MHI Internship Report:

Investigating Canadian Business & System Requirements at Allscripts Canada

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Acknowledgment and Endorsement

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This report has been authored by myself, Mara Miljanovic, and has not received any previous academic credit at this nor any other institution.

Mara Miljanovic.

Executive Summary

Understanding the foundational principles upon which our healthcare organization is built, is perhaps one of the most crucial things when considering the implementation of healthcare technology within different clinical settings. While performing the internship work-term at Allscripts Canada, the author utilized various knowledge bases and sources in order to fully understand the key principles of healthcare information technology implementation.

Allscripts is a multinational enterprise that equips healthcare providers with electronic health record (EHR) technology, including but not limited to, solutions for patient engagement and care coordination, as well as analytics and finance management. During their term at Allscripts, the author was involved with several multidisciplinary projects. The author contributed to the following projects and initiatives:

- *2bprecise Health*: a precision medicine platform using medical ontologies to store and integrate genomic data into healthcare workflows. This project was focused primarily on developing a deep understanding of the product and aligning these features, technical specifications and goals with like-minded research institutions within Canada to build new alliances. The outcome was a future plan to partner with Canadian research institutions and explore grant funding within Canada.
- *Follow My Health (FMH)*: a personal health record (PHR) platform focusing on patient engagement and collaboration with healthcare providers. This project was heavily based on privacy, security and interoperability standards within Canada. The outcome was a complete business requirements plan, projecting towards Canada Health Infoway certification of the PHR platform.
- *Discharge Abstract Database (DAD) & National Ambulatory Care Reporting System (NACRS):* data repositories capturing information pertaining to

administrative, clinical and demographic information upon discharge and for community-based ambulatory care. This project was centered on gathering information pertaining to submission requirements for CIHI. Knowledge regarding data policies, ICD-10-CA standards and health ministry infrastructure was needed to compile relevant and usable information.

- *InterRAI-MDS 2.0:* InterRAI clinical assessment protocols are individualized assessments and care-plans for residents within long-term care facilities, used to plan and measure care outcomes in standardized and evidence-based ways. This project analyzed the business requirements needed to initiate computerization of these assessment protocols.

At the end of this internship experience, the author was successfully able to identify opportune research avenues for genomic technology, to gather and analyze business requirements pertaining to privacy and security standards within Canada, to succinctly explore CIHI standards for submission to DAD and NACRS and to analyze InterRAI-MDS 2.0 assessment protocols within clinical workflow scenarios. By drawing upon several knowledge sources such as business process modelling, international health classification and coding schemas/systems, health policy standards and legal frameworks, the author was able to gain invaluable experience within the domain of Health Informatics.

This internship report will introduce the background information pertaining to the workplace and the project concepts, and will then describe in full the internship duties as well as the learning outcomes, project contributions, recommendations and proposed solutions. Finally, as concluding remarks, this report will outline the value of this opportunity to a student's professional and educational paths.

Table of Contents

1. Introduction

1.1 Innovation in Health Information Technology

It has been widely known for some time now that the digitization of health records provides a whole new breadth of data resulting in improved patient care and across the continuum of care. However, a new shift has been observed in the HIT climate that steers this idea towards the areas of patient engagement and personalized medicine. With the onus being put on proactive healthcare management instead of retroactive disease control, involving patients directly with the care planning process and implementing new precision medicine tools, enables a heartier approach to population and personal health alike. Conversely, it is equally as important to consider the aging population as a high percentage of the general population is slowly progressing into long-term care. As such, developing interoperable, agnostic and user compatible technology is crucial in this rapidly developing time.

Considering requirements (business and system alike) is an important step of system development as it lays the foundation for what needs to be built. Requirements integrate not only what the system needs to perform, but also how the users are to interact with the system in various scenarios. As such, regardless of the discipline or branch of HIT, gathering requirements, understanding security and privacy infrastructure and policy, and analyzing how these different components interact, are what make innovation and interoperability ultimately possible within the developing world of Health Informatics.

1.2 Multidisciplinary Approach to Health Informatics

The field of Health Informatics remains a rather new and emerging discipline within the healthcare sector. It is therefore important to understand that the flow and use of information within the health information technology systems being built and integrated, which in turn is

a multidisciplinary effort that requires and combines knowledge from many different sources. During their work-term at Allscripts, the author got to witness the intricacies and many complex sides to this multidisciplinary approach. It is however this very approach that enables the ease and flow of information through various forms of technology being constructed in the industry today. Working on a multitude of projects, all of varying disciplines and content, allowed the author to not only apply their working knowledge within the field, but also observe the intricacies and "behind-the-scenes" work that is performed each day within the field of Health Informatics.

2. Overview of the Organization

2.1 Allscripts

Allscripts Healthcare Solutions Inc., is a true healthcare IT innovator whose focus is on building an interconnected healthcare system through the integration and implementation of open and connected healthcare platforms. Founded in 1986, Allscripts open access solutions offer interoperable and connected healthcare IT systems. Allscripts healthcare solutions are targeted towards all sectors of the healthcare industry, including but not limited to, physicians, hospitals, governments, health systems, health plans, life sciences companies, retail clinics, retail pharmacies, pharmacy benefit managers, insurance companies, employer wellness clinics, and post-acute organizations, such as home health and hospice agencies. Their main prerogative is the improvement of healthcare outcomes through patient engagement platforms, population medicine, practice management, computerized physician order entry (CPOE) systems, precision medicine tools, clinical decision support tools and more. Allscripts solutions enable improved delivery of care across the spectrum through tools that utilize powerful analytics, hosting, outsourcing, and connectivity mechanisms. Their solutions empower patients and providers alike, by equipping them with the necessary and relevant data at the point of care.

The Allscripts mission is to enable smarter care, delivered with greater precision, for healthier patients, populations and communities. Allscripts continuously strives to bridge the current gaps in healthcare technology by seeking new ways to manage risk, improve quality, and reduce costs. The comprehensive and innovative strategies implemented and designed by the Allscripts team truly paves the path for the improvement of healthcare delivery in Canada, and across the world [1].

2.2 Allscripts Canada Team

The Canadian Allscripts team, led by Managing Director of Canada, Jennifer MacGregor, is the Canadian division of Allscripts that coordinates with clients across the country to meet the needs of Canadian healthcare institutions. The team is multidisciplinary in nature, consisting of members from various fields, such as senior managers of sales, outcomes executives, project managers, service managers, managers of hosting solutions and more. This interdisciplinary approach to the team, allowed the author to gain a much better understanding of how healthcare technology solutions are implemented and incorporated within various healthcare facilities across the country.

The author reported to Senior Product Manager, Jaimes Blunt, for all assigned projects during the internship period. In coordination with the Senior Product Manager and the Managing Director Jennifer MacGregor, the author was able to develop invaluable skills pertaining to healthcare IT requirements and project management methods as well as an in depth understanding of the development and launching of the products developed at Allscripts. With their outstanding guidance and feedback, the author was able to gain a better understanding overall of the role of Health Informatics within the Canadian healthcare IT market.

2.3 Partnership with Dalhousie University

In coordination with Dalhousie's Masters of Health Informatics (MHI) program, in 2015 Allscripts launched an innovative partnership with the university to enable MHI students to gain an in depth and knowledgeable understanding of the development and implementation of healthcare IT solutions within Canada. The MHI program, being a joint venture between the Faculty of Computer Science and the Faculty of Medicine, aligned its interests with those of Allscripts, forming a multidisciplinary and engaging opportunity for students within the field of Health Informatics to apply their expertise and skills to this exciting and rapidly growing field [2].

In addition to the internship opportunity, Dalhousie and Allscripts have also partnered on numerous occasions to extend experiential learning opportunities to computer science students at the university. Allscripts has shared some of the knowledge behind the Sunrise innovation technology with students at the university to harbor experience-based learning, ultimately bridging the gap between academia and real-world application. This invaluable partnership has provided students with industry experience and learning opportunities that demonstrate and build upon the innovative ideas of interoperability, analytics, population health and precision medicine, to name only a few [2].

3. Description of the Work at Allscripts

This multidisciplinary work opportunity allowed the author to gain valuable input and exposure to different types of projects within the field of Health Informatics. Pulling knowledge from various different sources enabled the author to integrate their working knowledge and perform duties that further expanded that knowledge base. During their time at Allscripts the

author worked on four projects of varying length and nature. The following is a short description of the work performed for each project.

3.1 2bprecise Health

Precision medicine has been an explosive presence recently in the Health Informatics world. These innovative and budding technologies introduce the concept of personalized treatments and health management regiments, available at the point of care [3]. 2bprecise, is a precision medicine tool that integrates predictive analytics within a normal clinical workflow. Utilizing knowledge sources in the form of medical ontologies and captured genomic data, this platform distills information down to what is critical for each individual patient [4].

As an introduction to Allscripts, the author worked on familiarizing themselves with this precision medicine tool and extending this knowledge further by researching opportunities for this product within Canada. Preliminary research showed the important and future projection of precision medicine within Canadian health technology systems. Further, the author also explored avenues of grant funding for this platform. Combining their technical and conceptual knowledge of the product as well as the domain of the platform, the author was able to create a comprehensive report outlining the funding opportunities within Canada. Additionally, the author also concluded this project with a recommendation outlining what the future goals may be based on previous grants in the same field.

> **Final Outcome:** detailed document outlining grant opportunities for 2bprecise within Canada.

3.2 Follow My Health

As with precision medicine, personal health record platforms have recently become an integral component of healthcare delivery. Patient portals are essentially online health records initiated, maintained and considered the property of the patient themselves. These records are tethered to the patient's provider, therefore integrating information from both EHRs and from the patient themselves. Patient platforms are an excellent resource for the patient as it engages them to be more involved with their health. These portals allow healthcare providers to establish a more holistic view of the patient's health as well as providing them with more accessible contact with the patient. The patient, in turn benefits also by having access to provider-endorsed websites that equip them with accurate knowledge surrounding the information within their record [5]. This bridge between provider and patient, empowers patients to gather evidence-based information in addition to contributing directly to the data being collected.

Follow My Health is a patient platform developed and launched by Allscripts that is integrated agnostically into provider EMR's. The FMH platform is structured such that the data and architecture arise from two sources: application side (FMH) and server side (Microsoft Azure). The application is a cloud-based platform that captures and stores information on the cloud, therefore making it a Software as a Service (SaaS) product. Sources of data capturing and storage are critical concepts to consider for many reasons. These sources, policies, architectures, specifications and designs are the main sources from which information was gathered in regards to this project.

As with most data that is managed electronically, there are many important themes to consider in regards to protecting and securing this sensitive and personal health information. The FMH project was centered around the gathering of evidence to fulfill privacy and

security requirements set forth by Canada Health Infoway in order to obtain certification. As mentioned, the author pulled information from various sources in order to comprehensively fulfill the list of requirements for certification. Firstly, the requirements were categorized by nature, in terms of whether the requirement was based on privacy or security measures. Next, an extensive review was done to determine whether the documentation for the requirement would be obtained from FMH or from Microsoft Azure.

The author then amassed various documents that contained the necessary information to fulfill the requirements. Access to both Microsoft Azure security and privacy measures as well as FMH (Allscripts) privacy and security policies allowed the author to comprehensively match the requirements needed. Within these documents, knowledge and evidence was pulled from various areas, including but not limited to, Canadian health privacy policy standards, data quality and validity, information security and management, risk management protocol, privacy impact assessments, threat risk assessments, vulnerability assessment and penetration testing protocols, business continuity planning, network protection, auditing, encryption and more. The full list of requirements along with their categorizations can be seen in Appendix A.

The author gained valuable exposure to privacy and security content by ultimately working directly with the structured and standardized requirements for the protection and security of sensitive health information. Working with the regulatory framework set forth by Canada Health Infoway provided the author with practical experience in the privacy and security sector of the Health Informatics field.

Final Outcome: Completed list (with proof provided; either document or screenshot format) of gathered requirements for security and privacy certification.

3.3 DAD & NACRS

The Discharge Abstract Databased (DAD) and the National Ambulatory Care Reporting System (NACRS) are two of the three emergency and ambulatory care databases maintained by CIHI that aggregate data in order to deliver unbiased, relevant and reliable information to support and inform decision making within healthcare institutions nationwide. DAD specifically, captures administrative, clinical and demographic information on hospital discharges (including deaths, sign-outs and transfers) [6]. This data is collected directly from acute care facilities or from regional health authorities. The data reported within these databases is structured based on ICD-10-CA standards [7]. Conversely, NACRS is data collected for all hospital-based ambulatory care (including day surgery, outpatient and community-based clinics and emergency departments). The data is also reported based on ICD-10-CA standards [8]. The goal of this project was to get familiarized with the multiyear documents that overview information pertaining to DAD and NACRS, in addition to gathering information pertaining to data submission requirements for Allscripts products. The author spent some time going over the submission guidelines as well as understanding both the role and implication of the data gathered from these databases into population health. The key pillars of these databases were explored, for instance ICD-10 coding standards, statistical analysis and data aggregation roles as well as the national data sorting framework that accumulates the data for DAD and NACRS. In sum, the flow of information was assessed and understood to gain a better understanding of the submission requirements to CIHI.

> **Final Outcome:** detailed document outlining the flow of information through the primary care facilities and regional institutions. As well as a list of submission guideline documents for data submission to DAD and NACRS for CIHI.

3.4 InterRAI-MDS

InterRAI is a collaborative collection of researchers from over 30 countries worldwide that encapsulate evidence-based clinical practice and policy decision -making through the collection and interpretation of data collected in regards to characteristics and outcomes of individuals in a variety of healthcare settings. RAI-MDS 2.0 is an assortment of assessment instruments designed for implementation and use within continuing care (i.e. long-term and home care). Within Canada CIHI oversees and holds the rights to RAI-MDS 2.0 implementation and data collection. As such, all implementation, integration and data collection performed via RAI-MDS 2.0 within Canada must abide by CIHI rules and regulations [9].

RAI-MDS is a standardized assessment protocol for assessing a resident's needs and functional status based on definitions and data elements outlined by the RAI-MDS 2.0 user manual and CIHI data submission guidelines [9]. There are several foundational concepts interwoven through the care guidelines of RAI-MDS, they are as follows: assessing the resident's strengths, functional limitations, health problems and possible causes for each problem area; establishing guidance for further assessment and resolution of problems (via Clinical Assessment Protocols); using an interdisciplinary approach to resident care (for assessment and for treatment protocols) and finally following coding guidelines to preserve data integrity for efficient care planning [9]. Below in Figure 1 is an image illustrating the pathway through which information flows and ultimately how the RAI-MDS process works, from information generation (assessment phase) to knowledge transferring and usage (care plan implementation and evaluation).

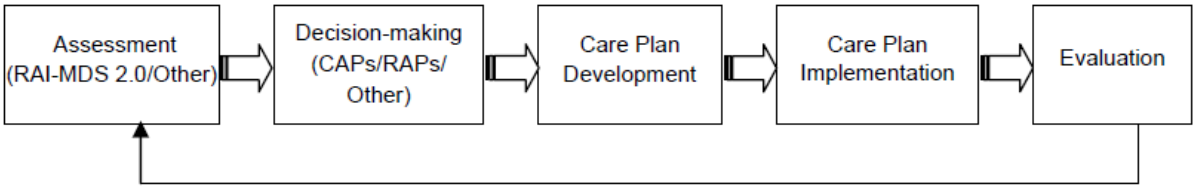

Figure 1: High level information flow and pathway of RAI MDS 2.0 assessments and care plans [9].

The RAI-MDS project at Allscripts consisted of several project goals and elements. Firstly, the author was tasked with mapping the workflows of the various assessments in terms of types and timings. Within InterRAI-MDS there are four overall types of assessments; Full Assessments, Quarterly Assessments, Admission Form and Discharge Form. Based on these fours assessments types (and variations within the assessment types), the author was able to map different scenarios and timings with respect to each assessment. The author created different workflows to illustrate the various functions within the system (for example, when an assessment is to be opened, closed, and locked), to illustrate different scenarios that may occur and to ultimately reveal different high level requirements for the system. Finally, workflow mapping allowed for any possible kinks that may occur with respect to timings (for example, if a resident is discharged and the assessment is incomplete and left open within the system) to be worked out and fine-tuned. These workflow scenarios generated an excellent overview of what system functions need to be present with respect to the CIHI submission standards for RAI-MDS 2.0.

Next, the author worked on the elements within the assessments themselves. This portion of the project entailed a detailed analysis of the different coding elements for the components within the assessments. The author used the user manual as well as the data submission manual to map the type, priority and validation of all of the elements contained within the assessments. This generated a systematic overview of the content within the assessments, as

well as a mapping of the conditional logic within the assessments. For example, responses to certain questions dictated that certain portions of the assessments may be skipped, this is referred to as "skip patterns". The mapping of these skip patterns allows for the automated omission of certain portions of the assessments based on the answer provided to certain trigger questions. Omitting portions that are not necessary to that particular workflow enables more efficient usage of the system as well as more efficient usage of time in general. Overall, the analysis of the elements within the Inter-RAI MDS assessments created a clear understanding of next steps for computerizing the assessments themselves.

Final Outcomes: Detailed workflow scenarios for types and timings of assessments, content analysis of the elements within the assessments (including data elements, coding instructions, validation, priority and general descriptions), sequence flow diagrams mapping the skip patterns and general sequences of the assessment categories. Excerpts from the documents drafted can be seen in Appendices B, C and D.

4. Relevance to Health Informatics

4.1 Coursework at Dalhousie

As previously stated, the internship position at Allscripts was in its essence a truly multidisciplinary role for the author. Knowledge was drawn from several academic courses taken at Dalhousie University during the author's MHI studies. The following will be a brief overview relating course content to project work at Allscripts.

Firstly, the author had to perform multiple research roles within the projects to analyze policy content, grant information, technical architecture diagrams as well as user manuals for various products. Drawing knowledge from multiple courses such as HINF 6101 (Flow &

Use), HINF 6110 (Systems & Issues), and HINF 6230 (Knowledge Management), the author was able to harness and provide critical thinking and analysis skills to each project. From a variety of different angles, the author was able to evaluate the literature presented as well as certain system designs and policies, and data submission guidelines, in order to synthesize information pertinent to the project. For example, the author was able to draw upon ontology knowledge from HINF 6230 in order to better understand the foundational platform of 2bprecise, a genomic analytical tool based on medical ontologies. Further, the author was also able to draw system development and modelling knowledge from HINF 6110, HINF 6101 and HINF 6102 (Flow & Standards) in order to understand certain architecture diagrams for the FMH patient platform.

Applying this knowledge and taking it a step further, the author was able to utilize workflow modelling and analysis skills when working with the InterRAI MDS assessments, effectively gathering business requirements and mapping certain administrative and clinical scenarios. When synthesizing the data element information from the assessment content, database design knowledge from HINF 6020 (Networks & Web) was utilized to understand the categorization and classification of the various elements within the assessments. In addition, UML database design and modelling knowledge from HINF 6102 was utilized to understand the next steps for these assessment workflow scenarios and data elements. Understanding the role of these requirements within the development process and the system development lifecycle overall, helped the author gain a better grasp of their role within the project, and within the field of HI overall.

The author was also lucky enough to participate in weekly team meetings that incorporated Project Management (HINF 6300) concepts into the multidisciplinary mix. The author was able to listen in on product launch plans, reviews as well as important milestones with respect to Request for Proposal (RFP) development. Exposure to this environment in

combination with the course content from the MHI program, enabled the author to obtain a well-rounded view of the skills and expertise within this field.

4.2 Industry Knowledge Base

The work done during the internship period at Allscripts was heavily immersed within the field of Health Informatics from several different perspectives. Firstly, exposure to cutting edge innovation such as the precision medicine tool 2bprecise and the FMH patient platform, allowed for an introduction into the world of technology that is developing solutions that are not only available at the point of care, but that are also paving the way for new medical practices. Additionally, working on projects involved in privacy and security allowed for a better understanding of the policy infrastructure that forms the backdrop of developing and implementing healthcare technology into practice. It is important to understand these frameworks and regulations as they set the regulatory standards by which all products must abide. Further, being able to design workflows from user perspectives and to gather requirements to accompany these workflows was an exceptional introduction into the business analyst world that essentially forms the first step of the SDLC framework. In sum, all of the various skills and tools used during this internship period allowed the author to lay down a solid foundation for their industry knowledge base within the health information technology sector.

5. Critical Analysis of Health Informatics Issues

In terms of analysis and problem solving, there are a multitude of problems to choose from within the HI domain. Having worked on documents that focused on user requirements and modelling workflows of a system process from a user perspective (in addition to a

system perspective), the author decided to tailor the critical analysis of an HI problem around usability concerns within healthcare technology.

To fully grasp the usability of HI technology and workflow organization within healthcare institutions, the author decided to perform some community outreach in order to gain better perspective. Focusing their attention on the InterRAI MDS 2.0 assessments, the author interviewed a music therapist that works with residents within a long-term care facility. The therapist was able to offer a whole breadth of information related to usability concerns at the point of care. Many of the problems and issues presented, were problems that are generally centered around InterRAI MDS but that may also be applied to various other HI applications. One of the major concerns highlighted within the InterRAI assessments was semantics and meaning behind the data elements and coding schemas within the assessments. For instance, ambiguous terminology within certain clinical assessment elements may lead to confusion and often misrepresentation of a resident's status. There is a major usability concern implicated here as well, providers do not have the time or the resources to flip through the lengthy user manuals in order to decipher the meaning of a certain element or coding range of elements. A potential innovative direction to follow with this would be to provide automated information that can be accessed within the assessments. For instance, clickable links, modules or user guide points within the product to offer information pertaining to the assessment contents (meaning and coding schemas).

Additionally, another concern that is directly related to the workflow aspect of the assessments is the interdisciplinary nature of the care team. As demonstrated in the assessments, there are many different types of providers that must contribute information about the resident in order to form a complete assessment of the resident. Timings for the assessments are often set by CIHI standards so it is difficult to adjust these according to facility use, however transfer of assessments between departments can be made more

interoperable. For instance, if there is a 14-day time frame for a certain element within the assessment and it requires input from multiple disciplines or departments, then perhaps a tracking feature can be implemented to ensure that all aspects necessary to the assessment element are completed by all departments/providers.

Finally, another issue arising from the care planning section of InterRAI MDS, also incorporates ideas of interdisciplinary collaboration. The decision-making process (based on algorithms that conclude care plans pulled from information generated from the assessments), could potentially include multiple avenues of care structuring. For example, in addition to the care plans provided by the Clinical Assessment Protocols (CAPs), the system could include an area that allows providers to add additional remarks or care plan suggestions based on their observations of the resident. Within the system, this could be designed as a structured note or a "suggestions" tab, offering an additional subjective layer to the computer-generated care plans.

Incorporating the knowledge gathered from working with the InterRAI MDS assessments and user manuals with domain knowledge from a provider that works with these tools at the point of care, allowed for a more holistic view of how systems and users interact. Many of these issues arise from usability concerns and as such incorporating these suggestions as a system is being built, allows for improved use and quality of the system overall. It is quite interesting to analyze these concerns from both a system and user perspective as it juxtaposes areas of development with healthcare provider usage. Overall, consulting with a real provider in the field created a tremendous learning opportunity in comparing the data structuring, user guides and workflow scenarios with real world application.

6. Concluding Remarks

This report aimed to summarize the key projects, learnings and outcomes during the author's internship period at Allscripts. This experience offered valuable exposure to many of the concepts taught in the MHI program at Dalhousie. As such, coupled with educational resources and practical experience, the author was able to amass a substantial amount of knowledgeable experience tailored to HI professions. Working on topics related to: precision medicine, patient portals, privacy and security policies, business and system requirements, database design and modelling as well as conditional logic and workflow analysis, the author was able to gain insight into what the field of Health Informatics is all about. Although a newly budding field still within the Canadian healthcare sector, HI is slowly but steadily making great strides at improving the quality of care through the technology developed at organizations such as Allscripts.

Many thanks again to all parties involved, there are too many to list off individually, however without the valuable contributions of managers, professors, colleagues and classmates, this opportunity would not have been possible, so thank you to all for your insight and help during this internship work term.

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Appendix A

The following is a complete summary of the requirements identified and completed for the Canada Health Infoway privacy and security certification of the FMH patient portal.

Summary of Requirements for FMH Certification

1. Documents

The table below is a summary of privacy and security requirements that FollowMyHealth (FMH) must provide to fully protect the privacy of patients and maintain confidentiality, integrity and availability of data as required by the Canada Health Infoway's Self-Assessment document.

ID	Requirements	Details
1.	Privacy Policy Document	The purpose of this requirement is to ensure that applicants who may meet PHI as part of the delivery of services can support their client privacy obligations.
2.	Privacy Policy Document (Communication Plan)	The purpose of this privacy policy requirement is to ensure that applicants who may meet PHI as part of the delivery of services can support their client privacy obligations.
3.	Privacy Policy Document (Personnel Training on Communication)	Applicant personnel that provide support or interact directly with clients are trained at least annually in how to communicate the applicant's privacy policy, as well as the process for escalating client privacy inquiries, complaints, and challenges in a confidential manner.
4.	Privacy Officer Name	The applicant has designated an individual accountable for ensuring ongoing compliance with legislated privacy requirements and the applicant's privacy policy.
5.	Privacy Breach Handling Procedure/Manual	The applicant has a documented procedure for handling suspected privacy breaches, which includes steps to inform affected individuals and other relevant parties.
6.	Information Security Policy Document	The purpose of this policy requirement is to ensure that applicant staff who may meet PHI as part of the delivery of services can support their client security obligations.
7.	Information Security Policy Document (Plan Review Evidence)	The applicant reviews their Information Security Policy and Information Security Plan on an annual basis, or more frequently, as well as upon the occurrence of a serious security incident.
8.	Compliance Audit Report	The applicant has performed an audit of its own compliance with the Information Security Policy within the 18 month prior to the certification application date.
9.	Information Security Plan (How objectives will be met on Information Security Policy)	The applicant has a documented Information Security Plan which details how the objectives of the Information Security Policy will be met.
10.	Information Security Plan (Management Process)	The applicant has in place processes for continuous management of Information Security, including monitoring Information Security status and evaluating and responding to emerging issues.
11.	Security Incident Management Process	The applicant has in place a documented procedure for managing security incidents.
12.	Information Security Plan (Procedure to contact external authorities)	The applicant has in place procedures for contacting authorities or involved external parties, in the event of a privacy breach, or security incident in which criminal activity is suspected, or which may require action by an external party.

13.	Terms of Use Document	Sample or Template client contract, and/or Terms of Use agreement to be agreed by patients.
14.	Privacy Impact Assessment	A Privacy Impact Assessment (PIA) or equivalent privacy assessment has been performed for the product and/or service, using an industry-standard method, within 12 months prior to the certification application date.
15.	Review of Information Security Policies	The applicant's approach to managing information security and its implementation (i.e. control objectives, controls, policies, processes and procedures for information security) have been reviewed independently by a third party in the 24 months prior to the certification application date.
16.	Information Security Policy (Conformance Procedure)	The applicant has a documented procedure for internally reviewing its Information Systems for conformance to the requirements of the Information Security Policy.
17.	Threat Risk Assessment (Review/Approval)	A Threat and Risk Assessment (TRA) or equivalent Security assessment has been performed for the product and/or service, using an industry-standard method, within 12 months prior to the certification application date.
18.	Risk Management Process/Procedure	The applicant has in place a documented process for the ongoing management of the privacy and security risks associated with the product and/or service
19.	Information Processing facilities document	Services supporting Information Processing facilities (e.g. power, cooling, network) are protected against interruption. Power and telecommunication cables, specifically, are protected against accidental or malicious damage or disconnection.
20.	Asset Inventory Overview	The applicant maintains an inventory of all assets used in the provision of the service.
21.	Information Classification Policy Overview	The applicant has in place information classification policy to classify the information assets based on the confidentiality, availability, integrity requirements of the assets, and establish security control requirements appropriate to each classification of the assets.
22.	Vulnerability Assessment/Penetration Testing/Report	The applicant performs regular vulnerability assessment or penetration testing to identify and mitigate security vulnerabilities.
23.	Privacy Information Notice + Communication Procedures	The applicant provides privacy information notice to inform the individuals.
24.	Health Information Collection Policy	The product and/or service only collects limited personal health information necessary for the purposes identified.
25.	Data Retention Policy	The applicant has in place a data retention policy specifying how long the data stored in the product will be retained before being disposed.
26.	Data Retention/Disposal Process	The applicant's operational procedures include provisions to meet data retention limits and rules, including mechanisms for removal of personal health information when its retention period has expired, or on request.
27.	Data Use and Disclosure Process	Personal health information in the product and/or service shall only be used or disclosed for the purpose for which it was collected.
28.	Access Control Procedure	The applicant has in place a documented process to respond to an individual's request to access their records.
29.	PHI Correction Procedure	The applicant has in place a documented process to respond to an individual's request to correct their records.
30.	Privacy Complain/Inquiry Procedure	The applicant has in place a documented process for the management of an individual's privacy complaint and/or inquiry.
31.	Terms of Use Document	The applicant does not use Personal Health Information for Marketing or Advertising without the express consent of the patient.

32.	User Registration Process	Users (including Administrative users) are registered through a formal process which establishes the user's identity and the appropriateness of the access which they are to be granted to personal health information. User IDs are only used by one user, and are not reused.
33.	User Authentication System Process	The product and/or service has mechanisms in place to ensure that: user IDs are unique and cannot be re-used; user IDs can be decommissioned, or have permissions removed, and that decommissioned user IDs cannot be re-used.
34.	User Credential Management Documentation	Users (including Administrative users) hold credentials (e.g. Passwords) which allow them to prove their identity to the product and/or service. These credentials are unique, stored securely and held only by their designated user. Passwords are never transmitted in the clear.
35.	User Credential Control Process	User credentials are controlled through a formal process which includes verification of the identity of the user. The credential is held only by the user.
36.	Inactive Account Management Mechanism	The product and/or service contains mechanisms by which the access of users who have not used the product and/or service for a defined period may be identified, and if necessary revoked.
37.	Empty	
38.	User Access Privileges (Review)	The product and/or service controls access to system features by permissions which are determined by the users' roles. The product and/or service allows an administrator to create, update and report upon the permissions associated with user roles and the roles assigned to users.
39.	Security Features (Protecting access to Network and Operating System	Administrative access to Network or Operating System infrastructure is restricted to authorized personnel.
40.	Password Policy (Configuration Mechanism)	The product and/or service contains mechanisms to ensure passwords chosen by users conform to configurable password quality policies.
41.	Printed Copy PHI (Completeness/e.g. Pg. no)	The product and/or service produces a visual indication in all printed reports that multi-page hardcopy is complete.
42.	Data Validation Description (Input data)	The product and/or service includes mechanisms to validate the accuracy of received data to safeguard against data quality errors by validating all data input to ensure that it is appropriate within given prescribed rules.
43.	Availability Engineering Description	The product and/or service's availability levels are documented and supported by an infrastructure design.
44.	Business Continuity Plan	The applicant has in place a documented Business Continuity Plan (BCP) for recovery of the services in the event of disaster.
45.	Maintenance Plan (Equipment)	Equipment used for provision of the product and/or service is subject to regular maintenance.
46.	Backup and Recovery (Procedure Manual)	The applicant backs up all software and data relating to the service, encrypts backups, stores backups securely, and regularly (at least annually) rehearses restoration from backup. Restoration activities are logged.
47.	Backup and Recovery Mechanism (Procedure Manual)	The product and/or service provides the ability to back up all software and data relating to the product and/or service, including encryption of backups and logging of restoration activities.
48.	Printed Copy PHI (Confidential Label)	The product and/or service produces a confidential label in all printed reports containing PHI.

49.	Storage of PHI Policy (End User Device encryption)	The product and/or service encrypts all personal health information that is stored on end user devices, or the product and/or service ensures that no personal health information is stored on end user devices.
50.	Storage of PHI Policy (End User Device data flow)	The applicant has policies that limit the storage of PHI on movable media and personal devices, and where necessary ensure that personal health information on movable media such as laptops and removable hard drives are always encrypted, and that movable devices are always physically protected while in transit.
51.	Management of Unencrypted PHI (inventory of media)	The applicant maintains an inventory of media containing unencrypted personal health information.
52.	Protection of External Electronic Message Description	Personal Health Information transmitted outside the product and/or service using electronic messaging is protected against unauthorized access or modification.
53.	Network Security (Protection of Access on Public Networks) Description	The product and/or service contains mechanisms to protect the confidentiality and integrity of information accessed over public networks.
54.	Network Security (Secure interchange) Description	Network Interfaces between the product and/or service's network infrastructure and third parties (particularly EHR systems) which carry personal health information use strong encryption and mutual authentication.
55.	Network Security (Protection of data at rest) Description	The product and/or service has appropriate security controls to protect the data at rest from unauthorized access.
56.	System Administration Manuals (screenshot or description)	The product and/or service logs all User and system actions and can display the details of who entered, accessed or modified what data, in what role, at what time, and from what device.
57.	Audit Logs Monitoring Process	The applicant has in place a mechanism to log administrative activities, such as configuration changes, or other changes originating from a client request or routine administrative activity.
58.	Disclosure of PHI Process/Procedure	The applicant has procedures covering disclosure to third parties, which require that all such disclosures are recorded, including: the party disclosed to; the content of the disclosure; the date and time of the disclosure.
59.	Audit Logs Protection Description	Audit logs are tamper-resistant, and protected against unauthorized access, or loss of integrity or availability, to the same extent as the personal health information which they refer to.
60.	Vulnerability Management Process	The applicant has in place a process for the management of vulnerabilities.
61.	Patch Management Process Documentation	The applicant has in place a documented process for the management of the security patches.
62.	Third Party Agreement Templates	Where a third party is involved in provision of the product and/or service, the third party is governed by a legal agreement.
63.	Third Party supply relationships	The applicant has a documented procedure for managing third-party suppliers.
64.	Confidentiality Agreement Policy Document (who have access to PHI)	The applicant requires all personnel who have access to Personal Health Information to sign a confidentiality agreement.
65.	User Agreement Template	The product and/or service requires users to read and agree to a statement explaining the purposes for which information is being collected, and limitations that will be placed on use and disclosure.

66.	Employment Competency Evidence (Privacy/Security)	Job Descriptions for the applicant's personnel who have access to Personal Health Information identify specific responsibilities and required competencies with respect to information security and privacy.
67.	Employment Terms and Conditions	Contractual agreements with the applicant's personnel state the parties' obligations with respect to Information Security and Privacy, both during employment and after termination.
68.	Employment Privacy and Security Training Policy and Materials Overview	Training material for the applicant's personnel includes material relating to Privacy and Security requirements, and Organizational Privacy and Security Policies and Procedures.
69.	Employment Disciplinary Outline	The applicant has a formal disciplinary process dealing with personnel breaches of information security.
70.	Employment Change of Role/Termination Outline	The applicant has in place documented procedures for handling changes in the role of its personnel including termination.
71.	Physical Security Overview (Information Processing Facility)	Information Processing facilities are housed in secure areas equipped with entry controls and other Physical Security Measures designed to protect against unauthorized access, natural disaster or accident.
72.	Physical Security (Applicants Premises)	Secure areas of the applicant's premises are protected by Physical Security Measures to prevent unauthorized access.
73.	Security (Offsite Equipment)	Equipment which might leave the applicant's premises is protected by security provisions to prevent unauthorized access to personal health information.
74.	Reuse/Disposal of equipment Procedure Manual	The applicant has procedures in place to cover secure disposal or reuse of equipment, media or storage space containing personal health information.
75.	Information Security Policy Overview	The applicant's Information Security Policy (or equivalent document) requires that equipment, data or software may not be removed from the applicant's premises without authorization.
76.	Overview of Hosting Services	Overview of hosting arrangements, identifying equipment (servers, virtual or physical storage, virtual or physical network segments) hosting the product and/or service.
77.	Overview of Capacity Management	Operational procedures include monitoring of levels of usage of IT infrastructure, and planning future required capacity. Operations Documentation.
78.	Overview of Anti-malware	The product and/or service is protected against malicious software, using technical and administrative measures. Overview of anti-malware provisions (both technical and administrative).
79.	Overview of Network Protection	Networks (including virtual private networks) connecting Information Processing Facilities include protection against unauthorized access. Overview of network architecture showing network features intended to prevent unauthorized access.
80.	Description of Time Synchronization features.	The product and/or service is synchronized with an authoritative source for the current time, so that any record of the time of an event is accurate.
81.	Description of protecting Cryptographic Keys	The applicant manages Cryptographic Keys in such a way that they are protected from unauthorized disclosure. Description of Security Features protecting Cryptographic Keys.
82.	Protection for Development and Test (source code, test data etc.)	The applicant protects source code, test data, development and test system environments against unauthorized access, loss of availability or integrity. Architecture Diagrams, Policy Documents and Description of security

		provisions protecting source code, test data, development and test system environments.
83.	Documents/Records Management Process/Procedure Manuals	The applicant has in place procedures for management of all documents or records required for its operations.
84.	Operations Document (Overview)	The applicant has documentation covering operational procedures for the product and/or service. The operating procedures specify the instructions for the detailed execution of jobs, such as performing backups, system restart and recovery procedures, and error handling.
85.	Information Systems Development Policies	The applicant has documented policies for Information Systems Development/Acquisition and Change.
86.	Information Systems Change Management Procedure/Manual	The applicant's procedures for changes to Operating Procedures, Information Systems or IT platform components, and onboarding of new partner applications, include explicit authorization from management accountable for Information Security, and testing to ensure there is no adverse effect on operations or security.

Table 1: A summary of privacy and security requirements stipulated by Canada Health Infoway's Self-Assessment document.

ID	Requirements	Details
1.	Patient Access Mechanism	The product and/or service contains mechanisms to produce a copy of the individual's records in a format usable by the individual (i.e. human readable).
2.	Corrections Mechanism	The product and/or service contains mechanisms that can be used to record the following four elements: patient's request to correct a portion of their health record; action taken in response to the request for correction (e.g., changes that were made, if any, or the reason that changes were not made); date/time of request; date/time of action taken in response to the request.
3.	Recording & Displaying Agreement	The product contains mechanisms to record a disagreement with the individual regarding information in their records. The product can display the disagreement to users who view the individual's records.
4.	Recording Consent	The product and/or service includes mechanisms to record a patient's disclosure directives including the withholding, withdrawal or revocation of consent to access information. Where consent is given by a substitute decision maker on behalf of a patient, the product includes mechanisms to record the identity of the substitute decision maker and the substitute decision maker's relationship to the patient.
5.	User Identity Management	The product and/or service has mechanisms in place to ensure that: user IDs are unique and cannot be re-used; user IDs can be decommissioned, or have permissions removed, and that decommissioned user IDs cannot be re-used.
6.	User Credential Management Documentation	The product and/or service shall have functionality to ensure that users (including Administrative users) hold credentials (e.g. Passwords) which allow them to prove their identity to the product and/or service.
7.	Screen Time-Out & Re-authentication	The product and/or service automatically locks and requires the User to re-authenticate after a configurable period of inactivity.

8.	Account Lockout	The product and/or service denies access to a known user for a defined period, if that known user has unsuccessfully attempted to log in a fixed number of times in a defined period.
9.	Role-based Access Control	The product and/or service controls access to system features by permissions which are determined by the users' roles.
10.	Secure Log-On	The product and/or service requires a user to authenticate themselves using a secure credential, prior to granting access to any personal health information.
11.	Password Management	The product and/or service contains mechanisms to ensure passwords chosen by users conform to configurable password quality policies.
12.	End User Device Encryption	The product and/or service encrypts all personal health information that is stored on end user devices, or the product and/or service ensures that no personal health information is stored on end user devices.
13.	Audit Records	The product and/or service logs all User and system actions and can display the details of who entered, accessed or modified what data, in what role, at what time, and from what device.
14.	Audit Reports	The product and/or service is capable of reporting: comprehensive history of accesses.
15.	Sorting of Audit Reports	Audit reports are sortable on the following fields, for privacy investigation purposes: Date/Time; Patient ID; User ID; Action taken (addition, change, deletion, print, copy, transmission, consent override); Data accessed.
16.	Logging of Faults	The product and/or service creates log records when unexpected errors occur.
17.	History Retention of Patient Records	The product and/or service is capable of displaying the former content of a record as it existed at any point in the past. This applies to patient data and non-patient data (e.g. practice metadata or user permissions metadata).
18.	Acceptable Use Agreements	The product and/or service includes mechanisms to make users aware of their responsibilities, by requiring users to agree to them as part of a configurable Acceptable Use Agreement.
19.	Confidentiality Message on Log-In	The product and/or service displays a confidentiality message to the user upon log-in.
20.	User Agreements	The product and/or service requires users to read and agree to a statement explaining the purposes for which information is being collected, and limitations that will be placed on use and disclosure.

Table 2: A summary of the requirements needing demonstrations as evidence of Canada Health Infoway's Self-Assessment document requirements.

Appendix B

The following is an excerpt from the business requirements workflow document drafted for the InterRAI MDS 2.0 project. These workflows demonstrate scenarios of assessment types and timings within the assessment protocol regiments.

4.0 FULL ASSESSMENT SCENARIOS & WORKFLOWS

The following workflows are used to describe instances of when end users fill out Full Assessment forms for the residents. Completion of Full Assessment forms occurs for four primary reasons of assessment: Admission Full Assessment (completed no later than 14 days after the day of admission), Full Annual Assessment (completed no later than 366 days after the last full assessment), Significant Change in Status Assessment (completed no later than 14 days after a significant change is detected) and Significant Correction of Prior Full Assessment (completed after the detection of an error within the last full assessment submitted).

4.1 KEY FIELD REQUIREMENTS

1. Primary Reason for Assessment (AA8)—Primary reason for assessment which is either Admission Assessment (before day 14) (01), Full Annual Assessment (02), Significant Change in Status Assessment (03), Significant Correction of Prior Full Assessment (04)
2. Assessment Reference Date (A3)— The last day of observation period. May be any date prior to the 14th day after admission. (YYYY/MM/DD)
3. Date Assessment Coordinator signed as complete (R2b)—Full Assessment form is complete and signed by the Assessment Coordinator on this date (YYYY/MM/DD)

**Note: all date calculations and timeframes include weekends.*

4.2 FULL ASSESSMENT WORKFLOW SCENARIOS: ADMISSION

Workflow scenarios for Full Assessments completed upon Admission to a facility. Reason for Assessment (AA8) is 01.

4.2.1 ASSESSMENT COMPLETED WITHIN TIMEFRAME

**Scenario: new resident admitted, form completed within 14 days.*

1. New resident is admitted to the facility on June 1st 2017 (day of admission counted as day "0")—(Primary Reason for Assessment AA8: 01)
2. Status of the Admission Full Assessment form is: open.
3. Facility staff establish the Assessment Reference Date after the final day of observation, on June 8th 2017 – (Assessment Reference Date A3)
4. The Assessment Coordinator sets the date for completion of the full assessment on June 15th 2017 (14-day item). – (Date Assessment Coordinator signed as complete R2b)
5. Assessment form is closed. (status of Admission Assessment form: closed).
6. Amendments may be made during the next 7-day period provided that the same Assessment Reference Date (A3) is used and there is a record of the date and time of change and the person making the change.

7. The record is locked after this 7-day period on June 22nd 2017. No alterations can be made to the record past this date.
8. Next Full Assessment date set to be completed by: June 16th 2018.
9. Next Quarterly Assessment to be completed by: September 15th 2017.

4.2.2 Resident Discharged & Re-Admitted within Timeframe with No Change in Status

**Scenario: new resident admitted, form partially completed (status of form: open), resident discharged to hospital, resident re-admitted to facility with NO significant change in status WITHIN the 14-day period, original open Admission Full Assessment form completed within 14 days.*

1. New resident is admitted to the facility on June 1st 2017 (day of admission counted as day "0"). — (Primary Reason for Assessment AA8: 01)
2. Facility staff establish Assessment Reference Date after final day of observation, on June 8th 2017– (Assessment Reference Date A3)
3. Resident is discharged to a hospital on June 9th 2017
4. Status of the Admission Full Assessment form is: open.
5. Resident is readmitted to the facility within the 14-day assessment period on June 11th 2017.
6. System check (prompts user with alert/question) performed to determine if there was a significant change in status.
7. It is determined that there was NO significant change is status.
8. Facility staff continue with the original full assessment.
9. The Assessment Coordinator sets the date for completion of the full assessment on June 15th 2017 (14-day item). – (Date Assessment Coordinator signed as complete R2b)
10. Admission Full Assessment form status: closed.
11. Amendments may be made during the next 7-day period provided that the same Assessment Reference Date (A3) is used and there is a record of the date and time of change and the person making the change.
12. The record is locked after this 7-day period on June 22nd 2017. No alterations can be made to the record past this date. Admission Full Assessment form status: locked.
13. Next Full Assessment Set to be completed by: June 16th 2018.
14. Next Quarterly Assessment to be completed by: September 15th 2017.

4.2.3 Resident Discharged & Re-Admitted within Timeframe with Significant Change in Status

**Scenario: new resident, form partially completed (status of form: open), resident discharged to hospital, resident re-admitted to facility WITHIN 14-day period, resident presents back at facility with SIGNIFICANT CHANGE in status, previous Admission Full Assessment form closed (status of form: closed OR cancelled), new Admission Full Assessment form opened and completed (resets timeline for all subsequent assessments), partially completed previous assessment stored in resident's record with notation explaining a new admission full assessment was initiated with reason stated.*

1. New resident is admitted to the facility on June 1st 2017 (day of admission counted as day "0"). — (Primary Reason for Assessment AA8: 01)
2. Facility staff establish Assessment Reference Date after final day of observation, on June 8th 2017. – (Assessment Reference Date A3)
3. Resident is discharged to a hospital on June 9th 2017
4. Status of the Admission Full Assessment form is: open.
5. Resident is readmitted to the facility within the 14-day assessment period on June 11th 2017.
6. System check (prompts user with alert/question) performed to determine if there was a significant change in status.
7. It is determined that there was a significant change is status.
8. Prior Admission Full Assessment Form is closed or cancelled (form status: cancelled), a record of the assessment is kept and a note is entered specifying reason for cancellation.
9. A new Admission Full Assessment is opened on June 11th 2017 (day of admission counted as day "0"). — (Primary Reason for Assessment AA8: 01)
10. Facility staff establish Assessment Reference Date after final day of observation, on June 18th 2017 – (Assessment Reference Date A3)
11. The Assessment Coordinator sets the date for completion of the full assessment 14 days on June 30th 2017. – (Date Assessment Coordinator signed as complete R2b)
12. Assessment form is closed.
13. Amendments may be made during the next 7-day period provided that the same Assessment Reference Date (A3) is used and there is a record of the date and time of change and the person making the change.
14. The record is locked after this 7-day period on July 7th 2017. No alterations can be made to the record past this date.
15. Next Full Assessment set to be completed by: July 1st 2018.
16. Next Quarterly Assessment set to be completed by: October 1st 2017.

4.2.4 Resident Discharged & Re-Admitted Outside of Timeframe

**Scenario: new resident, form completed (form status: closed), resident discharged to hospital resident re-admitted NOT within the 14-day period, new Admission Full Assessment form opened and completed (resets timeline for all subsequent assessments).*

1. New resident is admitted to the facility on June 1st 2017 (day of admission counted as day "0"). — (Primary Reason for Assessment AA8: 01)
2. Facility staff establish Assessment Reference Date after final day of observation, on June 8th 2017 – (Assessment Reference Date A3)
3. The Assessment Coordinator sets the date for completion of the full assessment on June 15th 2017 (14-day item). – (Date Assessment Coordinator signed as complete R2b)
4. Assessment form is closed.
5. Assessment form is locked 7 days after the date the Assessment Coordinator has signed it as complete (R2b).
6. Resident is discharged to a hospital and returns after the 14-day assessment period. Resident is re-admitted on June 16th 2017. -- (day of admission counted as day "0").
7. A new Admission Full Assessment is opened on June 16th 2017 (day of admission counted as day "0"). — (Primary Reason for Assessment AA8: 01)

8. Facility staff establish Assessment Reference Date after final day of observation, on June 23rd 2017 – (Assessment Reference Date A3)
9. The Assessment Coordinator sets the date for completion of the full assessment 14 days on June 30th 2017. – (Date Assessment Coordinator signed as complete R2b)
10. Assessment form is closed.
11. Amendments may be made during the next 7-day period provided that the same Assessment Reference Date (A3) is used and there is a record of the date and time of change and the person making the change.
12. The record is locked after this 7-day period on July 7th 2017. No alterations can be made to the record past this date.
13. Next Full Assessment set to be completed by: July 1st 2018.
14. Next Quarterly Assessment date set to be completed by: October 1st 2017.

4.2.5 RESIDENT DISCHARGED/DIES WITHIN TIMEFRAME

*Scenario: *new resident, form partially completed (form status: open), resident dies/discharged WITHIN the 14-day period, partially completed previous assessment stored in resident's record with notation explaining why assessment is not complete.*

1. New resident is admitted to the facility on June 1st 2017 (day of admission counted as day "0"). — (Primary Reason for Assessment AA8: 01)
2. Facility staff establish Assessment Reference Date after final day of observation, on June 8th 2017 – (Assessment Reference Date A3)
3. Admission Full Assessment status: open
4. Resident is dies or is discharged to a hospital within the 14-day period and does not return.
5. Partially completed Full Assessment is stored in resident's record with notation explaining that the assessment was not complete due to death or discharge from facility.
6. Assessment is closed after the 14-day period on June 15th 2017. (Admission Full Assessment status: closed)
7. Assessment is locked 7-day period on June 22nd 2017. No alterations can be made to the record past this date.

**Note: This excerpt demonstrates workflows done for full admission assessments only. Additional workflows were generated for all other subsequent assessment types.*

Appendix C

The following is an excerpt from the MDS Data Elements document drafted for the InterRAI MDS 2.0 project. Tables such as the one demonstrated below, were created for each assessment category. The goal was to map data elements within the assessment categories, their triggers, validations (data types and coding), descriptions and priority within the system.

COGNITIVE PATTERNS (B)

Cognitive Patterns consists of assessment information that determines a resident's ability to remember, think coherently and organize daily self-care activities. Information included is as follows.

The following items must be captured within the cognitive patterns:

	Item ID	Item Type
1.	B1	Comatose
2.	B2	Memory
3.	B3	Memory/Recall Ability
4.	B4	Cognitive Skills for Daily Decision-Making
5.	B5	Indicators of Delirium-Periodic Disordered Thinking/Awareness
6.	B6	Change in Cognitive Status

Figure 3.6: Summary of B Data Elements

Full & Quarterly Assessment Flows:

B1 → B2 → B3 → B4 → B5 → B6

**Skip Pattern: IF B1 codes 1 → THEN G1a*

ELSE B2

For description and detailed instructions for each data element, see table below:

Item ID	Item Type	Description	Priority	Trigger	Validation	Item Required on Record Type Y = Yes N = No				
						Full Assessment		Quarterly Assessment	Tracking	
						Admission	Comprehensive Assessment (Annual/Significant Change/Significant correction of Prior full)		Discharge	Re-Entry
B1	COMATOSE	To record whether there is a neurological diagnosis of coma or persistent vegetative state.	Mandatory on all Full and Quarterly Assessments	Subset of B	Persistent vegetative state or no discernible consciousness: 0 → No 1 → Yes *IF 1 (yes)* *THEN skip to item G1.* *IF 0 (no)* *THEN B2*	Y	Y	Y	N	N
B2	MEMORY	To determine resident's short-term and long-term memory.	Mandatory on all Full and Quarterly Assessments	Follows B1	a. Short-term memory PL—seems or appears to recall after 5 minutes 0 → Memory OK 1 → Memory Problem b. Long-term memory OK—seems or appears to recall long-term past 0 → Memory OK 1 → Memory Problem	Y	Y	Y	N	N
B3	MEMORY/RECALL ABILITY	To determine resident's	Mandatory on all Full and	Follows B2	Check all that resident was normally able to	Y	Y	Y	N	N

		memory/recall performance within the environmental setting.	Quarterly Assessments		recall during the LAST 7 DAYS. a. Current season b. Location of own room c. Staff names/faces d. That he/she is in a facility e. NONE OF ABOVE are recalled					
B4	COGNITIVE SKILLS FOR DAILY DECISISION MAKING	To record the resident's actual performance in making everyday decisions about tasks or activities of daily living.	Mandatory in all Full and Quarterly Assessments	Follows B3	Choose one: 0 → INDEPENDENT— decisions consistent and reasonable 1→ MODIFIED DEPENDENCE— some difficulty in new situations only 2 → MODERATELY IMPAIRED-- decisions poor; cues or supervision required 3 → SEVERLY IMPAIRED— never/rarely made decisions	Y	Y	Y	N	N
B5	INDICATORS OF DELIRIUM-PERIODIC DISORDERED THINKING/AWARENESS	To record behavioral signs that may indicate that delirium is present.	Mandatory in all Full and Quarterly Assessments	Follows B4	For each of the indicators, code for behavior as follows: 0 → Behavior not present 1 → Behavior present, not of recent onset 2 → Behavior present over last 7 days appears different from	Y	Y	Y	N	N

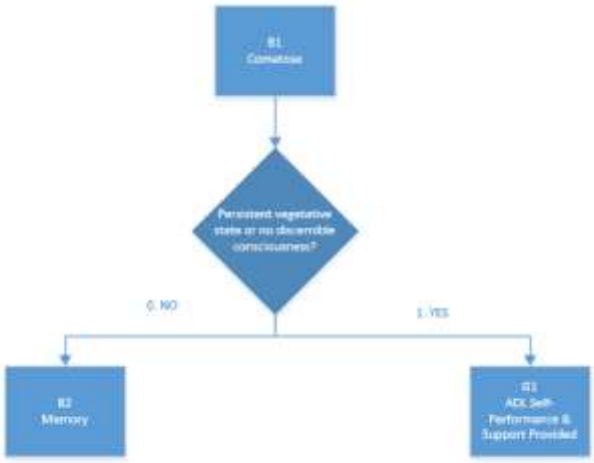
					resident's usual functioning (e.g. new onset or worsening) a. EASILY DISTRACTED (e.g. difficulty paying attention) b. PERIODS OF ALTERED PERCEPTION OR AWARENESS OF SURROUNDINGS (e.g. moves lips or talks to someone not present; believes he/she is somewhere else; confuses night and day) c. EPISODES OF DISORGANIZED SPEECH (e.g. speech is incoherent, nonsensical, irrelevant, or rambling from subject to subject; loses train of thought) d. PERIODS OF RESTLESSNESS (e.g. fidgeting or picking at skin, clothing, napkins etc.; frequent position changes; repetitive physical movements or calling out) e. PERIODS OF LETHARGY (e.g. sluggishness; staring into space; difficult to arouse; little bodily movement)					

					f. MENTAL FUNCTION VARIES OVER THE COURSE OF THE DAY (e.g. sometimes better, sometimes worse; behaviors sometimes, present sometimes not)					
B6	CHANGE IN COGNITIVE STATUS	To document changes in the resident's cognitive status, skills, or abilities as compared his/her status if 90 days ago (or since last assessment if less than 90 days ago).	Mandatory in all Full and Quarterly Assessments	Follows B5	Record the number corresponding to the most accurate response. 0 → No change 1→ Improved 2 → Deteriorated	Y	Y	Y	N	N

Appendix D

The following is an excerpt of skip pattern identification and modelling drafted for the InterRAI MDS 2.0 project. Skip pattern identification allows for the streamlining of the assessment workflows. These snapshots capture the skip pattern decision point only, not the entire workflow within the system.

Section B: Cognitive Patterns
Subsection B1: Comatose
IF code 1. (yes)
THEN skip to Section G (Physical Functioning and Structural Problems)
ELSE continue to B2 (memory)



Section N: Activity Pursuit Patterns
Subsection N1: Time Awake
IF B1 (comatose) code 1 (yes)
THEN code N1d (none of above)
AND skip to section O (Medications)
ELSE continue to N2 (Average Time Involved in Activities)