

Evaluation of an Electronic Central Referral Intake System and the Development of a CMS User  
Reference Manual for Nova Scotia Hearing and Speech Centres

by

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

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(Electronically signed)

Alanna Clarke

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## **1.0 Executive Summary**

### **1.1 Scope**

The CMS User Reference Manual project and the Electronic Central Referral Intake System Feasibility Report project will ultimately extend to all Nova Scotia Hearing and Speech Centers within the province of Nova Scotia. While the research will primarily be conducted within HRM with additional support and input from the NSHSC site in Sydney Mines, Cape Breton, the proposed electronic referral system (eReferral) and CMS User Reference manual will apply to all NSHSC sites within Nova Scotia. The eReferral strategy will affect incoming referrals, triage, pre-registering and the allocation of referrals within each individual NSHSC site. The CMS User Reference Manual will aid all personnel who require instructions pertaining to activities performed within Nightingale On Demand Version 8.9.

### **1.2 Purpose**

The purpose of the Database/Technology Design Student at Nova Scotia Hearing and Speech Centers was to gain valuable insight and experience in a healthcare setting while building on professional workplace skills. Throughout the internship period the author was tasked to complete two projects in order to correct various errors within the organization. These two projects were the CMS User Reference Manual and the Electronic Central Referral Intake System Feasibility Report.

The CMS User Reference Manual was severely outdated and did not provide accurate guidance or instructions to personnel using Nightingale On Demand. The purpose of updating the manual was to provide staff members with an accurate guide in order to navigate Nightingale On Demand. While mainly for new staff for learning purposes, the manual is also for existing staff requiring updates on new software features or reminders on how to complete various activities within the system. Once completed, staff members can rely on an updated, accurate, and detailed description on how to complete daily clinical activities using Nightingale On Demand.

The investigation into the feasibility of implementing an eReferral system for Nova Scotia Hearing and Speech Centres was conducted to reduce variance in the clinical pathway and increase patient access. Many patient referrals were becoming lost before they were pre-registered erasing any evidence of the referral from the NSHSC office. This resulted in referred patients not receiving the treatment they require. The purpose of the Electronic Central Referral Intake System Feasibility Report was to examine NSHSC and determine if an electronic referral system would benefit and function efficiently within the workflow while reducing the variance in the clinical pathway.

### **1.3 Findings**

The findings of the investigation regarding the feasibility of an electronic referral system for NSHSC resulted from extensive interviews with staff and additional research. The interviewees disclosed the flow of information regarding the referral process, more specifically, how a referral sent in by a patient moves through the system and receives services from NSHSC. Additionally, decision points and workplace practices regarding the referral process were discussed. Examining the flow of information, typical referral procedures, and decisions resulted in identifying a number of errors that contribute to misplaced referrals. Periodically pre-registering referrals, lack of standardized

procedures, referral storage methods, number of consultations for referrals, and the standard format of the referral which is a paper hard copy are all influences that contribute to misplaced patient referrals. In order to mitigate the volume of misplaced referrals due to these errors, a solution was developed as discussed in section 1.4 Analysis, an electronic referral system.

#### **1.4 Analysis**

The investigative work regarding the referral process led to the identification of various errors contributing to misplaced referrals. The responding solution that remedied these errors was an eReferral system. Further analysis was conducted into the feasibility of NSHSC adopting such technology and whether it would function efficiently in the workplace. The investigation resulted in the eReferral system being a feasible option for NSHSC. The eReferral system requires the activation of two policies that are currently in development at NSHSC. The first policy is that the Administrative Support Professional (ASP) is trained to triage the majority of referrals without consultation. The second policy is that the ASP is to pre-register referrals within one day of receiving them. These are two vital practices that support the adoption of the eReferral system. The eReferral system can be integrated into the existing flow of information at NSHSC without causing any major disruptions to personnel. This encourages the adoption of such technology, eases the transition, and ultimately contributes to the feasibility of implementing the system. While these contributions to the feasibility are technology independent, the technology must be accessible for the system to exist. These technological requirements include an electronic referral form, an eReferral database, and an interface within Nightingale On Demand. The technological requirements have confirmed to be an option for use in the eReferral system by the developers of Nightingale On Demand and therefore contribute to the overall feasibility. With many of the barriers surpassed, the author can conclude that adopting an eReferral system is a feasible option for NSHSC and it will reduce the current variance seen in the clinical pathway resulting in reduced patient access.

## **2.0 Introduction**

### **2.1 Background**

#### **2.1.0 Project Objectives**

The main objectives of the project assigned to the author throughout the internship period were to develop two professional reports to be used for educational and research purposes. The CMS User Reference Manual achieved the objective of providing staff members who use Nightingale On Demand with an extensive guide and set of instructions for completing day-to-day clinical activities within the software. The objective of the Electronic Central Referral Intake System Feasibility Report was to provide executive members with extensive research and investigation regarding the feasibility of implementing an electronic referral system within NSHSC. This document will be used for building a knowledge reservoir and to base future decisions and policies from.

### **2.1.1 Relevance**

The relevance that these projects have towards the field of medicine and health information technology is supporting the movement towards information technology within healthcare, supporting government health initiatives, and increasing patient access and safety.

The movement towards information technology within healthcare is referring to the migration from maintaining paper-based records to maintaining electronic-based records, such as, using an electronic medical record (EMR). This migration is beneficial for a number of reasons. Using an EMR in a clinical setting can increase the coordination of care, measure quality of care, and reduce medical errors (Hillestad et al., 2005). Interoperable EMR's are able to follow and store information about a patient's health throughout their entire lifespan ensuring that each new physician or medical provider is completely updated regarding their patient's health. The more information the physician has regarding the patient's health, the safer the patient. This availability of information is a component of the reasoning behind the importance of supporting information technology within healthcare. Not only can health information technology benefit the individual patient, but it can benefit the population as well. Data mining techniques and various health information technology techniques can use patient information captured through technology to support government health initiatives and evidence-based public health policies. These health initiatives and policies can encourage the population to adopt and maintain a healthy lifestyle.

Patients' access to medical care is a top priority and health information technology can contribute toward this priority. Pertaining to an eReferral system, which has an online referral form available on the organizations website, patients are able to easily fill out and submit the referral information transferring their request for services in real-time. This replaces the former method of completing the paper referral and submitting it through email, fax, or delivering it in person. The electronic method increases accessibility for patients and removes many of the barriers associated with referring with a paper hard copy, such as printing and delivering requirements. This method of referral for NSHSC will allow potential patients to refer themselves or someone on their behalf with ease, security and, efficiency while allowing them to access the medical care they require.

While on a smaller scale, the projects completed within NSHSC ultimately contribute to evidence-based research supporting future policies, availability of information, and patient access and safety. These areas of research are vastly important within the medical and health information technology fields.

### **2.1.2 Outcome**

The outcome of the CMS User Reference Manual and the Electronic Central Referral Intake System Feasibility Report were impactful and beneficial. The CMS User Reference Manual was distributed for approval upon completion and once approval was achieved, the manual was distributed to all sites across Nova Scotia and became available on SharePoint for easy access. Staff members are able to refer to the hard copy or electronic format at any time for learning or educational purposes regarding Nightingale On Demand.

The outcome of the Electronic Central Referral Intake System Feasibility Report was to provide executives council members of Nova Scotia Hearing and Speech Centres with a definitive guide to go forward with the design and planning phases of the eReferral system. This document provided them with the research necessary to base future decisions and to continue forward with devising an implementation strategy.

### **3.0 Organization**

#### **3.1 Organization Background**

Nova Scotia Hearing and Speech Centres is a Provincial Program of the Nova Scotia Department of Health and Wellness. NSHSC has been operating for over 50 years and provides hearing services to all ages and speech-language services to preschool children and adults. Each site contains a team of audiologists, speech-language pathologists, and a host of helpful support and administrative staff members to provide patients with hearing, speech, balance, and swallowing services ("About Us | Nova Scotia Hearing and Speech Centres", 2016).

##### **3.1.0 Organization Department Background**

The NSHSC department in which the author performed their internship was Operations. The department of Operations manages a number of specialties mainly focusing on information technology (IT) and desktop support related to any software or hardware used in the workplace, especially the content management system (CMS) currently in use, Nightingale on Demand. Operations provides technology support for the staff members working with Nightingale On Demand, such as, managing user accounts, security and permissions, troubleshooting, and communicating software updates to staff members. While IT support is the main focus, Operations management encompasses many aspects of NSHSC that encourage the clinical environment to function as efficiently as possible. These duties extend to overseeing the maintenance of the office, being the first point of contact when accidents or health hazards occur, managing the NSHSC budget and various financial affairs of the organization, and providing leadership and expertise to the executive managers when making decisions that affect the organization. The Operations department plays a vital role in the daily activities of the organization, NSHSC, and lends itself to several other departments offering support and guidance.

#### **3.2 Organization Internship Description**

The job description in which was provided to the author detailed overhead tasks such as conducting research and gathering evidence, business analysis, preparing reports and communication material, and presenting results to senior management. Conducting research and gathering evidence consisted of interviewing relevant personnel, examining background material, and gathering literature from scholarly sources. This step provided the background knowledge to accurately conduct analysis and develop reports. Business analysis consisted of examining the evidence gathered and further delving into the root cause and underlying features of the data. This allowed for the development of in depth knowledge base regarding the gathered evidence and encouraged further synthesis. Preparing the reports and communication material and presenting the findings to senior management consisted of developing a solution from the evidence gathered in previous steps and providing an appropriate

recommendation to execute that solution. This encompasses the overall objective pertaining to the job description.

### **3.2.0 Organization Internship Role**

The author's role within NSHSC was the Database/Technology Design Student. As the Database/Technology Design Student, the author was tasked to update the CMS User Reference Manual and investigate the feasibility of an electronic referral system. While the Operations department managed activities mainly related to IT, the author's role included expanding the scope of practice regarding the assigned projects to include working with Administrative Support Professionals, Clinicians, executive managers, and members of quality control. Bridging the gap between these bodies of knowledge aided in the development of the CMS User Reference Manual and the Electronic Central Referral Intake System Feasibility Report.

#### **3.2.1 Organization Internship Responsibilities**

Responsibilities allocated to the author consisted of project analysis and design, development and testing, and documentation. These three phases are the building blocks of the two main deliverables of the internship period, the CMS User Reference Manual and the Electronic Central Referral Intake System Feasibility Report. The project analysis and design phase of the CMS User Reference Manual consisted of completing extensive background research and becoming familiar with the application by completing training videos and e-learning tools. This method allowed for the controlled and regulated use of Nightingale On Demand while still being immersed within the application with no threat of completing unauthorized activities, such as, creating an incorrect patient encounter. The introduction to Nightingale On Demand allowed for the creation of a thorough project plan to develop the CMS User Reference Manual. The project plan then led to the testing and development phase which included testing the Nightingale On Demand features, such as pre-registering a patient or completing an encounter, to ensure accuracy and the utmost integrity. This phase was instrumental to the documentation of the CMS User Reference Manual, as each section regarding the Nightingale On Demand modules had to be written with a high level of precision.

The completion of the CMS User Reference Manual triggered the initiation of the Electronic Central Referral Intake System Feasibility Report. This project followed the same phases as the CMS User Reference Manual, project analysis and design, development and testing, and documentation. Project analysis and design pertaining to the Electronic Central Referral Intake System Feasibility Report consisted of interviewing relevant personnel about the current referral intake process. Sample questions posed to the group interview were related to how the referrals reach the NSHSC location, how the triage process operates, if there is a different route for audiology and speech language pathology referrals, and when the patients come off the wait list and are booked into a Clinician's schedule. The objective of the group interview was to develop the incoming referral information flow and determine what steps are involved throughout the referral process from start to finish. The target was to determine where the errors were occurring and the reasoning behind those errors. As a result of extensive interviews and gathering evidence, a project plan was developed outlining the main aspects of the Electronic Central Referral Intake System Feasibility Report. Aspects that were expanded on in the Electronic Central Referral Intake System Feasibility Report were the impact of a

central intake referral system, the challenges that NSHSC may face, the technological requirements of the system, and change management strategies for implementation. This extensive research allowed for the development of a conceptual design of a central referral intake system specifically for NSHSC to address the errors within the current referral process. The conceptual design could not be physically executed, however, discussing the workflow with colleagues allowed a realistic scenario to divulge the flow of information to ensure accuracy and legitimacy. The development and testing phase allowed the documentation of the Electronic Central Referral Intake System Feasibility Report to be an advantageous investigative report when discussing the possibility of an electronic referral system for NSHSC. The objective of the investigative work for the electronic referral system was to develop a Feasibility Report outlining the possibility of implementation. These were the two main responsibilities tasked upon the author and they were both completed with integrity and dedication.

### **3.2.2 Organization Internship Achievements**

The author accomplished two main achievements throughout the internship period, the completion and distribution of the CMS User Reference Manual and the completion of the Electronic Central Referral Intake System Feasibility Report to be used for planning purposes.

The CMS User Reference Manual was created to replace the previous CMS User Reference Manual, which was severely outdated and no longer useful within the workplace. The updated manual will provide a place of reference, education, and is ultimately a learning tool for new and existing employees to have their questions answered and have the support they need when using the NSHSC software. This manual will remain up to date when new software developments roll out and continue to provide a place of support and education.

The completion of the Electronic Central Referral Intake System Feasibility Report marked the first step in the implementation of the central referral intake system, the research. The recommendations made in the report will provide personnel with concrete instructions and exhibit the necessary research to continue the development of the electronic central referral intake system project.

## **4.0 Relation to Health Informatics**

The overarching subjects that relate to Health Informatics regarding the author's position with NSHSC is consulting, business requirements, information flow, standards architecture, knowledge management, and project management. These areas are the main subjects in which the majority of the projects completed during the internship period were focused on.

### **4.1 Consulting**

The tasks that were closely related to consulting were analyzing the problem, developing a solution, and presenting the solution to the involved parties. These solutions were based on the needs of the organization while adhering to the capabilities and possible limitations of the organization. The overall objective that was designing an eReferral solution to correct the errors contained in the current referral process can be seen as consulting because the organization is relying on the author's expertise in the field to design an appropriate solution.

## **4.2 Business Analysis**

Business requirements were an integral part in the development of the recommendations and solutions designed for NSHSC. To accurately make recommendations on how to implement an electronic referral system, knowledge of the current referral system had to be exact. Developing a set of requirement specifications based on the isolated components of the system instead of the system as a whole, allowed for the in depth analysis of the current referral process in order to identify errors and establish the flow of information through the actors and systems. This encourages the application of modifications that correct errors without affecting other sections of the referral process. Using these requirement specifications, information bottlenecks, redundancies, and information neglect can be pin-pointed and modified. Additional bodies of knowledge were examined such as conducting interviews to acquire first-hand accounts of what should be altered to reduce errors within the referral process, what the technology was capable of from the developer's perspective, and feedback from a technology expert and a domain expert were gathered to develop the best workflow design for the electronic referral system. This allows for the design of a solution based solely on the needs and requirements of the organization.

In addition to separating the main aspects of the current system into smaller parts and analyzing them, the electronic referral system also has to be analyzed and developed specifically for the NSHSC workflow. This requires developing a set of functional requirements or a list of requests of what the system is capable of doing to satisfy the daily needs of the clinical activities within NSHSC. Interviewing Clinicians, ASP's, and additional relevant staff members provided the information necessary to develop a set of functional requirements. Acting as a liaison between the business domain and the technological domain is the source of the business analysis and was an integral skill set when developing the requirements pertaining to the electronic referral system and analyzing the current referral system.

## **4.3 Data Modeling**

Gathering and articulating the evidence regarding the workflow and system requirements is an important step in developing a design solution for an organization, but also having the skill to model that information is just as important. Developing an accurate workflow diagram using Business Process Model Notation (BPMN) for example, will further explain and interpret the previously gathered information. Using knowledge management techniques such as flowcharts and decision tables are additional methods of modeling the data. These techniques use different notation for differentiating actors, locations, and systems throughout the referral process to fully separate and allow the readers and involved personnel to interpret where the information is going and to whom. Developing and including these data models within the reports allows for a well-rounded explanation of the current flow of information, problem, solution, and future flow of information.

## **4.4 Standards Architecture**

Once the steps have been taken to analyze the current system and design an appropriate solution, there are various security and privacy legalities for the electronic referral system to adhere to; this is referring to standards architecture. Designing an electronic referral system must follow strict electronic data interchange standards as patient information is very sensitive and confidential. There

is a standard that has been developed specifically for health information called Health Level 7. It is this standard that dictates the message format when transferring patient information. NSHSC must adhere to this standard. Additionally, the privacy and security of transferring patient information must closely follow the rules of the Personal Health Information Act (PHIA). This Act outlines the duties of the custodian of the information and any upgrades or modifications require a Privacy Impact Assessment (PIA) to ensure all rules are being followed by the organization.

Each of these subject areas within Health Informatics has contributed to the overall development, completion and success of the two main projects completed throughout the internship period, the CMS User Reference Manual and the Electronic Central Referral Intake System Feasibility Report.

### **5.0 Health Informatics Problem Analysis**

The most persistent issue with the current referral process was variance in the clinical pathway that resulted in reduced patient access, more specifically, the paper format of the incoming patient referrals were being misplaced and those patients were not receiving the services they required.

The reason why the paper referrals were being misplaced was due to periodic pre-registering, which is when there is too much time between receiving the referral from a patient and pre-registering the referral in Nightingale On Demand, lack of policies and standards regarding the referral process, and there were too many staff members touching the referral, such as, when an ASP would hand the referral to a Clinician for additional consultation. These reasons were identified after developing and analyzing the workflow, gathering information concerning the gap between time of referral receipt and time of referral pre-registration, and how many personnel had contact with each referral. Once the data had been gathered and the problem origin identified, solutions began developing.

### **5.1 Health Informatics Solution Development**

To reduce the volume of misplaced paper referrals, policies can be introduced to standardize the referral workflow and job roles can be altered to absorb more responsibility. Implemented policies would focus on the removal of periodic pre-registering. The new standard is that once a referral is received, it is to be pre-registered within the same day. This addresses losing the paper format of the referral and removing any evidence of the patient resulting in the patient unable to receive services. If a rigid policy stated that the referral must be pre-registered within one day of receiving the referral, there would be a decreased chance of misplacing the paper format of the referral. To further reduce the volume of misplaced referrals due to too many staff members handling the referral, a policy will be implemented stating that the entire referral process should only include 1-2 people. This is dependent on educating the ASP on how to triage referrals, accurately separating the urgent and non-urgent referrals. These policies have been initiated at NSHSC and will be closely monitored to ensure that the result is a decrease in lost referrals and an increase in patient access.

Workflow policies are solutions that can soon be initiated and active within the work culture. Another solution that is being currently investigated to address the errors associated with the current referral process is the electronic referral system. This system would build on the policies regarding the change in responsibility of the ASP and pre-registering referrals within one working day. The electronic referral system would use an electronic referral form available on the NSHSC website,

secure transfer of patient information, a database, and an interface with Nightingale On Demand to further decrease the volume of lost referrals. This method of receiving and managing referrals using Nightingale On Demand would erase the risk of losing the paper format of the referrals as it removes the need to store the paper referrals. Personnel would receive alerts notifying an incoming referral and once triaged and pre-registered, the patient can be easily waitlisted, booked in for an appointment, and assigned a Clinician, all completed within the same software.

An electronic referral system would mitigate the errors associated with the current referral process, misplaced referrals, while building on the policies that are being initiated at this point in time. The referrals would still have to be manually pre-registered within the Nightingale On Demand and the ASP's would still be expected to perform triage and treat the referral according to the level of urgency. The policies can be developed and implemented now and when the electronic referral system is implemented, these policies will already be in place and functioning efficiently easing the transition of the electronic referral system.

## **6.0 Recommendations**

The identification and analysis of the variance in the clinical pathway resulted in the development of a number of solutions in order to remedy this variance. Policies and an eReferral system have been proposed as potential solutions to the errors associated with the current referral process.

### **6.1 Policy Recommendation**

Two main policies are being investigated to correct the workflow errors associated with the referral process. Currently, referrals are being misplaced due to the number of personnel consulting on one referral and the practice of pre-registering referrals after several days of accumulation. To correct these errors, the new policy will dictate that the ASP will absorb all triage responsibilities, this reduces the need for extra consultation while reducing the number of personnel involved in triaging one referral. Instead of handing the referral to various clinicians for direction, the ASP will have the authority to triage each incoming referral, conclude that it is urgent or non-urgent and waitlist or book the patient accordingly. In addition, the practice of periodically pre-registering the incoming referrals will no longer be acceptable. Personnel must pre-register the incoming referral within one day of receiving it. Together, these two policies will reduce the volume of misplaced referrals due to workflow errors. These policies can be implemented as soon as possible and ASP's can begin the training for triage.

### **6.2 eReferral Recommendation**

The eReferral system would build on the error reduction seen with the implementation of the policies. An eReferral system would effectively eradicate the risk of misplacing the paper referrals, further increasing patient access. Using an electronic referral form available on the NSHSC website, secure data transmission, a database, and an interface within Nightingale, patients will be able to refer themselves or others, send in their referral form electronically, and know that their referral form has reached the correct location and will not be misplaced. The eReferral system is able to function within the current flow of information, which eases the adoption of such technology. The eReferral system flow of information includes the patient accessing the referral form on the NSHSC website

providing extensive patient information and pressing submit once the form has been completed. The captured patient information is securely transmitted to an eConsult module within Nightingale On Demand. It is at this point where NSHSC personnel will receive a notification of an incoming patient referral where they have the option to view and accept or decline the referral. An accepted referral form may be triaged, pre-registered, added to the site wait list or assigned to a Clinician and booked into that Clinician's schedule. The Clinician also receives a notification of a newly assigned referral and can review and triage the referral and begin to make preparations for therapy and treatment. An activity log will track the referrals throughout their lifespan for security purposes. The eReferral system augments the existing flow of information regarding referrals within NSHSC; there are no significant alterations or changes regarding information flow or personnel responsibility. Implementing an eReferral system would increase patient access, reduce workflow errors, and provide integral data analytics encouraging action based on evidence and further technology adoption.

## **7.0 Conclusion**

Nova Scotia Hearing and Speech Centres have been providing services to those in need for over 50 years, processing approximately 25,000 referrals each year. Therefore, NSHSC must have an efficient method for receiving and managing these referrals. The author's position as the Database/Technology Design Student allowed for the exploration of the referral process from start to finish and the in depth analysis of this process. The exposure led to identifying the reasoning behind variance in the clinical pathway resulting in reduced patient access while contributing to projects that benefit personnel, future initiatives, and encourage technology in the workplace. The variance in the clinical pathway was identified using health informatics techniques and methods of investigation such as business analysis, project and knowledge management, and data modeling. The solution to this problem was presented also using valuable health informatics techniques relying heavily on data modeling, standards architecture and knowledge management tools such as workflows and diagramming tools. These education materials were also used to develop a set of recommendations to plan and implement the proposed solution. These recommendations included developing a set of policies to modify and streamline the referral workflow, altering the job responsibilities of personnel to absorb additional tasks, and implementing an eReferral system to manage the incoming referrals. The end result is an Electronic Central Referral Intake System Feasibility Report that expands on how NSHSC would initiate developing and implementing an electronic referral service for their current needs.

## 8.0 References

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