T.16) Ability to produce a summary of care at the end of a patient consultation and manage patient-specific care summaries and treatment plans. (G.51) Ability to support presentation of self-reported patient symptoms and outcomes.
24	Patient follow-up volumes of patients returning for follow up visit by disease site group (DSG) at 3/6/12 months etc. and compare with resource utilization	(D.7) Ability to track referral dates for all programs as based on multiple disease sites, patient acuity, and geographic locations. (D.27) Ability to send a scheduling notification to Patient via voicemail and/or email and/or patient portal and/or mail. (RS.1) Ability to incorporate standard follow up disease specific practice guidelines. For example: the annual scheduling of mammography post breast cancer treatment. (RS.3) Ability to generate and record patient specific instructions, educational materials and provide a discharge statement that contains treatment outcome and community resources that the patient has accessed
25	Dose reduction (on dose dense protocols), and what was the outcome of the intervention?	(T.45) Ability to support patient specific dosing and warnings. (T.66) Ability to allow screens for the entry of changes in chemotherapy treatment including reasons for modification
26	Ontario Drug Benefit Exceptional Access Program (EAP) referrals and success rate	(T.51) Ability to support the drug eligibility process. (T.52) Ability to identify patients that have been referred to a drug funding specialist.
27	Follow-up visits via OTN	(G.16) Ability to provide support for inter-provider written communications. For example ability to document in the patient record verbal/telephone communication between providers or communicate using secured real-time messaging. Would add telecommunications/telehealth as an example of type of documentation – relevant in Ontario
28	Patient referral base	(D.1) Ability to incorporate and integrate patient clinical data and documentation for referral from external sources (i.e., primary care EMRs). (D.3) Ability to identify referring physician or specialist by a unique identifier code. (D.7) Ability to track referral dates for all programs as based on multiple disease sites, patient acuity, and

		geographic locations. (D.9) Ability to capture a referral request, sort and prioritize a patient's referral prior to scheduling
29	% of survivors who access supportive care services in cancer centres	(D.7) Ability to track referral dates for all programs as based on multiple disease sites, patient acuity, and geographic locations. (RS.3) Ability to generate and record patient specific instructions, educational materials and provide a discharge statement that contains treatment outcome and community resources that the patient has accessed.
30	Compliance with oral chemotherapy	(T.50) Ability to identify patients that have been prescribed oral chemotherapy drugs. (T.16) Ability to produce a summary of care at the end of a patient consultation and manage patient-specific care summaries and treatment plans. (T.71) Ability to generate and record patient-specific instructions and patient specific educational material list. (T.69)Ability to document counseling provided to a patients.
31	Patient Education	(G.53) Ability to access patient educational information from external sources. (G.54) Ability to email/mail applicable educational materials to a patient and/or patient representative. (T.69)Ability to document counseling provided to a patients. (T.70) Ability to import and view radiation patient education documentation. (T.71) Ability to generate and record patient-specific instructions and patient specific educational material list.
32	Uninsured report or percentage of patients that are uninsured	(D.15) Ability to create additional patient demographic fields such as nationality, cultural specificity, educational status, cultural considerations, language, geographic location, insurance information, tobacco use; past, current, cessation education. (G.46) Ability to flag activity not funded. For example, prescribing an oral chemotherapy not covered by the New Drug Funding Program (NDFP).
33	Treatment breaks (toxicity related)	(G.51) Ability to support presentation of self-reported patient symptoms and outcomes. (T.33) Ability to add comments to a record to explain scheduling delays for treatment. (T.16) Ability to produce a summary of care at the end of a patient consultation and manage patient-specific care summaries and treatment plans.

34	Market share report of intra-LHIN and inter-LHIN treatment patterns.	(D.12) Ability to capture patient demographics and unique identifiers, and import and manage patient demographic. (D.19) Ability to manage scheduling information between multiple facilities regardless of MOHLTC identifier. (T.58) Ability to manage clinical documents and notes. For example the recording and documenting by all members of the multidisciplinary team.
35	Number of patients on oral chemotherapy vs. systemic	(T.54) Ability to identify patients on oral chemotherapy medications. (T.16) Ability to produce a summary of care at the end of a patient consultation and manage patient-specific care summaries and treatment plans.
36	Appropriate Diagnostic testing	(D.39) Ability to maintain and update best practice guidelines for imaging standards such as PET scanning, chest x-rays, and bone scans. (D.43) Ability to create order sets. For example labs and radiology bundled together for diagnosis.
37	Number of cobalt/LINAC treated cases per machine	(T.21) Ability to import and view real time update on radiation treatment delivery information. (T.22) Ability to import and view radiation schedule such as historical schedule, treatment, clinic visits. (T.23) Ability to import and view radiation treatment planning summary from the treatment planning systems.

Ontario
Cancer Care Ontario
Action Cancer Ontario

CHAPTER 4: Oncology aEMR EXTRACTION STANDARD

4.1 Introduction

Cancer Care Ontario (CCO) is working toward building an information management infrastructure that can support a fully integrated cancer system. Ontario's cancer service providers provide CCO with key data that enable the planning and funding of cancer services, quality improvement initiatives and health services research. Advances in information technology combined with CCO's data holdings will help health care providers and patients to make better-informed treatment decisions and navigate through the cancer system with more ease. (Cancer Care Ontario, 2012) Table 1 in the appendix outlines the existing data holdings.

One of these data holdings, Activity Level Reporting (ALR), was the focus of this project. ALR provides an integrated set of data elements from Regional Cancer Centres (RCC) that cannot be obtained from other local or jurisdictional providers. ALR data is reported for various stages in the cancer journey. This makes it a valuable information asset for management decision-making, planning, accountability, and performance management at the RCC, local level and corporate level. (Cancer Care Ontario, 2012). The process by which the data is captured at each facility differs, however, the standardized data elements constitute patient level activity within the cancer system focused on radiation and systemic therapy services and outpatient oncology clinic visits.

Collection and reporting of rich data sets require a great deal of planning at the local level, It is well understood that capture, aggregation and provision of these data elements often present challenges for the RCCs who do not have fully integrated systems within their organization. The data elements required often reside in disparate health information systems and/or within paper charts requiring specialist resources to collect and report the required data. These challenges are further compounded by multiple site ALR data compilation processes for the RCCs. Current management practices of these data Extraction, Transform, Load (ETL: three database functions that are combined into one tool to pull data out of one database and place it into another database) transfers require maintenance of multiple methodologies and systems for all stakeholder organizations involved, both submitting and receiving. The Oncology aEMRs Standards project encompassed four distinct deliverables; this section speaks to the establishment of interface

specifications to ensure alignment of the Oncology aEMRs deployments to identified current and future provincial assets[1]. With the development of the direct HL7 v3 CCO Oncology aEMRs data extraction standard, planning can now commence to identify a strategy for eventual adoption. It is essential the planning process includes comprehensive stakeholder participation and input to clearly identify cost impact and associated benefits to be gained by the stakeholders and ultimately support improved patient care delivery within the Ontario Cancer Care system.

4.2 Purpose

The process for submitting ALR data is primarily semi-manual at this time, in which hospitals compile data from various sources into differing data formats identified by Cancer Care Ontario. Many hospitals have expressed that the data collection and reporting process is labor-intensive and is prone to data compilation and cross reference errors which results in extensive corrective actions.

To address the data collection and submission challenges, the Oncology aEMRs Extraction Standard attempts to provide a singular method of data submission using an interface between Oncology aEMRs and CCO. It is anticipated to address challenges ranging from collecting and reporting data from multiple sources to submitting data to CCO in various formats. The Oncology aEMRs Extraction standard supports the transmission of ALR data derived from patient-level records within the cancer system that pertain to radiation treatment, systemic therapy (chemotherapy) services and outpatient oncology clinic visits. The standard is based on HL7 version 3 (v3).

The advantage of HL7 v3 over other messaging standards is that it is built upon a comprehensive model driven methodology and Reference Information Model (RIM). This includes storyboard descriptions, trigger events, interaction designs, and domain object models derived from the RIM. HL7 v3 was chosen as a desirable future migration path for ALR because it is strongly favoured at the federal and provincial levels. Canada Health Infoway and provincial and regional health agencies like eHealth Ontario are adopting HL7 v3 as the data standard of choice to promote healthcare interoperability.

This standard will provide future guidance to hospitals and CCO for ALR by improving data quality and reducing submission timelines and inefficiencies. Additionally, the technical solution to data submission may relieve resource burdens at the Regional Cancer Centres. The Oncology aEMRs Extract is coupled with the vision to streamline and automate the data extraction process from Oncology aEMRs

and enable real-time data submission to Cancer Care Ontario. Implementation of an HL7 v3 interface specification for Activity Level Reporting will need to be prefaced by collaborative efforts between Cancer Care Ontario, Regional Cancer Centers and EMR vendors to define a mutual mission and strategy to innovate the methods of data submission from provincial cancer service providers to Cancer Care Ontario.

4.3 Methodology

A number of methodologies and their suitability were explored to compile the Oncology aEMRs Extraction Standard. Two approaches that were specifically explored were as follows; Infoway's pan-Canadian specifications (pCS) based on HL7 v3 messages and HL7 Clinical Document Architecture (CDA). Below are descriptions of these two approaches:

Infoway's pan-Canadian Standards (pCS): Canada Health Infoway has developed a suite of HL7 v3 specifications which covers numerous healthcare domains and contains very comprehensive support for domain specific clinical and administrative workflows. One specific domain of interest to this project is the Shared Health Record (SHR) domain. The SHR messages have been developed to support the concept of a repository which contains documents and records of care related to healthcare services provided to a patient and the interactions between a healthcare provider and a patient. In addition, the SHR repository is also envisioned to be a source of truth for the patient's current healthcare status and includes allergies and intolerances history.

HL7 Clinical Document Architecture (CDA): The purpose of this section is to describe constraints on the CDA Document Body elements for a Care Record Summary document. A Care Record Summary document contains patient's relevant health history for some time period. It is intended for communication between healthcare providers. (HL7 Standards, Overview of Care Record Summary). Specifically, the Ontario Clinical Document Specification (Ontario CDS) which is based on HL7 CDA was examined. The Ontario CDS " was created to facilitate and expedite the wider electronic availability and transfer of clinical documents between and among hospitals, physicians, Community Care Access Centres and other health care organizations in Ontario. The standard aligns with other Ontario specifications such as e-Referral and discharge summary, as well as existing pan-Canadian and international document standards and specifications." (eHealth Ontario, Standards, Clinical Document Specification)

The extensive review of the above revealed that Infoway's PanCanadian Standards (pCS) Shared Health Record (SHR) specifications were deemed to be too provider-centric and purposed; the ALR data is more reporting-centric. Cancer reporting is very complex with business rules which are very specific to this sub-domain within the healthcare sector and expressing these business rules in the SHR specifications will not be feasible.

CDA is optimized for flexibility and for complex business rules where it is sometimes not feasible to develop unique messages with fully realized structures. Based on this realization, CDA was a desirable solution. Once the focus was narrowed to CDA, two options were available – 1) CDC's implementation of CDA and 2) Ontario Clinical Document Specification. The Center for Disease Control's (CDC) implementation of CDA for cancer reporting was considered. CDC uses template-based approach, anchoring their templates on the HL7 International generic CDA. Developing templates for CCO's ALR reporting would not be achievable given the project's time constraints. Therefore, Ontario CDS, based on CDA and HL7 version 3 was selected. The Ontario CDS has a highly flexible but structured approach which met Ontario's specific needs with respect to data sharing agreements among Regional Cancer Centres and Cancer Care Ontario and our standardized data capture methods. Looking at many important factors such as timeframe, ease of use, cost implications, flexibility, we chose the Ontario Clinical Document Specification, which allowed for relatively quick development for submission to the Ontario EHR Interoperability Standards (OEIS) process spearheaded by eHealth Ontario. Furthermore, its core components could be used for other CDA projects with the appropriate changes.

4.3.1 Ontario EHR Interoperability Standards (OEIS) Program (http://www.ehealthontario.on.ca/en/why-standards)

The OEIS is an iterative process and is led by eHealth Ontario; its mandate is to transform health care in the province. The standards program ensures that information is designed in a way that can be readily exchanged and understood by care providers throughout the province. They work closely with health care providers, hospitals, community-based providers, the provincial government and vendors to develop and maintain the best solutions for Ontarians. Furthermore, the eHealth Ontario Standards Program is integrated with national and international standards initiatives so that Ontarians benefit from industry innovation and best practices. The OEIS Governance Committee is comprised of eleven stakeholder groups including Cancer Care Ontario, Connecting GTA, South Western Ontario, North Eastern Ontario, Ontario Association of Community Care Access Centres, Ontario Hospital Association, OntarioMD, Ontario Telemedicine Network, Ministry of Health and Long Term Care and Canada Health Infoway. The focus of the committee is to

help prioritize, establish, guide and approve Ontario EHR Interoperability standards for ehealth solutions and services. Figure 1 below illustrates the governance composition (eHealth Ontario, 2013).

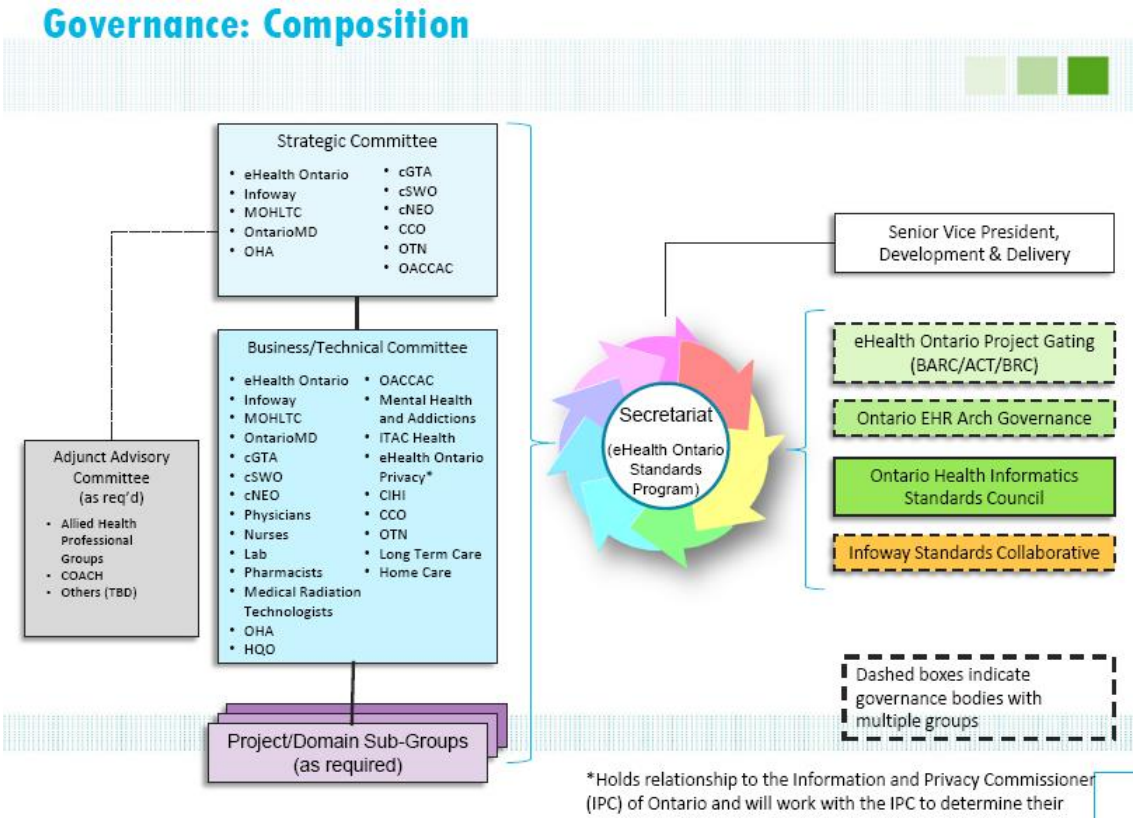

Figure 1: OEIS Governance Composition.

To establish a provincial standard that is in alignment with Ontario's EHR Blueprint, technical specification extraction standards must go through the OEIS process (Figure 2).Upon completion of the Extraction Standard, a series of meetings and reviews occurred to review and approve the specification, which included a formal review process with an open invitation to all stakeholders. This group and process oversee the development of standards pertaining to terminology, nomenclature, HL7 messages and Clinical Document Architecture (CDA). However, they are not responsible for products and services related to architecture; portal presentation and navigation; privacy and security policies; and technology standards. (eHealth Ontario). The Oncology aEMRs Extraction standard was developed based on existing reporting, business, and technical requirements from eHealth Ontario's clinical document specification and it was validated through the (OEIS) Process with numerous Ontario stakeholder groups from April through September 2013. Figure 2 below illustrates the OEIS process with key date durations within each step of the process. For more information on the OEIS Process, please visit http://www.ehealthontario.on.ca/en/why-standards

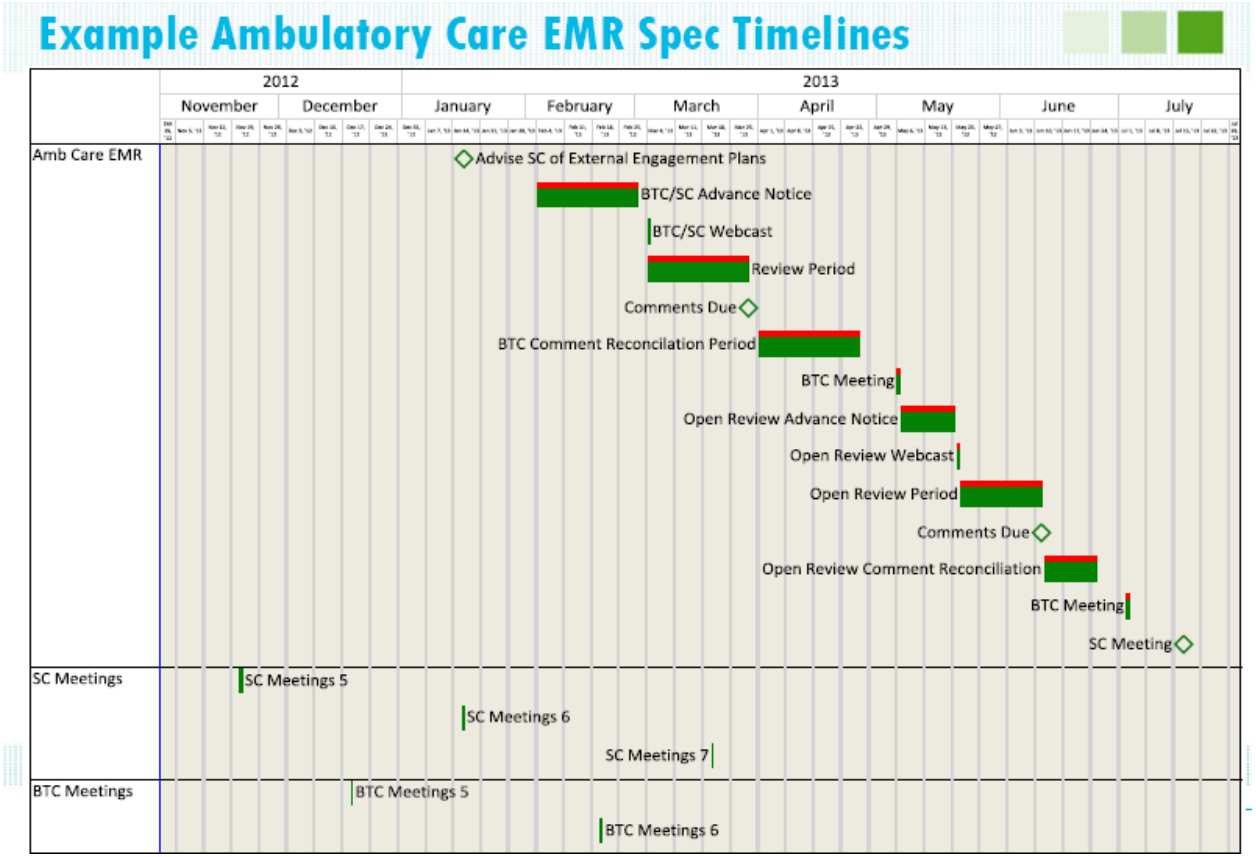

Figure 2: Example of an OEIS Process Timeline.

Tremendous research and preparatory work was completed prior to the initial engagement meeting in March 2013. Upon approval from the Business and Technical Committee (BTC) to proceed with the Open Review, eHealth Ontario, Cancer Care Ontario with a participatory audience of 65 plus organizations executed a Clinical and Technical Open Review Webinar. For a list of participants, please refer to the section Appendix.

Clinical, technical and Informatics experts presented the Oncology aEMRs Extraction standard from their respective viewpoints to provide a holistic and panoramic view of how the extraction standard could be utilized by the province. The Open Review Webinar generated some preliminary questions which were answered; however, the review period was slotted for one month to provide the necessary timeframe for an in-depth evaluation by interested stakeholders and Open Review participants.

Further to the OEIS Process, responses and rationale to the Open Review questions were presented to the Business and Technical Committee (BTC) at eHealth Ontario. On August 19th, 2013, the recommendation from the BTC to the Strategic Committee (SC) was to approve the Oncology aEMRs Extract as a standard, however, the Strategic Committee would decide upon its label.

4.4 Results

Due to the documentation complexity of the Oncology aEMRs Extract Standard, it is provided separately to preserve the format and content. To download the file, please refer to the Oncology aEMRs Extraction Standard Specifications appendix at the end of this section.

On September 19th, 2013 the Strategic Committee (SC) endorsed the Cancer Care Ontario Ambulatory Cancer EMR Extraction Standard as a standard that conducted appropriate stakeholder engagement, following the OEIS governance decision making processes, and achieved the desired outcomes of improving the overall quality of the standard and increasing awareness.

As agreed at the BTC meeting, there was further discussion as to whether or not the standard should be labeled an Ontario EHR Interoperability Standard (OEIS). The SC decided that based on current definitions it should not be labeled on OEIS. However, discussions were held to consider the expansion of the OEIS definition, which may introduce an opportunity to approve the CCO standard as an OEIS in the future via a fast track process.

Due to technological limitations, implementation of the Oncology aEMRs Extraction Standard is not feasible at this time. Planning for innovative methodologies to capture and transmit ALR data must take place across the province with the Regional Cancer Programs and Cancer Care Ontario. As such, the extraction standard will be revisited to ensure alignment with provincial and national standards and strategies upon the decision to proceed with deployment

4.5 Conclusion

CCO is committed to building and maintaining the information technology infrastructure required to support the best cancer system in the world. The Oncology aEMRs Data Extract standard is an important development towards this goal. This standard can enable automated, real-time data transmission between RCPs and CCO of key cancer-related data that is currently semi-manually submitted on a monthly basis. CCO has ensured alignment of this standard with the provincial EHR Blueprint by utilizing recognized, rigorous standards, such as HL7 v3, and following the Ontario EIS standards approval process, CCO will maintain the standard so that it reflects the ongoing data needs of the cancer system. It will also seek opportunities to pilot the standard with RCCs. These efforts will inform the evolution of CCO's future data transmission migration and information technology infrastructure strategies.

4.6 References

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4.7 Appendices

4.7.1 Table 1. Cancer Care Ontario's Data Holdings.

Activity Level Reporting (ALR) / Cancer Activity Datamart	Provides an integrated set of data elements from Regional Cancer Centres (RCC) hospitals that cannot be obtained from other providers. This information is used to support management decision-making, planning, accountability, and performance management at the RCC, regional, and corporate level.	This dataset contains: administrative data, clinical data and demographic data
Patient Information Management System (PIMS) / Pathology Datamart	Database comprised of patient and tumour information for cancer and cancer-related pathology reports (tissue, cytology), submitted from public hospital (and some commercial) laboratories. PIMS documents patient, facility, and report identifiers, and tumour identifiers, such as site, histology and behaviour. This information is used to support management decision-making, planning, disease surveillance and research, as well as contributing to resolved incidence case data in the Ontario Cancer Registry.	This dataset contains: administrative data, clinical data and demographic data
Ontario Cancer Registry (OCR)	The OCR is a computerized database of information on all Ontario residents who have been newly diagnosed with cancer ("incidence") or who have died of cancer ("mortality"). All new cases of cancer are registered, except non-melanoma skin cancer. This information is used to support management decision-making, planning, disease surveillance and research.	This dataset contains: administrative data, clinical data and demographic data

New Drug Funding Program (NDFP)	The NDFP database stores patient and treatment information about systemic therapy drug utilization at RCCs and other Ontario hospitals, for which reimbursement is being sought through the NDFP according to strict eligibility criteria.	This dataset contains: administrative data, clinical data (eligibility criteria) and demographic data
Ontario Breast Screening Program (OBSP)	The associated Integrated Client Management System database provides an integrated set of data for each client screened in the OBSP for the purposes of program administration, management and evaluation.	This dataset contains: administrative data, clinical data and demographic data
Colorectal Screening Data – Colonoscopy Interim Reporting Tool (CIRT)	The data collected through CIRT will be used to understand current colonoscopy activities conducted within participating hospitals from both volume and quality perspectives. It will also be used to validate incremental volume allocations across the province.	This dataset contains: administrative care and clinical data
Laboratory Reporting Tool (LRT)	LRT contains ColonCancerCheck program FOBT kit distribution and results data from the CCC partner labs.	
Ontario Cervical Screening Program	Cytobase is comprised of cervical cytology data ("Pap Test" results) collected from participating community laboratories. This cervical cancer screening database contains patient, physician and laboratory information. This information is used to administer and evaluate the performance of CCO's Cervical Screening Program, for cancer planning and management, and for cancer surveillance research.	This dataset contains: administrative data, clinical data and demographic data

Brachytherapy Funding Program	Stores patient and treatment information about prostate cancer patients at RCC hospitals, for which reimbursement is being sought.	This dataset contains: administrative data, clinical data, demographic data
Symptom Management Reporting Database	The Symptom Management Reporting Database data is comprised of three components: patient registration, symptom screening using the Edmonton Symptom Assessment System (ESAS) and functional assessment using the Palliative Performance Scale and/or Eastern Cooperative Oncology Group Performance Status. This information is captured by participating sites using the Interactive Symptom Assessment and Collection system and then submitted on a monthly basis to the Symptom Management Reporting Database.	This dataset contains: administrative data, clinical data and demographic data.
Interim Annotated Tumour Project (ATP) Database	The Interim ATP provides an integrated set of data, combining tumour information from the Ontario Institute for Cancer Research's Tumour Bank with CCO's Cancer Registry, for the purpose of increasing the accuracy and utility of the information for both researchers and CCO planners. For example, researchers may use this information to study the association between genetics and response to cancer drugs; in turn, CCO may use this information to create clinical guidelines for the care and treatment of cancer patients in Ontario.	This dataset contains: administrative data, clinical data and demographic data
Wait Times Information System (WTIS)	The Wait Time Information System is the first-ever information system for Ontario to collect accurate and timely wait time data. This system has been implemented in 82	This dataset contains: administrative data, clinical data and demographic data

Ontario hospitals. Work is underway to enhance this system to track wait times for all surgical procedures in Ontario. This web-based system performs several functions, which include:

- Enabling the collection of data related to wait times;
- Providing clinicians and other health professionals with the tools required to effectively assess patient urgency according to a defined wait times standard;
- Measuring and reporting wait times and data regarding utilization of procedures;
- Supplying clinicians, administrators and managers with near real-time information for use in monitoring and managing wait lists; and
- Reporting wait time information to the public on a website enabling patients to manage their own care and the public to assess progress on reducing wait times.

4.7.2 List of OEIS Open Review Webinar Participants

Cambridge Memorial, Cancer Care Ontario, Canadian Institute for Health Information, Dapasoft Inc., eHealth Ontario, Grand River Hospital, Headcan, Health Sciences North, Humber River Regional Hospital, Canada Health Infoway, Joseph Brant Memorial, LifeLabs, Mackenzie Health, Manitoba eHealth, Markham Stouffville Hospital, McKesson, M Dumontier, Sunnybrook Health Sciences, Thunder Bay Regional Hospital, The Ottawa Hospital, TracMed, University Health Network, Windsor Regional Hospital

4.7.3 Oncology aEMRs Extraction Standard Specifications

CLICK HERE to download the standard from Cancer Care Ontario's website.

Ontario
Cancer Care Ontario
Action Cancer Ontario

CHAPTER 5: CONCLUSIONS AND FUTURE DIRECTIONS

The Ontario Oncology Systems Standards project has initiated the defining of the "Meaningful Use" for ambulatory Oncology EMR systems in the Ontario environment, including meaningful use for end users to provide integrated cancer care to patients. This work forms the basis for the development of a framework and step-wise plan in the cancer system's ability to use technology such as Oncology aEMRs to facilitate the ever growing needs for the collection of data and management of cancer care through information standards to help understand the quality of care we deliver at a micro-, meso- and macro-system levels. Establishing standards for functional requirements, including interoperability, as well as an extraction (HL7 V3 interface) standard, will serve as fundamentals for understanding how to seamlessly flow cancer data including implications for Cancer Care Ontario and its data repositories. This entire scope of work will require a strong governance and coordination to ensure success and the development of these standards is a key first step.

The view of the future state for end users highlighted through the engagement process is a "single sign on access" to the vital data for the integrated patient cancer journey, with an ability for real or near real time quality metric evaluation at the local/regional level. End users look to this opportunity through newly adopted or future adoption of Oncology aEMR systems. This vision does not negate Cancer Care Ontario's current process of end user engagement in the development of provincial quality metrics with benchmarking and data flow through to CCO's ALR and like repositories. Nor does this vision negate the need for ongoing CSQI reporting. Hence, a stronger alignment of our various quality evaluation needs at health care delivery institutions and cancer system jurisdictional bodies is necessary with the utilization and optimization of existing structures. The Ontario Oncology model is strongly embedded in achieving integrated patient care, identifying the complete cancer journey, quality reporting and benchmarking and now is also implementing funding model reform looking at episodes of care including cost implications.

A current assessment of the state of Oncology aEMRs within Ontario reveals no standard model for an aEMR within the 14 regions. Each has chosen a different path although with common approaches. Given the cost and time implications these systems and the goals of data collection and quality reporting, a structured approach is necessary without interfering with end user customization to meet local workflow needs. Currently, there are single vendor systems for Hospital Information Systems (HIS) and EMRs with limited integration to specialist applications such as Radiation Therapy or ST CPOE modules. Another scenario is an Oncology aEMR vendor solution implemented with

various integration levels to the HIS and provision of specialist applications. Lastly, an "optimal HIS" is integrated with specialist treatment applications, patient portal options and with "middleware" to provide aggregated clinical information viewing.

Although three different approaches as described above exist, the end user needs for data and information remain unchanged and the need for data flow to various jurisdictional assets, including CCO, also remains unchanged. The challenge for us going forward is looking at an alignment of common needs through these various information technology systems and their interoperability specifications. Simply, functional requirements, interoperability and usability need to align to meet end user needs. Although there was clear patient advocacy through the engagement of the multidisciplinary end user team, direct patient engagement was not ascertained in the initial phase of this project and this will be a necessary and essential future goal.

To highlight the complexity of the delivery of cancer care in Ontario, it is important to note that the management of the patient's cancer journey spans across multiple clinical disciplines as well as geographical sites and locations. For example, the diagnosis and treatment phase of the journey is often undertaken outside of the RCC. Hence, it has been increasingly difficult for RCC and RCP information systems to keep up with these complexities. Most importantly, the electronic exchange of information or "interoperability" to support all aspects of integrated care will need to be a priority with an understanding of "clinical interoperability" from an end user perspective undertaken. This will require strategic alignment with eHealth Ontario's blueprint as well as interoperability standards, allowing linkage with provincial assets such as OLIS, Diagnostic Radiology, OntarioMD, Drug Information System (DIS) etc.

Given Cancer Care Ontario's middle agency role in support of cancer delivery across Ontario, a careful assessment and recognition of its role as it relates to the Oncology aEMR solution, including its capabilities versus limitations, will need to be clearly expressed. There are currently many CCO and jurisdictional applications supporting the cancer journey, including DAP-EPS, ISAAC, eClaims etc. As some established specialist applications are not easily found within an Oncology aEMR at this point, both alignment and interoperability of these applications will need to be considered as part of our process, including any future enhancements to these applications.

A roadmap for CCO data repositories and interoperability needs to be designed to seamlessly accept or send structured data from or to aEMR /health information systems or the associated middleware. The ideal model would focus on the patient-centred cancer care journey and capturing of this system at its source. The data should be in such a manner that it can be captured once and be shared and utilized by all parties to deliver integrated and coordinated patient care; the disease pathways management concordance evaluation would be a measure of vision. From this process, goals such as quality metrics and outcomes analysis should be inherent.

The future goal of the funding model and of end user engagement in this project looks towards administrative improvements based on volume and complexity of care. End users are hopeful this is attainable through aEMR systems or linked components, for example, scheduling systems. Cancer Care Ontario is currently also looking at models of care delivery with key partners, including primary care, CCAC, E-referral programs, survivorship and palliative care, through the EMR project.

As the key component of this exchange is through information technology systems, we will need to carefully look at the Oncology aEMR and its interoperability with key stakeholder IT systems. Lastly, the interaction between CCO, RCP's and RCC's has focused on clinical outcomes, funding and reporting. The interaction between RCCs and the associated regional hospitals with respect to IM/IT support needs to be reviewed for optimization and priority.

The "Ontario Oncology System Standards – Defining its Meaningful Use" report has provided a standards framework. Each section has highlighted the need for alignment between end users, the region and CCO. The information and data standards section of this report has helped shape our understanding of end user needs for the data and information that they want to use to help improve the patient cancer journey. The need for clinical interoperability has been highlighted throughout the engagement process, with a joint responsibility at the end user, CCO and provincial level. The HL7V3 Activity Level Reporting (ALR) interface concept is the first of its kind in Ontario aligning with the eHealth Ontario blueprint as well as having an optimal interface for complex structured data. The functional requirements section provides a core understanding of the complete integrated cancer patient journey. End users recognize that it is unlikely that one aEMR system will be able to provide all of these functional requirements but articulating them is the first and most important initial step – in essence, we have defined best clinical practice as a province for integrated cancer care. In this manner, this section can be used for a request for proposal (RFP) purposes, concordance evaluation to understand the "current state" and careful evaluation of special applications/modules within or outside aEMRs.

In conclusion, we are now moving towards a "Rapid Learning System" and hope to use the Oncology aEMR to help us achieve this goal. There is clear recognition that technology and clinical practice commitments with increasing IT interoperability standards such as Health Information Exchanges (HIE) at the forefront. The aEMR must integrate with upcoming systems and must exchange information between these systems to meet end user needs. The fundamentals will remain a standards approach of defining best clinical practice, identifying quality issues, and evaluating process and outcomes measures. From an IT perspective, readiness evaluation, workflow analysis, usability, adoption/implementation and change management are all required. Merging the clinical and IT fundamentals with a focus on sustainment of these systems post-implementation is essential. However, the aEMR does not function in isolation and in our Ontario cancer system

environment requires alignment with multiple local, CCO and provincial assets. It is possible that the aEMR is not able to meet all of these needs in its current state and that middleware solutions will be required, therefore, it is essential that a provincial standards-based framework and strategy with a step wise approach be developed to ensure success.