Evaluation of the Provincial Electronic Health Record HEALTHe NL and the HEALTHe NL Online Learning Module: The Nurse Practitioner Perspective

by

© Carolyn Morgan

A report submitted to the School of Graduate Studies in partial fulfillment of the requirements for the degree of

Master of Nursing

Faculty of Nursing

Memorial University of Newfoundland

December 2019

St. John's Newfoundland and Labrador

Abstract

Background: Newfoundland and Labrador's Electronic Health Record, HEALTHe NL, provides clinicians with a holistic view of their patients' health information. The HEALTHe NL online learning module was implemented in April 2018 to facilitate the orientation and adoption of HEALTHe NL into clinical practice. The current versions of these electronic systems had not been evaluated to date.

Purpose: Evaluation of HEALTHe NL and the online learning module from the perspective of nurse practitioners (NPs) was important to determine the benefits and challenges of these electronic systems, to enhance patient care, and to improve the availability of relevant content to healthcare providers.

Methods: The following methods were used: 1) literature review, 2) consultations with NPs and the Newfoundland and Labrador Centre for Health Information employees via semi-structured interviews and email, 3) environmental scan with other provinces throughout Canada via email, and 4) survey development using SurveyMonkey.

Results: A survey was disseminated to 147 NPs in Newfoundland and Labrador who are active HEALTHe NL users. Questions focused on the content featured under each of the five tabs in HEALTHe NL and organized under headings associated with the Delone and McLean framework: 1) system and information quality, 2) service quality, 3) use and intention to use, 4) user satisfaction, 5) net benefits and, 6) demographic information. Survey results were positive. Participants were 'very satisfied' with HEALTHe NL, 'definitely' likely to recommend it, and 'one-on-one demonstration' was rated as the preferred method of training.

Conclusion: The results of this evaluation survey will help support the continued use of these electronic systems, help promote the continuity of patient care, and help to identify ways to improve utilization of HEALTHe NL in the future.

Acknowledgements

I would like to thank Jill Bruneau, Margarita Coronado, Nicole Gill, Stephanie Hawco, Piotr Krajewski, Elizabeth Mallam, Aaron Morgan, Danielle Porter, Lauren Sinclair, Gillian Sweeney, and June Quilty-Clarke for their continued support, assistance, and encouragement throughout this project.

Table of Contents

Abstract i
Acknowledgements ii
Table of Contents iii
List of Appendices v
Introduction 1
Background 1
Current Issue 2
Proposed Solution 3
Practicum objectives 3
Overview of methods 4
Summary of Literature Review 5
Benefits of EHRs 6
Challenges of EHRs 6
Evaluation methods of EHR use 6
Evaluation of EHR training methods 8
Summary of Consultations 9
Consultation with NLCHI employees 9
Consultation with nurse practitioners 10
Summary of Environmental Scan 11
Environmental report 11
Development of an Evaluation Survey 12
Participants and survey 14
Ethical considerations 14
Overview of Evaluation Survey Results 15
Demographic summary 15
Evaluation of HEALTHe NL 15
Use and intention to use summary 15
System quality and information quality summary 15

User satisfaction summary 16
Net benefits summary 17
Evaluation of the HEALTHe NL Online Learning Module 17
Service quality summary 17
Survey Comments Summary 18
Advanced Nursing Practice Competencies 19
Leadership competency 19
Consultation and collaboration competency 19
Next Steps 20
Conclusion 20
References 22

List of Appendices

Appendix A: Integrative Literature Review

Appendix B: Consultation Report

Appendix C: Environmental Scan Report

Appendix D: HEALTHe NL User Survey

Appendix E: Evaluation Survey Report

Introduction

Electronic health records (EHRs) are systems that compile a lifetime record of a person's health history from hospitals, physicians, pharmacies, clinics, and laboratories. This information is crucial for the delivery of treatment and the continuity of patient care (Office of the Auditor General of Canada, 2010). The Newfoundland and Labrador Centre for Health Information (NLCHI) along with its partner, Orion Health, designed HEALTHe NL, the provincial EHR for Newfoundland and Labrador (NL). HEALTHe NL provides accurate and reliable data to authorized health care professionals to improve the delivery of health care across our province. This EHR links the four regional health authorities together and allows clinicians to have a holistic view of their patients' clinical documents, laboratory reports, diagnostic imaging reports, medication profiles, and immunization records. HEALTHe NL contains information from the client registry, the pharmacy network, the picture archiving and communications system (PACS), laboratory information system, and client and referral management system (CRMS). This EHR provides nurse practitioners and healthcare professionals with timely and secure access to patients' health records (NLCHI, 2019).

Background

Currently, nurse practitioners can use HEALTHe NL to review clinical documents, laboratory reports, diagnostic imaging reports, medication profiles, and immunization records. There are five tabs within HEALTHe NL: patient summary, timeline, encounters, medication profile, and immunizations. Nurse practitioners are required to complete medication reconciliations, and verify previous and current opioid

prescriptions prior to prescribing, as mandated by the Government of NL *Prescription Monitoring Act*. Medication reconciliation is the process of creating the most accurate list of all medications that a patient is currently taking (The Institute for Healthcare Improvement, 2019). The *Prescription Monitoring Act* was implemented in the province to help address the present and growing opioid issue (The Government of Newfoundland and Labrador, 2019). The nurse practitioner is responsible for comparing the list of the patient's medications with the admission, transfer, and/or discharge medication orders, and to ensure the correct medications are listed for each patient at all transition points within the hospital. If the patient has active medications at many different pharmacies, they will all print in one accurate list as a result of using HEALTHe NL.

Current Issue

With increasing adoption of EHRs, effective training processes to support the appropriate use of these electronic systems for nurses, and other healthcare providers, are of great importance (Ward, Vartak, Schwichtenberg, & Wakefield, 2011). Although EHRs, and their associated training procedures have received considerable research across Canada and the United States; the current version of the HEALTHe NL EHR had not been evaluated.

In addition, the related HEALTHe NL online learning module was developed in February 2018 and implemented in April 2018. The module had not been evaluated by healthcare providers to determine its benefits and challenges. Collecting this feedback from nurse practitioners will help support the continued use of these electronic systems,

the continuity of patient care, and identify ways to improve the module to better serve the learning process for future nurses and healthcare providers.

Proposed Solution

For the purpose of this practicum project, HEALTHe NL and the HEALTHe NL online learning module was evaluated. To determine the best method of evaluation, a literature review was completed to identify the benefits and challenges of EHRs, the methods of EHR evaluation, training methods for EHR implementation, and the evaluation of EHR training methods. In addition, a consultation plan was completed with NLCHI employees and nurse practitioners, and an environmental scan was conducted with other provinces in Canada. An implementation and evaluation plan was determined and a survey was developed and sent to nurse practitioners across the province who are current active HEALTHe NL users. Evaluating HEALTHe NL and the online learning module identified the benefits and challenges of using these electronic systems and the impact these systems have on the clinical practice of nurse practitioners. These results will help drive future enhancements to these electronic systems and the continued increase in HEALTHe NL adoption rates.

Practicum objectives. To evaluate HEALTHe NL and the HEALTHe NL online learning module and determine the impact these electronic systems have on the clinical practice of nurse practitioners working in the province of NL, the following objectives were identified:

1. To evaluate the benefits and challenges of using the provincial electronic health record, HEALTHe NL.

2. To understand nurse practitioners' perspectives on the strengths and weaknesses of using HEALTHe NL in relation to clinical practice.
3. To evaluate the nurse practitioners' perspectives on the strengths and weaknesses of the HEALTHe NL online learning module.
4. To demonstrate application of advanced practice nursing competencies.

Overview of methods. Five practicum methods were identified to assist with the evaluation of HEALTHe NL and the related online learning module: literature review, consultation plan, environmental scan, and the development of a survey.

The first method was a literature review. A literature search was conducted using PubMed, CINAHL, Embase, and the Cochrane Library to identify literature pertaining to EHRs, methods of evaluating EHRs, and the benefits and challenges of online learning modules for nurse practitioners.

The second method was a consultation plan. In consultation with the NLCHI Applications team, a statistical report was requested and generated to determine the number of nurse practitioners within the province of NL who are current active HEALTHe NL users. The nurse practitioners were identified as the key stakeholders for this practicum and were the focus of this evaluation. Two nurse practitioners on the cardiology unit at the Health Sciences Centre in St. John's, NL were consulted regarding survey content and the ideal length of time to complete it. The survey was sent to nurse practitioners via email with a link to the survey. I confirmed with the NLCHI that I could access and utilize SurveyMonkey to develop, implement, and evaluate the survey. I consulted with the Vice President of Clinical Information Programs & Change

Leadership at the NLCHI. The approval of my practicum project was granted and my survey aligned with the mandate of the organization. I consulted with the Manager of HEALTHe NL and the Change Management team and identified content to include in the survey to support this practicum project and the program initiatives at the NLCHI.

The third method was an environmental scan. Four provinces were selected: Nova Scotia, Ontario, Alberta, and Saskatchewan. An email was individually sent to each province to gather information on the evaluation of their EHR and EHR online learning module. Two out of the four provinces responded with feedback that was considered during the development of the survey.

The fourth method was the development of the survey using SurveyMonkey and the distribution of the survey to nurse practitioners throughout the province who are active HEALTHe NL users. The survey was developed using the DeLone and McLean Framework and feedback was collected from nurse practitioners to determine the benefits and challenges of HEALTHe NL and the online learning module, and the impact these electronic systems have on their clinical practice. Survey results were collected, reviewed, and conclusions drawn to determine what components of HEALTHe NL and the online learning module warrant action.

Summary of Literature Review

As seen in Appendix A, **t**he literature review highlighted the benefits of EHRs, the challenges of EHRs, the evaluation methods of EHR use, training methods for EHR implementation, and the evaluation of EHR training methods.

Benefits of EHRs. The benefits of EHRs are extensive and have been well documented in the research literature. These benefits include: the provision of effective patient care, improved clinician adherence to clinical practice guidelines, ease of access to patient information, improved knowledge of clinical guidelines, decreased health care costs, reduced duplication of diagnostic testing, reduced medication errors, reduced adverse effects, and improved workflow and efficiency in nurses' clinical practice. These benefits are all instrumental reasons for the continued use and application of EHRs.

Challenges of EHRs. It is important to understand the challenges of EHRs to determine how they apply to clinical practice and how EHR developers can improve these systems to support the workflow of nurse practitioners and other healthcare providers. The research identified the following challenges: negative financial implications for organizations, loss of work productivity, privacy and security concerns, nurses' workflow issues, and nurses' challenge with information technology in relation to EHRs. It is important to understand and consider these challenges when implementing EHRs in order to improve the overall quality of the EHR and the continuation of EHR use.

Evaluation methods of EHR use. Based on this research, surveys are often used as a method to evaluate EHRs and is an appropriate method to use for the purpose of this practicum project. The seven dimensions of the DeLone and McLean Framework: system quality, information quality, service quality, use, intention to use, user satisfaction, and net benefits should be considered when developing an evaluation tool. The DeLone and McLean Framework supports the evaluation of EHRs and the seven

dimensions were used to develop and organize a survey to evaluate HEALTHe NL and the HEALTHe NL online learning module.

Training methods for EHR implementation. Determining the preferred training methods of nurse practitioners and other healthcare professionals is imperative; this will support the implementation, adoption, and follow-up training required for EHR use. There are many different types of training methods that can used for the implementation of EHRs such as: e-learning, interactive techniques, online education in the form of video tutorials, web-based training modules, and training videos with an emphasis on patient-provider communication. Dalhem and Saleh (2014), conducted a study and the majority of nurses preferred e-learning. The results of the study highlighted a positive impact of e-learning courses on nurses' satisfaction. The majority of nurses' agreed that e-learning courses met their goals and objectives. According to Green and Huntington (2017), online education has proven to be useful for nurses demanding work schedule, and especially for those who work only night shifts. In addition, Nicklaus, Kusser, Zessin, and Amaya (2015), conducted a study that focused on web-based EHR training modules. The researchers separated the EHR training into short sections that were completed in 10 to 15 minutes. This type of training method promoted self-regulated learning among healthcare professionals.

These different training methods are essential to consider when conducting future enhancements to HEALTHe NL and the online learning module. It is critical to identify the most efficient training method to educate nurse practitioners while at the same time supporting their busy work schedule.

Evaluation of EHR training methods. The research has identified different training methods for EHR implementation such as teaching and practice sessions, instructor-led and blended training, educational interventions and training, and e-learning. It is essential to determine the most effective method of training when implementing EHRs to nurse practitioners and other healthcare providers. Edwards, Kitzmiller, and Breckenridge-Sproat (2012), conducted a study to determine staff satisfaction with health information technology training. Results indicated there was no difference between the mean learning satisfaction scores among the traditional instructor-led and blended learning. The participants of this study were equally satisfied with either method of training. Goveia et al. (2013), conducted a literature review to identify and determine what educational interventions and training are effective to improve the meaningful use of EHRs for specialist nurses, nurse practitioners, registered nurses, physicians, medical residents, and paramedics. The researchers determined classroom training, computer-based training, and feedback were the most effective methods of training to improve the meaningful use of EHRs.

Currently, clinicians are being directed to complete training for HEALTHe NL by referring to an online learning module. Following the evaluation of the HEALTHe NL online learning module, it is important to determine if this online learning module is the most effective way to educate nurse practitioners or if another avenue of training should be considered to support future enhancements to this electronic system.

Literature review summary. The findings of this literature review supported the purpose of this practicum project and helped with the development of a survey to

evaluate HEALTHe NL and the related online learning module for nurse practitioners in the province of NL. Collecting feedback from nurse practitioners will help support the continued use of these electronic systems, the continuity of patient care, and identify ways to improve the module to better serve the learning process for future nurses and healthcare providers.

Summary of Consultations

For the consultations, templates were developed with questions for the NLCHI employees and the nurse practitioners'. Templates were discussed or sent to each individual separately. Feedback was obtained through semi-structured interviews or via email and responses were reviewed to identify common themes. All responses from the consultations were compiled and can be found in the consultation report. The consultation report can be found in Appendix B.

Consultation with NLCHI employees. All identified objectives were met. I received responses from all of the NLCHI employees. The responses from the NLCHI employees were analyzed and four themes were identified: HEALTHe NL online learning module functionality, HEALTHe NL online learning module accessibility, HEALTHe NL education materials, and HEALTHe NL functionality.

HEALTHe NL online learning module functionality. Three participants reported they would like to see information in the survey that focuses on whether the online learning module was engaging for clinicians and how the module could be improved.

HEALTHe NL online learning module accessibility. The participants suggested to focus on why the user might stop watching the online learning module; to include open ended questions to determine necessary system enhancements; to determine if users would prefer to only watch the videos related to their access and usage of HEALTHe NL; to provide a link between each tab in HEALTHe NL and the related training video; and to provide a telephone number at the end of each video.

HEALTHe NL education materials. The participants responded they would like to determine if users would complete a quiz feature following the online learning module; if a help feature or live chat feature would be beneficial; if there is value in the education material; and what training materials users prefer.

HEALTHe NL functionality. The participants responded they would like to determine if users have difficulty creating passwords; difficulty changing their passwords; if the document view is confusing; if they understand the functionality of the merge icon; if the design of the medication profile supports their workflow; and if HEALTHe NL is missing any required data or results.

Consultation with nurse practitioners. Two out of the three nurse practitioners responded. The responses from the nurse practitioners' were analyzed and three themes were identified: regular usage, willingness to participate, and accuracy and feedback.

Regular usage. The nurse practitioners are using HEALTHe NL daily on patient admission and discharge.

Willingness to participate. The nurse practitioners are willing to spend ten minutes completing a survey.

Accuracy and feedback. The nurse practitioners identified the content of the survey should focus on the accuracy and confidence of the system and patient medications. In addition, the survey should contain a comment section.

Implication for evaluation. Consulting with the identified NLCHI employees and nurse practitioners assisted me to develop the survey to evaluate nurse practitioners' perspectives of HEALTHe NL and the related HEALTHe NL online learning module. Content identified by the employees at the NLCHI were included in the survey to benefit multiple program areas at the NLCHI. Conducting this survey with nurse practitioners identified ways to improve HEALTHe NL and the online learning module to support the continued use of these electronic systems, the continuity of patient care, and better serve the learning process for future nurse practitioners and other healthcare providers.

Summary of Environmental Scan

For the environmental scan, a template was developed with questions for each of the four provinces: Nova Scotia, Ontario, Alberta, and Saskatchewan. The template was individually sent to each province via email. Feedback was obtained via email and responses were reviewed and documented in the environmental scan report. The environmental scan report can be found in Appendix C.

Environmental report. All identified objectives were met. Responses were received from two of the four provinces. Two of the other provinces were contacted a second time via email with no response. One province had evaluated their EHR and EHR online learning module. The method of evaluation that was used consisted of administrative data, interviews, focus groups, system and use survey, review of project

documents, and the completion of a literature review. The other province is currently preparing to evaluate their EHR by using focus group meetings and distributing a small survey. Their target audience is physicians, nurses, medical office assistants, and pharmacists.

Implication for evaluation. It was important to consider the feedback from these provinces when developing the survey to evaluate HEALTHe NL and the online learning module. Based on these results, I incorporated focus group questions into the survey design. These sessions would allow nurse practitioners to offer feedback and be engaged in the development and prioritization of enhancements to HEALTHe NL and the online learning module in the future.

Development of an Evaluation Survey

The development of the survey was based on the DeLone and McLean Framework. This framework has been widely used to support the research design and data collection methods used to evaluate information systems (Bossen, Jensen, & Udsen, 2013; Nguyen, Bellucci, & Nguyen, 2014). This framework focuses on the seven dimensions that evaluates the success of information systems: system quality, information quality, service quality, use, intention to use, user satisfaction, and net benefits. Bossen et al. (2013), based their research study on this framework and chose to conduct a formative evaluation, which was intended to improve EHRs by presenting system providers with feedback from their users. The dimension, 'information quality' focused on whether the data in the EHR is relevant to the clinical work of clinicians. This information was retrieved by asking the follow question: Does the EHR provide you

with the information you need for your work? (Bossen et al., 2013). 'System quality' focused on whether the system has the required functionality to support the workflow of clinicians. This was addressed by the following question: Has it been easy for you to learn how to use an EHR? (Bossen et al., 2013). 'Service quality' investigated the support available to clinicians with regards to user training. The following question focused on this dimension: Are you satisfied with the available user guides and help functions? (Bossen et al., 2013).

The questions developed to evaluate HEALTHe NL and the online learning module focused on these key attributes. As shown in Appendix D, the survey was organized using the following headings from the DeLone and McLean Framework: use and intention to use, system quality and information quality, service quality, user satisfaction, and net benefits. In addition, demographic information questions were included in the survey. The HEALTHe NL survey questions focused on the content featured under each of the five tabs in HEALTHe NL: Patient Summary, Timeline, Encounters, Medication Profile, and Immunizations. Questions were organized using the following headings from the DeLone and McLean Framework: use and intention to use, system quality and information quality, user satisfaction, and net benefits. The HEALTHe NL online learning module questions were organized using the service quality heading from the DeLone and McLean Framework. This framework helped organize and focus the survey to gather pertinent information from nurse practitioners to support potential enhancements to HEALTHe NL and the online learning module.

Participants and survey. There are 183 nurse practitioners' in the province of NL and this group were identified as the target audience for this evaluation. The survey was developed and results collected through SurveyMonkey. The survey was individually sent via email to 147 nurse practitioners' who are active HEALTHe NL users. The email contained an introduction and link to the survey. The survey was disseminated on October 4th, 2019. Two additional emails were sent to 147 nurse practitioners reminding them to complete the survey. The survey closed on October 20th, 2019. Sixty-five nurse practitioners completed the survey (44% response rate). The results of the survey were analyzed using SurveyMonkey.

Ethical considerations. All of the nurse practitioners were notified that all feedback received would remain confidential. They were provided with three options with regards to the use of their responses to the SurveyMonkey questions: 1) to be used for the purpose of this practicum project, 2) to be used by the NLCHI, or 3) to be used for both purposes. My position as a Memorial University of Newfoundland (MUN) master student and as an employee of the NLCHI was disclosed. The Health Research Ethics Authority (HREA) Screening Tool was competed and the HREA was contacted. Ethics approval was not required for this practicum project and 100% of nurse practitioners agreed to take part in the survey for the purpose of this practicum project. A potential limitation to this practicum report is my position as a MUN master student and as an employee of the NLCHI. Participant knowledge of this could have potentially affected their responses to the survey questions.

Overview of Evaluation Survey Results

The survey results were evaluated using SurveyMonkey and the results were presented in diagrams as seen in Appendix E. The following survey results will be presented using the dimensions of the DeLone and McLean Framework.

Demographic summary. The majority of nurse practitioners have been using HEALTHe NL for 1 to 2 years, are 45-54 years old, and work within Eastern Health in a Community Clinic/Health Center. Also, the majority have only worked in NL, which indicates they do not have experience with EHRs outside of HEALTHe NL. This is a limitation, as their responses are based on the knowledge of one EHR.

Evaluation of HEALTHe NL

Use and intention to use summary. The majority of nurse practitioners are accessing the medication profile, which is not a surprise based on previous feedback I have received from clinicians. One hundred percent of community pharmacies province-wide are connected to the pharmacy network and this patient medication information is located in HEALTHe NL. This is the only electronic system in the province that provides nurse practitioners access to patient community pharmacy medication information to support the completion of their patients' medication reconciliations. In addition, the majority of nurse practitioners are using HEALTHe NL regularly and feel they are proficient using it, which implies they see benefit in the system.

System quality and information quality summary. HEALTHe NL contains dictated clinical documents, but does not contain scanned handwritten documents. Nurse practitioners are having to rely on Meditech to look up scanned documents, resulting in

having to use two different systems. The majority of nurse practitioners responded it would benefit their practice to have scanned documents and the Meditech nursing module documents available in HEALTHe NL. This is pertinent information to present to the HEALTHe NL Clinical Advisory Committee at the NLCHI to determine if this would be a future enhancement. The majority of nurse practitioners also responded they did not know the meaning of the merge icon or how to use it. It is evident that future communication and education is required. Not having this knowledge could impede their ability to access patients' information in HEALTHe NL.

The majority of nurse practitioners also responded that having access to the medication profile in HEALTHe NL has supported the timely completion of their patients' medication reconciliations. It would be beneficial to conduct future research to compare how long nurse practitioners spent completing medication reconciliations when they had to call the patients pharmacist to retrieve a list of their medication history versus accessing this information in HEALTHe NL. It would also be interesting to determine if more medication reconciliations are being completed on night shifts now that the nurse practitioner does not have to rely on the pharmacy being open to retrieve this information. They can now access this information in HEALTHe NL at any time of the day.

User satisfaction summary. The majority of nurse practitioners were very satisfied with HEALTHe NL and definitely likely to recommend it to other healthcare providers. This feedback is reflective of the benefit HEALTHe NL has on the clinical practice of nurse practitioners.

Net benefits summary. The majority of nurse practitioners have responded that HEALTHe NL contributes to the quality of patient care a considerable amount. In addition, the majority of nurse practitioners strongly agree that HEALTHe NL reduces medication errors and adverse events, and enhances patient safety. It would be beneficial to conduct future research to determine if medication errors and adverse events have decreased in the healthcare setting since the inception of HEALTHe NL.

Evaluation of the HEALTHe NL Online Learning Module

Service quality summary. The majority of nurse practitioners agreed the HEALTHe NL online learning module training they received was adequate, which is comparable to the number of nurse practitioners that agreed the one-on-one training they received was adequate. This indicates that both methods of training are effective. The majority of nurse practitioners responded that one-on-one is their preferred method of training, which is comparable to the number of nurse practitioners that prefer online education in the form of video tutorials. Currently, the NLCHI has been moving away from one-on-one training and are now directing nurse practitioners and other clinicians to the HEALTHe NL online learning module. These results indicate the NLCHI should inquire which method of training is preferred and have the ability to offer either method. The majority of nurse practitioner rated their computer proficiency as “proficient,” which could imply they have the knowledge and ability to access the HEALTHe NL online learning module and also navigate HEALTHe NL.

Survey Comments Summary

Individual responses from the nurse practitioners were listed verbatim under the related question and analyzed for common themes. Four common themes were identified: benefits, challenges, education, and enhancements. As indicated in Appendix E, the majority of the comments gathered from nurse practitioners identified challenges associated with the medication profile. A meeting with the Manager of Pharmacy is required to review these results and identify key areas of focus. The other key areas of focus that will be presented to the NLCHI are comments surrounding the display of laboratory results in HEALTHe NL. It would be beneficial to have these results displayed as they are in Meditech. Nurse practitioners identified having scanned documents available in HEALTHe NL would also be beneficial. There is a significant amount of patient information that is not dictated into Meditech and currently remains paper based. Not having this information available in HEALTHe NL could be causing a gap for nurse practitioners in accessing their patients' full health history. It was also identified it would be beneficial for HEALTHe NL to have the functionality to link hospital patient records with the community patient records from CRMS and the Electronic Medical Record (EMR), including medications dispensed by the hospital pharmacy, and allergy information from Meditech. This highlights a potential gap for nurse practitioners, as their visibility of what medications the patient is taking while in one hospital prior to the patient being transferred to another hospital can be limited. Nurse practitioners also identified the need for HEALTHe NL to display patient hospital appointment information. It is important to address these identified enhancement

requests to improve HEALTHe NL and support the clinical practice of nurse practitioners.

Advanced Nursing Practice Competencies

As per the Canadian Nurses Association (2019) document, "Advanced Practice Nursing: A Pan-Canadian Framework," the advanced nursing practice competencies identified were the leadership competency and the consultation and collaboration competency.

Leadership competency. This competency was met. One hundred and forty-seven (147) nurse practitioners throughout the province of NL who are current active HEALTHe NL users were identified. A survey was developed to identify the benefits and challenges of HEALTHe NL and the related HEALTHe NL online learning module, to determine its impact on the clinical practice of nurse practitioners.

Consultation and collaboration competency. This competency was met. Nurse practitioners, NLCHI employees, and my practicum supervisor, Jill Bruneau were consulted. To support the development of a survey to evaluate HEALTHe NL and the HEALTHe NL online learning module, I completed a literature review and an environmental scan of other provinces in Canada. Incorporating my literature search findings, such as the DeLone and McLean Framework into the survey, supported the development and organization of pertinent information to help evaluate HEALTHe NL and the online learning module from the perspective of nurse practitioners throughout the province. Gathering this information from nurse practitioners is pivotal to support the continued use of these electronic systems, to enhance the continuity of patient care, and

to help identify ways to improve the module to better serve the learning process for future nurses and healthcare providers.

Next Steps

In the near future, I hope to present this practicum project and survey results to the NLCHI. I will meet with the HEALTHe NL program personnel and HEALTHe NL Clinical Advisory Steering Committee to discuss key findings and to determine if any of the results will be added to the organizational roadmap for future enhancements. I would like to review our current method of training with the HEALTHe NL program and start offering clinicians the option to choose to receive one-on-one training or training via the online learning module. I will also determine if the NLCHI team would like to use this survey to collect information from all users of HEALTHe NL, allowing us to gather a holistic view of HEALTHe NL from multiple disciplines throughout the province. Additionally, I will determine if the NLCHI administrative team would like these survey results to be presented at any upcoming E-Health conferences to highlight the benefits and challenges of our provincial electronic health record.

Conclusion

This final report is a reflection of all the content that has been completed during this practicum project. The goal of this practicum project was to evaluate HEALTHe NL and the HEALTHe NL online learning module from the perspective of nurse practitioners working in NL. This project was completed to determine the benefits and challenges, to enhance patient care, and to improve the availability of relevant content. This goal has been met with the completion of an abstract, practicum proposal, literature review,

consultation report, environmental scan report, interim report, the development and implementation of a survey, analysis of the survey results, presentation to faculty and students, and the completion of this final practicum report.

Sixty-five nurse practitioners completed the survey that was disseminated via email through SurveyMonkey. Their responses highlighted the benefits and challenges of HEALTHe NL and the HEALTHe NL online learning module. The results of this survey will help drive future enhancements to these electronic systems, which will support their continued use, the continuity of patient care, and the clinical practice of nurse practitioners and other healthcare providers throughout the province of NL

References

Bossen, C., Jensen, L. G., & Udsen, F. W. (2013). Evaluation of a comprehensive EHR based on the Delone and McLean model for IS success: Approach, results, and success factors. *International Journal of Medical Informatics, 82(10),* 940-953. doi: 10.1016/j.ijmedinf.2013.05.010

Dalhem, W. A., & Saleh, N. (2014). The impact of eLearning on nurses' professional knowledge and practice in HMC. *Canadian Journal of Nursing Informatics, 9(3),* 1-16. Retrieved from http://cjni.net/journal/?p=3819

Edwards, G., Kitzmiller, R. R., and Breckenridge-Sproat, S. (2012). Innovative health information technology training: Exploring blended learning. *Computer, Informatics, Nursing, 30(2),* 104-109. doi: 10.1097/NCN.0b013e31822f7f7a

Goveia, J., Stiphout, F. V., Cheung, Z., Kamta, B., Keijsers, C., Valk, G., & Braak, E.T. (2013). Educational interventions to improve the meaningful use of electronic health records: A review of the literature: BEME guide no. 29. *Medical Teacher, 35(11),* 1551-1560. doi: 10.3109/0142159X.2013.806984

Government of Newfoundland and Labrador. (2019). *Prescription monitoring program.* Retrieved from https://www.health.gov.nl.ca/health/prescription/prescription_monitoring_program.html

Green, J. K., & Huntington, A. D. (2017). Online professional development for digitally differentiated nurses: An action research perspective. *Nursing Education in Practice, 22,* 55-62. doi: 10.1016/j.nepr.2016.11.009

Institute of Healthcare Improvement. (2019). *Medication reconciliation to prevent adverse drug events.* Retrieved from http://www.ihi.org/Topics/ADEsMedicationReconciliation/Pages/default.aspx

Jeanfreau, S. G., & Jack Jr., L. (2010). Appraising qualitative research in health education: Guidelines for public health educators. *Health Promotion Practice, 11(5),* 612-617. doi: 10.1177/1524839910363537

Newfoundland and Labrador Centre for Health Information. (2019). *HEALTHe NL*. Retrieved from https://www.nlchi.nl.ca/index.php/ehealth-systems/healthe-nl

Nguyen, L., Bellucci, E., & Nguyen, L. T. (2014). Electronic health records implementation: An evaluation of information system impact and contingency factors. *International Journal of Medical Informatics, 83(11),* 779-796. doi: 10.1016/j.ijmedinf.2014.06.011

Nicklaus, J., Kusser, J., Zessin, J., & Amaya, M. (2015). Transforming education for electronic health record implementation. *The Journal of Continuing Education in Nursing, 46(8),* 359-363. doi: 10.3928/00220124-20150721-02

Public Health Agency of Canada. (2014). *Infection prevention and control guidelines: Critical appraisal tool kit.* Retrieved from http://publications.gc.ca/collections/collection_2014/aspc-phac/HP40-119-2014-eng.pdf

Appendix A

Literature Review

Carolyn Morgan

Memorial University

Electronic health records (EHRs) are systems that compile a lifetime record of a person's health history from hospitals, doctors, pharmacies, clinics, and laboratories. This information is crucial for the delivery of treatment and the continuity of patient care (Office of the Auditor General of Canada, 2010). In 2013, the Newfoundland and Labrador Centre for Health Information (NLCHI), along with its partner Orion Health, designed HEALTHe NL, the provincial EHR for Newfoundland and Labrador (NL). With increasing adoption of EHRs, effective training processes to support the appropriate use of these electronic systems for nurses, and other healthcare providers, are of great importance (Ward, Vartak, Schwichtenberg, & Wakefield, 2011). Although EHRs, and their associated training procedures have received considerable research across Canada and the United States; the current version of the HEALTHe NL EHR and the related HEALTHe NL online learning module have not been evaluated. The following literature review considers the applications of EHRs, the benefits and challenges of EHRs, the methods of EHR evaluation, training methods for EHR implementation, and the evaluation of EHR training methods.

Current use of Electronic Health Information in NL

The provincial EHR in NL, HEALTHe NL aims to provide accurate and reliable data to authorized healthcare professionals to improve the delivery of health care across the province. This EHR offers clinicians a holistic view of their patients' clinical documents, laboratory reports, diagnostic imaging reports, medication profiles, and immunization records. HEALTHe NL contains information from the client registry, the pharmacy network, the picture archiving and communications system, and the laboratory

information system (Newfoundland and Labrador Centre for Health Information, 2019). In February 2018, an online learning module for HEALTHe NL was created for training purposes, and first implemented in April 2018. The current version of HEALTHe NL has not been evaluated, nor has the related HEALTHe NL online learning module. Evaluating these electronic health systems will identify their strengths and challenges, as well as assess the value and issues associated with EHR use in the clinical practice of nurse practitioners. Reviewing the literature used to evaluate EHRs will help determine the best plan to evaluate HEALTHe NL and the related online learning module in order to improve the delivery and online training for HEALTHe NL across the province.

Literature Search Strategy

This literature search was conducted using PubMed, CINAHL, Embase, and the Cochrane Library. In addition, a search of grey literature was completed. Key terms such as "electronic health record," "EHR," "nurse," "healthcare provider," "professional," "benefits," "challenges," and "clinical practice" were used to search for literature pertaining to the benefits and challenges of using an EHR. In addition, "module," "online learning," "nurse," "advanced practice nurse," "digital health," "survey," and "evaluation" were used in the search for literature pertaining to conducting a survey to determine the benefits and challenges of online learning modules for nurse practitioners. Articles from the years 2008 to 2019 were reviewed. Literature summary tables for each of the quantitative research articles were completed (Appendix A), using the "Infection Prevention and Control Guidelines: Critical Appraisal Tool Kit" (Public Health Agency of Canada, 2014). The qualitative research articles were assessed using

"Appraising Qualitative Research in Health Education: Guidelines for Public Health Educators" (Jeanfreau & Jack Jr., 2010).

Background

The development and adoption of EHRs have spread across Canada, and they are currently being used by a variety of healthcare professionals (Srivastava, 2018). In 2001, Canada Health Infoway was created by Canada's First Ministers to build a pan-Canadian electronic health record network that would manage personal health information in Canada. Since 2001, EHRs have been implemented in numerous provinces across Canada with the goal of linking our hospitals, clinics, and pharmacies together to enhance the quality of patient care and improve Canadians' access to health information (McGinn et al., 2012). Healthcare professionals' interest in EHRs is on the rise, as indicated by their growing adoption rates (Canada Health Infoway, 2017). Organizations continue to invest in EHR applications and processes to offer a wide range of patient health information to healthcare providers. According to Canada Health Infoway (2017), 162 000 clinicians across Canada were active users of EHRs. This number has doubled from three years prior, and it is estimated that roughly another 500 000 healthcare professionals could benefit from using EHRs in the future.

According to Canada Health Infoway (2018), to support the continued adoption of EHRs across Canada, it is important for organizations to engage healthcare professionals to identify the benefits and challenges of EHRs through evaluation in order to enhance EHR functionality and usability in daily clinical practice.

Electronic Health Record Benefits

The benefits of EHRs are extensive and have been well documented in the research literature. A core strength of these electronic systems is the direct positive impact they have on clinical outcomes; including improved patient safety (Handel & Hackman, 2008; Ledwich, Harrington, Ayoub, Sartorius, & Newman, 2009; Narcisse, Kippenbrock, Odell, & Buron, 2013; Office of the Auditor General of British Columbia, 2010). Use of EHRs can also result in positive organizational outcomes, including cost savings, protection of patient confidentiality and enhanced privacy and improved workflow efficiencies for nurses. (Office of the Auditor General of British Columbia, 2010). The strengths of EHRs are a powerful argument for their application across Canada, and a strong indicator of the potential for the continued use of the provincial EHR HEALTHe NL.

Improved patient care. Research has shown there is an improvement in the quality of patient care in multiple areas including the quality care indicators of 'effectiveness', 'efficiency' and 'patient safety' (Agency for Healthcare Research and Quality, 2018). According to the Agency for Healthcare Research and Quality (2018), effectiveness as a quality care indicator refers to the use of evidence-based clinical guidelines, and the provision of effective care. Health professionals find EHRs easily accessible; it provides them with their patients most current medical history and it is trustworthy and accurate; as a result, patients experience improved care based on current precise information. EHRs with embedded clinical reminders for clinicians improved adherence to clinical practice guidelines. In a study by Ledwich et al. (2009), the use of

EHRS with clinical reminders showed improved immunization rates of immunocompromised patients from 47% to 65% comparing pre and post implementing of use of clinical reminders.

The quality care indicator of efficiency is demonstrated across a number of EHR benefits. EHRs optimize the time required for receiving and reviewing test results as well as reduce the risk of redundant and invasive tests. These factors lead to a reduction in costs, a decrease in false-positive test results, and a decline in provincial speciality services wait times (Office of the Auditor General of British Columbia, 2010).

Further research focusing on the quality care indicator, patient safety, has indicated that EHRs have resulted in a reduction in medication errors and adverse drug reactions. Nurses actively using EHRs and working in a hospital setting have reported fewer patient safety incidents and fewer overall adverse events (Handel & Hackman, 2008; Narcisse et al., 2013). According to Kutney-Lee and Deena (2011), nurses that did not use EHRs reported a poorer overall unit grade on patient safety (31.9%) compared to nurses with a fully implemented EHR (26.9%). As well, nurses using an EHR reported 3.2% fewer medication errors compared to nurses without an EHR who reported a higher medication error rate of 4.7%.

Positive organizational outcomes. Organizational outcome benefits have also been identified in the research literature related to EHRs. Narcisse et al. (2013) reported a reduction in the costs associated with the staffing resources required to provide patient care, the supplies required to maintain paper systems, duplicate tests, and documentation transcription. According to Wallace (2015), safeguards are present within EHRs to

protect patient health information such as, encryption of data. Organizations often conduct audit reports, breach reports, and compliance enforcement to protect patient confidentiality. Gaylin, Moiduddin, Mohamoud, Lundeen and Kelly (2011), surveyed 1015 participants of the public regarding confidentiality and security of health information technology. Results revealed that 68% of participants thought health information technologies were secure and 64% agreed that the benefits outweighed the risks. Additionally, there have been reductions in billing errors and inaccurate coding, which has improved organizational revenue and enhanced cost saving initiatives (Office of the Auditor General of British Columbia, 2010). According to the Auditor General of British Columbia (2010), health administrators indicated EHRs provide a more effective use of health care dollars, improve quality of care, and support privacy and security standards. As a result of these benefits, the Canadian government supports the wide-spread dissemination of EHRs in hopes of improving long-term health care planning, and the privacy and security of patients' personal health information.

EHRs are useful for nursing. EHRs are becoming important and effective tools for nurses; tools that nurses rely on heavily when providing patient care. According to Kossman and Scheidenhelm (2008), nurses are using EHRs to complete patient documentation, care planning, treatments, admissions and discharges, and medication administration. Having access to patient records through an EHR has enhanced their overall job performance and time efficiency. They are documenting quicker and retrieving patient information at a faster rate. The ease of access to these records has supported their ability to make informed clinical decisions, therefore positively impacting

patient care. According to McQuade-Jones, Murphy, Novak, and Sarnowski (2014), the accuracy of patient information has improved with EHR use. Nurse practitioners are using EHRs to enter patient information and feedback, which is eliminating the potential for forgotten or incorrect patient information being documented. Nurse practitioners have reported having access to EHRs allows them to use their time more efficiently, as a result providing better quality patient care.

EHR adoption by nurses and nurse practitioners. The future of nursing depends on the professions willingness to be innovative in its adoption of health information technology, such as EHRs. Information technology has the potential to enhance patient safety, improve change management, assist workflow and user acceptance, and provide quality improvement (Yontz, Zinn, & Schumacher, 2015). According to Yontz et al. (2015), 89.8% of nurses were confident entering patient information into a computer, 87.2% felt that computers improved patient care documentation, and 66.6 % of nurses did not feel that computer documentation negatively impacted their ability to provide patient care.

Narcisse et al., (2013), studied advanced practice nurses age in relation to the adoption of EHRs. 34.6% of advanced practice nurses in the 35 – 45 age group are the highest EHR user group, whereas only 16.4% of advanced practice nurses who are 55 years and older will adopt EHRs. Kossman and Scheidenhelm (2008) also acknowledged that nurses across the age span of 30 – 50 years of age reported a high level of comfort with technology. Only 5% rated themselves as uncomfortable, and 83% rated themselves as very comfortable with technology; these results support the continued uptake of EHRs.

Kaya (2011) supports the notion that nurses are comfortable with technology. The sample they studied consisted of 890 nurses; results supported that nurses have positive attitudes toward technology and computers in health care, comfort using computer applications, awareness surrounding the usefulness of computers in various health care settings, and a realistic view of current information technology capabilities in health care.

Evaluation plan implications. The extensive benefits reviewed above are all instrumental reasons for the continued use and application of EHRs; from the provision of effective patient care, improved clinician adherence to clinical practice guidelines, ease of access to patient information, improved knowledge of clinical guidelines, decreased health care costs, reduced duplication of diagnostic testing, medication errors, adverse effects, and improved workflow and efficiency in nurses' clinical practice.

Challenges of Using EHRs

It is important to understand the challenges of EHRs to determine how they apply to clinical practice and how EHR developers can improve these systems to support the workflow of nurse practitioners and other healthcare providers. Research has identified a number of important considerations, including financial cost (The Office of the Auditor General of Canada, 2010), loss of productivity (Fleming, Culler, Mccorkle, Becker, & Ballard, 2011), privacy and security concerns (McMullen et al., 2014; Wallace, 2015), and potential negative impacts on clinician workflow (Narcisse et al., 2013).

Financial implications. The process of implementing and adopting EHRs, and the ongoing maintenance costs associated with EHR use, can potentially result in a loss of revenue. According to the Office of the Auditor General of Ontario (2016), from 2002

– 2016 the implementation of EHRs has cost the province and health care organizations a total of 8 billion. The Ministry does not have a clear understanding how much spending health care organizations have incurred on EHR initiatives. In addition, public funding is required to successfully complete the implementation of the EHR initiative, but the dollar amount required is unclear. It has been determine that a significant investment of taxpayer funding will be required to recognize the benefits EHRs have for patients and healthcare professionals within the province of Ontario. Considering the significance of these financial implications, an understanding of the limitations of these systems is instrumental for making informed decisions regarding their use within health care settings across the country, and in NL.

Loss of work productivity. Work disruption, loss of productivity, and privacy and security are significant concerns for healthcare providers using EHRs. The training and time associated with learning an EHR system can potentially have a negative impact on productivity. In some cases, healthcare providers have spent 134.2 hours on activities associated with accessing and learning a new EHR system (Fleming et al., 2011).

Privacy and security concerns. Researchers also identified privacy and security concerns associated with EHRs. EHRs hold a considerable amount of patient information, which is exchanged electronically. According to Wallace (2015), technological advancements, such as EHRs, have opened the door to potential breaches of patients' private and confidential health information. Patients have indicated they have privacy concerns surrounding their medical information being secure. In addition, nurses also expressed that EHRs could violate patient privacy and confidentiality (Sassen,

2009). A study conducted by Strauss (2013), explored the nurse-patient relationship when nurses utilized an EHR. Results indicated that participants were concerned the privacy of their personal health information was no longer secure in the EHR. They were uneasy that multiple providers had access to all their personal EHR information. As a result of these concerns, steps are being taken to ensure EHRs comply with privacy and confidentiality laws and regulations (Singh & Muthuswamy, 2013). McMullen et al. (2014) identified that threats to patients private health information may result from poor password management, security breaches conducted by internal employees, and unauthorized access by hackers. To mitigate the risk of a serious privacy breech, appropriate security measures need to be in place to secure patient information.

Issues with nurses' workflow. EHRs have also posed logistical problems for practicing nurses. According to Narcisse et al. (2013), the build and design of an EHR does not always coincide with a nurse's workflow. Nurses often experienced a lack of attention from EHR designers, which resulted in them devaluing EHRs (Bristol, Nibbelink, Gephart, & Carrington, 2018). It can hinder their work, impair their critical thinking and communication, and place a high demand on work time (Kossman & Scheidenhelm, 2008). Research conducted by Harris, Haskell, Cooper, Crouse, and Gardner (2018), surveyed 371 advanced practice nurses to determine if there is any association between burnout and EHRs. Results indicated that 19.3% of advanced practice nurses reported spending a high to excessive amount of time using their EHR at home. In addition, 50.1% agreed or strongly agreed that EHRs add to their daily frustrations and 32.8% of advanced practice nurses reported they had insufficient time to

complete their documentation. According to Sassen (2009), nurses felt that EHRs decrease the quality of patient care, patient outcomes, and have a negative impact on their clinical practice. The time spent searching patient information within the EHR created additional workload stress and nurses were often perceived as delivering poor nursing care (Bristol et al., 2018). It is evident from the research that nurses do not feel included in the development of these electronic systems; as a result, they experience and report negative workflow outcomes. Clearly, nursing perspectives on the development and enhancements of EHR systems is vital to the functional use of EHRs within the nursing profession.

Nurses' challenges with information technology. EHR implementation can be challenging for nurses. According to Ward et al. (2011), user resistance, computer characteristics, nursing staff variables, and organizational variables are four common themes related to the challenges of information technology for nurses. Kossman and Scheidenhelm (2008), identified computer and EHR issues have increased the amount of time that nurses have spent on computer use, which has taken time away from patient care. Nurses reported issues with computer speed, downtime, and a lack of computers in the nursing unit available to access EHRs; which may result in duplication of documentation on paper and in the computer system (Sassen, 2009). Planned downtimes due to infrastructure and hardware failure can also occur. A plan to deal with this downtimes is critical to the success of an EHR system (Handel & Hackman, 2008).

Spending time dealing with these computer issues have left nurses feeling they had less time to provide patient care, and more challenges with time management.

Nurses reported spending, on average, half their shift using computers to access EHRs. In addition, nurses reported difficulties with passwords to gain access to EHRs, navigating the EHR, lack of intuitive interfaces, and printing problems. Nurses reported having to remember up to eight passwords for various information systems, at times resulting in delayed access, or an inability to access their EHR (Sassen, 2009).

In addition, nurses did not feel they were receiving EHR technical support from organizations (Yontz et al. (2015). Research has acknowledged that supporting nurses in the implementation of EHRs is critical to success. According to Bristol et al. (2018), the technical support required for the initial implementation of EHRs is just as important as the ongoing support for nurses using them; without this, EHR adoption rates and nurses "buy in" are negatively affected. As indicated in the research literature, utilizing clinicians' skills, knowledge, and experience is important when planning and developing EHR functionality. EHRs should support time efficiency, communication, and critical thinking to improve the workflow of the nurses (Kossman & Scheidenhelm, 2008).

Evaluation plan implications. The financial implications, loss of work productivity, privacy and security concerns, nurses' workflow issues, and the nurses' challenges of information technology in relation to EHRs are important to understand and consider when implementing EHRs in order to improve the overall quality of the EHR and the continuation of EHR use. The purpose of evaluating HEALTHe NL and the online learning module is to identify potential improvements to support the continued use of EHRs in NL.

Evaluation Methods of EHR use

The literature has indicated a variety of methods used to evaluate the implementation of EHRs. Healthcare providers' opinions and perspectives of EHRs is important. A review of the literature will evaluate the most effective methods to gather this information. The Delone and McLean framework has been used widely to support researchers in their development of surveys aiming to evaluate information systems success, such as EHRs.

Methods of EHR Evaluation

There are many methods used by researchers to evaluate EHRs such as case studies, surveys, longitudinal, questionnaires, and interviews. Nguyen, Bellucci, and Nguyen (2014) conducted a systematic literature review of 98 papers from all over the world. The top three most popular research designs were case studies (single case study: n=39 and multiple case studies: n=10) followed by survey (n=34), and longitudinal (n=21). The three most popular methods of data collection were questionnaires (n=37) followed by mixed data collection (n=28), and interviews (n=19). In addition, the evaluation approach most frequently used was subjective data, which was referred to as 'perception-based data only', occurring in 79 of the 98 articles reviewed. The findings of this study should be considered when determining the appropriate design and data collection method to use for EHR evaluation.

In addition, Ellsworth et al. (2017), conducted a systematic review appraising published usability evaluations of EHRs. A total of 120 studies were analyzed and results indicated the most frequent evaluation method used was surveys at 37% followed

by think-aloud at 19%. Sixty-nine studies used surveys with 20% using a System Usability Scale and 16% using a Questionnaire for User Interaction Satisfaction.

Farzandipour, Riazi, and Jabali (2018) supported the use of questionnaires to evaluate EHRs. The researchers conducted a descriptive cross-sectional study that focused on the Delphi technique to develop a questionnaire, which included 163 items that were presented to 40 EHR users in the hospital setting. The questionnaire was designed to focus on nine areas. The first area, suitability for the task, focused on the ability of the user to be able to easily find information within the EHR. The second area, self-descriptiveness, focused on the ability of the user to understand the messages being relayed. The third area, controllability, focused on the user being able to easily navigate between screens and return to the main menu of the EHR. The fourth area, conformity with user expectations, focused on consistency in relation to software design, coloring, and abbreviations. The fifth area, error tolerance, focused on the user being able to understand error messages. The sixth area, suitability for individualization, focused on ensuring the software is compatible with users' skill level and knowledge. The seventh area, suitability for learning, focused on determining if users' could use the software independently without asking for help. The eighth area, visual clarity, focused on the user being able to clearly see pictures and characters on the screen. The final area, auditory presentation, focused on the effectiveness of a voice being used to translate information from the EHR to the user. Focusing on these nine areas, resulted in a comprehensive model to support the functionality, effectiveness, and users' satisfaction of EHRs (Farandipour et al., 2018).

The Delone and McLean Framework

During the development of a method to evaluate EHRs, an understanding of the main outcomes to be measured is crucial. The Delone and McLean framework has been widely used to support the research design and data collection methods used to evaluate information systems. (Bossen, Jensen, & Udsen, 2013; Nguyen et al., 2014). This framework focuses on seven dimensions that evaluates the success of information systems: system quality, information quality, service quality, use, intention to use, user satisfaction, and net benefits. Bossen et al. (2013), based their research study on this framework and chose to conduct a formative evaluation, which was intended to improve EHRs by presenting system providers with feedback from their users. The dimension, 'information quality' focused on whether the data in the EHR is relevant to the clinical work of clinicians. This information was retrieved by asking the follow question: Does the EHR provide you with the information you need for your work? (Bossen et al., 2013). 'System quality' focused on whether the system has the required functionality to support the workflow of clinicians. This was addressed by the following question: Has it been easy for you to learn how to use an EHR? (Bossen et al., 2013). 'Service quality' investigated the support available to clinicians with regards to user training. The following question focused on this dimension: Are you satisfied with the available user guides and help functions? (Bossen et al., 2013).

Implications for Evaluation

As indicated above, Nguyen et al. (2014), Ellsworth et al. (2017), and Farzandipour et al. (2018) have utilized survey questionnaires as one method to evaluate

EHR use. Based on this research, surveys could be used as a method to evaluate nurse practitioners' perspectives of HEALTHe NL. The Delone and McLean framework supports the evaluation of EHRs and the seven dimensions guides the development of questionnaires. The seven dimensions: system quality, information quality, service quality, use, intention to use, user satisfaction, and net benefits and the nine areas of focus identified by Farzandipour et al. (2018) should be considered when developing this evaluation tool. Bossen et al. (2013) used many questions under the seven dimensions that would be beneficial to the development of a survey to evaluate HEALTHe NL. The questions developed to evaluate HEALTHe NL and the online learning module will focus on these key attributes. Focusing on these key attributes will aid in the gathering of information from nurse practitioners to support potential enhancements to HEALTHe NL and the online learning module.

Training Methods for EHR Implementation

Determining the preferred training methods of nurse practitioners and other healthcare professionals is imperative; this will support the implementation, adoption, and follow-up training required for EHR use. Ward et al. (2011) identified that training before and after the implementation of EHRs has enhanced nurses' attitudes towards health information technology. As indicated by Narcisse et al. (2013) and Sassen (2009), high training costs have resulted in nurses receiving inadequate EHR training. These researchers acknowledged it is important to invest in proper training to foster positive attitudes towards EHRs. It is also important to tailor EHR training around the demands of a healthcare providers' busy work schedule. Training should be conducted within two

weeks of going live with a new EHR, so healthcare providers do not forget their newly acquired skills (Handel et al., 2008). Some researchers believe that timing training to coincide with EHR implementation, tailoring the training to users' needs, and providing on-site support, is required for successful EHR adoption (Lorenzi, Kouroubali, Detmer, & Bloorosen, 2009).

Types of Training Methods

There are many different types of training methods that can used for the implementation of EHRs such as: e-learning, interactive techniques, online education in the form of video tutorials, web-based training modules, and training videos with an emphasis on patient-provider communication.

Dalhem and Saleh (2014), conducted a study to assess the impact of e-learning on nurses' knowledge and practice. The total number of participants in the study consisted of 70 nurses. Results indicated that 30% of nurses reported their communication skills were improved due to e-learning and 32.9% reported their administrative skills were also improved. The survey questionnaire results indicated that 42.9% of nurses preferred e-learning. The overall results of the study highlighted a positive impact of e-learning courses on nurses' satisfaction. Over 95.7% of participants agreed that e-learning courses met their goals and objectives.

In contrast, a study conducted by Robinson and Kersey (2018) surveyed 3500 physicians from 30 specialties. In the use of interactive methods of training such as demonstration, individual coaching, and facilitated group discussions. The majority of physicians (85 to 98%) reported improved quality, readability, and clinical accuracy of

documentations. There were also fewer medical errors, and improved chart review and data retrieval. Seventy-eight percent of physicians estimated they saved four to five minutes more per hour as a result of using an EHR. Results indicated that 98% of the physicians would recommend these types of training methods to their peers.

According to Green and Huntington (2017), online education has proven to be useful for nurses demanding work schedule, and especially for those who work only night shifts. Nurses want to have access to online education in the form of video tutorials that they can complete at anytime, anyplace, and at any pace. The researchers conducted focus groups meetings and discussion results indicated that Information Technology (IT) support must be put in place to aid organizational transition to an online learning environment. Online video tutorials should be readily accessible and face-to-face tutorials should be available for staff that might initially require this type of support. It is also important to have online training material easily accessible and a sufficient number of computers available for staff to complete the training.

Nicklaus, Kusser, Zessin, and Amaya (2015) conducted a study that focused on web-based EHR training modules. This type of training was used to introduce healthcare providers to the basics of EHR navigation. The researchers separated the EHR training into short sections that were completed in 10 to 15 minutes, which focused on viewing orders and completing documentation. This type of training method promoted self-regulated learning among healthcare professionals.

Nurse practitioner training. Lynott, Kooienga, and Stewart (2012), conducted an ethnographic study to explore different methods of EHR training and provider-patient

communication for nurse practitioners and other primary care providers. In this participant observation study there was a comparison of EHR training methods for healthcare providers in three different healthcare systems A, B, and C.

The EHR training in these healthcare systems focused on how to enter patient orders, view patient information, and how to document and communicate with other healthcare providers. Health system A's training lasted eight hours and consisted of basic training with a focus on patient-provider communication issues and a training video on how to use the EHR in the examination room. Health system B's training lasted six hours and did not incorporate patient-provider communication issues. Health system C's training lasted four hours and patient-provider communication issues were focused on for only fifteen minutes out of the four hours.

Results indicated that nurse practitioners and other primary care providers should be taught that their computer use can have an impact on how patients view their clinical visits. It is important for patients to understand that nurse practitioners and other primary care providers spend time on the computer during clinic visits retrieving essential information that will assist them to provide the best possible patient care. In addition, training videos were deemed as an effective way of demonstrating communication to improve the patient-provider relationship. Out of the three systems, health system A was the only EHR training program for nurse practitioners and other primary care providers that included a training video with emphasis on patient-provider communication.

Follow-up EHR training for healthcare providers. Following the implementation of EHRs, appropriate resources should be identified for follow-up

training and to help refine the workflows of the EHR system. According to Hill, Stewart, and Ash (2010), pre implementation training alone was not enough to make healthcare providers feel they were efficient using EHRs. They identified it was challenging to translate what they learned and apply it to practice. The feedback of healthcare providers is important and will identify functionality enhancements. Periodic additional follow-ups are also needed and ongoing support from an IT help desk following implementation will ensure the EHR system is continuing to meet the needs of the end-users (Handel et al., 2008; McAlearney, Robbins, Kowalczyk, Chiscolm, & Song, 2012). McAlearney et al. (2012) identified that training and support was provided to users during the EHR implementation. Users received a combination of classroom and practical training and support, which facilitated active learning among the users. Applying an experienced change management resource and having a solidified change management plan in place for pre and post EHR implementation could also have a positive effect on the nurses' attitudes towards EHR adoption (Sassen, 2009).

Implications for Evaluation

As indicated in the literature, EHR training and support are important pre and post implementation and has implications for an evaluation plan of HEALTHe NL and the online learning module currently being used across NL. Training should be tailored around the busy work schedules of nurse practitioners and other healthcare providers. A variety of training methods were identified: e-learning, demonstration, individual coaching, facilitated group discussions, online education in the form of video tutorials, web-based training modules, and training videos with an emphasis on patient-provider

communication. Teaching nurse practitioners the computer skills to navigate an EHR and the communication skills to enhance of the patient-provider relationship is important. These different training methods are essential to consider when conducting future enhancements to HEALTHe NL and the online learning module. It is critical to identify the most efficient training method to educate nurse practitioners on these new enhancements while at the same time supporting their busy work schedule.

Evaluation of EHR Training Methods

The research has identified different training methods for EHR implementation such as teaching and practice sessions, instructor-led and blended training, educational interventions and training, and e-learning. Given that there are multiple modalities of training, it is important to identify research that has been conducted on the evaluation of these training methods to determine their effectiveness.

Evaluation of teaching and practice session training. Dastagir et al. (2012) implemented a program called 'Pathway to Proficiency' (P2P). This program consisted of a three day intensive training for physicians and nurse practitioners, with a focus on order entry, documentation, and the retrieval of results. Sessions consisted of clinical peer-instructor led presentations and practice sessions where the attendees could practice what they learned. There were 57 participants in the study and when asked direct questions about the P2P course, results were overwhelmingly positive. Over 90% were glad they attended the P2P program and strongly agreed or agreed the program enabled them to use the EHR more efficiently. Over 50% strongly agreed or agreed that they

were experiencing a better work-life balance since completing the program. Overall, the participants recommended this program to other clinicians.

Evaluation of instructor led and blended training. Edwards, Kitzmiller, and Breckenridge-Sproat (2012), conducted a study to determine staff satisfaction with health information technology training. There were 85 participants, which included registered nurses, nursing assistants, and unit coordinators. The two forms of training that were evaluated was traditional instructor-led and blended learning. The traditional instructor-led learning included classroom and face-to-face instruction. The blended learning included instructor-led lectures along with demonstration, practice, and the use of computers. Health information technology training was assessed using a web-based self-report survey. The survey consisted of 13 questions that were rated using a 5-point Likert scale. The majority of the participants were registered nurses at 83.6%. Results indicated there was no difference between the mean learning satisfaction scores among the traditional instructor-led (mean 42.12) and blended learning (mean 41.48). The participants of this study were equally satisfied with either method of training.

Evaluation of education interventions and training: Goveia et al. (2013), conducted a literature review to identify and determine what educational interventions and training are effective to improve the meaningful use of EHRs for specialist nurses, nurse practitioners, registered nurses, physicians, medical residents, and paramedics. Eight studies were chosen for this review. Four studies focused on classroom-based training, one study focused on personal guidance, and two studies focused on education intervention using feedback. Following a review of the literature, the researchers

determined classroom training, computer-based training, and feedback were the most effective methods of training to improve the meaningful use of EHRs. The researchers concluded that training should be tailored to the needs of healthcare professionals and should be available to complete outside their busy work schedules.

Evaluation of e-learning: Topaz, Rao, Creber, and Bowles (2013), developed a project based on Web 2.0. The Web 2.0 provided an interactive learning environment where participants were engaged in the learning processes through active participation, collaboration, and the sharing of knowledge. The researchers aimed to develop an interactive e-learning approach to provide nurses with EHR updates. The e-learning tutorial provided the user with an introduction to the project, the new elements of the EHR, an interactive scenario that incorporated a case study, and a summary focusing on the impact of documentation on patient outcomes. Results indicated that 74% (1546) of the 2080 nurses completed the e-learning tutorial. The education department at the hospital deemed the development of the e-learning tutorial a success. The researchers concluded that creating a brief and informative e-learning tool for nurses was successful based on the number of nurses that completed the e-learning tutorial. The amount of information presented to the nurses should be minimal while at the same time being clear and concise. Dividing the e-learning tool into several parts rather than combining all the information together is more effective and less overwhelming.

Implications for Evaluation

It is essential to determine the most effective method of training when implementing EHRs to nurse practitioners and other healthcare providers. Currently,

clinicians are being directed to complete training for HEALTHe NL by referring to an online learning module. Following the evaluation of the HEALTHe NL online learning module, it is important to determine if this online learning module is the most effective way to educate nurse practitioners or if another avenue of training should be considered to support future enhancements to this electronic system.

Conclusion

This literature review has highlighted the benefits and challenges associated with EHRs, which are important to understand and consider when implementing EHR enhancements to improve the overall quality of EHR use and the continued rise of EHR adoption rates. The different methods of EHR evaluation were also reviewed. Many studies have utilized survey questionnaires to evaluate EHR use. As a result, surveys could be used as a method to evaluate nurse practitioners'' perspectives of HEALTHe NL, and the Delone and McLean framework could support the development of this evaluation method.

This review also acknowledged different types of training methods that can be used to implement EHRs. This is important to consider when conducting future enhancements to HEALTHe NL and the online learning module and when educating nurse practitioners on new enhancements to these electronic systems. In addition, the evaluation of EHR training methods have been reviewed. Following the evaluation of HEALTHe NL and the online learning module, it is important to determine if the online learning module is the most effective way to educate nurse practitioners.

The findings of this literature review support the purpose of this practicum project and will help with the development of a survey to evaluate HEALTHe NL and the related online learning module for nurse practitioners in the province of NL. Collecting feedback from nurse practitioners will help support the continued use of these electronic systems, the continuity of patient care, and identify ways to improve the module to better serve the learning process for future nurses and healthcare providers.

References

Agency for Healthcare Research and Quality. (2018). Six *domains of health care quality*. Retrieved from https://www.ahrq.gov/talkingquality/measures/six-domains.html

Bossen, C., Jensen, L. G., & Udsen, F. W. (2013). Evaluation of a comprehensive EHR based on the Delone and McLean model for IS success: Approach, results, and success factors. *International Journal of Medical Informatics, 82(10),* 940-953. doi: 10.1016/j.ijmedinf.2013.05.010

Bristol, A. A., Nibbelink, C. W., Gephart, S. M., & Carrington, J. M. (2018). Nurses' use of positive deviance when encountering electronic health records-related unintended consequences. *Nursing Administration Quarterly, 42(1),* E1-E11. doi: 10.1097/NAQ.0000000000000264

Canada Health Infoway. (2017). *Year in review 2016-2017*. Retrieved from https://www.infoway-inforoute.ca/en/component/edocman/3350-annual-report-2016-2017/view-document?Itemid=101

Canada Health Infoway. (2018). *Connected health information in Canada: A benefits evaluation study.* Retrieved from https://www.infoway-inforoute.ca/en/component/edocman/3510-connected-health-information-in-canada-a-benefits-evaluation-study-document/view-document?Itemid=101

Dalhem, W. A., & Saleh, N. (2014). The impact of eLearning on nurses' professional knowledge and practice in HMC. *Canadian Journal of Nursing Informatics, 9(3),* 1-16. Retrieved from http://cjni.net/journal/?p=3819

Dastagir, M. T., Chin, H. L., McNamara, M., Porteraj, K., Battaglini, M.S., Alstot, L. (2012). Advanced proficiency EHR training: Effect on physicians' EHR efficiency, EHR satisfaction and job satisfaction. *AMIA Annual Symposium Proceedings Archive, v2012,* 136-143. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3540432/

Edwards, G., Kitzmiller, R. R., and Breckenridge-Sproat, S. (2012). Innovative health information technology training: Exploring blended learning. *Computer, Informatics, Nursing, 30(2),* 104-109. doi: 10.1097/NCN.0b013e31822f7f7a

Ellsworth, M. A., Dziadzko, M., O'Horo, J. C., Farrell, A. M., Zhang, J., & Herasevich, V. (2017). An appraisal of published usability evaluations of electronic health records via systematic review. *Journal of the American Medical Informatics Association, 24(1),* 218 – 226. doi: 10.1093/jamia/ocw046.

Farzandipour, M., Riazi, H., & Jabali, M. S. (2018). Proposing electronic health record usability requirements based on enriched ISO 9241 metric usability model. *Acta Inform Med, 26(1),* 29 – 34. doi: 10.5455/aim.2018.26.29-34

Fleming, N. S., Culler, S. D., Mccorkle, R., Becker, E. R., & Ballard, D. J. (2011). The financial and nonfinancial costs of implementing electronic health records in primary care practices. *Health Affairs, 30(3),* 481-489. doi: 10.1377/hlthaff.2010.0768

Gaylin, D. S., Moiduddin, A., Mohamoud, S., Lundeen, K., & Kelly, J. A. (2011). Public

attitudes about health information technology, and its relationship to health care quality, costs, and privacy. *Health Services Research, 46(3),* 920-938. doi: 10.1111/j.1475-6773.250.10.01233.x

Goveia, J., Stiphout, F. V., Cheung, Z., Kamta, B., Keijsers, C., Valk, G., & Braak, E.T. (2013). Educational interventions to improve the meaningful use of electronic health records: A review of the literature: BEME guide no. 29. *Medical Teacher, 35(11),* 1551-1560. doi: 10.3109/0142159X.2013.806984

Green, J. K., & Huntington, A. D. (2017). Online professional development for digitally differentiated nurses: An action research perspective. *Nursing Education in Practice, 22,* 55-62. doi: 10.1016/j.nepr.2016.11.009

Handel, D. A., & Jeffrey, L. H. (2008). Implementing electronic health records in the emergency department. *The Journal of Emergency Medicine, 38(2),* 257-263. doi: 10.1016/j.jermermed.2008.01.020

Harris, D. A., Haskell, J., Cooper, E., Crouse, N., & Gardner, R. (2018). Estimating the association between burnout and electronic health record-related stress among advanced practice nurses. *Applied Nursing Research, 43,* 36-41. doi: 10.1016/j.apnr.2018.06.014

Hill, H. K., Stewart, D. C. L., & Ash, J. S. (2010). The training and support needs of faculty and students using a health information technology system were significant: A case study in a Dental School. *AMIA Annual Symposium Proceedings Achieve, 13,* 301-305. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3041366/

Jeanfreau, S. G., & Jack Jr., L. (2010). Appraising qualitative research in health education: Guidelines for public health educators. *Health Promotion Practice, 11(5),* 612-617. doi: 10.1177/1524839910363537

Kaya, N. (2011). Factors affecting nurses' attitudes toward computers in healthcare. *Computers, Informatics, Nursing, 29(2),* 121-129. doi: 10.1097/NCN.0b013e3181f9dd0f

Kossman, S. P., & Scheidenhelm, S. L. (2008). Nurses' perceptions of the impact of electronic health records on work and patient outcomes. *Computers, Informatics, Nursing, 26(2),* 69-77. doi: 10.1097/01.NCN.0000304775.40531.67

Kutney-Lee, A., & Kelly, D. (2011). The effect of hospital electronic health record adoption on nurse-assessed quality of care and patient safety. *The Journal of Nursing Administration, 41(11),* 466-472. doi: 10.1097/NNA.0b013e3182346e4b

Ledwich, L. J., Harrington, T. M., Ayoub, W. T., Sartorius, J. A., & Newman, E. D. (2009). Improved influenza and pneumococcal vaccination in rheumatology patients taking immunosuppressants using an electronic health record best practice alert. *Arthritis Care & Research, 61(11),* 1505-1510. doi: 10.1002/art.24873

Lorenzi, N. M., Kouroubali, A., Detmer, D. E., & Bloorosen, M. (2009). How to successfully select and implement electronic health records (EHR) in small ambulatory practice settings. *BioMed Central Medical Informatics and Decision Making, 9 (15),* 1-13. doi: 10.1186/1472-6947-9-1510

Lynott, M. H., Kooienga, S. A., & Stewart, V. T. (2012). Communication and the

electronic health record training: A comparison of three healthcare systems. *Informatics in Primary Care, 20(1),* 7-12. doi: 10.14236/jhi.v20il.43

McAlearney, A. S., Robbins, J., Kowalczyk, N., Chiscolm, D. J., & Song, P. H. (2012). The role of cognitive and learning theories in supporting successful EHR system implementation training: A qualitative study. *Medical Care Research and Review, 69(3),* 294-315. doi: 10.117/1077558711436348

McGinn, C. A., Gagnon, M. P., Shaw. N., Sicotte, C., Mathieu, L., Leduc, Y., . . . Legare, F. (2012). Users' perspectives of key factors to implementing electronic health records in Canada: a Delphi study. *BMC Medical Informatics and Decision Making, 12(105),* 1-13. doi: 10.1186/1472-6947-12-105

McMullen, P. C., Howie, W. O., Philipsen, N., Bryant, V. C., Setlow, P. D., Calhoun, M., & Green, Z. D. (2014). Electronic medication records and electronic health records: Overview for nurse practitioners. *The Journal for Nurse Practitioners, 10(9),* 660-665. doi: 10.1016/j.nurpra.2014.07.013

McQuade-Jones, B., Murphy, J., Novak, T., & Sarnowski, L. N. (2014). Nurse practitioners and meaningful use: Transforming health care. *The Journal for Nurse Practitioners, 10(10),* 763-768. doi: 10.1016/j.nurpra.2014.08.004

Narcisse, M. R., Kippenbrock, T. A., Odell, E., & Buron, B. (2013). Advanced practice nurses' meaningful use of electronic health records. *Applied Nursing Research, 26,* 127-132. doi: 10.1016/j.apnr.2013.02.003

Newfoundland and Labrador Centre for Health Information. (2019). *HEALTHe NL*. Retrieved from https://www.nlchi.nl.ca/index.php/ehealth-systems/healthe-nl

Nguyen, L., Bellucci, E., & Nguyen, L. T. (2014). Electronic health records implementation: An evaluation of information system impact and contingency factors. *International Journal of Medical Informatics, 83(11)*, 779-796. doi: 10.1016/j.ijmedinf.2014.06.011

Nicklaus, J., Kusser, J., Zessin, J., & Amaya, M. (2015). Transforming education for electronic health record implementation. *The Journal of Continuing Education in Nursing, 46(8)*, 359-363. doi: 10.3928/00220124-20150721-02

Office of the Auditor General of British Columbia. (2010). *Electronic health record implementation in British Columbia.* Retrieved from https://www.bcauditor.com/sites/default/files/publications/2010/report_9/report/bcoag-electronic-health-records-ehr.pdf

Office of the Auditor General of Canada. (2010). *Electronic health records in Canada: An overview of federal and provincial audit reports.* Retrieved from http://www.oag-bvg.gc.ca/internet/English/parl_oag_201004_07_e_33720.html#hd4d

Public Health Agency of Canada. (2014). *Infection prevention and control guidelines: Critical appraisal tool kit.* Retrieved from http://publications.gc.ca/collections/collection_2014/aspc-phac/HP40-119-2014-eng.pdf

Robinson, K. E., & Kersey, J. A. (2018). Novel electronic health record (EHR) education intervention in large healthcare organization improves quality, efficiency, time, and impact on burnout. *Medicine, 97(38),* 1-5. Retrieved from

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6160120/pdf/medi-97-e12319.pdf

Sassen, E. J. (2009). Love, hate, or indifference: How nurses really feel about the electronic health record system. *Computers, Informatics, Nursing, 27(5),* 281-287. doi: 10.1097/NCN.0b013e3181b2162a

Singh, B., & Muthuswamy, P. (2013). Factors affecting the adoption of electronic health records by nurses. *World Applied Sciences Journal, 28(11),* 1531-1535. doi: 10.5829/idosi.wasj.2013.29.11.1899

Srivastava, S. (2018). *Adoption of electronic health records (EHR) in Canada: A review.* Retrieved from https://www.clinfowiki.org/wiki/index.php/Adoption_of_Electronic_Health_Records_(EHR)_in_Canada:_A_Review

Strauss, B. (2013). The patient perception of the nurse-patient relationship when nurses utilize an electronic health record within a hospital setting. *Computers, Informatics, Nursing, 31(12),* 596-604. doi: 10.1097/CIN.0000000000000014

Topaz, M., Rao, A., Creber, R. M., & Bowles, K. H. (2013). Education clinicians on new elements incorporated into the electronic health record: Theories, evidence, and one educational project. *Computers, Informatics, Nursing, 31(8),* 375-379. doi: 10.1097/NXN.0b013e318295e5a5

Wallace, I. M. (2015). Is patient confidentiality compromised with the electronic health record? A position paper. *Computer, Informatics, Nursing, 33(2),* 58-62. doi: 10.1097/CIN.0000000000000126

Ward, M. M., Vartak, S., Schwichtenberg, T., & Wakefield, D. S. (2011). Nurses' perceptions of how clinical information system implementation affects workflow and patient care. *Computers, Informatics, Nursing, 29(9),* 502-511. doi: 10.1097/NCN.0b013e31822b8798

Yonz, L. S., Zinn, J. L., & Schumacher, E. J. (2015). Perioperative nurses' attitudes toward the electronic health record. *Journal of PeriAnesthesia Nursing, 30(1),* 23-32. doi: 10.1016/j.jopan.2014.01.007

Literature Summary Table 1

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Bossen, C., Jensen, L. G., & Udsen, F. W. (2013). Evaluation of a comprehensive EHR based on the Delone and McLean model for IS success: Approach, results, and success factors. *International Journal of Medical Informatics, 82(10),* 940-953. doi: 10.1016/j.ijmedinf.2013.05.010	Randers Regional Hospital (RRH) in Denmark. Physicians, nurses, medical secretaries, and physiotherapists (n = 244)	DeLone and McLean framework for evaluating information systems success. Case-based and mixed-methods. Data from the questionnaire was analyzed with a series of ANOVA tests. SPSS was used. Semi-structured interviews was analyzed in NVivo.	Response rate of 63%. There was statistical significant results of the questionnaire items concerning information quality across professions. There was statistical significant results with regards to items concerning system quality across professions. There was statistical significant	Evaluations immediately following implementation are difficult. Staff assessment may play a major role in interviews and surveys. Generalizability may be low. No conflicts of interests reported.	Evaluation of a comprehensive EHR shortly after implementation may be necessary, can be conducted, and may inform political decision making. The overall strength of the study was weak. The quality of the study was medium. The directness of the evidence was direct evidence.

An evaluation of a comprehensive electronic health record (EHR) in the shake down phase after implementation.			differences in the questionnaire concerning the assessment of ordering information. Physicians and medical secretaries are less satisfied with all service-quality items than nurses and physiotherapists.		The focus question was strong. The assessment of the study participants' representativeness was strong. Assessment of data collection sources and methods was strong. The assessment of validity and reliability of data collection was strong. The adequacy of ethical conduct was weak. The assessment of statistics was strong.

Literature Summary Table 2

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Dalhem, W. A., & Saleh, N. (2014). The impact of eLearning on nurses' professional knowledge and practice in HMC. *Canadian Journal of Nursing Informatics, 9(3),* 1-16. Retrieved from http://cjni.net/journal/?p=3819 Assess the impact of e-learning on the nurses' professional	Purposive survey sampling. 70 nursing staff who participated in e-learning courses provided by HMC. Administrative staff in the nursing department were excluded. Pilot study was carried out with seven staff nurses.	Descriptive study design. Survey questionnaire. Section 1: demographic data about age, education, designation, years of experience, facility and classification of computer skills of participants. Section II: descriptive data related to e-learning courses	95.7% agreed the courses met their objectives and goals. 30% communication skills were improved; 32.9% administrative skills improved. Courses improved nursing activities: 47.1% highly effective; 27.1% were moderately; 22.9% effective.	Permission obtained from the Medical Research Department. Only 29% responded back after three months of requests for participation. Confidentiality maintained. Rules and regulation guidelines of the Research Committee were followed.	Results revealed a positive impact of e-learning courses on participants' satisfaction. The overall strength of the study was weak. The quality of the study was medium. The directness of the evidence was direct evidence. The focus question was strong.

knowledge and practice and the factors influencing the effective utilization of e-learning in Hamad Medical Corporation (HMC).		names, benefits, effectiveness, and achievement of objectives in relation to staff day to day nursing activities, methods of learning, and obstacles faced. SPSS 19.0 was used to perform the tabulation and statistical analysis.	50% course was completely beneficial. Face to face formal training in groups 54.3%. Face to face individual training 34.3%. e-learning 42.9% Workbooks and e-library – neutral. Workshops 47.1%.		The assessment of the study participants' representativeness was weak. Assessment of data collection sources and methods was strong. The assessment of validity and reliability of data collection was strong. The adequacy of ethical conduct was strong. The assessment of statistics was strong.

Literature Summary Table 3

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Dastagir, M. T., Chin, H. L., McNamara, M., Porteraj, K., Battaglini, M.S., Alstot, L. (2012). Advanced proficiency EHR training: Effect on physicians' EHR efficiency, EHR satisfaction and job satisfaction. *AMIA Annual Symposium Proceedings Archive, v2012*, 136-143. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/art	Kaiser Permanente Northwest (KPNW) in Oregon and southwest Washington. 155 clinicians who worked in ambulatory and hospital settings. Program was offered on a self-select basis.	A pre-test and post-test study was provided to all participants of the pathway to proficiency (P2P) program using an online questionnaire. 155 clinicians trained at five different sessions throughout 2010. Three of the five sessions were geared to outpatient use and two targeted inpatient use.	Likert Scale: significant improvement was seen in clinicians' perception of the adequacy of training and in their ability to find orders and diagnosis ($p < 0.001$). Following trainings, they were spending less time on the EHR outside of their scheduled work hours, compared to their colleagues ($p = 0.012$).	One of the first studies to report on the relationship between EHR proficiency and job satisfaction, and how one may improve the other.	The P2P program for experienced users of an EHR can significantly improve clinician self-perceived efficiency with the EHR, perception of organizational support for providing good patient care, and clinician job satisfaction. The overall strength of the study was weak. The quality of the study was medium.

icles/PMC3540432/ Describes a 3-day Peer-Led EHR advanced proficiency training program and the results of the training based on participant surveys.		A questionnaire consisted of a five-point Likert scale to evaluate clinician self-perceptions of their efficiency, satisfaction with the system and job satisfaction. Data was downloaded from the online survey site into excel and transferred to SPSS for statistical analysis. Descriptive analysis was used to assess frequencies, percentages, mean, medians, and standard deviations.	Significant improvements in self-rating of general computer ($p = 0.003$) and EHR skills ($p < 0.0001$). Significant improvement in job satisfaction and work-life balance ($p < 0.001$). Significant improvement in the perception that the organization was supporting them in providing good care to patients ($p = 0.016$). Over 90% strongly agreed that they were glad they attended the P2P program.		The directness of the evidence was direct evidence. The focus question was strong. The assessment of the study participants' representativeness was moderate. Assessment of data collection sources and methods was strong. The assessment of validity and reliability of data collection was strong. The adequacy of ethical conduct was weak.

		Related samples Wilcoxon signed rank test was used to compare differences between the before and after responses to the questions.	Over 90% strongly agreed or agreed that the skills learning in the program will enable them to use the EHR more efficiently. Over 50% are experiencing a better work-life balance as a result of the training.		The assessment of statistics was strong.

Literature Summary Table 4

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Edwards, G., Kitzmiller, R. R., and Breckenridge-Sproat, S. (2012). Innovative health information technology training: Exploring blended learning. *Computer, Informatics, Nursing, 30(2),* 104-109. doi: 10.1097/NCN.0b013e31822f7f7a To determine if staff satisfaction with health information technology (HIT) on emergency	Convenience sample of staff members (RNs, nursing assistants, and unit coordinators) from two emergency departments (EDs). N = 85. The first ED was a 70 bed level 1 trauma center that treats 70 000 patients a year. The second ED was a 36 bed community ED that treats 63 000 patients a year.	Mixed-methods approach with a retrospective, comparative, descriptive, secondary data analysis comparing training participant satisfaction with two different types of HIT training: BL and TIL. HIT training was assessed using a self-report survey. Cronbach [alpha] was calculated based on the study's sample. Item correlation	Independent t test of TIL vs BL satisfaction: TIL Mean 42.12 and BL mean 41.48. P = .573 and t = 0.567. No significant difference between the mean learning satisfaction scores among TIL and BL participants.	A small convenience sample and self-reported survey data was used. Follow-up studies should randomize assignment into the learning groups to decrease biases.	A BL approach to HIT training provides healthcare workers with practical experience that may improve adoption of these innovative technologies. The overall strength of the study was weak. The quality of the study was medium. The directness of evidence was direct evidence. The focus question was strong.

department information system (EDIS) differed between traditional instructor-led (TIL) and blended learning (BL).		ranged from low of 0.622 to high of 0.926. Since no items had a corrected item-total correlation less than 0.3, all were retained for analysis.			The assessment of the participants' representativeness was weak. Assessment of data collection was strong. Assessment of validity and reliability was strong. Adequacy of ethical conduct was weak. Assessment of statistics was strong.

Literature Summary Table 5

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Farzandipour, M., Riazi, H., & Jabali, M. S. (2018). Proposing electronic health record usability requirements based on enriched ISO 9241 metric usability model. *Acta Inform Med, 26(1),* 29 – 34. doi: 10.5455/aim.2018.26.29-34 To provide a comprehensive list of electronic health record (EHR) system usability.	40 individuals working in hospital information system who were interested in taking part in the study and had at least 10 years' experience in the medical field and 5 years' experience working with health information systems (HIS) in nursing, pharmacy laboratory, medical documents, finance, nutritional units, and outpatient clinics.	Descriptive cross-sectional design conducted using Delphi Technique in 2013. Semi-produced questionnaire. System usability requirement for the EHR were designed in nine areas. Final questionnaire was designed – 163 closed ended questions including suitability for the task, self-descriptiveness, controllability, conformity with	Suitability for the tasks, self-descriptiveness, controllability, conformity with user expectations, error tolerance, suitability for individualization, suitability for learning, and visual clarity obtained a mean point of 3 or higher and were confirmed. 6 out of the 8 requirements for auditory representation obtained a score of 3 or higher and	No conflict of interest.	A comprehensive model for using EHR was presented, which can increase functionality, effectiveness, and users' satisfaction. The model should be adopted by system designers and healthcare system institutions. The overall strength of the study was weak. The quality of the study was medium.

	N = 85. The first ED was a 70 bed level 1 trauma center that treats 70 000 patients a year. The second ED was a 36 bed community ED that treats 63 000 patients a year.	user expectations, error tolerance, suitability for individualization, suitability for eLearning, visual clarity, auditory presentation, and an open-ended question. 5 point Likert scale was used. Answers were given points and 0, 1, 2, 3 and 4 points were given to answers of completely disagree, disagree, no opinion, agree, and completely agree, respectively. Final mean point of 3 or higher were finally confirmed, less than 2 were deleted and 2 to	were confirmed. 2 requirements obtained a score of 2 to less than 3 and were confirmed. The final list of usability requirements was designed in nine subjects with 163 requirements.		The directness of evidence was direct evidence. The focus question was strong. The assessment of the participants' representativeness was weak. Assessment of data collection was strong. Assessment of validity and reliability was strong. Adequacy of ethical conduct was strong. Assessment of statistics was strong.

		less than 3 were offered to experts for further analysis and the items were either confirmed or deleted. Correlation coefficient was calculated as 0.99 for the questionnaire. SPSS software (18^{th} version was used to analyze the results.			

Literature Summary Table 6

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Gaylin, D. S., Moiduddin, A., Mohamoud, S., Lundeen, K., & Kelly, J. A. (2011). Public attitudes about health information technology, and its relationship to health care quality, costs, and privacy. *Health Services Research, 46(3),* 920-938. doi: 10.1111/j.1475-6773.250.10.01233.x	Sample size of 1,015. Selected a national random-digit-dial (RDD) sample from households across the United States. Interviewers asked for the youngest male (18 years of older) and if not available, the youngest female (18 years or older).	Telephone interviews were conducted. Surveys collected information on consumers' attitudes and experiences with EMRs, electronic prescribing, electronic PHRs, broader health IT, electronic medical information sharing, and the patient-physician relationship. Univariate results on the overall attitudes and opinions are	78% (95% CI, 74.4-80.8) favored the use of electronic records in doctor's offices as part of the office visit and only 17% (95% CI, 14.3-20.1) did not. 32% (95% CI, 28.6-35.7) responded they would be more likely to choose a doctor who used health IT, 57% (95% CI, 53.5-61) said it would not make a difference, and 10% (95%CI, 7.5-11.8) said they would be less likely	Those who elected not to respond to the survey may have different views of health IT therefore, the results are subject to nonresponse bias. This study is a snapshot of the public's views at the time the questions were asked rather than over a period of time.	American's believe that health IT adoption is an effective means to improve the quality and safety of health care. The overall strength of the study was weak. The quality of the study was medium. The directness of evidence was direct evidence. The focus question was strong.

Conduct a methodologically rigorous survey of public attitudes toward health information technology and electronic medical records.		reported as weighted frequencies and proportions (with confidence intervals (CI). Multivariate analyses used logistic regressions to assess the importance of various respondent characteristics on specific attitudes. Response rate was calculated as the product of resolution rate (86%), screener rate (76%), and interview completion rate (66%).	to use a doctor who uses health IT.		The assessment of the participants' representativeness was strong. Assessment of data collection was strong. Assessment of validity and reliability was strong. Adequacy of ethical conduct was weak. Assessment of statistics was strong.

Literature Summary Table 7

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Goveia, J., Stiphout, F. V., Cheung, Z., Kamta, B., Keijsers, C., Valk, G., & Braak, E.T. (2013). Educational interventions to improve the meaningful use of electronic health records: A review of the literature: BEME guide no. 29. *Medical Teacher, 35(11),* 1551-1560. doi: 10.3109/0142159X.2013.806984	Articles published between 2000 and 2012. Healthcare workers providing direct clinical care – physicians, nurses, residents, and other healthcare professionals. Eligibility of studies with comparative or non-comparative research designs. Exclusion: non-educational interventions aiming to improve	Kirkpatrick's hierarchical evaluation model to categorize the results of included studies. Two reviewers independently screened all identified studies. BEME systematic review coding sheet. Five point scale to rate the evaluation methods, the strength of the findings, the appropriateness of the study design,	A total of eight studies were chosen. Four studies described classroom-based training to improve the use of EHRs. One study described personal guidance as a method to improve the use of clinical information systems. Two studies described an educational	The authors cannot say for certain they did not miss any relevant articles. Not all studies provided detailed protocols of the educational intervention to improve EHR use. There was no standardized tools to assess improvements in meaningful use of EHRs. No conflict of interest.	A combination of classroom training, computer-based training and feedback is most effective to improve meaningful use. The overall strength of the study was weak. The quality of the study was medium. The directness of evidence was direct evidence. The focus question was strong.

To provide evidence to guide healthcare educators in the design of evidence-based educational interventions to improve the meaningful use of EHRs.	meaningful EHR use. Research setting other than hospital or primary care.	and quality of the article.	intervention using feedback.		The methodology of the review was strong. Assessment of methodology was moderate. The review process was strong. Assessment of study results was strong. There is a clear effect. There was consistency of results across studies. The number of studies was sufficient. The effect was clinically meaningful.

					The assessment of applicability was moderate. 5 out of the 7 studies had a weak study design.

Literature Summary Table 8

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Harris, D. A., Haskell, J., Cooper, E., Crouse, N., & Gardner, R. (2018). Estimating the association between burnout and electronic health record-related stress among advanced practice nurses. *Applied Nursing Research, 43*, 36-41. doi: 10.1016/j.apnr.2018.06.014 Characterize Health information technology (HIT) use and measure associations	APRNs N = 1197 May – June 2017. APRNs licensed in Rhode Island, United States.	Electronic survey was administered to all APRNs N = 1197 in May – June 2017. The dependant variable was burnout. It was measured with the validated Mini z burnout survey. The main independent variables were three EHR related stress measures: time spent on EHR at home, daily frustration with the	371 APRN participants in the sample. 73 (19.8%) experienced one or more symptoms of burnout and 333 (89.9%) reported using an EHR. 64 (19.3%) reported spending a moderately high to excessive amount of time on their EHR at home. 165 (50.1%) agreed or strongly agreed EHRs add to their daily frustration.	Some participants may not report the extent of their burnout. 31% response rate is less than preferred and limits the data and generalizability of the results. No conflicts of interest.	Results indicated that EHR related environmental factors are associated with burnout among APRNs. The overall strength of the study was weak. The quality of the study was high. The directness of evidence was direct evidence. The focus question was strong. The assessment of the participants'

between EHR-related stress and burnout among advanced practice registered nurses (APRNs).		EHR, and time for documentation. Logistic regression was used to measure the association between EHR-related stress and burnout. Bivariable chi-square and Fisher's exact tests were used. All statistical analyses was conducted using Stata version 14.0.	97 (32.8%) reported insufficient time for documentation. 82.5% agreed or strongly agreed EHR improve their clinical workflow. 63.4% agreed or strongly agreed EHRs improve patient care. 77.8% agreed or strongly agreed EHRs improve communication among providers and staff. 48.0% reported that EHRs improve their job satisfaction. Participants who agreed that EHRs added to their daily frustration had 3.60 (95% CI: 2.0–6.51) times the odds of		representativeness was moderate. Assessment of data collection was strong. Assessment of validity and reliability was strong. Adequacy of ethical conduct was strong. Assessment of statistics was strong.

			burnout compared to APRNs who disagreed EHRs add to their daily frustration. APRNs who reported moderately high to excessive use of their EHR at home had 5.02 (95% CI: 2.64–9.56) times the odds of burnout compared to ARPNs who reported minimal to no use of their EHR at home. APRNs who reported insufficient time for documentation had 5.15 (95% CI: 2.84–9.33) times the odds of burnout compared to APRNs who		

			reported sufficient time for documentation. Remote EHR access was also significantly associated with burnout (95% CI: 1.17–4.08).		

Literature Summary Table 9

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Kaya, N. (2011). Factors affecting nurses' attitudes toward computers in healthcare. *Computers, Informatics Nursing, 29(2),* 121-129. doi: 10.1097/NCN.0b013e3181f9dd0f To determine the factors affecting nurses' attitudes toward computers in healthcare.	Nurses employed in one state and one university hospital in Turkey Total number of nurses employed: 1085. The sample included 890 nurses. Willingness to participate and purposive sampling. Participants were requested to complete the survey within 24 hours.	Cross-sectional study. The Pretest for Attitudes Toward Computers in Healthcare Assessment Scale v.2 was used for examining the nurses' attitudes toward computers in healthcare. SPSS version 11.0 and ANOVA was used.	There was significant difference in attitudes in categories of age, marital status, education, type of facility, job title, computer science education, computer experience, duration of computer use, and the place of computer use. PATCH Assessment Scale scores with increasing duration of computer use	Approval from the ethics committee where the research data was gathered. Participants were told their responses were anonymous and the data would be used for scientific purposes only. The research was only conducted in two hospitals.	Results could be used during planning and implementation of computer training programs for nurses. It could be used to improve the participation of nurses' in the development of hospital information systems. The overall strength of the study was weak. The quality of the study was high.

			(r = -0.314, P = .000), indicated a positive effect of experience with computers on the attitudes toward computers in healthcare. The highest PATCH Assessment Scale score was obtained by nurses using computers both at home and at work, followed by those using computers at work only and at home only. An assessment of the correlation between PATCH Assessment Scale scores and nurses' ages revealed reduced PATCH Assessment Scale		The directness of evidence was direct evidence. The focus question was strong. The assessment of the participants' representativeness was strong. Assessment of data collection was strong. Assessment of validity and reliability was strong. Adequacy of ethical conduct was strong. Assessment of statistics was strong.

			scores with increasing age (r = -0.178, P = .000), which indicated a negative effect of age on attitudes toward computers in healthcare.		

Literature Summary Table 10

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Kutney-Lee, A., & Kelly, D. (2011). The effect of hospital electronic health record adoption on nurse-assessed quality of care and patient safety. The *Journal of Nursing Administration, 41(11),* 466-472. doi: 10.1097/NNA.0b013e3182346e4b To examine the effect of having a basic electronic health record (EHR) on nurse-assessed quality of	Registered nurses in California, Florida, New Jersey, and Pennsylvania. 98 000 nurses completed the survey. Surveys were collected by mail.	Cross-sectional secondary analysis of 3 data sources. 2006-2007 multi-site nursing care and patient safety survey of nurses. 2008 American Hospital Association EHR Adoption database. 2007 AHA Annual Survey Data. Descriptive statistics were calculated to assess differences in EHR adoption.	Final analytic sample was 16,352 nurses working in 316 hospitals. 16.8% of nurses who worked in hospitals with a fully implemented basic EHR reported that the actions of hospital management did not highly prioritize patient safety, compared with 22.5% of nurses who worked in hospitals without a fully implemented	Small number of hospitals (n = 21) with fully implemented basic EHRs. Could not examine unit-level associations. Response bias in the collection of AHA EHR data.	The implementation of a basic EHR may result in improved and more efficient nursing care, better care coordination, and patient safety. The overall strength of the study was weak. The quality of the study was high. The directness of evidence was direct evidence. The focus question was strong. The assessment of the participants'

care, including patient safety.		Logistic regression models accounted for the clustering of nurses within hospitals. Odds ratio and 95% confidence intervals were calculated. SAS version 9.2. Results were considered statistically significant at P < .05.	basic EHR (P < .001). Nurses who worked in the hospital with a fully implemented basic EHR had a 14% decrease in the odds of reporting that "things fell between the cracks" (P < .05). 25% decrease in the odds of reporting that actions of hospital management show that patient safety is a low priority (P = .001). 18% decrease in the odds of giving their unit a poor grade on patient safety (P < .05).		representativeness was moderate. Assessment of data collection was strong. Assessment of validity and reliability was strong. Adequacy of ethical conduct was strong. Assessment of statistics was strong.

			17% decrease in the odds of reporting they were not confident in patients' readiness for discharge (P < .05).		

Literature Summary Table 11

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Ledwich, L. J., Harrington, T. M., Ayoub, W. T., Sartorius, J. A., & Newman, E. D. (2009). Improved influenza and pneumococcal vaccination in rheumatology patients taking immunosuppressants using an electronic health record best practice alert. *Arthritis Care & Research, 61(11),* 1505-1510. doi: 10.1002/art.24873	Rheumatology patients taking a listed immunosuppressive drug, seen in the office during influenza season (October 1 through February 28), and age ≥18 years. Pneumococcal vaccination: rheumatology patients taking an immunosuppressive drug, age ≥18 years. Lack of documentation of a prior vaccination within the past 5	Retrospective chart review. At site 1, a hospital-based academic practice, physicians ordered vaccinations. At site 2, a community-based practice, physicians signed orders placed by nurses. Chi-square and Fisher's exact test analysis compared vaccination and documentation rates.	Post BPA influenza vaccination rates significantly increased (47% to 65%; $P < 0.001$). Post BPA pneumococcal vaccination rates likewise significantly increased (19% to 41%; $P < 0.001$). Site 2 had significantly higher pre BPA vaccination rates for influenza (69% versus 43%; $P< 0.001$) than	BPA system is based on clinic visits and patients often miss appointments.	An EHR programmed to alert providers is an effective tool for improving quality of care for patients receiving immunosuppress-ants. The overall strength of the study was moderate. The overall quality of the study was medium. The directness of the evidence was direct evidence.

To examine whether an electronic health record (EHR) best practice alert (BPA), improved vaccination rates in rheumatology patients receiving immunosuppress-ants.	years if age ≥65 years. There were 777 influenza vaccine–eligible patients observed at both sites prior to the influenza BPA implementation, and 758 influenza vaccine–eligible patients observed after. There were 516 pneumococcal vaccine–eligible patients observed at both sites prior to the pneumococcal BPA implementation and 426 pneumococcal vaccine–eligible patients observed after.	Breslow-Day statistics tested the odds ratio of improvement across the years between the sites.	pneumococcal (47% versus 15%; $P < 0.001$).		The focus question was strong. The assessment of the study participants' representativeness was strong. The adequacy of control of selection bias was strong. The assessment of internal validity was strong. The adequacy of control of information bias was moderate. The validity and reliability of data collection instruments was strong. The adequacy of retention and

					follow-up was moderate. The comparability of control group and intervention/expos-ed group was strong. The adequacy of control of major confounders was moderate. The adequacy of ethical conduct was weak. The adequacy and interpretation of statistical testing was strong. The power and sample size was strong. The assessment of applicability was moderate.

Literature Summary Table 12

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Narcisse, M. R., Kippenbrock, T. A., Odell, E., & Buron, B. (2013). Advances practice nurses' meaningful use of electronic health records. *Applied Nursing Research, 26,* 127-132. doi: 10.1016/j.apnr.2013.02.003 To better understand electronic health records use among advanced practice nurses (APNs).	Convenience sampling was used. State boards of nursing: Arkansas, Louisiana, Mississippi, and Tennessee. 6986 postcards were sent and 526 individuals responded to the survey. EHR-users and non-users.	Non-experimental research design. Descriptive and multiple logistic regression analyses. Socio-demographics and practice characteristics were obtained through an online survey. Survey had mixture of closed-ended, open-ended and multiple-choice questions.	Younger APNs (less than 35) are less likely to use technology than their 35-55 year-old counterparts. APNs who reported practicing in a hospital setting are more likely to use EHRs. Statistically significant differences were found in age categories, practice size, practice settings, and in tasks related to	The University of Arkansas Institutional Review Board approved the project. Convenience sampling was used which limits generalizability. Study focused on four states, which has received a smaller proportion of incentive monies. Meaningful use involves other criteria that were	One third of APNs are non EHR users. More efforts are needed to help guide adoption and diffusion of EHRs in practice. The overall strength of the study was weak. The overall quality of the study was medium. The directness of the evidence was direct evidence. The focus question was strong.

		The design is a cross sectional survey. Chi-square test, nonparametric test of Mann-Whitney U Test, alpha level of 0.05, and multiple logistic regression.	imagery report review.	not investigated in this article.	The assessment of the study participants' representativeness was weak. The assessment of data collection sources and methods was strong. Assessment of validity and reliability of data collection instruments was strong. The adequacy of ethical conduct was strong. The assessment of statistics was strong.

Literature Summary Table 13

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Nguyen, L., Bellucci, E., & Nguyen, L. T. (2014). Electronic health records implementation: An evaluation of information system impact and contingency factors. *International Journal of Medical Informatics, 83(11),* 779-796. doi: 10.1016/j.ijmedinf.2014.06.011 A review of electronic health record (EHR) implementation	Peer-reviewed scholarly journal publications from the last 10 years (2001- 2011). Collection of journal papers in 56 journals retrieved from the Scopus, Embase Informit, Medline and Proquest Health and Medical Complete databases. Exclusion criteria included industry papers, non-English, non-peer-reviewed,	Systematic Literature review. Analysed data based on the DeLone and McLean's information system (IS) evaluation framework. Three researcher reviewed each paper. Study designs were the case study—single case study (n = 39) as well as multiple cases (n = 10)—and	Quantitative data analysis was found to be the most popular (62 papers). Clinicians and patients were found to have positive and moderately positive attitudes towards EHR. Increase number of EHR implementations in primary care. Not all EHR functions are used by end users. User satisfaction ranged from high,	Selected and reported only research efforts and findings that met certain criteria. Lack of well-defined conceptual frameworks for evaluation in various papers. Large number of studies were survey and quantitative, which does not identify issues such as conflicts between clinical and secondary EHR use.	EHRs can aid patient care and clinical documentation. Negative impacts include, changes to workflow and work disruption. The quality of the study was low. The directness of evidence was direct evidence. The focus question as strong. The methodology of the review was strong.

around the world and reports on findings including benefits and issues associated with EHR implementations.	duplicate, non-empirical, outside the 2001–2011 time period, and papers without an EHR focus. Inclusion criteria included suitable research questions, description of methods, and reported findings on impacts arising from EHR Implementation.	surveys (*n* = 34 papers). 19 out of 21 papers reporting longitudinal studies.	through to medium and low. Learning laboratories provided an effective method to reinforce classroom and web-based training. The computer skills assessment tool was effective in determining who may benefit from additional computer support.		Assessment of the methodology was weak. The rigorous review process was strong. Assessment of the study results is strong. There is a clear effect. There is consistency of results across studies. The number of the studies that contributed to clear effect was sufficient. The effect is clinically meaningful.

					The assessment of applicability was strong. Assessment of statistics was moderate.

Literature Summary Table 14

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Nicklaus, J., Kusser, J., Zessin, J., & Amaya, M. (2015). Transforming education for electronic health record implementation. *The Journal of Continuing Education in Nursing, 46(8),* 359-363. doi: 10.3928/00220124-20150721-02 The transformation from an instructor-led classroom training plan into a focused clinician	Dell children's medical center of central Texas. EHR journey began in 2005. Instructor-led, hands-on training, with focus on navigating the electronic chart. 10 years later EHR is implemented in seven additional hospitals. Scenario and workflow-based implementation model.	Five stages of Benner's classic novice-to-expert model was defined: Novice, Advanced Beginner, Competent, Proficient, and Expert. Lowe's five key principles: send trainees the right messages, make the most of in-house trainers, aim for distraction-free training, spread training out so it sinks in, and figure out the clinical	Integration of specialty-specific scenarios in classroom training aids in understanding of content. Learning laboratories provided an effective method to reinforce classroom and web-based training. The computer skills assessment tool was effective in determining who may benefit from	Gaps in complex processes were noted during the implementation process. Limitations of successful training included budgetary concerns. Facilitators required proficiency skills.	The use of clinician specialty workflow training pathway meets learners' needs and decreases time to competency. The overall strength of the study was weak. The quality of the study was medium. The directness of evidence was direct evidence. The focus question was moderate. The assessment of the participants'

workflow training pathway.		workflow for the clinical specialty. Computer skills assessment test to evaluate computer literacy, EHR proficiency tool, web-based training modules, clinical scenarios, and learning laboratory.	additional computer support.		representativeness was weak. Assessment of data collection was strong. Assessment of validity and reliability was strong. Adequacy of ethical conduct was strong. Assessment of statistics was moderate.

Literature Summary Table 15

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Robinson, K. E., & Kersey, J. A. (2018). Novel electronic health record (EHR) education intervention in large healthcare organization improves quality, efficiency, time, and impact on burnout. *Medicine, 97(38),* 1-5. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6160120/pdf/medi-97-e12319.pdf	Three day intensive EHR education intervention. 46 trainings from 2014-2016. 3500 physicians. 30 specialities	Mixed-method evaluation. Training designed by Kaiser Permanente Southern California. Multiple data sources: Just-in-time feedback, end-of-day surveys, post-activity surveys, and collection of performance data from the EHR. Statistical analysis was performed	85 to 98% of physicians self-reported improved quality, readability, clinical accuracy of documentation, fewer medical errors, and increased efficiency in chart review and data retrieval. 78% reported estimated time savings of 4 to 5 minutes or more per hour. 98% would recommend their	The implementation of additional clinical training on related organization-wide clinical initiative may have influenced results. Reported no conflict of interest.	The advanced EHR training was well-received by physicians and may help reduce physician burnout. The overall strength of the study was weak. The quality of the study was medium. The directness of evidence was direct evidence. The focus question was strong. The assessment of the study participant's

Describe an advanced electronic health record (EHR) skills training that was developed in a large healthcare organization to improve EHR documentation, while reducing stressors that are linked to physician burnout.		using Stata, version 14.2 Relative risks and 95% confidence intervals (CIs) were used.	training to their peers.		representativeness was weak. Assessment of the data collection sources and methods was strong. Assessment of validity and reliability of data collection was strong. Adequacy of ethical conduct was strong. Assessment of statistics was strong.

Literature Summary Table 16

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Ward, M. M., Vartak, S., Schwichtenberg, T., & Wakefield, D. S. (2011). Nurses' perceptions of how clinical information system implementation affects workflow and patient care. *Computers, Informatics, Nursing, 29(9),* 502-511. doi: 10.1097/NCN.0b013e31822b8798 The study compared changes in nurse's	Midwestern rural hospital with 300 staffed beds and 2700 employees. Registered nurses (RN) and licensed practical nurses (LPN). 1395 respondents. 354 nurses completed the pertaining survey, 203 nurses completed the post training, and 148 completed the post implementation survey.	Descriptive analyses. Factorial analysis of variance was used to compare mean responses across three administrations, RNs, and LPNs. Mean responses greater than 3 indicated the respondents expected or experienced improvement. Mean responses greater than 4 indicated that the	Nurses with previous EHR experience expressed more positive responses on 19 of the 47 items. Subsequent analyses examined the interaction between EHR experience and the pattern of responses. Two items produced significant interactions, "my ability to learn about and improve our patient care processes" and	The analyses is focused on nurses at a single hospital, which might restrict generalizability. Not all nurses completed the second and third survey. Time may have affected variation in sample. The respondents may have exhibited response biases.	Perceptions were more positive in nurses who had previous experience with EHRs and less positive in nurses with more years of work experience. The overall strength of the study was weak. The quality of the study was medium. The directness of evidence was direct evidence. The focus question was strong.

perceptions about patient care processes and workflow before and after a comprehensive clinical information system implementation at a rural hospital.		respondents agreed with the statement.	"the consistency with which patient care data are recorded." 6 months after implementation, nurses with previous EHR experience maintained a positive view, while nurses without previous experience reported a decrease in their optimism.		The assessment of the study participant's representativeness was moderate. Assessment of the data collection sources and methods was strong. Assessment of validity and reliability of data collection was strong. Adequacy of ethical conduct was weak. Assessment of statistics was strong.

Literature Summary Table 17

Name, Author, Date, Study Objective	**Sample/Groups (Size, Setting, Characteristics)**	**Design and Methodology**	**Key Results/Findings**	**Strengths/ Limitations**	**Conclusion and Rating**
Yonz, L. S., Zinn, J. L., Schumacher, E. J. (2015). Perioperative nurses' attitudes toward the electronic health record. *Journal of PeriAnesthesia Nursing, 30(1),* 23-32. doi: 10.1016/j.jopan.2014.01.007 To identify perioperative nurses' attitudes toward the use of the EHR.	Setting: Not-for-profit integrated tertiary health network in the south-eastern United States. Targeted population: 396 nurses from preadmission testing, same day surgery, operating room, and post anesthesia care. Inclusion criteria: must be a perioperative registered nurse, willing to participate,	Quantitative descriptive survey. A computer-based learning module was written and used to describe and invite the participants. Nurses voluntarily completed an anonymous online survey. 32 item questionnaires were used to gather demographic data and determine attitudes.	88 nurses participated in the survey. 89.8% agreed and/or strongly agreed, they were confident entering patient care information into the computer. 80.8% reported EHR will lead to improved patient care. 78.2% had adequate time to document in the record.	Presented at the health system nursing research council. Received Institutional Review Board approval. The survey only included one hospital system in the southeastern United States. Most of the perioperative staff were currently using an electronic record to document care.	Perioperative nurses generally had positive attitudes toward the use of the electronic health record. The overall strength of the study was weak. The quality of the study was medium. The directness of evidence was direct evidence. The focus question was strong. The assessment of the study

	employed in the health system between February 23, 2012 and March 23, 2012.	A four-point Likert scale was used for people, computer, and organizational variables.	79.2% reported using an EHR was beneficial. 87.2% reported computers had helped improve documentation of patient care. 66.6% reported computer documentation did not take them away from their patients. 77.9% reported computer documentation did not interfere with their ability to care for the patient. 83.5% had access to a computer when they needed one.	Data collection took place over a short period of time. Staff participating in the survey received credit on their annual performance review. Questionnaire was not tested for reliability and validity.	participant's representativeness was weak. Assessment of the data collection sources and methods was strong. Assessment of validity and reliability of data collection was weak. Adequacy of ethical conduct was strong. Assessment of statistics was strong.

			70.5% reported all computers had the same functionality. 67.5% did not take longer to document care in the computer. 72.0% reported computers did not create more work. 65.3% reported help was readily available. 71.7% reported the hospital provided a user-friendly environment with adequate training and back up support.		

Appendix B

Carolyn Morgan

Consultation Report

Memorial University

Memorial University of Newfoundland

School of Nursing

Master of Nursing Program

PRACTICUM: CONSULTATION REPORT

Student's Name: Carolyn Morgan **Student ID #: 009915661**

Course Names and Numbers: Practicum N6660

Supervisor: Jill Bruneau

Title: An Evaluation of the Provincial Electronic Health Record HEALTHe NL and the HEALTHe NL Online Learning Module: The Nurse Practitioner Perspective

Date: August 16th, 2019

1. Brief overview of the project

The Newfoundland and Labrador Centre for Health Information (NLCHI) along with its partner, Orion Health, designed HEALTHe NL, the provincial EHR for Newfoundland and Labrador (NL). HEALTHe NL provides accurate and reliable data to authorized health care professionals to improve the delivery of health care across our province. This EHR links our four regional health authorities together and allows clinicians to have a holistic view of their patients' clinical documents, laboratory reports, diagnostic imaging reports, medication profiles, and immunization records. HEALTHe NL contains information from the client registry, the pharmacy network, the picture archiving and communications system, and the laboratory information system. There are five tabs within HEALTHe NL: patient summary, timeline, encounters, medication profile, and immunization. Each of these tabs and its contents will be evaluated to

determine what nurse practitioners are accessing and what they identify as the strengths and challenges of HEALTHe NL. This EHR provides nurse practitioners and healthcare professionals with timely and secure access to patients' health records (NLCHI, 2019).

In addition, the related HEALTHe NL online learning module was developed in February of 2018 and implemented in April of 2018. Since its implementation, the module has not been evaluated by healthcare providers to determine its strengths and challenges. A survey will be developed and sent to nurse practitioners across the province of NL who are currently active HEALTHe NL users. Collecting this feedback from nurse practitioners will help support the continued use of these electronic systems and the continuity of patient care. It will also identify ways to improve the content in HEALTHe NL and the online learning module to support the workflow of healthcare providers, their ability to use HEALTHe NL, and to better serve the learning process for future nurses and healthcare providers.

The objectives of this practicum project are to evaluate the benefits and challenges of using the provincial electronic health record, HEALTHe NL, to understand nurse practitioners' perspectives on the benefits and challenges of using HEALTHe NL in relation to clinical practice, to evaluate the nurse practitioners' perspectives on the benefits and challenges of the HEALTHe NL online learning module, and to demonstrate application of advanced practice nursing competencies.

2. Specific objective(s) for the consultation

1. By the end of this consultation, I will have confirmed with Nicole Gill, Director of Evaluation and Performance Improvement at the NLCHI that I can access and utilize SurveyMonkey for this practicum project.
2. By the end of this consultation, I will have communicated with Danielle Porter, Manager of HEALTHe NL at the NLCHI, to determine if she would like to include specific content in the survey that may benefit NLCHI program initiatives.
3. By the end of this consultation, I will have requested the Applications Team at the NLCHI to generate a report indicating the nurse practitioners in the province of NL who are active HEALTHe NL users.
4. By the end of this consultation, I will have communicated with the Change Management Specialists at the NLCHI to determine if they would like to include particular content in the survey that may benefit NLCHI program initiatives.
5. By the end of this consultation, I will have confirmed with Gillian Sweeney, VP of Clinical Information Programs & Change Leadership at the NLCHI that she approves of this practicum project and that my survey aligns with the mandate of the NLCHI.
6. By the end of this consultation, I will have requested feedback from three nurse practitioners on the cardiology unit at the Health Sciences Centre on the survey content and ideal length of time to complete it.

3. Setting and Sample

For the purpose of this practicum project, the employees at the NLCHI and three nurse practitioners on the cardiology unit at the Health Sciences Centre were chosen to consult with on the development of a survey to evaluate HEALTHe NL and the related online learning module.

Nicole Gill was chosen because she is involved with research that is conducted at the NLCHI, and has the application tool to build a survey. Danielle Porter and the Change Management Specialists can provide suggestions on survey content since they are heavily involved with the implementation of HEALTHe NL, the online HEALTHe NL learning module, and clinician interaction on a daily basis. The Applications Team has access to generate reports of all active HEALTHe NL users. Gillian Sweeney is head over the department and is the main contact for this practicum project. The nurse practitioners on the cardiology unit were chosen because they are active HEALTHe NL users and can provide feedback on the content that should be included in the survey, as well as identify the amount of time it will take to complete the survey.

An email correspondence was sent to Danielle Porter and the Change Management Specialists to gather information for the practicum project and survey development. In addition, a semi-structured interview was conducted with Nicole Gill and Gillian Sweeney. A ticket was opened with the NLCHI service desk requesting a list of all nurse practitioners in the province of NL who are active HEALTHe NL users. This list will be generated closer to the distribution of the survey. As indicated in Appendix B,

an email was sent to three nurse practitioners on the cardiology unit at the Health Sciences Centre.

The following individuals were consulted:

1. Nicole Gill, Director of Evaluation & Performance Improvement at the NLCHI in St. John's, NL.
2. Danielle Porter, Program Manager of HEALTHe NL at the NLCHI in St. John's, NL.
3. Applications Team at the NLCHI in St. John's, NL.
4. Change Management Specialists at the NLCHI in St. John's, NL.
5. Gillian Sweeney, VP of Clinical Information Programs & Change Leadership at the NLCHI in St. John's, NL.
6. The three nurse practitioners located on the cardiology unit at the Health Sciences Centre in St. John's, NL.

4. Data Collection

The data was individually collected from Danielle Porter and the Change Management Specialists via email. In addition, data was collected from Nicole Gill and Gillian Sweeney via a semi-structured interview. I provided an overview of my practicum project and discussed the applicable questions as indicated in Appendix A. Their feedback and suggestions were documented in Appendix A. The names of nurse practitioners in the province of NL who are active HEALTHe NL users will be generated

in a report by the Applications Team closer to the distribution of the survey. As indicated in Appendix B, an email was sent individually to the three nurse practitioners. The responses from two out of the three nurse practitioners are documented in Appendix B.

5. Data Management and Analysis

NLCHI Employees

The individual responses from the identified employees at NLCHI are recorded on the attached interview form (Appendix A). As indicated in Appendix A, all six NLCHI employees responded. My practicum project has been approved by NLCHI and supports the mandate of the organization. They also confirmed I can use SurveyMonkey for the purpose of this practicum project. Four themes were identified in the responses of the NLCHI staff, including: HEALTHe NL online learning module functionality, HEALTHe NL online learning module accessibility, HEALTHe NL education materials, and HEALTHe NL functionality.

NLCHI Employee Data Analysis

HEALTHe NL online learning module functionality. Three participants reported they would like to see information in the survey that focuses on whether the online learning module was engaging for clinicians and how the module could be improved. The suggested areas of focus included: automated voice vs. natural voice, length of video, open text for recommendations, clarity, conciseness, level of detail, comprehensiveness, effectiveness, user friendliness, introduction quality, organization,

speech time, visual aids, meeting expectations, and overall rating.

HEALTHe NL online learning module accessibility. Three of the participants had different suggestions in relation to accessibility. Participant C suggested focusing on why a user might stop watching the online learning module. The suggested areas of focus included: time constraints, level of engagement, and browser compatibility issues. It was suggested that all survey content should contain open ended questions to determine necessary system enhancements. Participant D would like the survey to highlight if users would find it helpful if each tab within HEALTHe NL had a link to the related training video. Participant D would also like to determine if having the telephone number to the NLCHI service desk available at the end of each video would be an effective way to address user difficulties. Participant E would like to determine if users would prefer to only watch the videos related to their access and usage of HEALTHe NL rather than watching the whole online learning module.

HEALTHe NL education materials. Three of the participants had suggestions in relation to the HEALTHe NL education materials. Participant C would like to determine if users would be open to completing a quiz feature following the completion of the online learning module. Participant D would like to determine if a help feature or live chat feature would be beneficial for users having difficulty with HEALTHe NL or the online learning module. Participant F would like know if users value the education materials, and if they refer to the "What's New" tab within HEALTHe NL. Participant F would also like to determine what training materials users prefer (i.e. the HEALTHe NL help materials or the online learning module).

HEALTHe NL functionality. Three of the participants had suggestions in relation to HEALTHe NL functionality. Participant D would like to determine if users have difficulty creating passwords and if creation criteria should be listed across from where the user will enter the password. Participant E would like to determine if users have difficulty changing their passwords. Participant D would like to determine if users find the document view confusing because the specific range is not indicated as the "last 12 months." In addition, Participant E would like to determine if this functionality should be considered as an enhancement to the current online learning module, along with an overview and definition of the four filters available under the medication tab. Participant E would also like to determine if users are aware of the lock icon and merge icon, and the functionality of each. Participant F would like to determine if the design of the medication profile and CDV tree supports clinicians' workflows and if any enhancements could be recommended. Participant F would also like to determine if the clinical documents listed under the CDV tree requires subcategorization of reports, and if HEALTHE NL is missing any required clinical data or medical test results.

Nurse Practitioners

The individual responses provided by the nurse practitioners are recorded on the attached interview form (Appendix B). As indicated in Appendix B, two out of the three nurse practitioners responded. Three themes were identified: regular usage, willingness to participate, and accuracy and feedback.

Regular usage. Both nurse practitioners described frequent usage of HEALTHe

NL. Nurse A reported using HEALTHe NL on patient admission and discharge and Nurse B reported using HEALTHe NL daily.

Willingness to participate. Both nurse practitioners reported they have not completed or viewed the HEALTHe NL online learning module. Nurse A and Nurse B reported they would complete a survey, and would be willing to spend an average of 10 minutes completing it.

Accuracy and feedback. Nurse A reported survey content should focus on the accuracy and confidence of the system, especially in relation to patient medications. Nurse B reported the survey should contain a comment section.

6. Ethical Considerations

I sent an individual meeting invite to Nicole Gill and Gillian Sweeney to discuss the identified questions as indicated in Appendix A. I also sent the applicable questions indicated in Appendix A to Danielle Porter and the Change Management Specialists. I informed them of my practicum project topic and the reason for the consultation. Their responses are confidential and are only identifiable by numerical code (i.e. Participant A, Participant B, etc.) In addition, I requested a report of nurse practitioners who are active HEALTHe NL users. This report will be generated closer to the survey distribution. I sent the three nurse practitioners an email and explained the reason for the consultation, and kindly requested their time to respond to the questions identified in Appendix B. The nurse practitioners' identity is confidential, and their responses are only identifiable by numerical code (i.e. Nurse A, Nurse B, etc.). The feedback received is confidential and is

stored on a password protected computer. For the purpose of this practicum project, the Health Research Ethics Authority Screening Tool was completed and is located in Appendix C.

7. Conclusion

This practicum project has been approved by the NLCHI and will be developed using SurveyMonkey. As indicated in the results, the management team has identified content to include in the survey that will benefit program initiatives. The report requested will be generated by the Applications Team and will indicate the nurse practitioners throughout the province of NL who are active HEALTHe NL users. Three nurse practitioners located on the cardiology unit at the Health Sciences Centre were contacted to complete the questions identified in Appendix B. Two out of the three nurse practitioners responded. Consultation with the identified NLCHI employees and nurse practitioners has assisted me with the preparation of the survey development to evaluate nurse practitioners' perspectives of HEALTHe NL and the related HEALTHe NL online learning module. Content identified by the employees at the NLCHI will be included in the survey to benefit multiple program areas at the NLCHI. Conducting this survey with nurse practitioners will help support the continued use of these electronic systems, the continuity of patient care, and identify ways to improve HEALTHe NL to benefit the workflow of healthcare providers and the HEALTHe NL online module to better serve the learning process for future nurses and healthcare providers.

8. References

Newfoundland & Labrador Centre for Health Information. (2019). *HEALTHe NL*. Retrieved from https://www.nlchi.nl.ca/index.php/ehealth-systems/healthe-nl

Appendix A

NLCHI Employee Semi-Structured Interview

A semi-structured interview or email was conducted with NLCHI employees to determine if I can access SurveyMonkey, if the survey aligns with the NLCHI's mandate, if the practicum project is approved, and if particular content should be included in the survey that may benefit program initiatives.

The following script was used to provide an overview of HEALTHe NL.

"To *date HEALTHe NL and the related online learning module have not been evaluated. As you know, April 2018, the HEALTHe NL online learning module was implemented to assist with training healthcare professionals province-wide. The purpose of this practicum project is to develop and distribute a survey to nurse practitioners throughout the province to evaluate the five tabs within HEALTHe NL and the HEALTHe NL online learning module. Collecting this feedback from nurse practitioners will help support the continued use of these electronic systems, the continuity of patient care, and identify ways to help us improve HEALTHe NL and the online learning module to better serve the learning process for future nurses and healthcare providers. I have some questions for you that will assist me in the development of a survey to evaluate these electronic systems,"*

The following questions were discussed face-to-face or via email correspondence:

1. Can I use the organizational SurveyMonkey to create and distribute the survey?

Participant A:

- Yes. We have a team account that you can access to build and distribute your survey.

2. Does the creation of a survey to evaluate nurse practitioners' perspectives of HEALTHe NL and the HEALTHe NL online learning module align with the NLCHI's mandate?

Participant B:

- Yes. It will be interesting to survey nurse practitioners' because their clinical scope is very different from other healthcare professionals.

3. Do you approve of this practicum project?

Participant B:

- Yes.

4. What content would you like to include in the survey that may help benefit program initiatives?

Participant C:

- It would be great to know if users find the training material comprehensive, effective and user friendly.
- We have often heard that the voice over for the training videos is somewhat robotic/unengaging. I think it would be of benefit to gauge how engaging the videos are and then maybe have some questions to capture how specific

components of the videos could be improved (e.g., automated voice vs. natural voice, length of videos, open text for recommendations).

- I remember (X) commenting during PMP that the first couple of videos had a lot of views but the latter videos did not- almost like people stopped watching. If this is still the case (I think you can see the number of views on YouTube) it would be great to know why people stop watching (e.g., "Did you watch all the relevant training videos?" "If you did not watch all of the relevant training videos please indicate why: Time constraints, not engaging, unable to open the link, open text for explanation, etc.").

Participant D:

- Computer Generated Voice - Many health care providers have mentioned that it would be nice to have a real voice in the videos. This would make it easier to watch and would likely result in people watching more of the videos.
- Possible Survey Question for NPs - Do you feel that the HEALTHe NL videos are engaging/clear/concise/detailed for the learner?
- Placement of Training Materials - Having a button/link that users could click on to view the applicable training video when they are in a tab (i.e. timeline, encounters patient summary etc.) would be helpful. A separate window could open (so that they don't lose their place in HEALTHe NL) and allow them to quickly refresh their minds on how to use that particular tab. People aren't likely to go fishing for the training materials heading and leave the tab they already are in to find the applicable training video.

- Possible Survey Question for NPs - In your opinion, are the training materials easily accessible for a new learner? If not, please advise how we could make these materials more accessible for new HEALTHe NL learners.
- Organizing the Folders on the Main Training Materials Screen- This screen could generate confusion for new learners. Perhaps we could re-organize this with folder titles that are clearer. In future, we could have separate folders that hold HEALTHe NL, myCCath, Vascular Lab, Telehealth, eOrdering, eConsult links for training materials. The user would need to select what type of training that is more applicable to them without having to scan through multiple other file names.
- Possible Survey Question for NPs - Do you feel that the main HEALTHe NL Training Materials screen could be organized more effectively to allow for clarity?
- Interactive Training Video Links - It would be cool if the learner could click on the various features of the screen to view the video of interest. If a screen shot kind of image was displayed (in replace of the list that currently exists) on our main Training Materials Screen, the learner could click on the applicable tabs/features and launch into the applicable training video. This would be easier for the learner to maneuver around the features that are of interest to them and their role. This is a more advanced option compared to the one mentioned above.

- Service Desk Contact Information- At the end of each training video, the Service Desk number for NLCHI should be provided. A message like 'need additional training or HEALTHeNL support? contact our 24/7 Service Desk number to speak with one of our staff.'
- Help/Chat Features- There are also certain systems that have a help feature and a chat feature that allow the user to either (1) look up relevant documents when they are stuck or (2) ask relevant training questions through a chat platform. Not sure if answers to common questions are coded or if a support staff would be hired to respond to these questions. Would be a cool, easy to use type of feature for users.

Participant E:

- Patient Demographic Search: Are they aware how to proceed if a lock icon is next to a patient's name? Are they aware how to proceed to view a patient's file if a merged patient indicator icon is next to patient's name?
- Changing Password: Reset link should be renamed. When changing password within HEALTHe NL, the instructions on password requirements is not listed.
- Searching for a patient: Patient summary tab - the video does not indicate the default time range or show the user the eye icon to select date range.
- Medication tab: Video does not indicate what "completed, suspended, aborted, active" means. Could there be a key with the meaning of each?

- Online learning: Did the introduction provide a general overview of the presentation? Was the presentation organized in a logical manner? Was the rate of speech and tone appropriate? Were visual aids used effectively and appropriately? Did the training meet your expectations? Overall rating of the presentation?

Participant F:

- I'd like to know if there is value in the education materials with HEALTHe NL and whether the design of the med profile and CDV tree support their workflows in a meaningful way so that it is embedded in their patient care. If not, what changes would improve this? Provide examples.
- Do they refer to What's New – is it helpful to learn about new functionality or updates? If no, is there another method that would be preferred?
- Do they use the help material within HEALTHe NL or prefer to use the training site and videos?
- Did you plan on asking about the medication profile – e.g. does the design support workflow? Are there enhancements that would improve the clinical value or efficiency?
- Organization of the CDV tree – Clinical documents are combined within a single category (with the exception of discharge summaries) – is it easy to find reports, or would a subcategorization of reports improve efficiency?

5. Do you have any additional comments?

Participant C:

- In adobe presenter there is the ability to have a built in quiz feature which would recap the material from the video by asking the user questions. I wonder if this is something that users would find helpful/more engaging.
- I think it would be of benefit to have open ended questions as we will not anticipate all of the feedback. Open ended questions that capture how the training resources can be improved/suggestions for enhancements, and/or the positive aspects of the resources would be beneficial. Would be great to know what's working well too.

Participant D:

- Should we have the NLCHI Service Desk number more visible? Users have to click in and then scroll down to see the NLCHI Service Desk number listed. I briefly mentioned that to (X) once.
- The other thing that would help us with sign ons is for the user to have a box similar to the box that appears when someone sets up a token. The box has all the criteria listed (i.e. 8-12 characters, combination of letters and numbers etc.) and it even ticks off when the user has met the criteria. It's a good guide for users and would help to speed up the sign on/avoid confusion/miscommunication when setting up a password.
- The heading under document view should probably be 'last 12 months' or something. It's not really clear what specific range means.

Participant E:

- I know this may not be relevant to NP as their role allows them to access all information in Healthe NL therefore they would require to watch all the training material. However, when we direct other users to watch the online training videos would it be beneficial to instruct or notify them somehow that they may not have to watch all videos depending on their access? We can communicate it with the user when we sign them on, however many times they may already have training completed prior to completing the sign on. Just a thought.

Participant F:

- Are there clinical data or results that are presently not in HEALTHe NL that prevent more frequent, meaningful use?

Appendix B

Nurse Practitioners

An email was sent to three nurse practitioners to determine the content that should be included in the survey and the length of time it should take to complete it.

The following script was used to provide an overview of HEALTHe NL.

"HEALTHe NL is Newfoundland and Labrador's provincial electronic health record. The Newfoundland and Labrador Centre for Health Information is implementing HEALTHe NL to authorized health care professionals' province-wide. HEALTHe NL links our four regional health authorities together, and provides nurses and other healthcare providers with patient demographic information, clinical documents, laboratory results, diagnostic imaging reports, hospital encounters, community medication history, and immunization data. In April 2018, a HEALTHe NL online learning module was implemented to assist with training healthcare professionals province-wide. The purpose of this practicum project is to develop and distribute a survey to nurse practitioners throughout the province to evaluate HEALTHe NL and the related online learning module."

The following questions were asked:

1. How often do you access HEALTHe NL?

Nurse A:

- A lot. I use it when I first get assigned to a patient & use it during their admission to ensure all pre-op medications are restarted/assessed & again prior to discharge to ensure no meds are missed.

Nurse B:

- I use HEALTHe NL daily in my practice.

2. Have you viewed the HEALTHe NL online learning module?

Nurse A:

- No.

Nurse B:

- No I have not viewed the learning module.

3. Are you willing to complete an online survey related to the evaluation of HEALTHe NL and the related online learning module?

Nurse A:

- Yes.

Nurse B:

- I am willing to complete a survey.

4. What is the ideal length of time you would spend completing a survey?

Nurse A:

- 5-10 minutes.

Nurse B:

- I would spend up to 15 mins completing a survey.

5. To help me evaluate HEALTHe NL and the online learning module, what particular content should be included in the survey?

Nurse A:

- I guess if one feels the system is accurate and can be used with total confidence. I really like using HEALTHe NL however after speaking to some Community Pharmacies there are still medications patients are taking that we cannot see on our source or doses have been changed or drugs changed but the previous medication is still on HEALTHe NL as a current med. (I have several examples but this is a recent one - recently had a patient tell me he was on Basiglar Insulin but not visible on HEALTHe NL so I called the Pharmacist who confirmed on their records patient was indeed on that insulin).

Nurse B:

- I would like to see some space to provide feedback.

Appendix C

Health Research Ethics Authority Screening Tool

	Question	Yes	No
1.	Is the project funded by, or being submitted to, a research funding agency for a research grant or award that requires research ethics review	❒	✓
2.	Are there any local policies which require this project to undergo review by a Research Ethics Board?	❒	✓
	IF YES to either of the above, the project should be submitted to a Research Ethics Board. **IF NO** to both questions, continue to complete the checklist.	❒	❒
3.	Is the primary purpose of the project to contribute to the growing body of knowledge regarding health and/or health systems that are generally accessible through academic literature?	✓	❒
4.	Is the project designed to answer a specific research question or to test an explicit hypothesis?	✓	❒
5.	Does the project involve a comparison of multiple sites, control sites, and/or control groups?	❒	✓
6.	Is the project design and methodology adequate to support generalizations that go beyond the particular population the sample is being drawn from?	✓	❒
7.	Does the project impose any additional burdens on participants beyond what would be expected through a typically expected course of care or role expectations?	✓	❒
LINE A: SUBTOTAL Questions 3 through 7 = (Count the # of Yes responses)		4	
8.	Are many of the participants in the project also likely to be among those who might potentially benefit from the result of the project as it proceeds?	✓	❒
9.	Is the project intended to define a best practice within your organization or practice?	✓	❒

10.	Would the project still be done at your site, even if there were no opportunity to publish the results or if the results might not be applicable anywhere else?	✓	❒
11.	Does the statement of purpose of the project refer explicitly to the features of a particular program, Organization, or region, rather than using more general terminology such as rural vs. urban populations?	✓	❒
12.	Is the current project part of a continuous process of gathering or monitoring data within an organization?	✓	
LINE B: SUBTOTAL Questions 8 through 12 = (Count the # of Yes responses)		**5**	
	SUMMARY **See Interpretation Below**		

Interpretation:

- If the sum of Line A is greater than Line B, the most probable purpose is **research**. The project should be submitted to an REB.
- If the sum of Line B is greater than Line A, the most probable purpose is **quality/evaluation**. Proceed with locally relevant process for ethics review (may not necessarily involve an REB).
- If the sums are equal, seek a second opinion to further explore whether the project should be classified as Research or as Quality and Evaluation.

These guidelines are used at Memorial University of Newfoundland and were adapted from ALBERTA RESEARCH ETHICS COMMUNITY CONSENSUS INITIATIVE (ARECCI). Further information can be found at: http://www.hrea.ca/Ethics-Review-Required.aspx.

Appendix C

Environmental Scan Report

Carolyn Morgan

Memorial University

Memorial University of Newfoundland

School of Nursing

Master of Nursing Program

PRACTICUM: ENVIRONMENTAL REPORT

Student's Name: Carolyn Morgan **Student ID #:** 009915661

Course Names and Numbers: MN Practicum 1: N6660

Supervisor: Jill Bruneau

Title: An Evaluation of the Provincial Electronic Health Record HEALTHe NL and the HEALTHe NL Online Learning Module: The Nurse Practitioner Perspective.

Date: August 16th, 2019

1. Brief overview of the project (*maximum 1 page*)

The Newfoundland and Labrador Centre for Health Information (NLCHI) along with its partner, Orion Health, designed HEALTHe NL, the provincial EHR for Newfoundland and Labrador (NL). HEALTHe NL provides accurate and reliable data to authorized health care professionals to improve the delivery of health care across our province. This EHR links our four regional health authorities together and allows clinicians to have a holistic view of their patients' clinical documents, laboratory reports, diagnostic imaging reports, medication profiles, and immunization records. HEALTHe NL contains information from the client registry, the pharmacy network, the picture archiving and communications system, and the laboratory information system. There are five tabs within HEALTHe NL: patient summary, timeline, encounters, medication

profile, and immunization. Each of these tabs and its contents will be evaluated to determine what nurse practitioners are accessing and what they identify as the benefits and challenges of HEALTHe NL. This EHR provides nurse practitioners and healthcare professionals with timely and secure access to patients' health records (NLCHI, 2019).

In addition, the related HEALTHe NL online learning module was developed in February of 2018 and implemented in April of 2018. Since its implementation, the module has not been evaluated by healthcare providers to determine its benefits and challenges. A survey will be developed and sent to nurse practitioners across the province of NL who are currently active HEALTHe NL users. Collecting this feedback from nurse practitioners will help support the continued use of these electronic systems and the continuity of patient care. It will also identify ways to improve the content in HEALTHe NL and the online learning module to support the workflow of healthcare providers, their ability to use HEALTHe NL, and to better serve the learning process for future nurses and healthcare providers.

The objectives of this practicum project are to evaluate the benefits and challenges of using the provincial electronic health record, HEALTHe NL, to understand nurse practitioners' perspectives on the strengths and challenges of using HEALTHe NL in relation to clinical practice, to evaluate the nurse practitioners' perspectives on the strengths and challenges of the HEALTHe NL online learning module, and to demonstrate application of advanced practice nursing competencies.

2. Specific objective(s) for the environmental scan

1. To conduct an environmental scan to determine if EHRs have been evaluated in specific provinces in Canada.
2. To conduct an environmental scan to determine if specific provinces in Canada have developed and evaluated an EHR online learning module.
3. To conduct an environmental scan to determine the audiences that were targeted for EHR evaluation throughout other provinces in Canada.
4. To conduct an environmental scan to determine the audiences that were targeted for the evaluation of the EHR online learning module in other provinces in Canada.
5. To conduct an environmental scan to determine what methods of evaluation other provinces in Canada have used to evaluate their EHR.
6. To conduct an environmental scan to determine what method of evaluation other provinces in Canada have used to evaluate their EHR online learning module.

3. Sources of Information

During the environmental scan, I have determined that other provinces have evaluated their EHR and EHR online learning module. I conducted a website search and focused on the provinces of Nova Scotia, Ontario, Alberta, and Saskatchewan. I have selected these provinces to cover the Atlantic Canada region, and other major health centers across Canada. In consultation with the NLCHI EHR development team, I

identified a contact that is directly associated with the EHR in each of the four provinces and sent them an email as indicated in Appendix A.

4. Data Collection

The data for this environmental scan was collected by identifying a contact that is directly associated with the EHR in each of the four provinces and consulting with them. As indicated in Appendix A, the identified contacts from each of the four provinces were emailed individually. Two out of the four provinces responded. The responses from these two provinces are documented in Appendix A.

5. Data Management and Analysis

The individual responses from the two provinces are documented on the form (Appendix A). As indicated in Appendix A, two out of the four provinces responded. Contact A has not evaluated their EHR to date. Contact B has conducted an evaluation of their EHR. Contact A's target audience for their focus groups have been health care professionals (physicians, nurses, medical office assistants, pharmacists, etc.). Contact B indicated their target audience are key informants that were identified from each jurisdiction. Contact A is currently focusing on evaluating their EHR Viewer, which will consist of focus group meetings and a small survey. When asked about the method of evaluation that was used, Contact B indicated the following: administrative data, interviews, focus groups, the system and use survey, the review of project documents, and the completion of a literature review to gain a better understanding of EHR project

implementation. Contact A and Contact B identified they have an EHR online learning module/training materials. The EHR training material was evaluated by internal stakeholders for Contact A and Contact B. Contact B indicted their target audience consisted of all custodians and support staff within the public and private sectors. Contact B used the industry standard for plain language and the assessment of adult learning as their method of EHR training material evaluation.

6. Ethical Considerations

For the purpose of this practicum project, I emailed the identified contacts from each of the four provinces as indicated in Appendix A. The identity of the contacts will remain confidential, and the data will only be identifiable by numerical code (i.e. Contact A, Contact B, etc.) The feedback received will remain confidential and will be stored on a password protected computer. The Health Research Ethics Authority Screening Tool has been completed and can be found in Appendix B.

7. Conclusion

For the purpose of this practicum project, it was important to determine if the provinces of Nova Scotia, Ontario, Alberta, and Saskatchewan had evaluated their EHR and whether they had developed and evaluated an EHR online learning module. Two out of the four provinces responded. One province has evaluated their EHR and EHR online learning module. The other province is currently preparing to evaluate their EHR by using focus group meetings and distributing a small survey. I will consider the feedback

received from these provinces when developing a survey to evaluate HEALTHe NL and the related online learning module.

8. References

Newfoundland & Labrador Centre for Health Information. (2019). *HEALTHe NL*. Retrieved from https://www.nlchi.nl.ca/index.php/ehealth-systems/healthe-nl

Appendix A

Email Template

An email was sent individually to each contact identified in Nova Scotia, Ontario, Alberta, and Saskatchewan to determine if their EHR and/or EHR online learning module has been evaluated, who was the target audience, and what evaluation method was used. The following email was sent:

Hi (contact name),

I am the Manager of eHealth Change Leadership at the Newfoundland and Labrador Centre for Health Information in St. John's, Newfoundland. I work very closely with our provincial EHR (HEALTHe NL). I am currently completing my Master of Nursing with a focus on the evaluation of HEALTHe NL and our HEALTHe NL online learning module. I am conducting an environmental scan with other jurisdictions across Canada, and I am kindly requesting your assistance with the following questions.

Thank you in advance. If you have any questions, please let me know. If you would like to add any additional comments that might assistance me with the evaluation of these electronic systems, I would greatly appreciate it.

Sincerely,

Carolyn Morgan

EHR:

1. Has your EHR been evaluated?

Contact A:

- We have not formally evaluated our EHR Viewer.

Contact B:

- Yes – CHI funded, multi-jurisdictional BE. 2010 / evaluated by NLCHI

2. Who was your target audience? (i.e. nurse practitioners, etc.)

Contact A:

- Our target group has been Health Care Professionals (Physicians, Nurses, Medical Office Assistants and Pharmacists, etc.) We have had a few focus groups to identify what users would like to see in the EHR Viewer or what they would like changed.

Contact B:

- Key informants were identified by each jurisdiction.

3. What method of evaluation did you use? (i.e. survey, etc.)

Contact A:

- We are currently working on trying to evaluate the EHR Viewer and determine what we should enhance in the future. We are just starting to talk about this and are thinking we could have dedicated focus group meetings with our customers

based on their specialties (Doctors, Nurses etc.). We are also considering having a small survey to get feedback prior to our focus group meetings.

Contact B:

- (1) administrative data (e.g. lab data);
- (2) interviews and/or focus groups; and
- (3) The System & Use survey.
- In addition to this, the evaluation team reviewed project documents (e.g., scoping documents, project charters, budgets, etc.) and completed a literature review to gain a better understanding of the process of project implementation/context.

EHR online learning module/training:

1. Do you have an EHR online learning module/training video?

Contact A:

- We have EHR Viewer Training Materials on our eHealth Site.

Contact B:

- Learning materials were available within the network via a learning module system.

2. Has the EHR online learning module/training video been evaluated?

Contact A:

- We have not had external users validate the training, this has been done internally.

Contact B:

- Evaluated by Communications (X) prior to publishing.

3. Who was your target audience? (i.e. nurse practitioners, etc.)

Contact A:

- N/A

Contact B:

- All custodians and their support staff within the public sector (e.g. health authority/IWK) and in the private sector (e.g. LTC, Privacy practice).

4. What method of evaluation did you use? (i.e. survey, etc.)

Contact A:

- N/A

Contact B:

- The industry standard for plain language, adult learning was assessed.

Appendix B

Health Research Ethics Authority Screening Tool

	Question	Yes	No
1.	Is the project funded by, or being submitted to, a research funding agency for a research grant or award that requires research ethics review	❒	✓
2.	Are there any local policies which require this project to undergo review by a Research Ethics Board?	❒	✓
	IF YES to either of the above, the project should be submitted to a Research Ethics Board. **IF NO** to both questions, continue to complete the checklist.	❒	❒
3.	Is the primary purpose of the project to contribute to the growing body of knowledge regarding health and/or health systems that are generally accessible through academic literature?	✓	❒
4.	Is the project designed to answer a specific research question or to test an explicit hypothesis?	✓	❒
5.	Does the project involve a comparison of multiple sites, control sites, and/or control groups?	❒	✓
6.	Is the project design and methodology adequate to support generalizations that go beyond the particular population the sample is being drawn from?	✓	❒
7.	Does the project impose any additional burdens on participants beyond what would be expected through a typically expected course of care or role expectations?	✓	❒
LINE A: SUBTOTAL Questions 3 through 7 = (Count the # of Yes responses)		4	
8.	Are many of the participants in the project also likely to be among those who might potentially benefit from the result of the project as it proceeds?	✓	❒
9.	Is the project intended to define a best practice within your organization or practice?	✓	❒

10.	Would the project still be done at your site, even if there were no opportunity to publish the results or if the results might not be applicable anywhere else?	✓	❒
11.	Does the statement of purpose of the project refer explicitly to the features of a particular program, Organization, or region, rather than using more general terminology such as rural vs. urban populations?	✓	❒
12.	Is the current project part of a continuous process of gathering or monitoring data within an organization?	✓	
LINE B: SUBTOTAL Questions 8 through 12 = (Count the # of Yes responses)		**5**	
	SUMMARY **See Interpretation Below**		

Interpretation:

- If the sum of Line A is greater than Line B, the most probable purpose is **research**. The project should be submitted to an REB.
- If the sum of Line B is greater than Line A, the most probable purpose is **quality/evaluation**. Proceed with locally relevant process for ethics review (may not necessarily involve an REB).
- If the sums are equal, seek a second opinion to further explore whether the project should be classified as Research or as Quality and Evaluation.

These guidelines are used at Memorial University of Newfoundland and were adapted from ALBERTA RESEARCH ETHICS COMMUNITY CONSENSUS INITIATIVE (ARECCI). Further information can be found at: http://www.hrea.ca/Ethics-Review-Required.aspx.

Appendix D

HEALTHe NL User Survey - Nurse Practitioners

Introduction

My name is Carolyn Morgan and I am the Manager of Clinical Adoption at the Newfoundland and Labrador Centre for Health Information (the Centre). I work very closely with our provincial Electronic Health Record (HEALTHe NL) team.

I am currently completing my Master of Nursing Degree at Memorial University. The purpose of my practicum project is to evaluate HEALTHe NL and its online learning module. In collaboration with the Centre, I am conducting a survey with Nurse Practitioners regarding their experiences as users of HEALTHe NL. Collecting this feedback from you and other Nurse Practitioners will help the Centre to support the increased use of these electronic systems, the continuity of patient care, and identify ways to help improve HEALTHe NL and its online learning module to better serve the learning process for future nurses and healthcare providers. A report containing the results from the survey will be submitted to fulfill my practicum requirements.

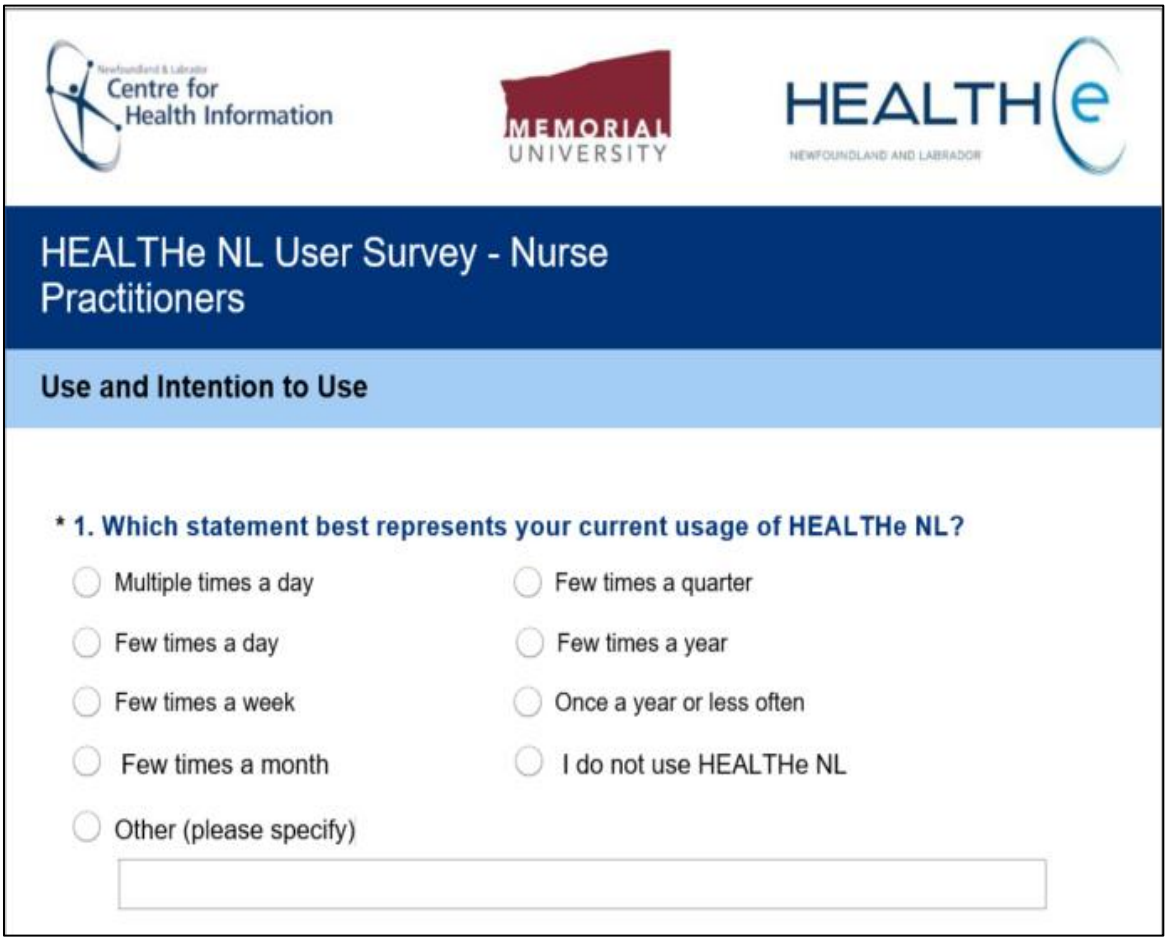
Your participation in the survey is voluntary and all information provided is anonymous and confidential. I am kindly requesting 10 minutes of your time to complete this survey.

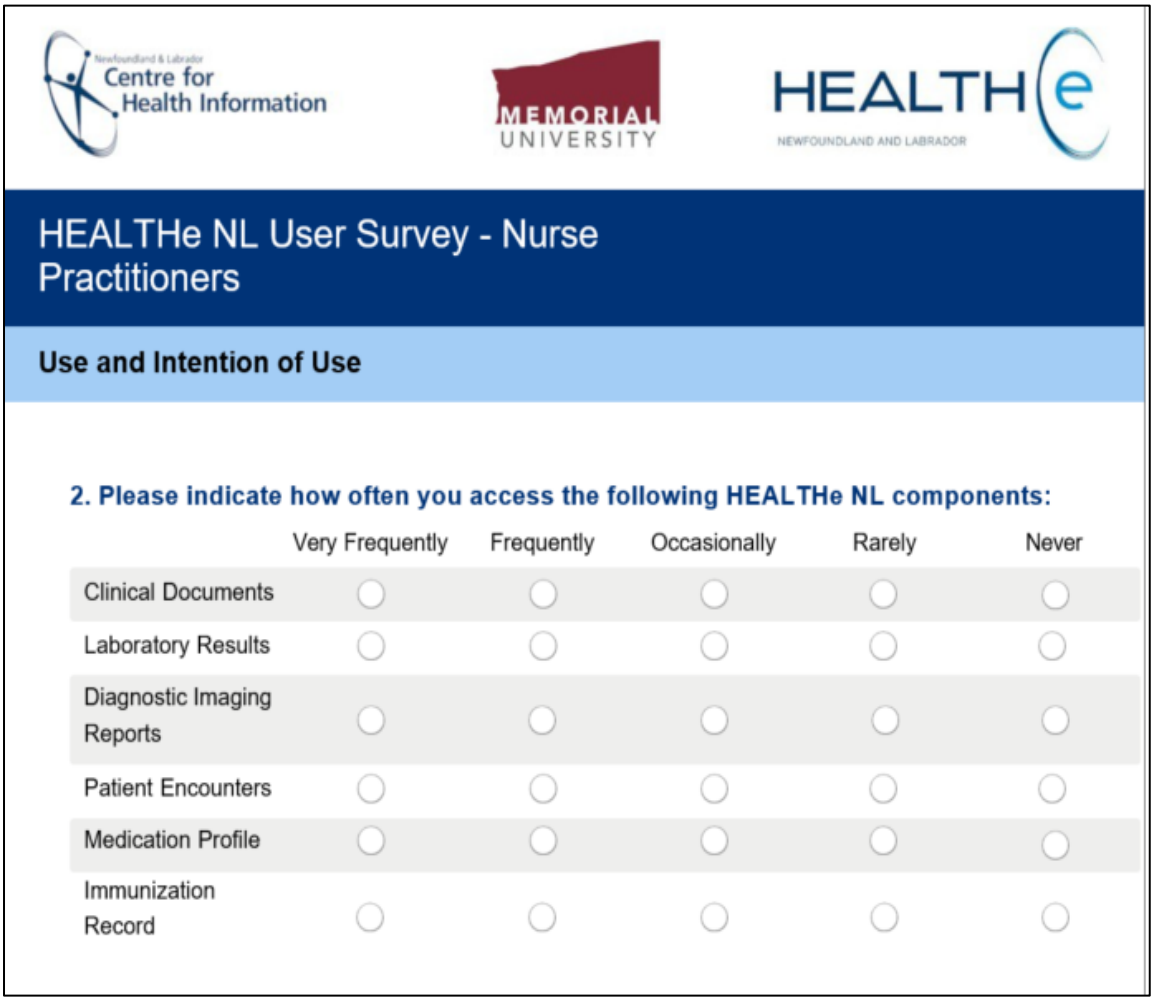
If you have any questions about the survey please contact me using the details below:

Carolyn Morgan B.A., B.N., R.N.
Manager, Clinical Adoption
Email: carolyn.morgan@nlchi.nl.ca
Phone: 709-752-6107

*** If you would like to take part in the survey please indicate your preferences below:**

- ○ I agree to take part in the survey and for my responses to be used as part of the aforementioned practicum project.
- ○ I agree to take part in the survey and for my responses to be used by the Centre to support HEALTHe NL program improvement.


Centre for Health Information
MEMORIAL UNIVERSITY
HEALTHe
NEWFOUNDLAND AND LABRADOR
HEALTHe NL User Survey - Nurse Practitioners
Use and Intention to Use
* 1. Which statement best represents your current usage of HEALTHe NL?
Multiple times a day
Few times a day
Few times a week
Few times a month
Other (please specify)
Few times a quarter
Few times a year
Once a year or less often
I do not use HEALTHe NL


Newfoundland & Labrador
Centre for Health Information
MEMORIAL UNIVERSITY
HEALTHe
NEWFOUNDLAND AND LABRADOR
HEALTHe NL User Survey - Nurse Practitioners
Use and Intention of Use
2. Please indicate how often you access the following HEALTHe NL components:
Very Frequently
Frequently
Occasionally
Rarely
Never
Clinical Documents
Laboratory Results
Diagnostic Imaging Reports
Patient Encounters
Medication Profile
Immunization Record

3. Please indicate which of the following negatively impact your current usage of HEALTHe NL:

- ☐ It is not an expectation of my role as a Nurse Practitioner
- ☐ I do not have easy access to a computer in my workplace
- ☐ I use eDOCSNL (EMR) instead of HEALTHe NL
- ☐ I prefer to use the patient's chart to retrieve information
- ☐ I do not see any benefit in using HEALTHe NL
- ☐ The information in HEALTHe NL is incomplete
- ☐ The information available in HEALTHe NL is unreliable
- ☐ Other (please specify)
- ☐ I cannot remember my password to access HEALTHe NL
- ☐ HEALTHe NL is difficult to navigate
- ☐ HEALTHe NL's response time is slow
- ☐ I do not know how to use HEALTHe NL
- ☐ HEALTHe NL is not safe to use
- ☐ Nothing impacts my usage of HEALTHe NL, I already use it regularly

HEALTHe NL User Survey - Nurse Practitioners

System Quality and Information Quality

4. Please indicate your level of agreement or disagreement with each of the following statements related to the quality and accessibility of the information provided by HEALTHe NL:

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
HEALTHe NL is integrated with my workflow	○	○	○	○	○
HEALTHe NL is easy to use	○	○	○	○	○
HEALTHe NL is reliable in its performance	○	○	○	○	○
HEALTHe NL information is reliable	○	○	○	○	○
HEALTHe NL is aligned with my clinical needs	○	○	○	○	○
The availability of lab results in HEALTHe NL supports my clinical practice	○	○	○	○	○
It would benefit my practice to have scanned clinical documents available in HEALTHe NL	○	○	○	○	○
Having access to diagnostic imaging information supports my clinical practice	○	○	○	○	○
Having access to patient encounters supports my clinical practice	○	○	○	○	○

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Having access to immunization information supports my clinical practice	○	○	○	○	○
The design of HEALTHe NL supports my clinical practice	○	○	○	○	○
It would benefit my clinical practice to have documents from the Meditech Nursing Module available in HEALTHe NL	○	○	○	○	○

5. Below is one of the icons available in HEALTHe NL:

The following statements are related to the icon displayed above. Please select all that apply to you.

- [ ] I understand the meaning of the icon
- [ ] I know how to use this icon
- [ ] I am not sure what is the meaning of the icon and how to use it
- [ ] My workflow is negatively impacted by tasks associated with this icon
- [ ] Other (please specify)

6. Please rate the overall quality of HEALTHe NL?

- ( ) Very poor
- ( ) Poor
- ( ) Acceptable
- ( ) Good
- ( ) Very good

Additional comments about the quality and accessibility of information in HEALTHe NL and how it can be improved:

HEALTHe NL User Survey - Nurse Practitioners

Medication Profile Tab

7. All community pharmacies throughout the province are connected to the Pharmacy Network. This medication information is accessible in HEALTHe NL under the Medication Profile Tab. Please indicate your level of agreement or disagreement with each of the following statements:

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Having access to this information has supported the timely completion of my patients medication reconciliations	○	○	○	○	○
Having access to this information has increased the efficiency of my work	○	○	○	○	○
This medication information is reliable	○	○	○	○	○
The design and display of the medication information is useful for my clinical needs	○	○	○	○	○

For additional examples or comments please use box below:

8. How often do you access HEALTHe NL to view opioid prescriptions?

- ○ Very frequently
- ○ Frequently
- ○ Occasionally
- ○ Rarely
- ○ Never

HEALTHe NL User Survey - Nurse Practitioners

Training Received

*** 9. Please indicate what method of HEALTHe NL training you received:**

- ○ Online learning videos
- ○ One-on-one
- ○ None

HEALTHe NL User Survey - Nurse Practitioners

Online Training

10. Please indicate your level of agreement or disagreement with each of the following statements in relation to the completion of the HEALTHe NL online learning videos:

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Unsure or N/A
The HEALTHe NL training I received was adequate	○	○	○	○	○	○
The HEALTHe NL training videos were easy to navigate	○	○	○	○	○	○
The HEALTHe NL training videos were sufficient in length	○	○	○	○	○	○
The training videos prepared me to use HEALTHe NL independently	○	○	○	○	○	○
The voice quality in the HEALTHe NL training videos was sufficient	○	○	○	○	○	○
Completing an online quiz following the HEALTHe NL training videos would be beneficial	○	○	○	○	○	○
The level of on-going HEALTHe NL training is acceptable	○	○	○	○	○	○
When I have contacted the HEALTHe NL Clinical Adoption Specialist or Service Desk my issue was resolved successfully	○	○	○	○	○	○

HEALTHe NL User Survey - Nurse Practitioners

Training Preferences

11. Please indicate your preferred method(s) of training:

- ○ One-on-one demonstration
- ○ Facilitated group sessions
- ○ Online education in the form of video tutorials
- ○ Other (please specify)

12. Please rate your computer proficiency:

- ○ Basic
- ○ Competent
- ○ Proficient
- ○ Expert

HEALTHe NL User Survey - Nurse Practitioners

User Satisfaction

13. How satisfied or dissatisfied are you with HEALTHe NL?

- ○ Very dissatisfied
- ○ Moderately dissatisfied
- ○ Neither satisfied nor dissatisfied
- ○ Moderately satisfied
- ○ Very satisfied

14. How likely are you to recommend HEALTHe NL to other healthcare providers?

- ○ Definitely
- ○ Probably
- ○ Possibly
- ○ Probably not
- ○ Definitely not

HEALTHe NL User Survey - Nurse Practitioners

Net Benefits

15. To what extent does HEALTHe NL positively contribute to the quality of patient care?

- ○ Not at all
- ○ Very little
- ○ Somewhat
- ○ Considerably
- ○ To a great extent

16. Thinking about your own experiences with HEALTHe NL, please indicate your level of agreement or disagreement with each of the following statements:

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
HEALTHe NL supports the continuity of patient care between transition points throughout the health care system	○	○	○	○	○
HEALTHe NL improves the quality of clinical decision-making	○	○	○	○	○
HEALTHe NL enhances patient safety	○	○	○	○	○
HEALTHe NL reduces medication errors and adverse events	○	○	○	○	○
HEALTHe NL contributes to timely patient care	○	○	○	○	○
HEALTHe NL increases the efficiency of the health care system	○	○	○	○	○
HEALTHe NL decreases the risk of patients receiving duplicate testing	○	○	○	○	○
HEALTHe NL contributes to cost reduction within the health care system	○	○	○	○	○

For additional examples or comments please use box below:

17. Please rate your proficiency in the use of HEALTHe NL:

- ○ Basic
- ○ Competent
- ○ Proficient
- ○ Expert

Please indicate how HEALTHe NL can be improved:

HEALTHe NL User Survey - Nurse Practitioners

Demographic Information

18. How long have you been using HEALTHe NL?

- ○ Less than 3 months
- ○ 3 to 6 months
- ○ 7 to 11 months
- ○ 1 to 2 years
- ○ 3 to 4 years
- ○ 5 or more years

19. I am in the following age category:

- ○ 25-34 years
- ○ 35-44 years
- ○ 45-54 years
- ○ Over 55 years

20. Where have you worked as a Nurse Practitioner? (Select all that apply)

- [ ] Newfoundland & Labrador
- [ ] Canada
- [ ] United States
- [ ] Other (please specify)

21. Please indicate the years of service you have worked in your current profession:

- ○ Less than one year
- ○ 1 to 2 years
- ○ 3 to 5 years
- ○ 6 to 10 years
- ○ 11 to 20 years
- ○ More than 20 years

22. Which regional health authority covers your geographic location?

- ○ Eastern Health
- ○ Central Health
- ○ Labrador-Grenfell Health
- ○ Western Health

23. In what area(s) do you primarily work? (Select all that apply)

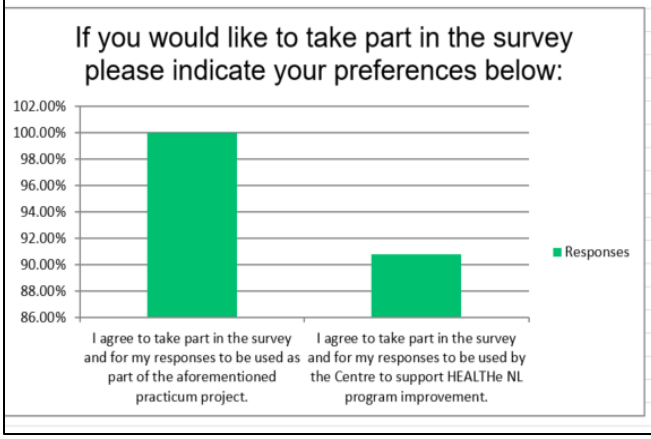
- [ ] Academic/Teaching Hospital
- [ ] Community Clinic/Health Centre
- [ ] Community Hospital
- [ ] Other (please specify)
- [ ] Nursing Home/Long Term Care Facility
- [ ] Private Office/Clinic

Appendix E

HEALTHe NL User Survey - Nurse Practitioners

If you would like to take part in the survey please indicate your preferences below:

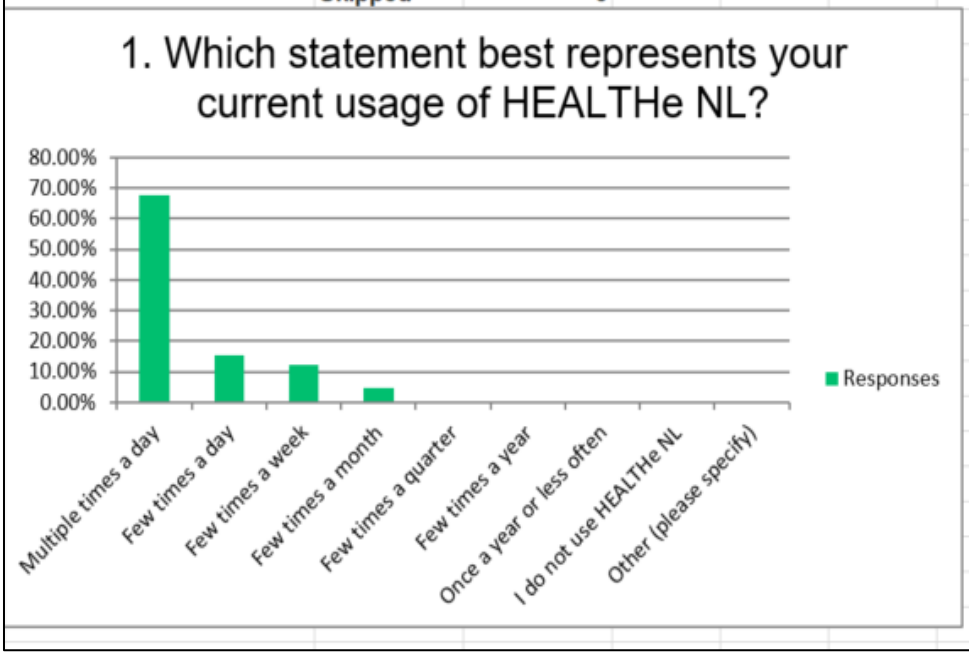
Answer Choices	Responses	
I agree to take part in the survey and for my responses to be used as part of the aforementioned practicum project.	100.00%	65
I agree to take part in the survey and for my responses to be used by the Centre to support HEALTHe NL program improvement.	90.77%	59
	Answered	**65**
	Skipped	**0**



HEALTHe NL User Survey - Nurse Practitioners

1. Which statement best represents your current usage of HEALTHe NL?

Answer Choices	Responses	
Multiple times a day	67.69%	44
Few times a day	15.38%	10
Few times a week	12.31%	8
Few times a month	4.62%	3
Few times a quarter	0.00%	0
Few times a year	0.00%	0
Once a year or less often	0.00%	0
I do not use HEALTHe NL	0.00%	0
Other (please specify)	0.00%	0
	Answered	**65**
	Skipped	**0**



HEALTHe NL User Survey - Nurse Practitioners

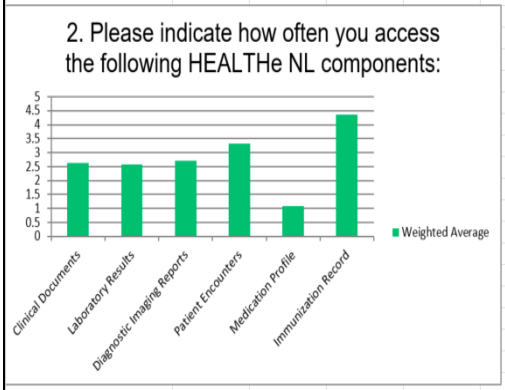
2. Please indicate reasons why you are not using HEALTHe NL:

Answer Choices	Responses	
It is not an expectation of my role as a Nurse Practitioner	0.00%	0
I do not have easy access to a computer in my workplace	0.00%	0
I use eDOCSNL (EMR) instead of HEALTHe NL	0.00%	0
I prefer to use the patient's chart to retrieve information	0.00%	0
I do not see any benefit in using HEALTHe NL	0.00%	0
The information in HEALTHe NL is incomplete	0.00%	0
The information available in HEALTHe NL is unreliable	0.00%	0
I cannot remember my password to access HEALTHe NL	0.00%	0
HEALTHe NL is difficult to navigate	0.00%	0
HEALTHe NL's response time is slow	0.00%	0
I do not know how to use HEALTHe NL	0.00%	0
HEALTHe NL is not safe to use	0.00%	0
Other (please specify)	0.00%	0
	Answered	**0**
	Skipped	**65**

HEALTHe NL User Survey - Nurse Practitioners

2. Please indicate how often you access the following HEALTHe NL components:

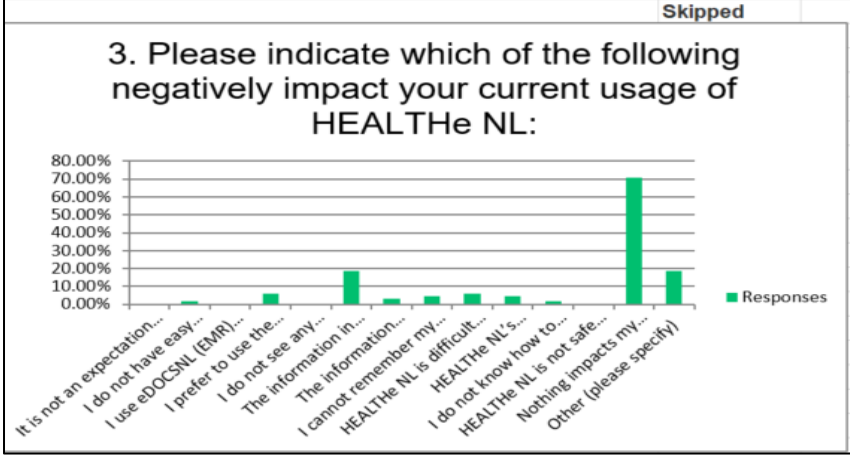
	Very Frequently		Frequently		Occasionally		Rarely		Never		Total	Weighted Average
Clinical Documents	26.15%	17	18.46%	12	32.31%	21	13.85%	9	9.23%	6	65	2.62
Laboratory Results	32.31%	21	16.92%	11	23.08%	15	15.38%	10	12.31%	8	65	2.58
Diagnostic Imaging Reports	20.00%	13	27.69%	18	24.62%	16	15.38%	10	12.31%	8	65	2.72
Patient Encounters	12.70%	8	6.35%	4	34.92%	22	26.98%	17	19.05%	12	63	3.33
Medication Profile	92.31%	60	6.15%	4	1.54%	1	0.00%	0	0.00%	0	65	1.09
Immunization Record	3.17%	2	1.59%	1	11.11%	7	23.81%	15	60.32%	38	63	4.37
											Answered	**65**
											Skipped	**0**



HEALTHe NL User Survey - Nurse Practitioners

3. Please indicate which of the following negatively impact your current usage of HEALTHe NL:

Answer Choices	Responses	
It is not an expectation of my role as a Nurse Practitioner	0.00%	0
I do not have easy access to a computer in my workplace	1.54%	1
I use eDOCSNL (EMR) instead of HEALTHe NL	0.00%	0
I prefer to use the patient's chart to retrieve information	6.15%	4
I do not see any benefit in using HEALTHe NL	0.00%	0
The information in HEALTHe NL is incomplete	18.46%	12
The information available in HEALTHe NL is unreliable	3.08%	2
I cannot remember my password to access HEALTHe NL	4.62%	3
HEALTHe NL is difficult to navigate	6.15%	4
HEALTHe NL's response time is slow	4.62%	3
I do not know how to use HEALTHe NL	1.54%	1
HEALTHe NL is not safe to use	0.00%	0
Nothing impacts my usage of HEALTHe NL, I already use it regularly	70.77%	46
Other (please specify)	18.46%	12
	Answered	**65**
	Skipped	**0**

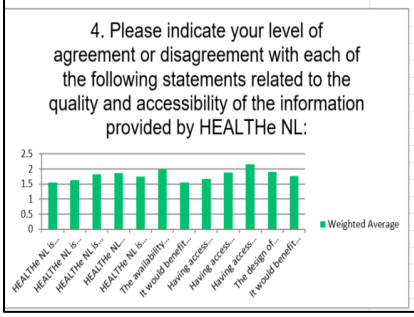


Respondents	Response Date	Other (please specify)
1	Oct 17 2019 09:59 AM	sometimes, the current medications are not easily identifiable. For example, there have been times when I know a med has been ordered but I could not find it. Thus, I had to call pharmacy
2	Oct 16 2019 01:59 PM	clarify that I have limited knowledge outside of medication lookup) of how to use HEALTHe NL
3	Oct 16 2019 01:09 PM	I use meditech (unfortunately), and find the only thing missing is the medication profile, which is the main reason I use HealtheNL
4	Oct 10 2019 11:52 AM	Use it for med history other chart information I get on Meditech
5	Oct 10 2019 11:21 AM	Have to click on individual lab result and wait for result to populate eg Cr....EGFR....LFT all seperate results and time consuming
6	Oct 10 2019 11:15 AM	Use meditech mostly and patients chart. I rely on Healthnl for accurate medications and also if patient seen outside of Central health, then for clinical visit with specialist as the hard copies are often delayed or the go to the wrong provider.
7	Oct 10 2019 11:13 AM	Some of the medication profile is difficult to interpret (Samples not included, drugs filled but not dispensed, etc); The layout of documents and reports is very tedious, lengthy, and not well organized; Older Data hasn't been included; Hospital Pharmacy still not required to input
8	Oct 10 2019 10:57 AM	I have seen discrepancies for example: medications have been discontinued prior to admission & often swtiched to another medication but still have both meds listed as current status. A Pharmacist in the community did tell me not same practice used across the board depending on time restraints etc. Also have had patients on an Insulin type not listed on HealtheNL but after telephoning a Pharmacist they confirmed it could be viewed on their profile.
9	Oct 10 2019 10:56 AM	Would like to have a way to modify worklist- ie have a fillable space to enter due date for Rx renewals- ie Suboxone
10	Oct 08 2019 03:00 PM	sometimes- med list is incomplete which increases reliability concern
11	Oct 07 2019 10:23 AM	I work out of clients home adn the health authority dies not provide me with data to access clients at point of care for me to check opioids so this impeeds my day. Also all providers should have notes in health E for a better view of clients file so I still have to use meditech with it.Great for info from St. John's as this is not on meditech we use.
12	Oct 04 2019 05:42 PM	Prefer meditech b/c it's easier to navigate, see full history

HEALTHe NL User Survey - Nurse Practitioners

4. Please indicate your level of agreement or disagreement with each of the following statements related to the quality and accessibility of the information provided by HEALTHe NL:

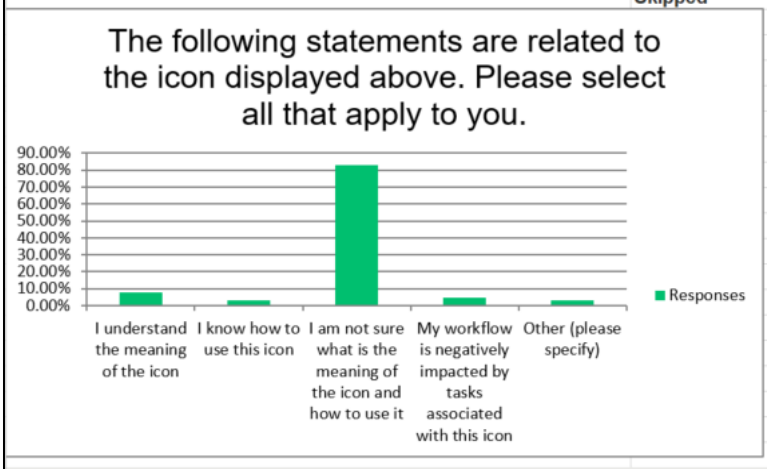
	Strongly Agree		Agree		Neither Agree nor Disagree		Disagree		Strongly Disagree		Total	Weighted Average
HEALTHe NL is integrated with my workflow	51.56%	33	43.75%	28	1.56%	1	3.13%	2	0.00%	0	64	1.56
HEALTHe NL is easy to use	43.75%	28	50.00%	32	6.25%	4	0.00%	0	0.00%	0	64	1.63
HEALTHe NL is reliable in its performance	32.81%	21	54.69%	35	9.38%	6	3.13%	2	0.00%	0	64	1.83
HEALTHe NL information is reliable	32.81%	21	51.56%	33	12.50%	8	3.13%	2	0.00%	0	64	1.86
HEALTHe NL is aligned with my clinical needs	39.06%	25	50.00%	32	7.81%	5	3.13%	2	0.00%	0	64	1.75
The availability of lab results in HEALTHe NL supports my clinical practice	31.25%	20	43.75%	28	20.31%	13	4.69%	3	0.00%	0	64	1.98
It would benefit my practice to have scanned clinical documents available in HEALTHe NL	54.69%	35	35.94%	23	9.38%	6	0.00%	0	0.00%	0	64	1.55
Having access to diagnostic imaging information supports my clinical practice	45.31%	29	43.75%	28	9.38%	6	1.56%	1	0.00%	0	64	1.67
Having access to patient encounters supports my clinical practice	34.38%	22	45.31%	29	17.19%	11	3.13%	2	0.00%	0	64	1.89
Having access to immunization information supports my clinical practice	25.00%	16	37.50%	24	34.38%	22	3.13%	2	0.00%	0	64	2.16
The design of HEALTHe NL supports my clinical practice	28.13%	18	59.38%	38	7.81%	5	3.13%	2	1.56%	1	64	1.91
It would benefit my clinical practice to have documents from the Meditech Nursing Module available in HEALTHe NL	43.75%	28	37.50%	24	17.19%	11	1.56%	1	0.00%	0	64	1.77
											Answered	**64**
											Skipped	**1**



HEALTHe NL User Survey - Nurse Practitioners

The following statements are related to the icon displayed above. Please select all that apply to you.

Answer Choices	Responses	
I understand the meaning of the icon	7.81%	5
I know how to use this icon	3.13%	2
I am not sure what is the meaning of the icon and how to use it	82.81%	53
My workflow is negatively impacted by tasks associated with this icon	4.69%	3
Other (please specify)	3.13%	2
	Answered	**64**
	Skipped	**1**

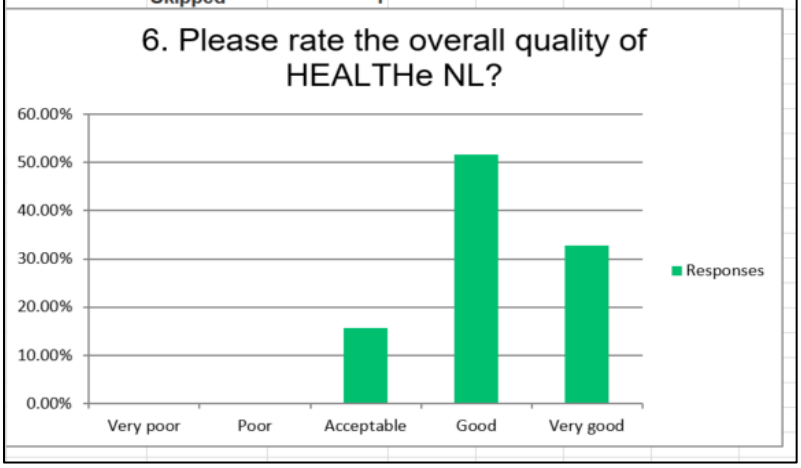


Respondents	Response Date	Other (please specify)
1	Oct 17 2019 04:26 PM	never seen it before
2	Oct 08 2019 09:01 AM	Can't ever remember seeing this icon

HEALTHe NL User Survey - Nurse Practitioners

6. Please rate the overall quality of HEALTHe NL?

Answer Choices	Responses	
Very poor	0.00%	0
Poor	0.00%	0
Acceptable	15.63%	10
Good	51.56%	33
Very good	32.81%	21
	Answered	**64**
	Skipped	**1**



HEALTHe NL User Survey - Nurse Practitioners

Additional comments about the quality and accessibility of information in HEALTHe NL and how it can be improved:

Answered	**17**
Skipped	**48**

Respondents	Response Date	Responses
1	Oct 17 2019 08:50 PM	Multiple times I have had a patient who is unaware of their allergies and it is not documented on the Healthe NL.
2	Oct 17 2019 10:05 AM	the medication piece could use some improvements. If you look at ALL meds(current and completed) it would be better that have all current ones grouped together instead of having to go through several pages of "completed" listed meds and current in order to find the info you are looking for. (they are all mixed together
3	Oct 16 2019 04:44 PM	On several occasions HealthENL showed rx refills but when the client went to pharm there were no refills. Also, I have called to enquire about refills showing on healthENL but the pharmacy stated its not always accurate and not always updated esp with social service and pension clients.
4	Oct 16 2019 02:05 PM	Difficult to rate HEALTHe NL as limited knowledge of use of entire system coupled with having very limited time to spend to advance my level of knowledge about it. Only instruction received was r/t how to look up meds for narcotics prescribing with the use of new tamper resistant scripts and needing to indicate HEATHe NL was checked prior to writing Rx
5	Oct 16 2019 12:16 PM	I feel when accessing lab data it would be useful to be able to get a sheet with all the CBCs rather than clicking on each component separately. Maybe that's possible and I don't know how to do it??
6	Oct 10 2019 05:50 PM	There are occasions where quantities of medications available on prescriptions are not consistent when compared with local pharmacy databases. I find myself often calling local pharmacies and asking them to confirm amounts available to ensure they are accurate. This can be a major issue when prescribing narcotics whereby it is a requirement to consult health eviewer prior to writing prescriptions. This is something that could be improved/looked into.
7	Oct 10 2019 11:25 AM	having faster navigation of labs and radiographic info would improve quality and accessibility

HEALTHe NL User Survey - Nurse Practitioners

Additional comments about the quality and accessibility of information in HEALTHe NL and how it can be improved:

Answered	**17**
Skipped	**48**

Respondents	Response Date	Responses
8	Oct 10 2019 11:19 AM	We need one chart for all patients across all settings - the documentation system is Newfoundland is too fragmented. We should have a one patient/one chart philosophy. More patient information added to HealtheNL would be helpful. An improved layout and organization would be helpful. A patient portal is necessary (So patients can review their own chart) An E-Prescribing Module should be added.
9	Oct 10 2019 10:59 AM	At times Rx appear to have been dispensed the status is coming up as completed. However, when contacting pharmacy sometimes this is not the case. It may have been entered in the am and then not removed. I feel that this needs to modified in some way to ensure client safety. I am not sure if this is product of the system or the user. Also at times medications recently dispensed do not always appear correctly within the system. Last refill on med may show up as two months ago when in fact client had it filled one month prior.
10	Oct 09 2019 12:24 PM	This incident has occurred to me multiple times - I log into HealtheNL through Meditech to view one patient's medication profile, then I close out the internet page. Then when I open up a new patient's medication profile through Meditech a error will appear. It will tell me I have two many pages open or it will just give me a string of code (which I don't understand). However I will close out of EVERYTHING and try again and the error will keep reappearing. This may happen six or seven times before I can finally access the patient medication profile.
11	Oct 08 2019 09:01 AM	More clinical information i.e. FIT test results, etc
12	Oct 08 2019 08:23 AM	It would be less time consuming if the medication list could be directly copied to the patients medication list on the EMR

HEALTHe NL User Survey - Nurse Practitioners

Additional comments about the quality and accessibility of information in HEALTHe NL and how it can be improved:

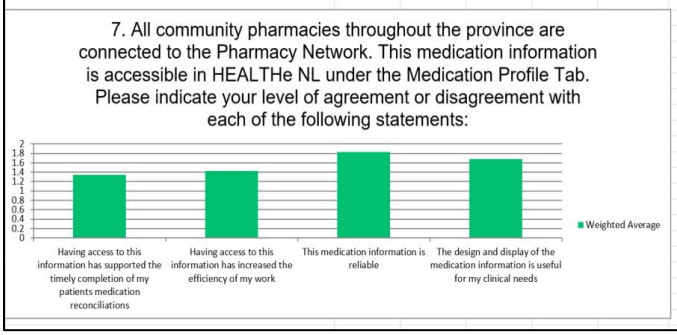
Answered	**17**
Skipped	**48**

Respondents	Response Date	Responses
13	Oct 07 2019 10:40 AM	very slow checking labs, etc. the print option for print view never works to print documents. It doesn't show notes from encounters. Lab results should be grouped i.e chemistry, etc.
14	Oct 07 2019 10:27 AM	AS a community NP I am documenting in CRMS and none of my notes are used for health E. I have to print and send paper copies to the providers myself. Major insufficiency's in the documentation access for all providers. EMRs from clinics are not available on this. Visits with specialists who are fee for service and in their clinics are not accessible.
15	Oct 07 2019 09:55 AM	I would like to be able to view if appointments have been made and/or kept. ie: I order a CT scan on patient in Central health - I'd like to see if appt is made and if kept or missed.
16	Oct 07 2019 08:46 AM	I have never seen anything documented in the 'immunizations' tab so I strongly question the accuracy / relevance of this until it is reconciled with public health records and it would be even further improved if office-based clinicians and pharmacists document administration of influenza / pneumococcal vaccines and employee wellness staff at health boards document things like TDaP boosters
17	Oct 05 2019 11:21 PM	my only issue as that I do not have access to older records

HEALTHe NL User Survey - Nurse Practitioners

7. All community pharmacies throughout the province are connected to the Pharmacy Network. This medication information is accessible in HEALTHe NL under the Medication Profile Tab. Please indicate your level of agreement or disagreement with each of the following statements:

	Strongly Agree		Agree		Neither Agree nor Disagree		Disagree		Strongly Disagree		Total	Weighted Average
Having access to this information has supported the timely completion of my patients medication reconciliations	68.75%	44	28.13%	18	3.13%	2	0.00%	0	0.00%	0	64	1.34
Having access to this information has increased the efficiency of my work	67.19%	43	23.44%	15	9.38%	6	0.00%	0	0.00%	0	64	1.42
This medication information is reliable	41.27%	26	39.68%	25	14.29%	9	4.76%	3	0.00%	0	63	1.83
The design and display of the medication information is useful for my clinical needs	46.03%	29	46.03%	29	1.59%	1	6.35%	4	0.00%	0	63	1.68
											Answered	**64**
											Skipped	**1**



HEALTHe NL User Survey - Nurse Practitioners

For additional examples or comments please use box below:

Answered	**17**
Skipped	**48**

Respondents	Response Date	Responses
1	Oct 17 2019 04:28 PM	Please extend display to show more meds
2	Oct 17 2019 10:05 AM	see previous page
3	Oct 16 2019 02:08 PM	Several times when reviewing patient's medications in HEALTHe NL there are omissions noted for Rx I know I have prescribed. This I find concerning and therefore limits my trust in reliability of the system.
4	Oct 16 2019 01:12 PM	I have come across a couple of situations where the information is not up to date, or the medication prescriber and prescriber number is incorrect. However, most encounters are positive.
5	Oct 16 2019 12:16 PM	I wish there was a way to link the meds prescribed in Emerge to HealtheNL
6	Oct 11 2019 09:32 AM	Sometimes medication in the past is left as "active" when it no longer is. Unsure if this is a pharmacy-related issue or a HealthE-NL-related issue
7	Oct 10 2019 11:55 AM	I find sometimes the statuses are confusing like completed do you mean the patient refill is out or the medication is completed all together....I feel like the way the information is listed could be easier to read it should be template more in line with how a prescription would look for ease of reading
8	Oct 10 2019 11:19 AM	There are instances where it is difficult to interpret the data presented. I.E prescribed drugs but not filled; patient samples, among others.
9	Oct 10 2019 11:19 AM	Sometimes find it difficult to see who first prescribed and following how long taking same. This is mostly because my work involves LTC residents and I often have to rely on Helathnl to creat a history of the resident and find out why they are taking what they are. They hx and px from the GP/NP is only a two page document and often looks at the patient currently and not events prior. Health nl helps guide the reasoning but I wish I could see more detail.

HEALTHe NL User Survey - Nurse Practitioners

For additional examples or comments please use box below:

Answered	**17**
Skipped	**48**

Respondents	Response Date	Responses
10	Oct 10 2019 09:06 AM	Last refill time as well as quantity remaining on prescriptions are not always reliable.
11	Oct 08 2019 09:02 AM	Only issue I have found is when prescriptions are transferred between pharmacy, they are not always shown as dispense - some still look like they have a refill remaining.
12	Oct 08 2019 08:32 AM	on rare occasions medication information was not up-to-date. also, it would be useful to have an explanation of adverse reactions. On one occasion I had seen an error from the pharmacy in filling a medication, and I could not locate the patient and I did not know which pharmacy it was used to fill the medication. I think the name of pharmacy that is filling the medication should be listed as this would enhance collaborative practice with the pharmacy.
13	Oct 07 2019 10:28 AM	Design is good but only as accurate as the pharmacist who updates. Sometimes supplies are not updated.
14	Oct 07 2019 09:52 AM	Recently I have noted some discrepancy in the amounts prescribed, the amounts dispensed/ amounts on hand for dispensing. This is challenging with managing narcotics particularly. On a couple of occasions I called the pharmacist who confirmed that the information in HEALTHeNL was not accurate (ie. medication amounts) or not matching what was on pharmacy file. Also it would be great if discontinued/completed medications were at the end of the list or in a separate file. For example, if synthroid dosage is adjusted, the previous doses are still listed and unless the prescriber views the entire list in detail, he/she may reorder the wrong dose.

HEALTHe NL User Survey - Nurse Practitioners

For additional examples or comments please use box below:

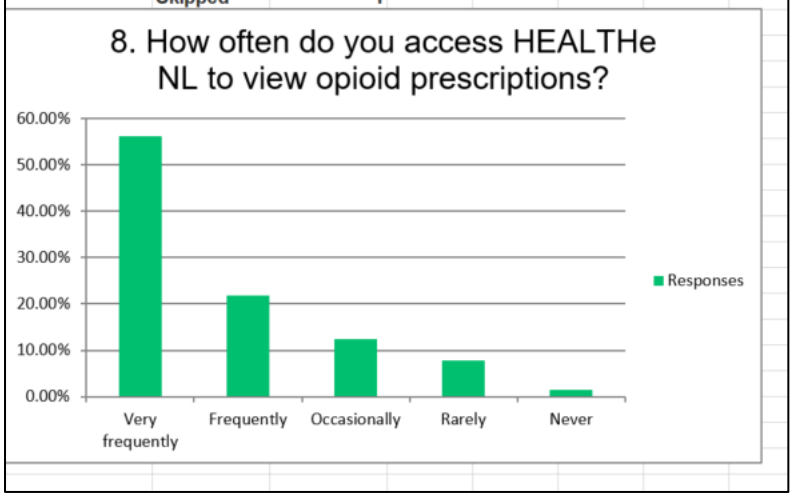
Answered	**17**
Skipped	**48**

Respondents	Response Date	Responses
15	Oct 07 2019 09:20 AM	Sometimes it is difficult to determine refills and last dispensed. As well refill information is not always accurate, and often times things that have been discontinued are not updated
16	Oct 07 2019 09:08 AM	Re: # 8 response should be always as it is requirement of the Prescription monitoring Program
17	Oct 04 2019 05:06 PM	Extend beyond 2 year history

HEALTHe NL User Survey - Nurse Practitioners

8. How often do you access HEALTHe NL to view opioid prescriptions?

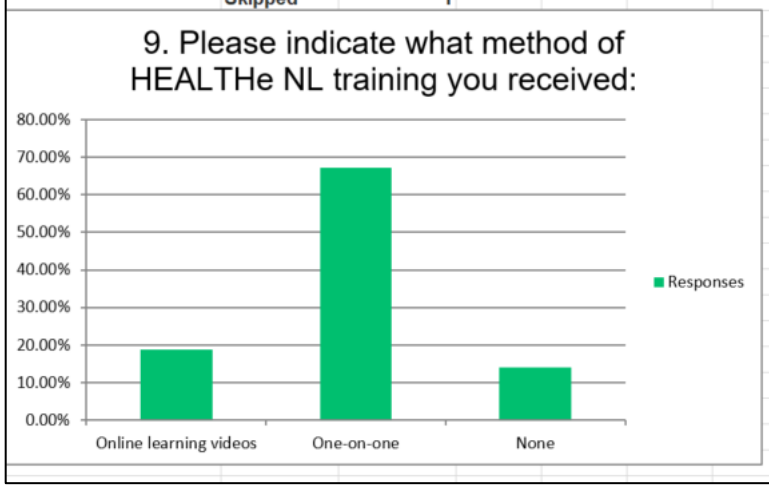
Answer Choices	Responses	
Very frequently	56.25%	36
Frequently	21.88%	14
Occasionally	12.50%	8
Rarely	7.81%	5
Never	1.56%	1
Answered		**64**
Skipped		**1**



HEALTHe NL User Survey - Nurse Practitioners

9. Please indicate what method of HEALTHe NL training you received:

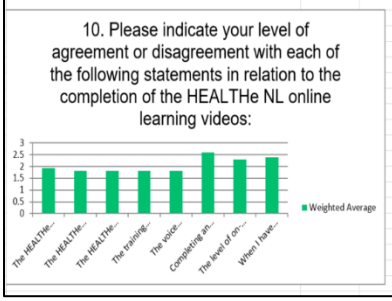
Answer Choices	Responses	
Online learning videos	18.75%	12
One-on-one	67.19%	43
None	14.06%	9
Answered		**64**
Skipped		**1**



HEALTHe NL User Survey - Nurse Practitioners

10. Please indicate your level of agreement or disagreement with each of the following statements in relation to the completion of the HEALTHe NL online learning videos:

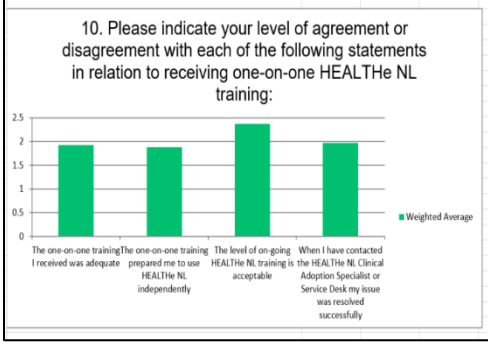
	Strongly Agree		Agree		Neither Agree nor Disagree		Disagree		Strongly Disagree		Unsure or N/A		Total	Weighted Average
The HEALTHe NL training I received was adequate	25.00%	3	58.33%	7	16.67%	2	0.00%	0	0.00%	0	0.00%	0	12	1.92
The HEALTHe NL training videos were easy to navigate	25.00%	3	58.33%	7	8.33%	1	0.00%	0	0.00%	0	8.33%	1	12	1.82
The HEALTHe NL training videos were sufficient in length	25.00%	3	58.33%	7	8.33%	1	0.00%	0	0.00%	0	8.33%	1	12	1.82
The training videos prepared me to use HEALTHe NL independently	25.00%	3	58.33%	7	8.33%	1	0.00%	0	0.00%	0	8.33%	1	12	1.82
The voice quality in the HEALTHe NL training videos was sufficient	25.00%	3	58.33%	7	8.33%	1	0.00%	0	0.00%	0	8.33%	1	12	1.82
Completing an online quiz following the HEALTHe NL training videos would be beneficial	18.18%	2	18.18%	2	36.36%	4	18.18%	2	0.00%	0	9.09%	1	11	2.6
The level of on-going HEALTHe NL training is acceptable	18.18%	2	36.36%	4	27.27%	3	9.09%	1	0.00%	0	9.09%	1	11	2.3
When I have contacted the HEALTHe NL Clinical Adoption Specialist or Service Desk my issue was resolved successfully	18.18%	2	9.09%	1	45.45%	5	0.00%	0	0.00%	0	27.27%	3	11	2.38
													Answered	**12**
													Skipped	**53**



HEALTHe NL User Survey - Nurse Practitioners

10. Please indicate your level of agreement or disagreement with each of the following statements in relation to receiving one-on-one HEALTHe NL training:

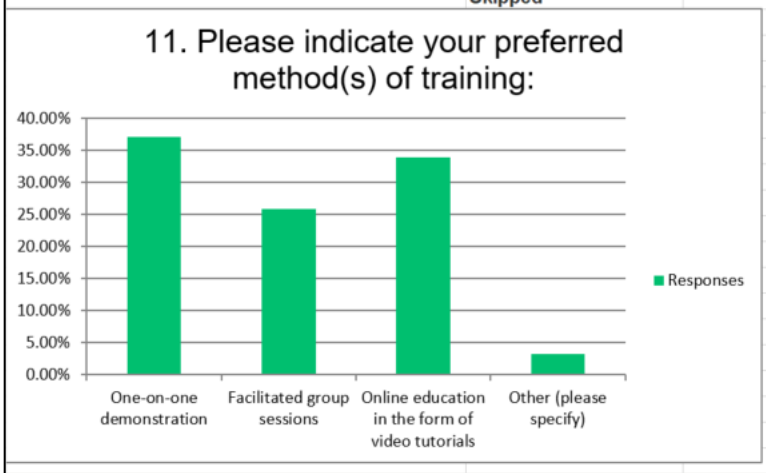
	Strongly Agree		Agree		Neither Agree nor Disagree		Disagree		Strongly Disagree		Unsure or N/A		Total	Weighted Average
The one-on-one training I received was adequate	23.26%	10	62.79%	27	4.65%	2	2.33%	1	2.33%	1	4.65%	2	43	1.93
The one-on-one training prepared me to use HEALTHe NL independently	27.91%	12	58.14%	25	6.98%	3	4.65%	2	0.00%	0	2.33%	1	43	1.88
The level of on-going HEALTHe NL training is acceptable	16.28%	7	37.21%	16	25.58%	11	9.30%	4	2.33%	1	9.30%	4	43	2.38
When I have contacted the HEALTHe NL Clinical Adoption Specialist or Service Desk my issue was resolved successfully	27.91%	12	30.23%	13	25.58%	11	0.00%	0	0.00%	0	16.28%	7	43	1.97
													Answered	**43**
													Skipped	**22**



HEALTHe NL User Survey - Nurse Practitioners

11. Please indicate your preferred method(s) of training:

Answer Choices	Responses	
One-on-one demonstration	37.10%	23
Facilitated group sessions	25.81%	16
Online education in the form of video tutorials	33.87%	21
Other (please specify)	3.23%	2
	Answered	**62**
	Skipped	**3**

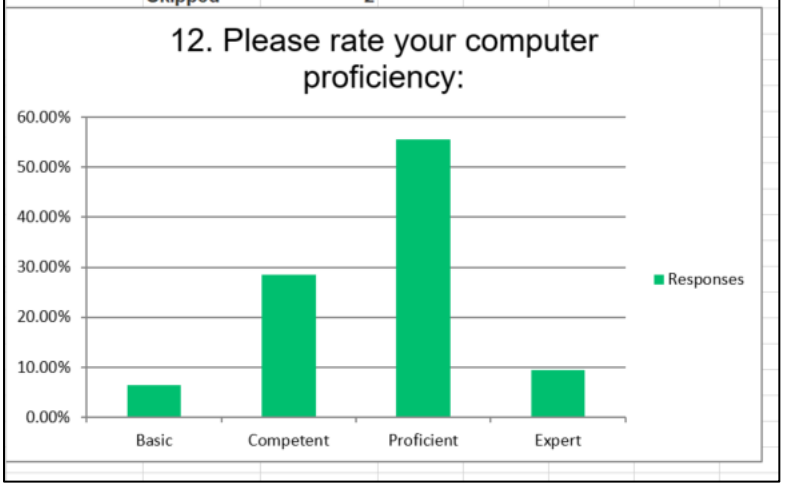


Respondents	Response Date	Other (please specify)
1	Oct 12 2019 09:55 AM	no training
2	Oct 07 2019 09:54 AM	Depends on the training. Sometimes one-one is sufficient as in the case for HEALTeNl training; sometimes group sessions work well

HEALTHe NL User Survey - Nurse Practitioners

12. Please rate your computer proficiency:

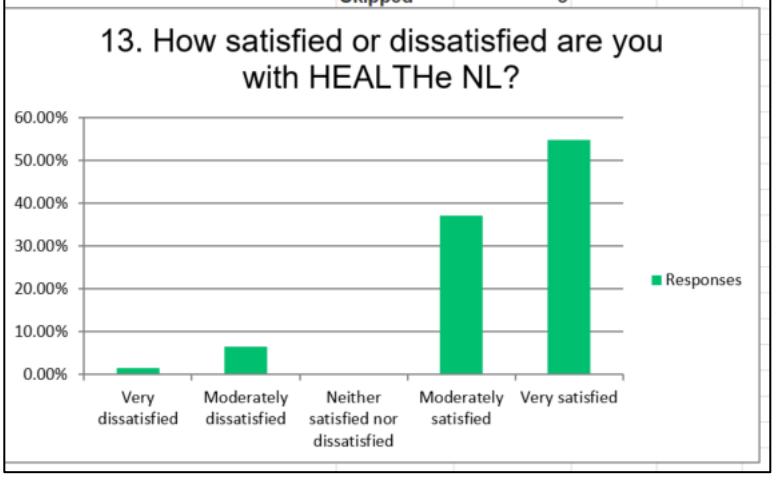
Answer Choices	Responses	
Basic	6.35%	4
Competent	28.57%	18
Proficient	55.56%	35
Expert	9.52%	6
	Answered	**63**
	Skipped	**2**



HEALTHe NL User Survey - Nurse Practitioners

13. How satisfied or dissatisfied are you with HEALTHe NL?

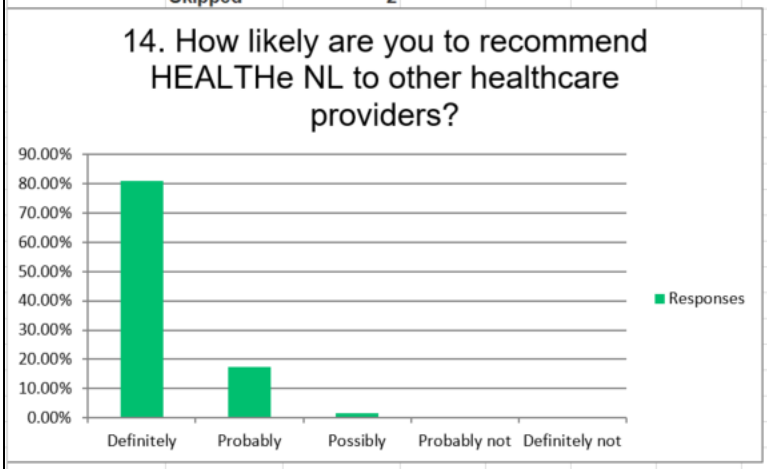
Answer Choices	Responses	
Very dissatisfied	1.61%	1
Moderately dissatisfied	6.45%	4
Neither satisfied nor dissatisfied	0.00%	0
Moderately satisfied	37.10%	23
Very satisfied	54.84%	34
	Answered	**62**
	Skipped	**3**



HEALTHe NL User Survey - Nurse Practitioners

14. How likely are you to recommend HEALTHe NL to other healthcare providers?

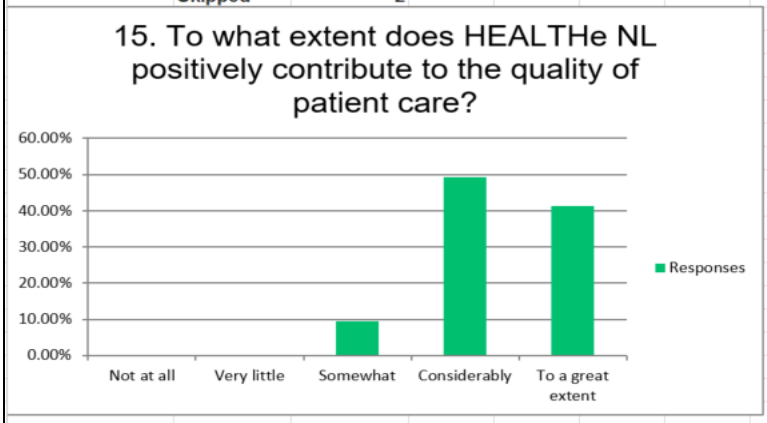
Answer Choices	Responses	
Definitely	80.95%	51
Probably	17.46%	11
Possibly	1.59%	1
Probably not	0.00%	0
Definitely not	0.00%	0
	Answered	**63**
	Skipped	**2**



HEALTHe NL User Survey - Nurse Practitioners

15. To what extent does HEALTHe NL positively contribute to the quality of patient care?

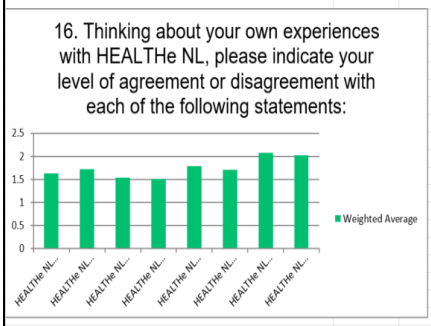
Answer Choices	Responses	
Not at all	0.00%	0
Very little	0.00%	0
Somewhat	9.52%	6
Considerably	49.21%	31
To a great extent	41.27%	26
	Answered	**63**
	Skipped	**2**



HEALTHe NL User Survey - Nurse Practitioners

16. Thinking about your own experiences with HEALTHe NL, please indicate your level of agreement or disagreement with each of the following statements:

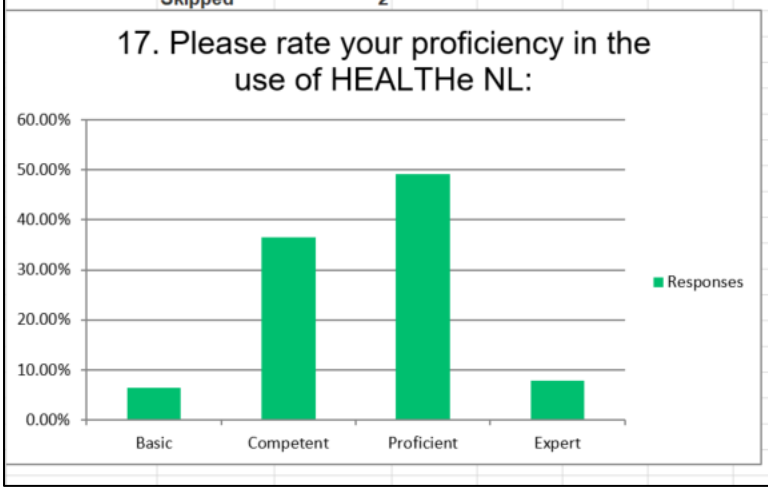
	Strongly Agree		Agree		Neither Agree nor Disagree		Disagree		Strongly Disagree		Total	Weighted Average
HEALTHe NL supports the continuity of patient care between transition points throughout the health care system	44.44%	28	49.21%	31	4.76%	3	1.59%	1	0.00%	0	63	1.63
HEALTHe NL improves the quality of clinical decision-making	41.27%	26	46.03%	29	11.11%	7	1.59%	1	0.00%	0	63	1.73
HEALTHe NL enhances patient safety	50.79%	32	44.44%	28	4.76%	3	0.00%	0	0.00%	0	63	1.54
HEALTHe NL reduces medication errors and adverse events	53.97%	34	39.68%	25	6.35%	4	0.00%	0	0.00%	0	63	1.52
HEALTHe NL contributes to timely patient care	38.10%	24	46.03%	29	14.29%	9	1.59%	1	0.00%	0	63	1.79
HEALTHe NL increases the efficiency of the health care system	41.27%	26	50.79%	32	3.17%	2	4.76%	3	0.00%	0	63	1.71
HEALTHe NL decreases the risk of patients receiving duplicate testing	34.92%	22	31.75%	20	23.81%	15	9.52%	6	0.00%	0	63	2.08
HEALTHe NL contributes to cost reduction within the health care system	31.75%	20	34.92%	22	33.33%	21	0.00%	0	0.00%	0	63	2.02
											Answered	**63**
											Skipped	**2**



HEALTHe NL User Survey - Nurse Practitioners

17. Please rate your proficiency in the use of HEALTHe NL:

Answer Choices	Responses	
Basic	6.35%	4
Competent	36.51%	23
Proficient	49.21%	31
Expert	7.94%	5
	Answered	**63**
	Skipped	**2**



HEALTHe NL User Survey - Nurse Practitioners

Please indicate how HEALTHe NL can be improved:

Answered	**9**
Skipped	**56**

Respondents	Response Date	Responses
1	Oct 17 2019 10:08 AM	EKG and consultation reports take longer time to appear on the network. Would be better if the time could be reduced.
2	Oct 16 2019 02:15 PM	I feel more education needed to better use the system more efficiently and effectively. However, even if more education provided I am still concerned that not all opioid Rx I have written for a patient not visible in patient's HEALTHe NL record when I check the system prior to writing next opioid Rx. This has happened with different patients on several occasions.
3	Oct 11 2019 09:35 AM	Ensuring medication is fully updated.
4	Oct 10 2019 11:57 AM	Making the medication profile easier to read with more clear medication status - often you try to clarify with elderly patients if a medication is completed or not and they don't know
5	Oct 10 2019 11:20 AM	We need one chart for all patients across all settings - the documentation system is Newfoundland is too fragmented. We should have a one patient/one chart philosophy. More patient information added to HealtheNL would be helpful. An improved layout and organization would be helpful. A patient portal is necessary (So patients can review their own chart) An E-Prescribing Module should be added. Automatic population of Medication Reconciliation Forms with prescription availability.
6	Oct 07 2019 12:01 PM	rarely information regarding immunizations there now. I do not use for that reason. Medication lists can be confusing at times. It would be nice to have last prescribing pharmacy listed.

HEALTHe NL User Survey - Nurse Practitioners

Please indicate how HEALTHe NL can be improved:

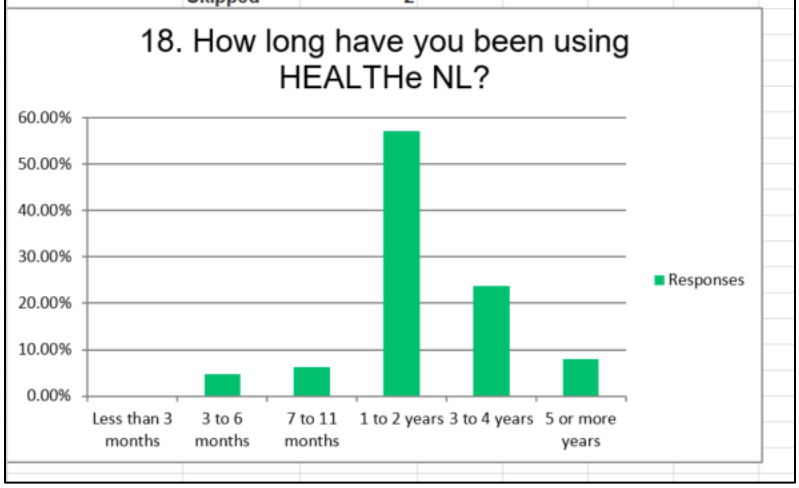
Answered	**9**
Skipped	**56**

Respondents	Response Date	Responses
7	Oct 07 2019 10:32 AM	Need updates emailed when changes occur so we can check out the new additions.
8	Oct 07 2019 09:25 AM	as above and resolve issues with pharmacy as discussed
9	Oct 07 2019 08:55 AM	I would like to have more information from clinics in HealthE NL however - there have been times when I had to call Janeway psychiatry to get information on youth because their records were not being stored on the system

HEALTHe NL User Survey - Nurse Practitioners

18. How long have you been using HEALTHe NL?

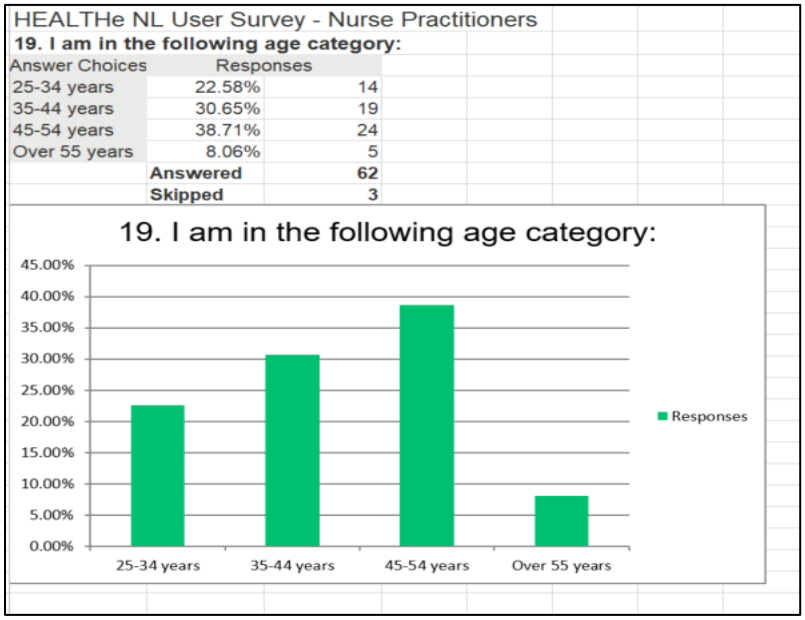
Answer Choices	Responses	
Less than 3 months	0.00%	0
3 to 6 months	4.76%	3
7 to 11 months	6.35%	4
1 to 2 years	57.14%	36
3 to 4 years	23.81%	15
5 or more years	7.94%	5
	Answered	**63**
	Skipped	**2**



HEALTHe NL User Survey - Nurse Practitioners

19. I am in the following age category:

Answer Choices	Responses	
25-34 years	22.58%	14
35-44 years	30.65%	19
45-54 years	38.71%	24
Over 55 years	8.06%	5
	Answered	**62**
	Skipped	**3**



HEALTHe NL User Survey - Nurse Practitioners

20. Where have you worked as a Nurse Practitioner? (Select all that apply)

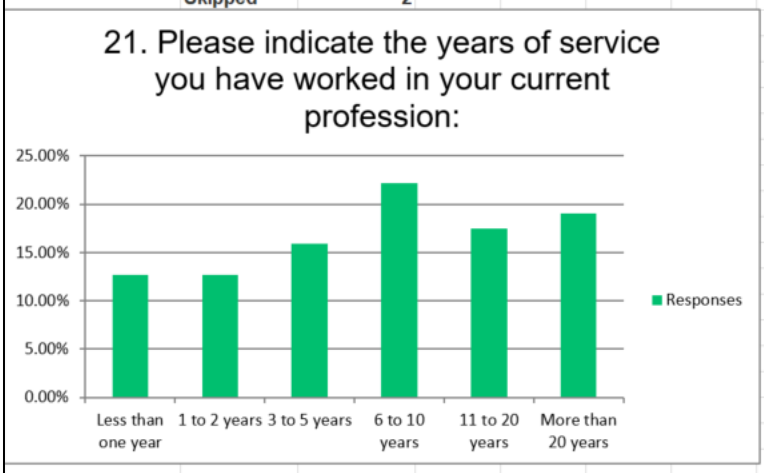
Answer Choices	Responses	
Newfoundland & Labrador	96.83%	61
Canada	14.29%	9
United States	0.00%	0
Other (please specify)	1.59%	1
	Answered	**63**
	Skipped	**2**

Respondents	Response Date	Other (please specify)
1	Oct 10 2019 12:03 PM	ON

HEALTHe NL User Survey - Nurse Practitioners

21. Please indicate the years of service you have worked in your current profession:

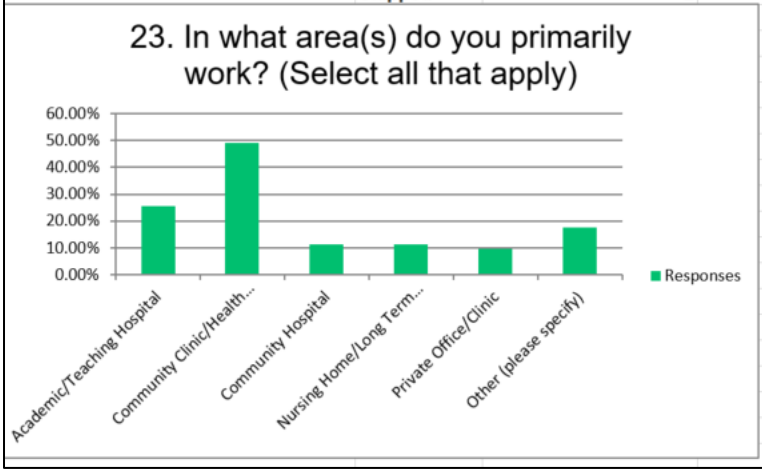
Answer Choices	Responses	
Less than one year	12.70%	8
1 to 2 years	12.70%	8
3 to 5 years	15.87%	10
6 to 10 years	22.22%	14
11 to 20 years	17.46%	11
More than 20 years	19.05%	12
	Answered	**63**
	Skipped	**2**



HEALTHe NL User Survey - Nurse Practitioners

23. In what area(s) do you primarily work? (Select all that apply)

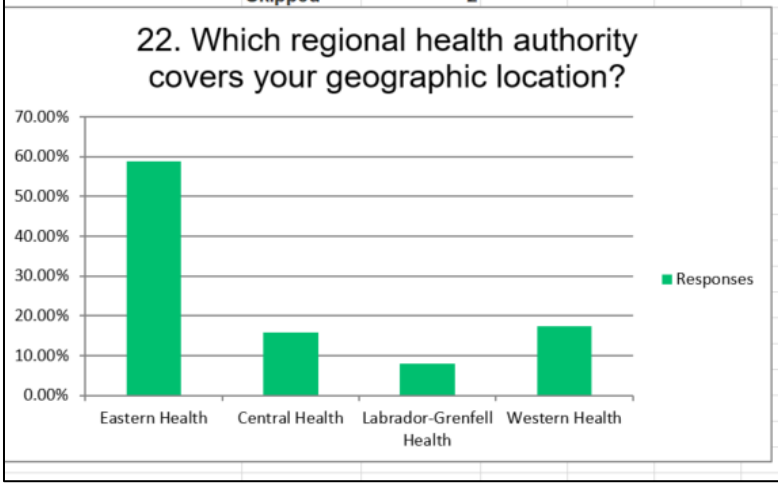
Answer Choices	Responses	
Academic/Teaching Hospital	25.40%	16
Community Clinic/Health Centre	49.21%	31
Community Hospital	11.11%	7
Nursing Home/Long Term Care Facility	11.11%	7
Private Office/Clinic	9.52%	6
Other (please specify)	17.46%	11
	Answered	**63**
	Skipped	**2**



HEALTHe NL User Survey - Nurse Practitioners

22. Which regional health authority covers your geographic location?

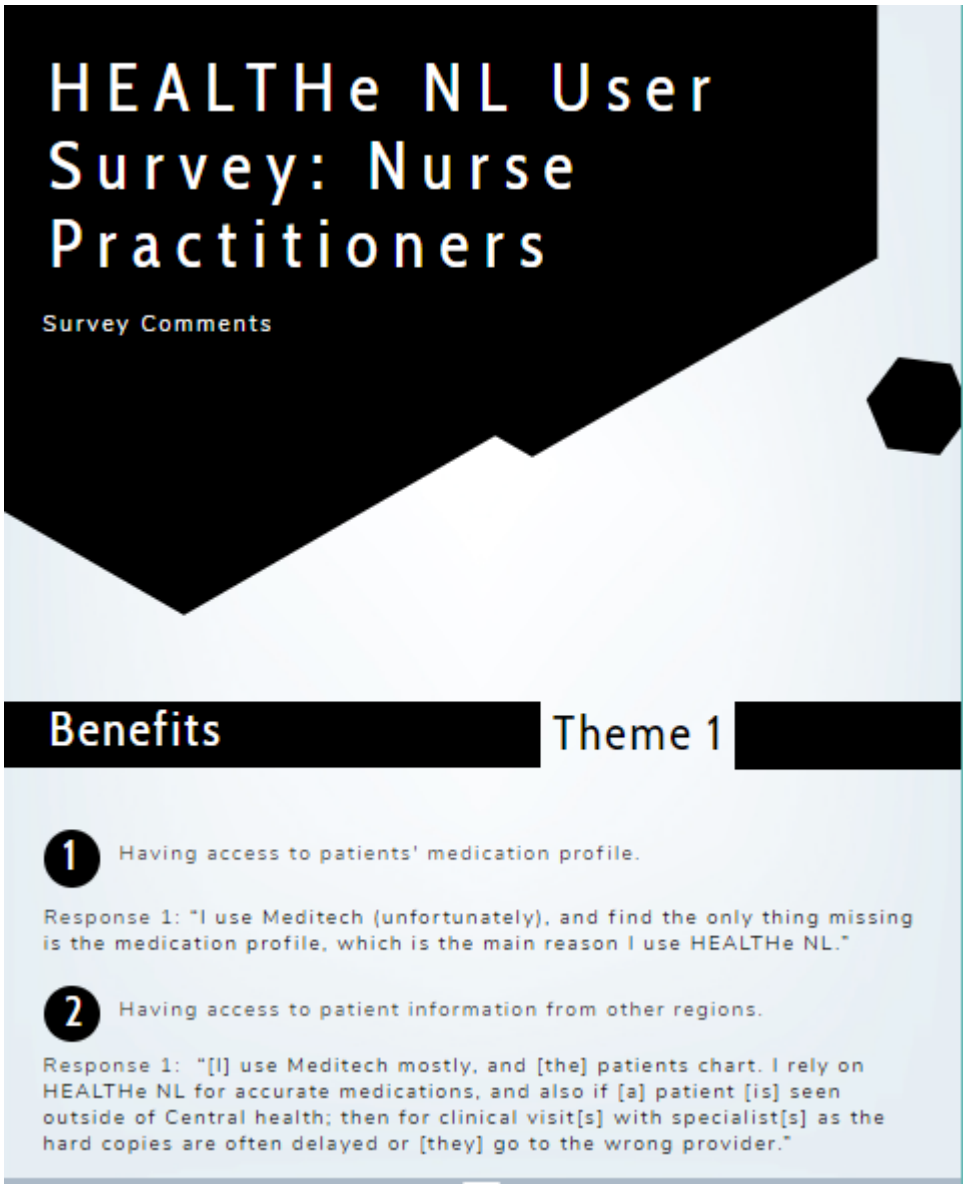
Answer Choices	Responses	
Eastern Health	58.73%	37
Central Health	15.87%	10
Labrador-Grenfell Health	7.94%	5
Western Health	17.46%	11
	Answered	**63**
	Skipped	**2**



HEALTHe NL User Survey - Nurse Practitioners

23. In what area(s) do you primarily work? (Select all that apply)

Respondents	Response Date	Other (please specify)
1	Oct 16 2019 02:29 PM	Outpatient Clinic with in Eastern Health and Inpatient unit
2	Oct 16 2019 02:16 PM	both community hospital and community settings
3	Oct 11 2019 09:36 AM	Downtown community clinics
4	Oct 10 2019 11:16 AM	corrections
5	Oct 08 2019 09:05 AM	Prison
6	Oct 07 2019 10:32 AM	Community home supports, home visits
7	Oct 07 2019 10:02 AM	Acute care outpatients and provincial wide travelling clinic
8	Oct 07 2019 09:11 AM	emergency department
9	Oct 07 2019 08:56 AM	residential setting
10	Oct 07 2019 08:25 AM	Emergency Department
11	Oct 07 2019 07:48 AM	dialysis


HEALTHe NL User Survey: Nurse Practitioners
Survey Comments
Benefits
Theme 1
1
Having access to patients' medication profile.
Response 1: "I use Meditech (unfortunately), and find the only thing missing is the medication profile, which is the main reason I use HEALTHe NL."
2
Having access to patient information from other regions.
Response 1: "[I] use Meditech mostly, and [the] patients chart. I rely on HEALTHe NL for accurate medications, and also if [a] patient [is] seen outside of Central health; then for clinical visit[s] with specialist[s] as the hard copies are often delayed or [they] go to the wrong provider."

Challenges Theme 2

1. Layout and organization of documents and reports in HEALTHe NL.

Response 1: "Some of the medication profile is difficult to interpret (samples not included, drugs filled but not dispensed, etc.); The layout of documents and reports is very tedious, lengthy, and not well organized; Older Data hasn't been included; Hospital Pharmacy still not required to input."

2. Medication Profile is difficult to interpret, there are discrepancies, and incomplete profiles.

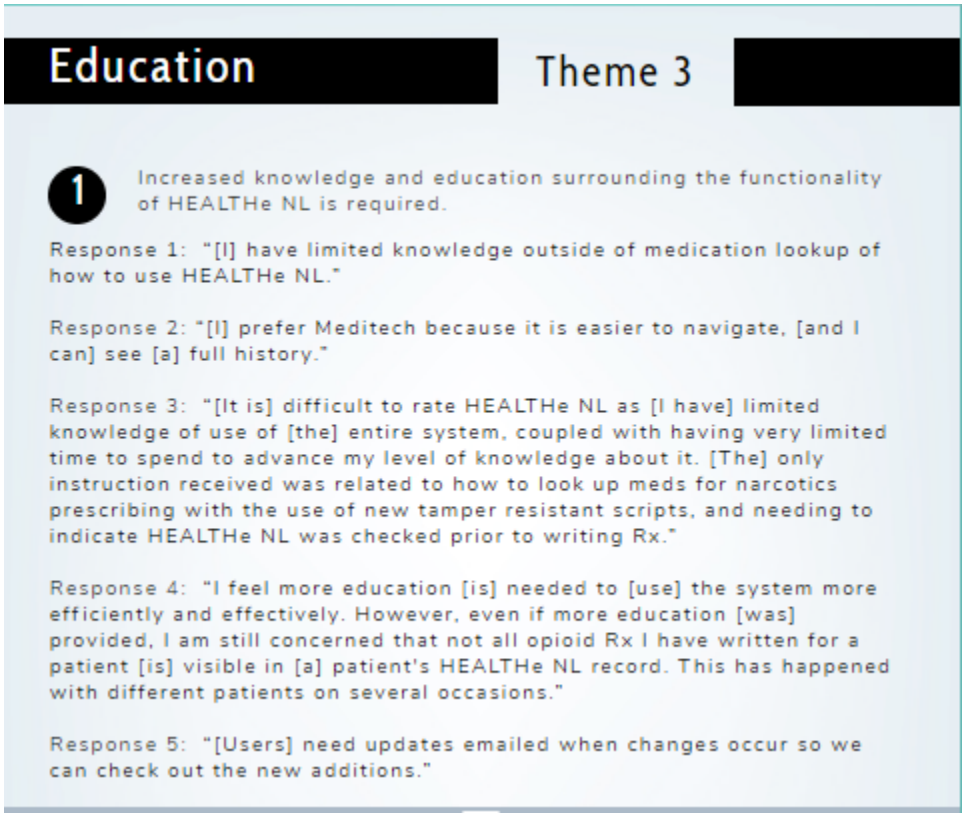
Response 1: "I have seen discrepancies, for example: medications have been discontinued prior to admission & often switched to another medication, but still have both meds listed as current status. A Pharmacist in the community did tell me [that the] same practice [is not] used across the board, depending on time restraints, etc. [I] also have had patients on an Insulin type not listed on HEALTHe NL, but after telephoning a Pharmacist they confirmed it could be viewed on their profile."

Response 2: "Sometimes [the] med list is incomplete, which increases reliability concern." In addition, one nurse practitioner responded, "sometimes, the current medications are not easily identifiable. For example, there have been times when I know a med has been ordered but I could not find it. Thus, I had to call [the] pharmacy."

Response 3: "At times Rx appear to have been dispensed [as] the status is coming up as completed. However, when contacting pharmacy sometimes this is not the case. It may have been entered in the am and then not removed. I feel that this needs to [be] modified in some way to ensure client safety. I am not sure if this is [a] product of the system or the user. Also at times medications recently dispensed do not always appear correctly within the system. Last refill on [a] med may show up as 'two months ago' when in fact [the] client had it filled one month prior."

Response 4: "Sometimes medication in the past is left as "active" when it no longer is. [I am] unsure if this is a pharmacy-related issue or a HEALTHe NL related issue."

Response 5: "[The] design is good but only as accurate as the pharmacist who updates. Sometimes supplies are not updated."


Education
Theme 3
1
Increased knowledge and education surrounding the functionality of HEALTHe NL is required.
Response 1: "[I] have limited knowledge outside of medication lookup of how to use HEALTHe NL."
Response 2: "[I] prefer Meditech because it is easier to navigate, [and I can] see [a] full history."
Response 3: "[It is] difficult to rate HEALTHe NL as [I have] limited knowledge of use of [the] entire system, coupled with having very limited time to spend to advance my level of knowledge about it. [The] only instruction received was related to how to look up meds for narcotics prescribing with the use of new tamper resistant scripts, and needing to indicate HEALTHe NL was checked prior to writing Rx."
Response 4: "I feel more education [is] needed to [use] the system more efficiently and effectively. However, even if more education [was] provided, I am still concerned that not all opioid Rx I have written for a patient [is] visible in [a] patient's HEALTHe NL record. This has happened with different patients on several occasions."
Response 5: "[Users] need updates emailed when changes occur so we can check out the new additions."

Enhancements

Theme 4

1. Laboratory results are separated in HEALTHe NL, which is not reflective of how laboratory results appear in Meditech.

Response 1: "[I] have to click on individual lab result[s] and wait for [them] to populate."

2. It would be beneficial to have a fillable space in the worklist.

Response 1: "[I] would like to have a way to modify [the] worklist- i.e. have a fillable space to enter due date for Rx renewals."

3. All providers should have notes in HEALTHe NL.

Response 1: "I work out of [a] clients' home and the health authority does not provide me with data to access clients at [the] point of care [to] check opioids. [This] impedes my day. Also all providers should have notes in HEALTHe NL for a better view of [a] client's file; so I still have to use Meditech with it. Great for information from St. John's as this is not on [the] Meditech we use."

4. Integration of patient information from the Client and Referral Management System (CRMS) and the Electronic Medical Record (EMR) into HEALTHe NL.

Response 1: "As a community NP I am documenting in CRMS and none of my notes are used for HEALTHe NL. I have to print and send paper copies to the providers myself. Major insufficiencies in the documentation access for all providers. EMRs from clinics are not available on this. Visits with specialists who are fee for service and in their clinics are not accessible."

5 One patient chart and the integration with a patient portal and e-prescribing module.

Response 1: "We need one chart for all patients across all settings - the documentation system in Newfoundland is too fragmented. We should have a one patient/one chart philosophy. More patient information added to HEALTHe NL would be helpful. An improved layout and organization would be helpful. A patient portal is necessary (So patients can review their own chart). An E-Prescribing Module should be added."

6 The grouping all laboratory results (reflecting Meditech), the grouping all medications, and the integration of allergy information from Meditech into HEALTHe NL.

Response 1: "I feel when accessing lab data it would be useful to be able to get a sheet with all the CBCs rather than clicking on each component separately. Maybe that's possible and I don't know how to do it?"

Response 2: "The medication piece could use some improvements. If you look at all meds (current and completed) it would be better [to] have all current ones grouped together instead of having to go through several pages of "completed" listed meds and current in order to find the info you are looking for. They are all mixed together."

Response 3: "Multiple times I have had a patient who is unaware of their allergies and it is not documented on the Healthe NL."

7 Ability to view patient information, Janeway psychiatry records, and medications prescribed in the Emergency Room.

Response 1:"I would like to be able to view if appointments have been made and/or kept. i.e.: I order a CT scan on [a] patient in Central health - I'd like to see if [the] appointment is made, and if kept or missed."

Response 2: "I would like to have more information from clinics in HEALTHe NL, however - there have been times when I had to call Janeway psychiatry to get information on youth because their records were not being stored on the system."

Response 3: "I wish there was a way to link the meds prescribed in Emerge to HEALTHe NL."

Response 4: "It would be much more useful if we were able to access more documentation from other health care boards, for example, when a [patient] is admitted under Eastern Health, all I can see at Western Health [are] any labs, DI and any operative reports. There is no access to discharge summaries, etc."

8 Being able to document in HEALTHe NL.

Response 1: "I see clients in community and any visits from specialists or FP in clinics are not available, therefore I am often left in the dark and have to take time to call physicians to talk about history of clients. I should be documenting under HEALTHe NL, and my notes [should] be available to their family providers and specialists. It's not thorough enough yet."