DALHOUSIE UNIVERSITY

MHI Internship Report:
Medication Reconciliation Project at Allscripts Canada

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Acknowledgment and Endorsement

This report has been written by me and has not received any previous academic credit at this or any other institution.

I would like to thank Allscripts Canada and the Master of Health Informatics program, Dalhousie University for offering this meaningful internship program.

Also, I would like to thank Jennifer MacGregor, Managing Director of Allscripts Canada, Jaimes Blunt, Senior Product Manager, and other team members of the Allscripts Canada Team for the guidance, support and encouragement throughout the internship.

Finally, many thanks to Dr. Raza Abidi and other faculty members in the Master of Health Informatics program for the help in preparing me for this internship.

Executive Summary

The author performed the Master of Health Informatics Internship at Allscripts Canada, a Health IT company that delivers information technology and services to help healthcare organizations achieve better clinical, financial and operational results. The author contributed to the Medication Reconciliation Specifications and Requirement for Canada project during the internship.

At the end of the internship, the author has successfully met the objectives and deliverables of this project, which are:

- Clinical workflow diagrams of Medication Reconciliation best practices

- Business requirements of proposed processes improvements

- Presentation of the results and recommendations

Also, this internship was highly related to the field of Health Informatics and provided the author invaluable experience and insights into Health Informatics.

This internship report introduces the background knowledge in Medication Reconciliation, describes the internship duties, learnings, and contributions, as well as analyses a problem in the domain of work and provides the solutions as a result.

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1. Introduction

1.1 Medication Reconciliation

Medication reconciliation is a formal process in which healthcare providers work together with patients, families and care providers to ensure accurate and comprehensive medication information is communicated consistently in the transitions of care. Medication reconciliation requires a systematic and comprehensive review of all the medications a patient is taking to ensure that medications being added, changed or discontinued are carefully evaluated. It is a component of medication management and will inform and enable prescribers to make the most appropriate prescribing decisions for the patient.

1.2 Health Informatics in Medication Reconciliation

Electronic Medication Reconciliation uses information technology to access and integrate electronically stored patient medication data to support:

- The collection of the electronic Best Possible Medication History, the detection and resolution of discrepancies,

- The development of an electronic Best Possible Medication Discharge Plan

- The comparison of electronic Best Possible Medication History and new orders at admission, transfer, and discharge.

To better understand the current how electronic Medication Reconciliation is implemented across Canada, a 2013 survey study have found that:

- "48% of respondents reported that electronic Medication Reconciliation was partially or fully implemented within their facilities.

- Of the 52% of respondents who are not currently doing electronic Medication Reconciliation, 61% are considering or planning an implementation of electronic Medication Reconciliation.

- Electronic Medication Reconciliation is practiced across healthcare sectors, including ambulatory care, clinic, and other settings.

- Electronic Medication Reconciliation functionality was highly variable. Participants indicated that when electronic Medication Reconciliation functions were available, they were not using them to their full capability.

- The majority of respondents indicated that no additional resources (e.g., human, financial) were allocated to implementing or sustaining electronic Medication Reconciliation.

- The top three methods of training users were: one-to-one training with a clinical champion, unit based in-services, and in-class training with an instructor.

- Approximately half of survey respondents reported that they were currently evaluating or had previously evaluated their electronic Medication Reconciliation process.

- The three most prevalent performance measures were: number/percentage of patients reconciled, the accuracy of reconciliation and frequency of use.

- Participants, who had implemented electronic Medication Reconciliation, considered the implementation to be successful to very successful. (The Electronic Medication Reconciliation Group, 2014)"

2. Description of the Organization

2.1 Allscripts

Allscripts Healthcare Solutions, Inc., were founded in 1986. They deliver information technology and services to help healthcare organizations achieve better clinical, financial and operational results. Their solutions are sold 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. They help clients improve the quality and efficiency of health care by providing electronic health records, connectivity, hosting, outsourcing, analytics, patient engagement, clinical decision support, and population health management solutions.

They are also working to further deliver integrated, evidence-based, personalized treatment plans directly to the point of care and to identify optimal ways to maximize increasing volumes of associated genomic information in the care process. Their solutions empower healthcare professionals with the data, insights, and connectivity to other caregivers needed to succeed in an industry that is rapidly changing from fee-for-service models to fee-for-value advanced payment models. They believe they offer some of the most comprehensive solutions in the industry today. Healthcare organizations can effectively manage patients and patient populations across all care settings using a combination of their physician, hospital, health system, post-Acute Care, and population health management products and services. They believe these solutions will help transform health care as the industry seeks new ways to manage risk, improve quality, and reduce costs (Allscipts, 2016).

2.2 Allscripts and Dalhousie University

In 2015, Allscripts and Dalhousie University have launched a partnership program, in which graduate students in the Master of Health Informatics program will be able to develop expertise in the company's clinical information system. Allscripts is sharing their solutions as an Experiential Learning Program with the Dalhousie, which will enable the students to become familiar with the system.

Also, Allscripts Canada is offering paid summer internships to two graduate students from the Master of Health Informatics program to work at Allscripts' Vancouver headquarters for 13 weeks, from May to August. The author is honored to be one of the interns being offered this great opportunity.

2.3 The Allscripts Canada Team

The team the author was working with is called "Allscripts Canada Team". The team is led by the Managing Director of Canada, and it consists of other executive managers of Allscripts Canada, including Outcome Executives, Senior Sales Manager, Senior Product Manager, Senior Services Manager, Project Managers, etc.

The Allscripts Canada Team works directly with all the clients coast to coast. From implementing health information solutions to providing project advisories, the team helps the clients achieve their clinical transformation goals and push Health Informatics practice forward in major Canadian regional healthcare systems and hospitals.

As an intern, the author reported directly to the Senior Product Manager. On one hand, the author is glad to have the great opportunity to learn more about these Health Informatics solutions

across the continuum of care, on the other hand, the author was able to learn more about the health

IT business as a whole within the Allscripts Canada Team.

3. Description of the Work at Allscripts

3.1 Role and Responsibility

As a Health Informatics Intern, The author was assigned the project that working on Medication Reconciliation requirements/specifications for Canada.

The author was responsible for investigating clinical Medication Reconciliation processes including ordering medication through to administration of medication in Acute Care, Ambulatory Care, and Emergency Department, and providing Canadian requirements for those processes.

3.2 Statement of Objectives of the Projects

The project investigated the required practices and best practices of Medication Reconciliation in Canada, from various sources. Then mapped them into workflow diagrams and translated them into business requirements that can be used in solution development in later stages of the project.

3.3 The Deliverables of the Project

The main deliverables of the project include:

- Workflow diagrams of
    - Creating Best Possible Medication History
    - Medication Reconciliation at Hospital Admission
    - Medication Reconciliation at Hospital Transfer

- Medication Reconciliation at Hospital Discharge

- Generating Best Possible Medication Discharge Plan

- Medication Reconciliation in Ambulatory Care Settings

- Medication Reconciliation in Emergency Department

- Business requirements for

  - The clinic forms including Best Possible Medication History, Admission Medication Orders, Transfer Orders, and Best Possible Medication Discharge Plan.

  - Procedures including Medication Reconciliation at Hospital Admission, Medication Reconciliation at Hospital Transfer, Medication Reconciliation at Hospital Discharge, Medication Reconciliation in Ambulatory Care Settings, and Medication Reconciliation in Emergency Department.

- Presentations on the main findings and recommendations of this project.

3.4 The Learning Experience and Contributions

The author's learning experience and contributions to the assigned project can be summarized as 5 phases: Understanding, Researching, Initializing, Refining, and Closing.

Understanding

The first phase of the project was to understand the project, including objectives, background, business drivers, project scope, and project considerations. This was done by meeting with the author's reporting functional manager, who is acting as the project manager.

This was a very important phase as it has laid the foundation for the main work being performed during the internship and also served as a great learning opportunity for the author to practice how projects are defined and managed in big health information technology organizations.

Researching

The second phase was to research for best practices and required practices of Medication Reconciliation in Canada.

In the Master of Health Informatics program, the author has gained some understanding of Medication Reconciliation, particularly electronic Medication Reconciliation. However, the project required more detailed specifications in this practice.

The research was conducted through various sources, including but not limited to:

- Accreditation Canada

- The Institute for Safe Medication Practices Canada (ISMP Canada)

- The Canadian Patient Safety Institute (CPSI)

- *Safer Healthcare Now!* Program

- Canada Health Infoway

- Canadian Institute for Health Information (CIHI)

- The Patient Safety Education Program Canada (PSEP Canada)

- Hospitals and regional health centers policies

- Published academic articles

- Stakeholder meetings

- Client Documentations

During the research phase, the author has extensively learned about the background knowledge, the problem and issues, the best practices, and the Health Informatics insights regarding the domain of Medication Reconciliation in Acute Care, Ambulatory Care, and Emergency Department settings.

Initializing

After gathered the information on required and best practices on electronic Medication Reconciliation, the next step was to map these practices into workflow diagrams.

The author chose to use Business Process Model and Notation (BPMN) to demonstrate the workflows, as has learned in the Master of Health Informatics program. For the business requirements, the author followed the standard documentation template provided by the manager at Allscripts, this ensures the consistency and reusability of these business requirements after the project closure and the author finished his work.

Refining

The refining phase was the most important phase as well as the most rewarding phase of this project.

The author worked closely with the project manager on refining the workflow diagrams and business requirements. On one hand, the project manager has provided a great amount of advice and suggestions during the weekly project updates meetings. On the other hand, the author extended the range and depth of the research process in order to refine the workflows and business requirements.

During this phase, the author has learned a lot from both the project manager and from the work itself on a range of aspects:

- Medication Reconciliation practices

- Health Informatics research

- Project delivery

- Business analytics

- Software development life cycle

Closing

In this phase, the business requirement documentation was passed along to the development team at Allscripts, with choosing functionalities and features, which will be used for software development in future projects.

Also, the results and recommendations of the project were presented by the author.

4. Discussion on How Work Relates to Health Informatics

4.1 Relates to Coursework

The author has had successfully finished 8 courses before undertaking this internship. The author found these courses were very important for the author to better understand the field of Health Informatics. In term of this specific project the author worked on at Allscripts, The author would like to highlight some of the courses that are extremely helpful:

HINF 6101 - Health Information Flow and Use

The work conducted during this internship has greatly used the knowledge and techniques learned from HINF 6101.In the author's work, all the clinic workflows were analyzed through the

flow of health information, and then the processes were mapped with the use of Business Process Model and Notation (BPMN) introduced in the class.

HINF 6110 - Health Information Systems and Issues

Two main pieces of knowledge have been used in this project from HINF 6110:

- Clinical Information Systems: the introduction of all the clinical information systems in this course has laid the foundation for a good understanding of the products and solutions during the internship work.
- System Development Life Cycle: this internship focused on the requirement analysis stage of the System Development Life Cycle, and all the analysis were directly related to clinical information system development.

HINF 6120 - Fundamentals of Clinical Care for Non-Clinicians

This internship involved a large amount of workflow analysis in various care settings, including Acute Care inpatient units, Ambulatory clinics, and Emergency Department. Having the knowledge and skills learned from HINF 6120 were extremely helpful in understanding research material and performing the workflow analysis.

HINF 6102 - Health Information Flow and Standards

Understanding the health information standards and interoperability was an important component in this internship, especially in the analysis of different clinical information systems (e.g. CPOE and Medication Reconciliation tools).

HINF 6300 - IT Project Management

HINF 6300 has trained me those basic concepts in IT project management, which has proved to be useful when working on a project during the internship.

4.2 Relates to the field of Health Informatics

This internship was performed at one of the best Health Informatics solution provider. It was highly related to the field of Health Informatics. This experience has greatly improved the author's understanding of the field through 3 facets: Health Informatics solution provider, healthcare providers, and the Canadian healthcare system.

Health Informatics Solution Provider

Having been working at the Health Informatics solution provider for 13 weeks, the author has gained a lot of insight on the field of Health Informatics through the lens of vendors. The author has gained some knowledge in the Health Informatics solution development, implementation, and support services. Also, the author had the opportunity to watch some demonstrations of the most advanced solutions and explore some functions in the testing environment.

This experience will be very useful for the future work as the author will have a better understanding of commercialized Health Informatics solutions.

Healthcare Providers

In the author's work, the author has come across some documentations from our clients, a major regional healthcare system, demonstrating their Medication Reconciliation implementation project.

The author has gained some insights into the current state, issues, challenges, solutions, outcomes, etc. This will be very helpful for the later coursework and future engagement in the field of Health Informatics.

The Canadian Healthcare System

This internship also gave the author the opportunity to explore the Canadian healthcare system, especially the digital health systems.

During the internship, the author had the opportunity to participate the annual eHealth conference held in Vancouver, and the organization's quarter business meetings, where the author has improved the knowledge in the Canadian Healthcare system.

5. Discussion of a Problem and the Corresponding Solution

Medication Reconciliation in Acute Care has been misperceived as extra administrative works as nurses or pharmacists "filling out forms". The solution of this is to integrate Medication Reconciliation into clinic workflows.

Medication Reconciliation in Acute Care can be summarized as 3 main steps:

- Obtaining the most complete and accurate list possible of the patient's regularly taken home medications.
- Using the list when writing medication orders.
- Comparing the list of the patient's admission, transfer or discharge orders, identifying and bringing any discrepancies to the attention of the team and, if appropriate, making changes to the orders and documenting all changes.

The following BPMN diagrams, as part of the author's project work in the internship, are the solutions that illustrate how to integrate the Medication Reconciliation best practices in the transaction of Acute Care, namely admission, transfer, and discharge:
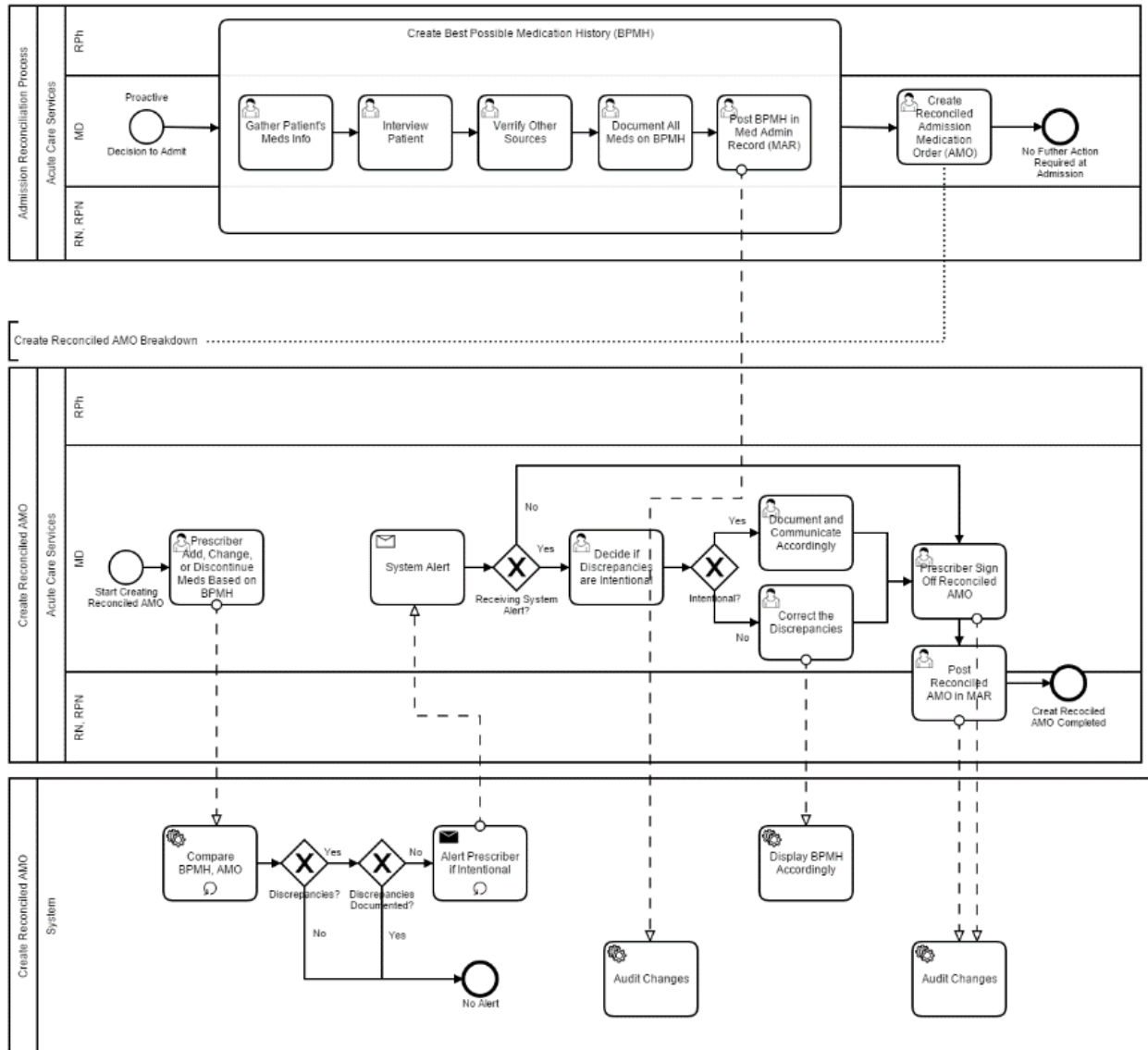

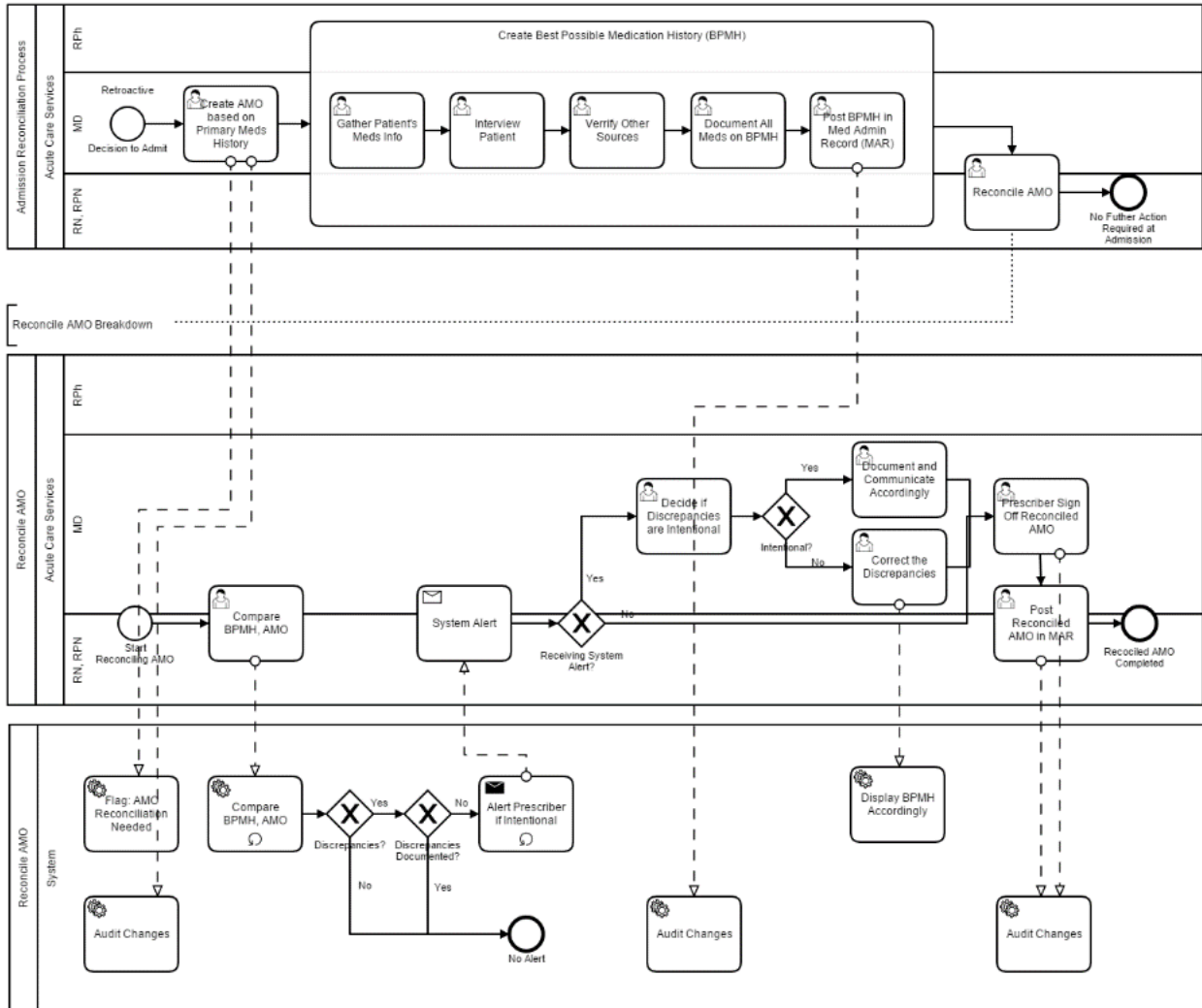**Figure 1: Proactive Medication Reconciliation at Admission**

Figure 2: Retroactive Medication Reconciliation at Admission

There are two admission medication reconciliation models: proactive and retroactive. In the proactive model, the Best Possible Medication History is created first and it leads directly to the generation of reconciled admission medication orders. In the retroactive model, the prescriber writes admission orders and at a time the following admission, the Best Possible Medication History is collected, and Best Possible Medication History and admission medication orders are then compared to identify discrepancies.

Best Possible Medication History should be done by a healthcare professional (e.g. doctor, nurse, nurse practitioner, and pharmacist) whose scope of practice includes this activity and who:

- Receives training on how to create a Best Possible Medication History;
- Follows a systematic process such as a BPMH interview guide where possible;
- Are conscientious, responsible and accountable for conducting the process.

Create Reconciled Admission Medication Order should be done by an authorized prescriber, it is best served by having the attending physician who is responsible for ongoing care write the admission orders. The emergency physician should not write admission orders unless he/she is assuming ongoing care and responsibility for the patient. Reconcile Admission Medication Order in the retroactive process can be started by RN, PRN. When identified discrepancies need to be addressed, the prescriber should document and sign the order. The pharmacist, wherever possible, should take primary responsibility for ensuring proper communication of medication information to patients/clients, families and other healthcare providers on admission. And RN should ensure medication orders are transcribed correctly to the Medication Administration Record.
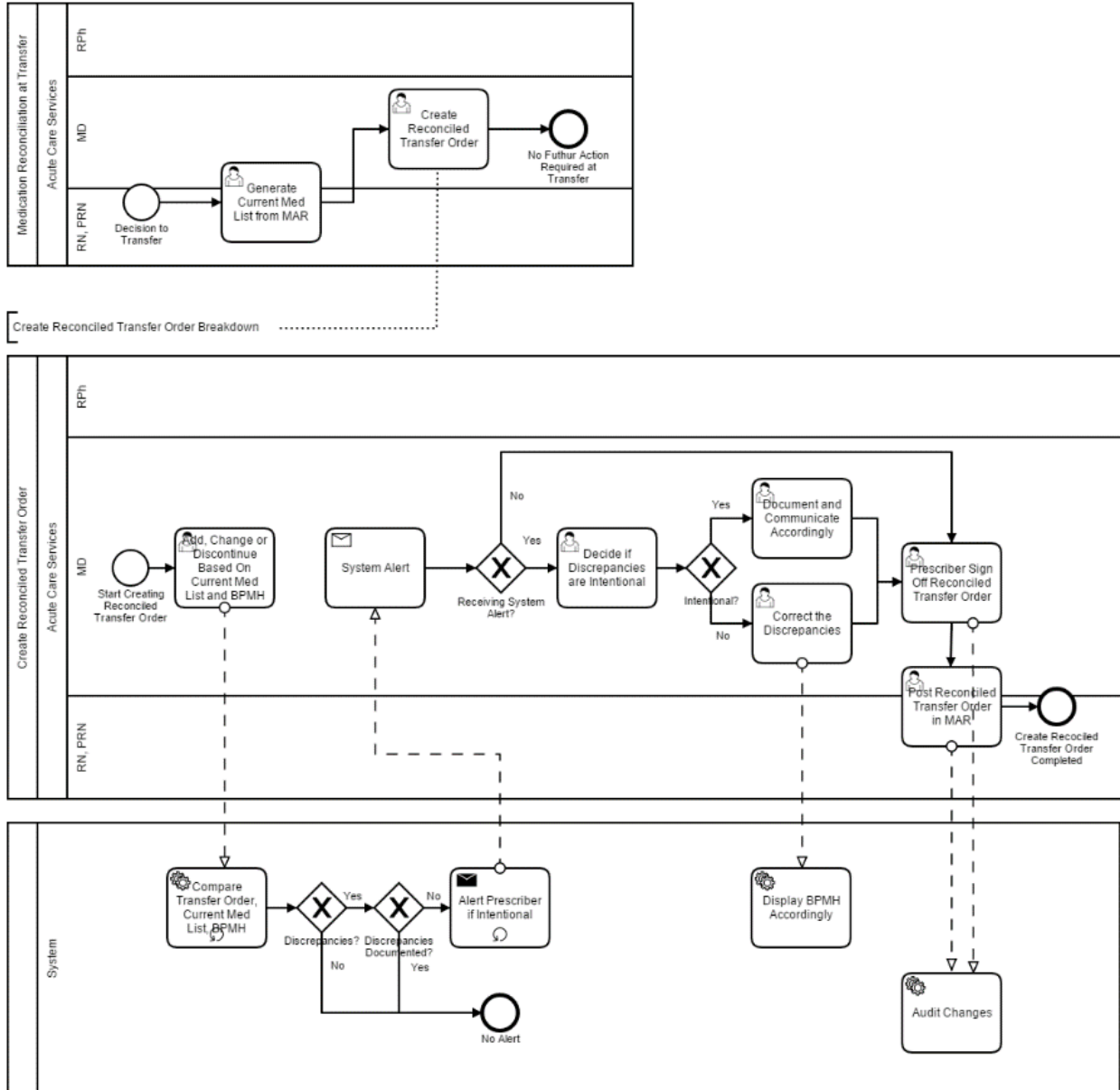
Figure 3: Medication Reconciliation at Transfer

During transfer, many hospitals, either through the pharmacy information system or computerized physician order entry (CPOE) system, have the capability to electronically generate a current medication list (from Medication Administration Record) at the time of transfer that allows the prescriber to select, add, change, and discontinue the medications for the next level of care. It is required for medication orders to be re-written according to facility policy (e.g. post-op, the transfer from ICU, changes in responsible medical service, changes in the level of care).

This procedure may vary among hospitals, it is important to have a policy that designates who is responsible for completing the reconciliation (receiving or transferring unit) and when it should occur. Most systems do not generally have a mechanism for addressing Best Possible Medication History, especially on transfer from an ICU to a ward, and it is essential to ensure that this type of reconciliation occurs.
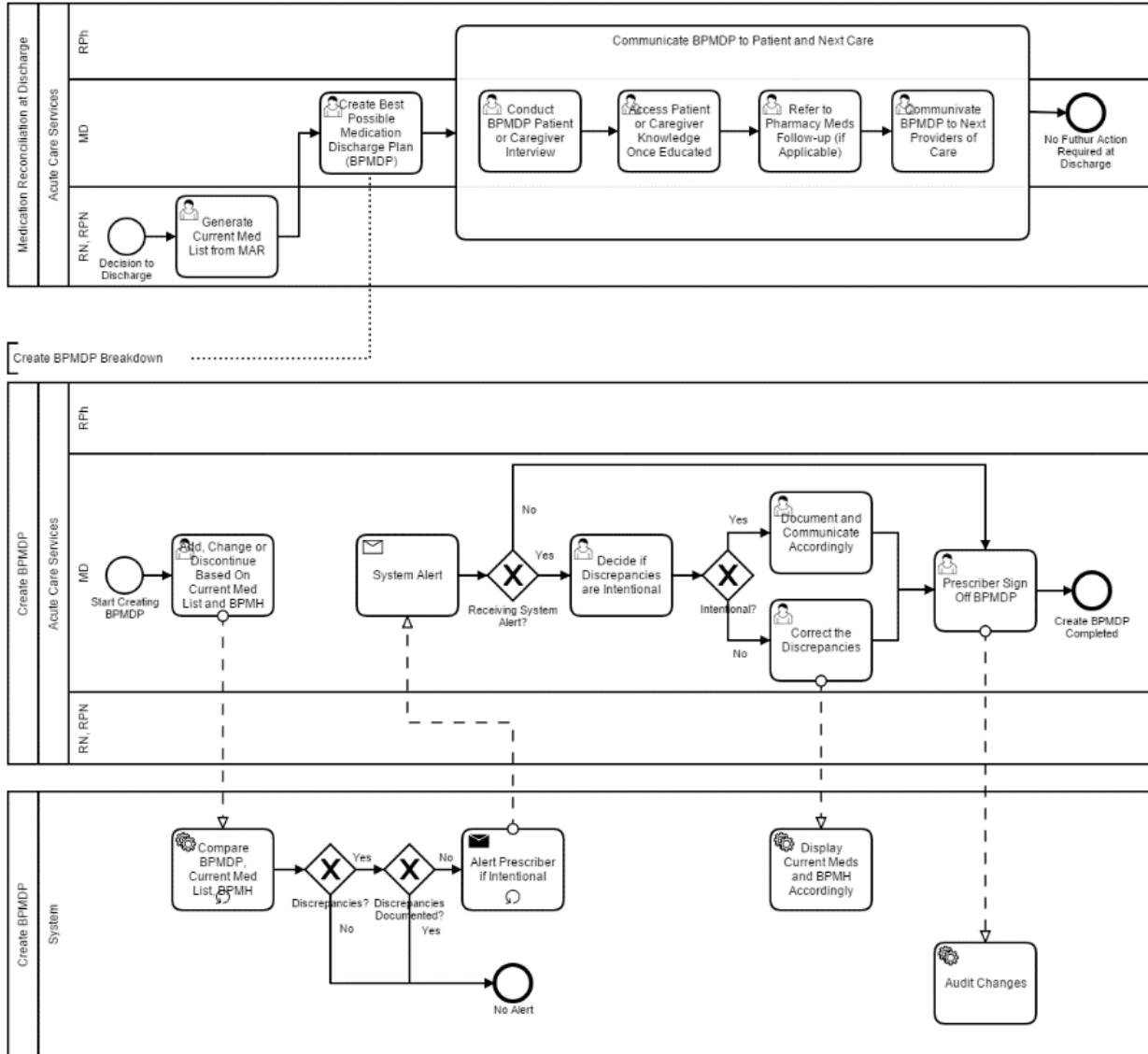
Figure 4: Medication Reconciliation at Discharge

During discharge, there should be tools to support the clinician and patient with discharge reconciliation and should integrate and clarify medication information from all sources. Also, the Best Possible Medication Discharge Plan should be communicated to patients and their next care providers clearly indicating which medications are new, which preadmission medication are to be continued without changes, which preadmission medications are to be continued with changes in dose/frequency/route/formulation, which preadmission medications are discontinued in the hospital, and which preadmission medications should be stopped. Also, patients should receive the discharge regimen in the language they could understand.

6. Conclusion

The internship program at Allscripts Canada is a great learning and working opportunity for a Master of Health Informatics student, as it:

- Exhibits a culture of teamwork, innovation and results.

- Provides hands-on experience of the award-winning Health Informatics solutions

- Provides the valuable insights into the Canadian Healthcare System and the development of Health Informatics

The author was able to gain exposure and contribute to improving the clinical workflows using top ranked Health Informatics solutions, and it allowed the author to:

- Better understand the tools being used in the field of Health Informatics

- Gain valuable knowledge in the Health Informatics System Development Life Cycle

- Practice business analysis and project management skills in the field of Health Informatics

7. Recommendations

- There is still much room for improvement regarding the development of technology and tools in healthcare. As of the author's experience, Health Informatics solutions are still behind many other IT solutions being used in other industries.

- Reimaging and redesigning of clinical workflows is a definite challenging work. This requires the commitment and collaboration from the all clinical, technological and management parties.

- The clinical adoption of Health Informatics solutions and patient engagement were not addressed in this internship, however, they are very important parts in realizing a better healthcare delivery, and that encourage the author to keep exploring and contributing in the future career upon graduation.

Reference

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