

USE OF THE CANADIAN C-SPINE RULE BY EMERGENCY DEPARTMENT NURSES

by

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Dedication

This project is dedicated to my husband Adam. You have always encouraged me to chase my dreams, advocate for improving patient care and strive for nursing excellence. Thank you for your endless support, frequent words of encouragement, and editing every single paper over the last two years.

Abstract

Background: Approximately 1.3 million Canadians present to the Emergency Department (ED) annually with a suspected cervical spine (c-spine) injury secondary to blunt force trauma. These patients are often alert and hemodynamically stable with less than 1% suffering a cervical spine fracture. Developed and validated at the Ottawa Research Institute, the Canadian C-Spine Rule is a highly sensitive clinical decision tool designed to mitigate the unnecessary use of radiography in alert, stable, trauma patients.

Aim: The aim of this study is to explore the feasibility of developing a clinical practice guideline implementing the use of the Canadian C-Spine Rule by ED nurses working in Vancouver, British Columbia.

Literature Review: Previous research demonstrates that when used by both ED physicians and registered nurses the Canadian C-Spine Rule enables accurate and reliable identification of trauma patients at low-risk for cervical spine injuries and is associated with decreased use of unwarranted radiography. In the ED, registered nurses do not routinely assess the cervical spine of alert, stable trauma patients; however, enabling nurses to remove cervical immobilization by utilizing the Canadian C-Spine Rule, could improve patient comfort, increase patient flow and optimize nurses' roles and responsibilities in busy EDs.

Methods: A short electronic survey was sent to members of the Vancouver General Hospital (VGH) ED Quality Council for input. Findings from this survey and informal interviews were utilized to perform a SWOT (Strength, Weakness, Opportunity, Threats) analysis related to educating local ED nurses to clear the cervical spine of low-risk trauma patients.

Results: Respondents noted potential facilitators of this project included a strong nursing education team and highly motivated frontline nurses who are keenly interested in educational opportunities. Potential barriers identified within VGH ED could be a lack of physician support, nursing resistance due perceived increased workload, competing priorities for nursing education and a lack of low-risk trauma patients presenting to VGH ED immobilized in cervical collars.

Conclusion: Prior to implementing this change into clinical practice, key recommendations based on stakeholder engagement and the SWOT analysis addressing internal and external factors facilitating or impeding practice change should be considered.

Keywords: Nursing, Emergency Department or Emergency Room, Cervical Collars, Canadian C-spine Rule, Trauma.

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Chapter One: Introduction

Approximately 1.3 million Canadians present to the Emergency Department (ED) annually with a suspected cervical spine injury secondary to blunt force trauma (Clement et al., 2016; Stiell et al., 2018, 2010). Typically, these patients present to the ED alert, hemodynamically stable, and immobilized on a hard board with a cervical collar in place, with less than one percent sustaining a cervical spine fracture (Clement et al., 2016; Stiell et al., 2010, 2018). Upon arrival to the ED, they are first assessed by a triage nurse and typically placed in high acuity areas where they remain immobilized for extended periods of time while awaiting physician assessment and radiography to rule out a cervical spine injury (Clement et al., 2016; Stiell et al., 2018, 2010).

In the ED, registered nurses do not routinely assess the cervical spine of alert, stable trauma patients; however, enabling nurses to remove cervical immobilization by utilizing the Canadian C-Spine Rule, could improve patient comfort, increase patient flow and optimize nurses' roles and responsibilities in busy EDs. As a registered nurse working in various EDs over eighteen years, the author has witnessed firsthand the dilemma triage nurses face when assessing low-risk trauma patients arriving in cervical immobilization. These patients are often uncomfortable, lying supine on a hard spine board with their neck immobilized in a rigid cervical collar. They are unable to independently roll onto their side, increasing their risk for aspiration. These patients are therefore triaged to high acuity areas, or trauma bays, where they are closely monitored while immobilized until they are assessed by an ED physician. This current practice often leads to lengthy immobilization for patients and puts additional strain on the healthcare system as they occupy valuable acute care spaces in overcrowded EDs.

To improve ED efficiency and flow, and maximize nurses' roles and responsibilities in the ED, registered nurses may use their clinical judgement by utilizing nurse-initiated orders. These orders may include initiating bloodwork, or simple diagnostic tests, under approved medical directives at triage. Nurse-initiated orders may include an electrocardiogram (ECG) when patients present with chest pain, bloodwork for abdominal pain or chest pain, and extremity x-rays utilizing clinical decision rules such as the Ottawa Ankle Rules. Further expanding ED nurses' roles and responsibilities to include the use of the Canadian C-Spine Rule to assess the cervical spine of low-risk trauma patients has the potential to improve patient comfort by decreasing the time patients spend immobilized and increasing patient flow by allowing these patients to be seen in lower acuity areas of the ED.

Background

Clinical decision rules are simple tests that can be performed at the bedside utilizing medical history and physical examination to reduce uncertainty in medical decision-making (Stiell & Bennett, 2007; Stiell et al., 2010). When designing a clinical decision rule, sensitivity and specificity are important to minimize the risk of missed diagnoses (Stiell & Bennett, 2007). Sensitivity refers to the ability of the clinical decision rule to correctly identify patients with a condition while specificity is the ability to correctly identify those patients without the condition (Polit & Beck, 2017). Developing and testing a clinical decision rule involves three stages: creating the rule with a derivation study; assessing the rule's accuracy, reliability and potential impact with a validation study; and determining the rule's impact on patient care with an implementation study (Stiell & Bennett, 2007).

Developed in 2001 by Dr. Ian Stiell and his colleagues at the Ottawa Research Institute, the Canadian C-Spine Rule is a highly sensitive (100% Confidence Interval [CI] 98-100) and

specific (42.5% CI 40-44) clinical decision rule designed to mitigate the unnecessary use of c-spine radiography in alert, stable, trauma patients (Stiell et al., 2001). The Canadian C-spine Rule utilizes three high-risk criteria, five low-risk criteria and a clinical exam focused on neck range of motion, allowing clinicians to remove cervical immobilization without radiography (Clement et al., 2016; Stiell et al., 2010). Previous research demonstrates that when used by physicians, the Canadian C-Spine Rule enables accurate and reliable identification of trauma patients at low-risk for cervical spine injury and is associated with decreased use of unwarranted radiography (Stiell et al., 2001, 2018).

In 2018, Stiell et al., further validated this clinical decision rule by expanding its use by nurses. Stiell et al. (2018) conducted a large, multi-center, prospective cohort study from December 2010 to October 2012, in which 180 nurses screened 2229 patients for eligibility, enrolled 1408 patients in the study, and removed immobilization in 331 patients with no adverse effects. In this study, nurses indicated that with adequate education and support from physicians, nursing leadership and peers, they felt confident utilizing the Canadian C-Spine Rule in practice (Clement et al., 2011, 2016; Stiell et al., 2018, 2010). This study demonstrated that safe and effective application of the Canadian C-spine Rule by specially trained ED nurses in low-risk, stable, trauma patients allows for earlier removal of spinal immobilization, thereby increasing patient comfort, improving department efficiency and encouraging autonomy of nursing practice (Stiell et al., 2010, 2018).

Research Gap

Currently there is a paucity of literature describing the use of the Canadian C-Spine Rule by nurses. The author is aware of two tertiary hospital EDs in London and Ottawa, Ontario where utilizing the Canadian C-spine Rule in low-risk trauma patients has been officially

adopted into nursing practice. Utilizing previously validated education could provide a framework to support implementation of this nursing skill within Vancouver, British Columbia. Application of the Canadian C-spine Rule by local ED nurses would strengthen the evidence available to guide practice across nursing groups and Canadian healthcare jurisdictions.

Aims

The aim of this scholarly advancement research project (SPAR) is to explore the feasibility of developing a clinical practice guideline implementing the use of the Canadian C-Spine Rule by ED nurses working in Vancouver, British Columbia.

Chapter Two: Literature Review

Search Strategy

A search of CINAHL and PubMed databases was conducted via the UBC Library from 1982 to April 2020 using keywords and synonyms incorporating the concepts ‘nursing,’ ‘cervical collars,’ ‘trauma,’ ‘Canadian C-spine Rule,’ and ‘emergency department or emergency room’ to find relevant literature. Keywords and synonym searches were combined using the Boolean operator ‘OR’ prior to applying ‘AND’ to structure the search. Reference lists from relevant studies were manually searched. Additionally, a search of grey literature published in the last five years was performed via the UBC Library utilizing the TRIP database and Google Scholar.

Inclusion and exclusion criteria originally developed for use in the Canadian C-Spine Rule was used to guide the inclusion of studies for this project. Studies were included if they recruited patients who were 16 years of age or older who presented to the triage desk alert, in stable condition, with a blunt mechanism suggestive of a possible cervical spine injury within the past 48 hours (Stiell et al., 2001, 2009, 2018). In this scenario, “alert” is defined as a Glasgow

Coma Scale (GCS) score of 15/15 and “stable condition” is defined as a systolic blood pressure of greater than 90 mmHg and a respiratory rate between 10 and 24 breaths per minute (Stiell et al., 2001 p. 1842). Studies were excluded if participants were younger than 16 years of age, or patients had sustained a penetrating trauma, suffered acute paralysis, had known vertebral disease, had undergone previous cervical spine surgery, or were returning for reassessment of a previously treated injury (Stiell et al., 2001, p.1842). Titles and abstracts of studies relevant to this project were reviewed. Those deemed unrelated to the project included studies that did not focus on the target population of ED nurses, studies that used the NEXUS criteria instead of the Canadian C-Spine Rule to evaluate cervical spine injury, and studies evaluating different outcomes.

Relevant literature regarding ED nurses’ use of the Canadian C-Spine Rule in practice is largely limited to the seminal work by Dr. Stiell and his colleagues from the Ottawa Research Institute. Their multi-center cohort studies conducted in Ontario, Canada were the only studies to educate nurses using the Canadian C-Spine Rule and enable them under a medical directive to clear the cervical spine of low-risk trauma patients. Internationally, only two small scale studies were found evaluating nurses’ use of the Canadian C-Spine Rule in practice. In both these studies ED nurses were educated to use the Canadian C-Spine Rule and record if they would remove immobilization; however, patients’ cervical immobilization remained in place until they were assessed by ED physicians (Kelly, Bradshaw, & Kerr, 2004; Miller, Coffey, Reid, & Stevenson, 2006). The literature review search strategy is outlined in Table 1.

Table 1*Literature Review Search Strategy*

Keywords	<p>Keywords set to be recognized within title/abstract:</p> <ul style="list-style-type: none"> • Searched keywords and synonyms incorporating the concepts of: Nursing, Emergency Department or Emergency Room, “Cervical Collars,” “Canadian C-spine Rule,” Trauma 								
Inclusion criteria	<p>Searches were limited to the following:</p> <ul style="list-style-type: none"> • Patients 16 years of age or older • Studies including ED nurses • English language • Patients sustaining blunt trauma with low-risk mechanism of injury 								
Exclusion criteria	<p>The searches excluded the following:</p> <ul style="list-style-type: none"> • Studies using the NEXUS criteria to clear cervical spine • Patient population less than 16 years of age 								
Database results	<table border="1"> <thead> <tr> <th>Database:</th> <th>Results found:</th> </tr> </thead> <tbody> <tr> <td>CINAHL</td> <td>50</td> </tr> <tr> <td>PubMed</td> <td>69</td> </tr> <tr> <td>TRIP database</td> <td>30</td> </tr> </tbody> </table>	Database:	Results found:	CINAHL	50	PubMed	69	TRIP database	30
Database:	Results found:								
CINAHL	50								
PubMed	69								
TRIP database	30								
Screening evidence	<ul style="list-style-type: none"> • After duplicates were removed, titles and abstracts were screened by the author for inclusion and exclusion criteria 								
Final number	<ul style="list-style-type: none"> • Four prospective cohort studies, two survey studies, one randomized trial, one observational study and one quality improvement project were included in the final review 								

Despite searching the grey literature, no further studies were found. In total, seven studies met inclusion criteria. To ensure a comprehensive analysis of the subject, two studies examining the development, implementation and accuracy of the Canadian C-Spine Rule in ED physician

practice were included in the final review. The studies included in this literature review are listed in Table 2.

Table 2

Studies included in literature review

Author	Title	Type of Study
Stiell et al. (2001)	The Canadian c-spine rule for radiography in alert and stable trauma patients	Prospective cohort study
Kelly, Bradshaw & Kerr (2004)	Can nurses apply the Canadian c-spine rule? A pilot study	Observational study
Miller et al. (2006)	Can emergency room nurses use the Canadian cervical spine rule to reduce unnecessary patient immobilisation?	Prospective cohort study
Stiell et al. (2009)	Implementation of the Canadian c-spine rule: prospective 12 centre cluster randomised trial	Matched pair cluster randomised trial
Stiell et al. (2010)	Multicentre prospective validation of use of the Canadian c-spine rule by triage nurses in the emergency department	Prospective cohort study
Clement et al. (2011)	Perceived facilitators and barriers to clinical clearance of the cervical spine by emergency department nurses: A major step towards changing practice in the emergency department	Prospective quantitative survey
Clement et al. (2016)	Facilitators and barriers to application of the Canadian c-spine rule by emergency department nurses	Paper-based and electronic survey
Fontaine et al. (2018)	Cervical spine collar removal by emergency room nurses: A quality improvement project	Practice improvement project
Stiell et al. (2018)	A multicentre program to implement the Canadian c-spine rule by emergency department nurses	Prospective cohort study

Study Characteristics

Cohort studies and case-control studies are two primary types of observational studies (Greenlaugh, 2014; Song & Chung, 2010). Well-designed observational studies play an important role in developing evidence and can provide powerful results (Greenlaugh, 2014; Song & Chung, 2010). Cohort studies are particularly beneficial because patients are selected by their exposure status allowing the researcher to study multiple outcomes simultaneously (Greenlaugh, 2014; Song & Chung, 2010). Stiell et al. (2001, 2009, 2010 & 2018) performed several large prospective cohort studies each involving multiple hospital sites spanning up to 32 months when implementing the use of the Canadian C-Spine Rule in both physician and nursing practice. Miller et al. (2006) performed a significantly smaller prospective cohort study spanning 14 months at one large teaching hospital in Nottingham, United Kingdom. Kelly et al. (2004) performed an observational sub-group analysis as part of a larger project evaluating the impact of the Canadian C-Spine Rule on ordering rates of radiology tests in an ED in Melbourne, Australia. The other studies in this review included a matched pair cluster randomized trial to evaluate the use of the Canadian C-Spine Rule in physician practice (Stiell et al., 2009), two surveys examining facilitators and barriers to ED nurses adopting the Canadian C-Spine Rule in practice (Clement et al., 2011, 2016) and a practice improvement project (Fontaine, Forgione, Lusignan, Lanoue, & Drouin, 2018). The matched pair cluster randomized trial (Stiell et al., 2009) collected information over two years from twelve Canadian EDs while the practice improvement project (Fontaine et al., 2018) spanned eight months and included training nine charge nurses to clear cervical spine immobilization at a trauma hospital in Quebec, Canada.

To determine the feasibility of introducing nurse-led clearance of the cervical spine in low-risk trauma patients, Stiell et al. (2010) conducted a validation study where they provided

ED nurses with the necessary education to confidently assess a patient's cervical spine. They asked nurses to document whether they would remove cervical immobilization but did not permit the removal of cervical collars at this time (Stiell et al., 2010). The following implementation study enabled ED nurses to utilize their new skill and remove cervical immobilization in select patients under approved local medical directives (Stiell et al., 2018).

Prior to, and following the implementation of utilizing the Canadian C-Spine Rule in nursing practice, Clement et al. (2011, 2106) utilized surveys to gather information regarding the facilitators and barriers to nurses' use of the Canadian C-Spine Rule in practice. The first survey gathered information from 158 triage nurses who had participated in the previous validation study with the aim to gain evidence that could assist in planning future implementation studies (Clement et al., 2011). The second survey was performed after the implementation study with the goal of understanding the facilitators and barriers to nurses' use of the Canadian C-Spine Rule in practice from a wider range of stakeholders including 489 nurses, 301 physicians and 29 organizational leaders (Clement et al., 2016).

Utilizing convenience sampling, all studies included patients who were 16 years of age or older, presenting to the ED with a possible cervical spine injury secondary to blunt force trauma. Studies by Stiell et al. (2001, 2009, 2010, 2018) included the largest number of patients and the largest number of participating ED staff. In the initial validation study, physicians enrolled 8,924 patients (Stiell et al., 2001) followed by 11,824 patients in the implementation study (Stiell et al., 2009). In the nursing validation study, 191 nurses enrolled 3,633 patients (Stiell et al., 2010), while 312 nurses enrolled 4,506 patients in the subsequent implementation study (Stiell et al., 2018). Other studies in this review trained up to 112 ED nurses and screened up to 132 patients (Fontaine et al., 2018; Kelly et al., 2004; Miller et al., 2006).

Study Findings

Correct identification of a clinically important cervical spine injury defined as any fracture, dislocation or ligamentous injury (Stiell et al., 2001, p. 1842) by both physicians and registered nurses when using the Canadian C-Spine Rule was the primary outcome in four studies (Miller et al., 2006; Stiell et al., 2001, 2009, 2010, 2018). When developing and implementing the Canadian C-Spine Rule in ED physician practice 8,924 to 11,824 patients were enrolled and physicians correctly identified 174 patients with a clinically significant cervical spine injury, achieving a sensitivity of 100% for the clinical decision rule (Stiell et al., 2009, 2001). Miller et al.(2006) enrolled 460 patients in their study and found that ED nurses correctly identified the two patients who presented with clinically significant cervical spine injuries. Early in their prospective validation study, Stiell et al. (2010) found that nurses failed to identify four patients with clinically significant injuries despite the presence of high-risk factors according to the Canadian C-Spine Rule. As a result, additional education, including newsletters and in-person sessions, resulted in improved clinical assessments and no further missed cases (Stiell et al., 2010). In the subsequent implementation study, ED nurses assessed 809 patients and correctly identified all six patients with a clinically significant cervical spine injury and did not incorrectly remove immobilization on any patient with a cervical spine injury (Stiell et al., 2018).

Other outcomes examined in these studies include nurse-physician agreement when using the Canadian C-Spine Rule and patient length of stay in the ED when nurses removed the cervical collar of low-risk trauma patients. When comparing ED nurses' decisions using the Canadian C-Spine Rule with those of physicians, Kelly et al. (2004) found that nurses were more conservative in their interpretation of the rule while Miller et al. (2006) and Fontaine et al. (2018) found no significant difference between physicians and nurses when applying the rule.

Overall, Stiell et al. (2018) found that when ED nurses removed cervical immobilization in low-risk trauma patients arriving by ambulance, their length of stay in the ED was reduced by 1.1 hours (3.8 versus 4.9 hours).

Nurses participating in the studies conducted by Stiell et al. (2010, 2018) were asked to complete surveys regarding facilitators and barriers to adding this new skill to their practice (Clement et al., 2011, 2016). Survey questions were informed by themes previously identified during interviews with nurse educators regarding informal feedback they received from participating frontline nurses, physicians, paramedics and hospital administrators (Clement et al., 2011). Results from this survey highlight that support from ED physicians, nursing leadership, educators and peers is paramount to promoting ED nurse clearance of the cervical spine (Clement et al., 2011). Physicians and nurse leaders can support frontline staff when implementing changes in practice by advocating for the use of evidence-based practice to improve patient care (Clement et al., 2016). Clement et al. (2011) found that nurses were supportive of adding this skill to their practice but were also concerned that this could further add to an already heavy workload and feared legal liability if they applied the Canadian C-Spine Rule incorrectly. Also evident in this survey was the variation of responses from each site, emphasizing the importance of understanding the local culture in each ED prior to implementing use of a new skill in a practice (Clement et al., 2011). Using valuable information garnered from these surveys, researchers were able to customize the project implementation strategy utilizing site specific data regarding local facilitators and barriers (Clement et al., 2011).

The research team also surveyed ED physicians, nurses and organizational leaders in participating hospitals after implementing nurse clearance of the cervical spine in select hospitals in Ontario. Once again, nurses stated the importance of support from nursing leadership,

physicians and their peers (Clement et al., 2016). Common barriers to use of the Canadian C-Spine Rule in practice were heavy workloads (35.9%), insufficient numbers of low-risk trauma patients to gain confidence with this new skill (21.0%) and a perceived lack of support from physicians (13.2%) (Clement et al., 2016). Physician respondents commented on the importance of supportive nursing leadership, identifying front-line nurse champions, and appointing a physician leader when bringing about change in clinical practice (Clement et al., 2016). Physicians commented that barriers to this change in practice included busy departments (26.5%), reluctance from nurses to use the Canadian C-Spine Rule (21.2%), perceived lack of adequate education and training for the nurses (20.5%), and physicians being uncomfortable with nurses applying the Canadian C-Spine Rule in practice (17.9%) (Clement et al., 2016). Unlike the nurses surveyed, physicians appeared to rate legal and liability concerns low (5.3%) regarding nurses utilizing the Canadian C-Spine Rule under a medical directive. Clement et al. (2016) report that one of the most valuable lessons ED physicians reported they learned during this research study was realizing that their nursing colleagues were capable of applying the Canadian C-Spine Rule in practice and that they believed the addition of this clinical skill aided in increasing patient flow through busy EDs (Clement et al., 2016). Overall, these studies show that nurses can reliably use the Canadian C-Spine Rule to determine patients at low-risk of cervical fracture and feel comfortable using this tool for patient assessment (Clement et al., 2011, 2016; Stiell et al., 2010, 2018). A summary of key study findings is presented in Table 3.

Table 3*Summary of key findings*

Author	Primary Outcome Measure	Key findings
Stiell et al. (2001)	Clinically important cervical spine injury identified by physicians	Physicians diagnosed 151 patients with a clinically important cervical spine injury Radiologists agreed with 100% of the diagnoses
Kelly, Bradshaw & Kerr (2004)	Nurse-physician agreement when using the Canadian C-Spine Rule	Physicians & nurses agreed on application of the Canadian C-Spine Rule in 85 of 88 cases (96.6%)
Miller et al. (2006)	Clinically important cervical spine injury identified by nurses	Nurses correctly identified two clinically significant cervical spine injuries (100%)
	Nurse-physician agreement when using the Canadian C-Spine Rule	Physicians cleared cervical spine in 53% of cases, while nurses cleared cervical spine in 51% of cases (2% difference)
	Reduction in cervical immobilization if nurses could clear the cervical spine	A 25% reduction in immobilization rates would have occurred if nurses could clear the cervical spine of patients assessed
Stiell et al. (2009)	Proportion of eligible patients referred for cervical spine radiographs by ED physicians	A 12.8% reduction of cervical spine radiographs ordered by ED physicians at the intervention sites
	Overall performance of the Canadian C-Spine Rule	The Canadian C-Spine Rule correctly identified all 23 patients with clinically significant cervical spine injuries, achieving 100% sensitivity
Stiell et al. (2010)	Identification of clinically important cervical spine injury by ED nurses	Nurses correctly identified 37 of 41 (90.2%) patients with clinically important cervical spine injury relative to the investigators

Author	Primary Outcome Measure	Key findings
Clement et al. (2011)	Identify facilitators and barriers to implementing the use of Canadian C-Spine Rule in nursing practice	High rate of support for a policy having ED nurses clear the cervical spine of low-risk trauma patients
Clement et al. (2016)	Identify facilitators and barriers to implementing the use of the Canadian C-Spine Rule in nursing practice	High rate of support from physicians, nurses and hospital administrators for a policy having ED nurses clear the cervical spine of low-risk trauma patients
Fontaine et al. (2018)	Nurse-physician agreement when using the Canadian C-Spine Rule	Physicians agreed with nurses' decisions to remove cervical immobilization in 114 patients (100%)
Stiell et al. (2018)	Identification of a clinically important cervical spine injury by ED nurses	The 6 patients with clinically important cervical spine injury were correctly identified by nurses (100%)
	Patient length of stay in the ED	Patient length of stay decreased by 1.2 hours when cervical immobilization was removed by nurses
	Nurse accuracy using Canadian C-Spine Rule	Zero missed cervical spine injuries by nurses using the Canadian C-Spine Rule

Summary

In the ED, nurses do not typically assess the cervical spine of alert, stable trauma patients; however, it has been shown that with adequate education and support nurses can confidently apply the Canadian C-spine Rule to determine patients at low-risk for cervical spine fracture (Clement et al., 2011, 2016; Stiell et al., 2010, 2018). Small studies performed in the United Kingdom and Australia found that nurses were often hesitant to temporarily loosen the collar to palpate a patient's neck for mid-line tenderness or assess a patient's range of motion by asking them to actively rotate their neck to a minimum of 45 degrees (Kelly et al., 2004; Miller

et al., 2006; Stiell et al., 2001). Specific range of motion assessments and the presence of midline tenderness in the context of trauma are new skills for nurses. Consequently, researchers found that many nurses simply observed the physicians' assessments rather than completing an assessment independently (Kelly et al., 2004). This highlights the need for appropriate nurse education including extensive interdisciplinary training during implementation combined with frequent refresher training to increase nurses' confidence when performing new clinical skills (Miller et al., 2006)

Overall, these studies demonstrate that when used by both ED physicians and registered nurses the Canadian C-Spine Rule enables accurate and reliable identification of trauma patients at low-risk for cervical spine injuries and is associated with decreased use of unwarranted radiography. Stiell et al. (2018) believe that comprehensive education emphasizing inclusion and exclusion criteria, and identifying patients at high-risk for cervical spine injury, are key factors to effectively implementing the use of the Canadian C-Spine Rule in nursing practice. Frequent refresher training sessions can also be beneficial in reinforcing this new skill.

Bringing about change in clinical settings is complex, but it also provides the opportunity to introduce nursing innovations that improve patient care (Clement et al., 2016; MacPhee, 2007). When introducing new skills into nursing practice strong leadership, effective communication and physician support are all important factors for success (Clement et al., 2016). Understanding local facilitators and barriers are also key components to successful knowledge translation projects (Clement et al., 2016).

Chapter 3: Local Stakeholder Engagement and Analysis

Healthcare improvement projects provide valuable opportunities for innovation, leading to improved efficiency, increased staff morale and better patient outcomes; however, they can also be marred by bureaucracy and poor implementation resulting in low rates of adoption (Hilton & Anderson, 2018; MacPhee, 2007). For healthcare improvement projects to become successful, they must be readily adopted by frontline healthcare workers, thereby becoming self-sustaining (Hilton & Anderson, 2018; MacPhee, 2007). Successful projects must also have measurable, positive outcomes that are seen to benefit both patients and clinicians, such as improved patient flow in busy EDs (Berwick, 2003; MacPhee, 2007). Frontline healthcare workers are more likely to adopt change initiatives if they believe the change is compatible with their values and beliefs and these projects are more likely to be successful when they are simple and build upon current practices (Berwick, 2003; MacPhee, 2007).

Improvement projects impact patients, frontline healthcare workers and healthcare leaders; therefore, these initiatives need to be a viable alternative for all stakeholders involved (Hilton & Anderson, 2018). Prior to implementing change initiatives, leaders should identify and engage key stakeholders who will be affected by their project (MacPhee, 2007). This chapter includes findings from a self-designed, short answer survey tool sent to a purposeful selection of a few key stakeholders from the VGH ED Quality Council. The author is an active member of the VGH ED Quality Council, which is an interdisciplinary group comprised of physician leaders, nurse leaders, and frontline nurses with a keen interest in quality improvement within the ED. To assist in understanding local stakeholder engagement, an electronic survey comprised of five demographic questions and five short answer questions was sent to members of the VGH ED Quality Council for input. Findings from the survey tool were used to perform a

SWOT (Strength, Weakness, Opportunity, Threats) analysis on internal strengths and weaknesses and external threats and opportunities related to enabling ED nurses to clear the cervical spine of low-risk trauma patients utilizing the Canadian C-Spine Rule.

Summary of Stakeholder Engagement

Nursing research provides a foundation for evidence-based practice; however, to implement and sustain change efforts, research must be supported throughout the healthcare organization (Chan et al., 2011). Ideally, a unit based quality improvement council can support the integration of evidence-based practices within the clinical setting and aid in understanding and advancing nursing research (Chan et al., 2011). Surveys can obtain feedback from a broad population, but tend to yield low response rates (Polit & Beck, 2017). While response rates greater than 65% present a smaller risk for bias, lower response rates are often the norm (Polit & Beck, 2017). Nine of the fourteen (64%) Quality Council members, six of the nine nurses (66.7%) and three of the five physicians (60%), responded to the request for feedback via a short-answer survey. This lack of physician response, despite an email reminder, presents early difficulty in gaining physician engagement and support for this project.

Findings from the short-answer survey have been separated into nurse responses and physician responses. Separating the responses allowed the author to follow a similar protocol to Clement et al. (2016), who surveyed nurses and physicians after implementing use of the Canadian C-Spine Rule into nursing practice in Ontario. Separating nurse and physician responses also allowed the author to gain a more detailed view of key stakeholders' opinions and provided valuable information regarding stakeholders who are likely to support such a project and those who would be more resistant. Survey results are presented in Table 4 (Demographic Questions) and Tables 5 to 9 (Summary of Responses).

Table 4*Survey Results: Demographic Questions*

Demographics	Answers
Nurses	
Employment Status	Full-time: 83.3% Part-time: 16.7%
Number of years working in healthcare	Range: 7 – 17 (mean: 10.8 years)
Number of years working in an ED	Range: 5 – 17 (mean 10 years)
Number of years working in VGH ED	Range: 5 – 15 (mean 9.2 years)
Demographics	Answers
Physicians	
Employment Status	Full time: 67% Self-Employed: 33%
Number of years working in healthcare	Range: 7 – 15 (mean 10.3 years)
Number of years working in an ED	Range: 7 – 11 (mean 9 years)
Number of years working in VGH ED	Range 4 – 6 (mean 5.6 years)

Table 5*Survey Results: Summary of Responses to Question One*

Question 1: Would utilization of the Canadian C-Spine Rule by VGH ED nurses improve patient care? Please explain your answer.
<p>Nurses:</p> <ul style="list-style-type: none"> • Five nurses (83.3%) agreed that utilization of the Canadian C-Spine Rule by ED nurses would improve care by: <ul style="list-style-type: none"> ○ Improving patient experience ○ Improving patient comfort ○ Decreasing risk of potential pressure sores and/or aspiration ○ Improving department flow • One nurse (16.7%) reported being “unsure” as they had not worked at a site where nurses utilized the Canadian C-Spine Rule and stated they had “no experience with it”
<p>Physicians:</p> <ul style="list-style-type: none"> • Two physicians (67.0%) agreed that utilization of the Canadian C-Spine Rule by ED nurses would improve patient care for the following reasons: <ul style="list-style-type: none"> ○ Patients who had their collars removed by ED nurses could sit in a chair awaiting physician assessment instead of unnecessarily occupying a stretcher ○ Decreased rates of pressure sores related to cervical collars ○ Increase patient comfort ○ Increase patient independence ○ Increase patient satisfaction

Question 1: Would utilization of the Canadian C-Spine Rule by VGH ED nurses improve patient care? Please explain your answer.

- Increase department efficiency
 - One physician (33.3%) disagreed stating *“Given the context no. Because [BCEHS] are implementing the rule earlier on in the care of patients, only high-risk patients remain in collars. The only added benefit would be that nurses would recognize walk-in patients who should be placed in collars, and this may not improve care.”*
-

Key Findings

Key finding from nurses who responded to the survey included an overall support for utilization of the Canadian C-Spine Rule by ED nurses because they believed it would improve patient care. Nurses stated this initiative would improve patient comfort and increase patient flow through the department, thus improving patient care. Nurses indicated that prolonged time spent in cervical immobilization has been shown to lead to increased risk of complications including pressure sores and aspiration. By decreasing the time patients spend immobilized, nurses believed the risk of complications would also be decreased.

Two of the three physicians surveyed agreed that utilization of the Canadian C-Spine Rule by VGH ED nurses would improve patient care. These physicians felt that nurse application of the Canadian C-Spine Rule would improve patient care by increasing patient independence, increasing patient comfort and decreasing rates of pressure sores related to cervical collars. It was also noted that these patients could be placed in lower acuity areas after having their collars removed while awaiting physician assessment. One physician did not believe this initiative would improve patient care due to the perceived low prevalence of this patient population. In June 2017, British Columbia Emergency Health Service (BCEHS) paramedics changed their practice for transportation of low-risk trauma patients in cervical immobilization. This practice change included the adoption of a Spinal Motion Restriction (SMR) guideline. Under this new guideline paramedics now transport low-risk trauma patients

on a stretcher with a cervical collar in place and the head of the stretcher elevated at 30 degrees (BC Emergency Health Services, 2017). Due to this recent paramedic initiative, one physician stated that given the context of care in the VGH ED, only high-risk patients were transported to ED in cervical immobilization and therefore they did not believe this initiative would improve care.

Table 6

Survey Results: Summary of Responses to Question Two

Question 2: With appropriate education would nurses in the VGH ED be able to use the Canadian C-Spine Rule to clear the cervical spine of low-risk trauma patients? Please explain your answer.

Nurses:

- Five nurses (83.3%) agreed that with appropriate education nurses in the VGH ED would be able to use the Canadian C-Spine Rule to clear the cervical spine of low-risk trauma patients for the following reasons:
 - Nurses are able to follow algorithms and utilize clinical decision tools
 - Nurses are able to utilize clinical expertise when assessing appropriate patients for cervical collar removal
 - The literature demonstrates successful removal of cervical collars by nurses
 - Two (33%) nurses were involved in Stiell et al. (2018) study sites and felt that the assessment process was thorough, the education was adequate, and the study was well validated.
 - One (16.7%) nurse was unsure because they had not previously worked with the Canadian C-Spine Rule.
-

Physicians

- Three (100%) physicians agreed that with appropriate education nurses in the VGH ED would be able to use the Canadian C-Spine Rule to clear the cervical spine of low-risk trauma patients for the following reasons:
 - VGH ED nurses have the clinical understanding and ability to apply the Canadian C-Spine Rule
 - The Canadian C-Spine Rule is straightforward to use
-

Key Findings

Nurses agreed that with appropriate education they believed they could safely and effectively utilize the Canadian C-Spine Rule to clear the cervical spine of low-risk trauma

patients. Two nurse respondents were working at study sites involved in the seminal research by Dr. Stiell in Ontario and felt that the education they received was thorough and the clinical decision rule was easy to apply. It was noted that nurses working in the VGH ED already successfully utilize clinical decision tools such as the Ottawa Ankle Rules when ordering nurse-initiated x-rays and nursing expertise when providing nurse initiated analgesic or anti-emetics to patients prior to physician assessment. All physicians believed that with appropriate education nurses could apply the Canadian C-Spine Rule in practice; however, one physician noted that due to the perceived low prevalence of this patient population, retention of this skill could be problematic.

Table 7

Survey Results: Summary of Responses to Question Three

Question 3: Please identify any facilitators to successful implementation of the Canadian C-Spine Rule by VGH ED nurses

Nurses:

- Strong commitment to continued education within VGH ED
 - ED nurses are motivated to learn and provide high-quality care
 - Nurse champions
 - Sustainable implementation/training strategy
 - Clear evidence presented to nurses, physicians and paramedics allowing a shared understanding of the new protocol
 - Experienced front-line nurses
 - Nurse mentors/preceptors
 - Head Nurses
 - Nurse Educators
 - Education days
 - Daily education huddles/rounds
 - Training videos that could be easily accessible on the team website
 - Visual aids (pictures & graphs) at triage to help with decision-making
-

Physicians:

- Positive culture of learning in VGH ED.
 - In-situ education
 - Visual aids at triage to help with decision-making
 - Members of VGH ED Quality Council could help with this initiative
-

Key findings

Nurse respondents felt that the strong commitment to continued education within the VGH ED would be a facilitator to the successful implementation of the Canadian C-Spine Rule in nursing practice. Four nurse respondents (67%) believed that ED nurses are motivated to learn and provide high-quality patient care. All of the nurse respondents noted that there are multiple levels of support for nurse education and practice change within VGH ED including: head nurses, nurse educators, mentors, preceptors and experienced frontline nurses. Education days and daily huddles were identified as facilitators that already exist within the VGH ED for dissemination of new information. Nurses believed that pictures and graphs displayed at triage as reminders of the Canadian C-Spine Rule would also assist nurses with adopting this new skill in practice. Utilizing technology such as the VGH ED team website, was suggested as a way to ensure training videos are easily accessible for staff to review. Five (71%) of the nurses surveyed also noted that frontline nurses who would be willing to take on the role as unit champions would be essential to the implementation and sustainment of this project. All physicians noted that facilitators for successful implementation of this project included a culture of learning within the ED. One physician respondent (33%) noted that the Quality Council could be used to facilitate and support the use of the Canadian C-Spine Rule by VGH ED nurses.

Table 8

Survey Findings: Summary of Responses to Question Four

Question 4: Please identify any barriers to successful implementation of the Canadian C-Spine Rule by VGH ED nurses.

Nurses:

- Physician support
 - Lack of time due to heavy workloads and high-acuity patients
 - Competing operational and educational priorities
 - Significant time and effort would be essential to:
 - Develop education tools
-

Question 4: Please identify any barriers to successful implementation of the Canadian C-Spine Rule by VGH ED nurses.

- Implement required training
- Design media to aid in maintaining nurse competency and sustain initiative
- Capacity to develop, implement and maintain nurse competence
- Lack of low-risk trauma patients presenting to the ED in cervical immobilization making it difficult for nurses to maintain adequate skill competency
- Liability concerns
- Scope of practice concerns
- Nurse confidence in this skill

Physicians:

- Inadequate nurse education and orientation to the project
 - Liability concerns (restrictions from the nursing college)
 - Lack of time due to heavy workloads and high-acuity patients
 - Low prevalence of low-risk trauma patients presenting to the VGH ED with cervical immobilization in place.
-

Key Findings

Fifty percent of nurse respondents felt that physician support would pose a significant barrier to the successful implementation of the Canadian C-Spine Rule by nurses in the VGH ED. Nurse respondents noted that workload and acuity is high in the VGH ED, and nursing colleagues may feel they are too busy to add another task to their workload. It was noted that competing educational and operational priorities of the ED leadership team could be a barrier to implementing this new skill in practice because significant time and effort would be essential to developing educational tools, implementing required training, and designing media to aid in maintaining nurse competency and sustaining this initiative.

Both nurse and physician respondents noted a concern regarding the lack of low-risk trauma patients presenting to the ED in cervical immobilization, making it difficult for nurses to maintain adequate skill competency. Both nurses and physicians agreed that the recent BCEHS protocol change introducing the SMR guideline for paramedics transporting low-risk trauma patients, combined with increased research regarding the complications of cervical collars, has

resulted in fewer patients presenting to the ED in cervical immobilization. Other barriers suggested by physician respondents were inadequate nurse education or orientation to the project and concerns regarding liability and coverage for the additional scope of practice change by the nursing college.

Table 9

Survey Findings: Summary of Responses to Question Five

Question 5: Do you have any additional comments or suggestions?

Nurses:

- *“Great idea – like the idea of increasing nursing scope of practice to improve the patient experience”*
 - *“It is a responsibility experienced/senior nurses could take on, but it is a band-aid solution to a bigger problem that should have a better fix. If there is significant delay to patients being assessed for cervical spine clearance due to workload/volumes/wait-times, a better answer is to fix those issues”*
 - *“I think patients remain on spine boards and in cervical collars longer than they need to. I think clearing the cervical spine at triage would be the first in a long series of steps needed to reduce time patients spend in cervical collars post trauma.”*
-

Physicians:

- No physicians offered additional comments
-

Key Findings

Three nurses provided additional comments to the survey. Overall, nurses supported the concept of improving patient care for those patients awaiting physician assessment while immobilized in a cervical collar. One nurse felt that enabling nurses to remove the cervical collar was a band-aid solution to much larger systemic and organizational issues within the healthcare institution. This nurse raised the valid point that if department flow and ED congestion are issues causing long wait times for these patients, examining the root cause of these issues may be a better place to start. Further interviews with each nurse involved in this survey would assist in better understanding these comments.

SWOT Analysis

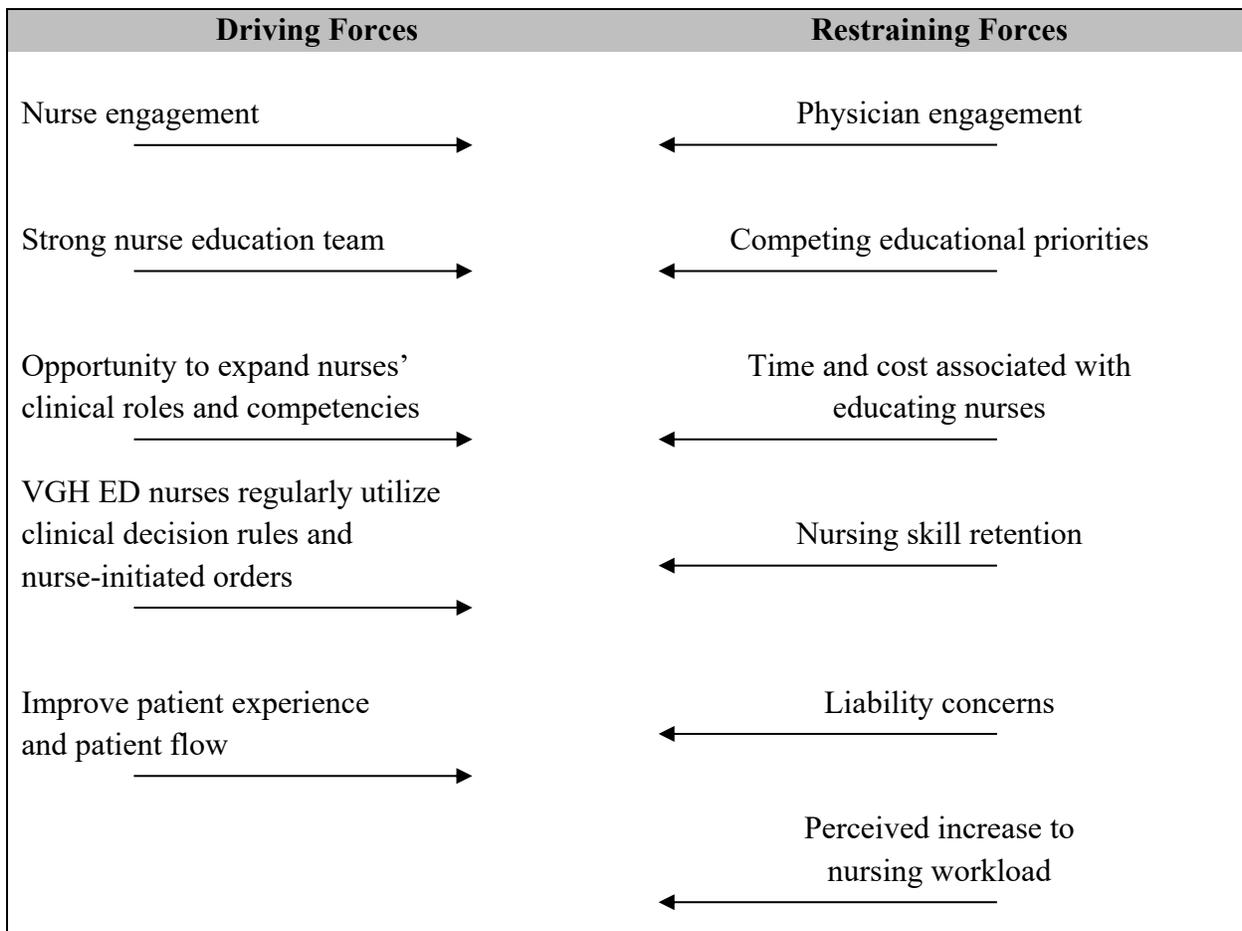
When attempting to implement a change project within healthcare, it can be useful to examine the key stakeholders affected by the project utilizing a SWOT analysis (Hollingsworth & Reynolds, 2020; MacPhee, 2007). The acronym SWOT stands for S: internal strengths; W: internal weaknesses; O: external opportunities; T: external threats (MacPhee, 2007). A SWOT analysis includes key stakeholders and examines the strengths, weaknesses, opportunities and threats to a proposed change project (Hollingsworth & Reynolds, 2020; MacPhee, 2007).

Examining internal and external facilitators and barriers allows leaders to develop short and long term goals for a project (MacPhee, 2007). Internal strengths and weaknesses offer leaders an opportunity to adjust and adapt care delivery while external opportunities and threats often cannot be changed (Hollingsworth & Reynolds, 2020). A SWOT analysis for the use of the Canadian C-Spine Rule by VGH ED nurses gathered from survey findings and informal discussions with VGH ED nursing leadership after survey results were gathered is presented in Table 10.

Table 10*SWOT Analysis*

S: Strengths (Internal Facilitators)	W: Weaknesses (Internal Barriers)
<ul style="list-style-type: none"> • Strong department education team • ED nurses are motivated • Long standing use of clinical decision tools and nurse-initiated orders by ED nurses • Education days provide an opportunity to introduce this new skill 	<ul style="list-style-type: none"> • Lack of physician support for the project • Nursing perception that the project will increase workload • Competing department priorities for education • Cost associated with education and sustainment of project
O: Opportunities (External Facilitators)	T: Threats (External Barriers)
<ul style="list-style-type: none"> • Previous research demonstrating successful implementation of Canadian C-Spine Rule in nursing practice • Increased nurse competencies • Increased job satisfaction • Increased patient comfort • Increased patient flow through the department 	<ul style="list-style-type: none"> • Lack of low-risk patients presenting to the ED in cervical collars making it difficult to maintain skill competency • Nursing Regulatory College implications regarding increased competencies

After performing a SWOT analysis, the author utilized Lewin's force field analysis (as cited in Baulcomb, 2003) to assess the driving and restraining forces associated with evidence-based practice change. This theory places importance on identifying the driving forces and restraining forces associated with change (Baulcomb, 2003). Driving forces are the strengths of a proposed change while restraining forces are the limitations (Baulcomb, 2003). Optimizing the driving forces of a project while minimizing the restraining forces is key to successfully implementing evidence-based practice changes (Baulcomb, 2003). A force field analysis for use of the Canadian C-Spine Rule by VGH ED nurses when assessing the cervical spine of low-risk trauma patients is presented in Table 11.

Table 11*Force Field Analysis*

Results from local stakeholder engagement highlight the driving forces within the VGH ED. It has been noted that the VGH ED already has a strong education team who value integrating research into practice and nurses who are highly motivated and keenly interested in educational opportunities. Stakeholders identified that VGH ED nurses already successfully utilize clinical decision tools and nurse-initiated orders in daily practice. Education days and daily huddles were identified as facilitators that already exist within the VGH ED for dissemination of new information. When value is placed on integrating research into practice

and is encouraged by organizational leaders, front-line nurses are more likely to adopt evidence-based practice changes (Chan et al., 2011; Clement et al., 2016).

Creating nurse-driven protocols enables nurses to expand their clinical role and competencies and provide early interventions, resulting in improved patient care and better patient experiences (Roberts & Miller, 2019). Local stakeholders noted that early removal of cervical collars in low-risk trauma patients would allow these patients to be seen in lower acuity areas of the ED, thus improving patient flow because they would no longer occupy a stretcher and telemetry monitoring in higher-acuity areas of the department. Additional comments provided in the short-answer survey also identified support for increasing nursing competencies and improving the patient experience.

A significant restraining force to the addition of the Canadian C-Spine Rule in nursing practice within VGH ED could be a lack of physician support. Fifty percent of nurse respondents felt that physician support would pose a significant barrier to the successful implementation of the Canadian C-Spine Rule by nurses in the VGH ED. Both nurse and physician stakeholders identified nursing resistance due to heavy workloads as an internal threat to the success of this project. Due to the intensive education that would be needed to successfully integrate the Canadian C-Spine Rule into nursing practice, other competing priorities for educational time and finances was also identified as a significant barrier.

Results from this local survey highlight both physician and nursing concerns regarding a lack of low-risk trauma patients presenting to VGH ED immobilized in cervical collars which could negatively affect nurses' confidence and competence in this new skill. Physicians and nurses also both voiced concerns regarding college restrictions on nursing scope of practice and potential liability issues. Physicians were concerned that increasing nursing competencies to

include applying the Canadian C-Spine Rule would not be supported by the nursing college and nurses feared legal liability if they applied the clinical decision rule incorrectly.

Utilization of the Canadian C-Spine Rule by ED nurses increases nurses' autonomy when caring for low-risk trauma patients leading to increased job satisfaction and improved nurse retention (Gorman, 2019; Stiell et al., 2010). Successful implementation of healthcare practice changes requires leaders who understand the local context and adapt the change initiative according to the individual setting (Berwick, 2003; MacPhee, 2007). A small survey of key stakeholders has been helpful to aid in understanding the local context; however, further stakeholder engagement could assist in better understanding local beliefs when seeking to change clinical practice.

Chapter 4: Discussion

A recent survey and SWOT analysis conducted with local key stakeholders at VGH ED has provided valuable insights regarding implementing the Canadian C-Spine Rule into nursing practice in this department. A force field analysis model will be utilized to discuss the feasibility of developing a decision support tool enabling nurses to utilize the Canadian C-Spine Rule to clear the cervical spine of low-risk trauma patients. These results will be compared to similar survey results from nurses and physicians working in Ontario, Canada where the Canadian C-Spine Rule has been adopted into nursing practice. Examining the driving and restraining forces found in nursing and physician practice in Ontario can provide useful suggestions for implementing this practice in VGH ED.

Driving Forces

Nurse Engagement

One of the strengths identified by members of the Quality Council during the recent survey was nurse engagement. Respondents highlighted that the VGH ED is a high-performing team with nurses who are keenly interested in educational opportunities focused on improving patient care. Respondents also identified that the combination of engaged clinical nurse educators and motivated frontline staff will be key to successful implementation of any change project. Survey results and informal conversations with Quality Council members and nursing leaders suggest that those who are either interested in this project, or who have previously utilized this decision support tool in practice, will be key stewards for its success. The identification of local nursing leaders who support change projects was paramount to the successful implementation of the Canadian C-Spine Rule into nursing practice in Ontario (Clement et al., 2011, 2016; Stiell et al., 2018) and will be key to the successful implementation of this project in the VGH ED.

Adoption of new evidence-based practice requires the investment of time and energy from leaders and early engagement and support from key stakeholders (Berwick, 2003; Roberts & Miller, 2019). Healthcare leaders can increase the adoption of new evidence-based practice by investing in the curiosity of those staff members who are interested in change (Berwick, 2003). Successful implementation of the Canadian C-Spine Rule into nursing practice in VGH ED will be dependent on a receptive culture within the department amongst nurses who will utilize the new decision support tool, support from nurse educators and physicians, and clinical leaders who advocate for change (Clement et al., 2011, 2016; Miller et al., 2006).

Restraining Forces

Physician Engagement

Physician support will be imperative for successful adoption of the Canadian C-Spine Rule into nursing practice and sustaining this practice change in VGH ED; however, survey results suggest that physician engagement could be an early limitation. Only three of the five physicians participated in the survey despite a reminder email being sent. Nurse leaders commented that gaining physician support for this project could be a significant barrier to overcome. Primary physician concerns regarding this project were a lack of low-risk patients presenting to the VGH ED in cervical collars, inadequate nurse education, and concerns regarding liability coverage from the nursing college when expanding nurse competencies to include the Canadian C-Spine Rule.

Early physician engagement in practice changes can provide credibility and aid in organizational approval for adoption of proposed projects (Roberts & Miller, 2019). Clement et al. (2011, 2016) found in both their surveys that nurses valued physician support because it aided in increasing their comfort level utilizing the Canadian C-Spine Rule in practice.

Physicians surveyed felt early senior physician engagement and identifying a physician champion prior to rolling out the project aided in gaining overall physician support (Clement et al., 2016). Identifying supportive and engaged physicians, who could also be physician champions within VGH ED, will be critical for this project to succeed.

When physicians were surveyed in Ontario, researchers found that 27 of the 151 physicians (17.8%) responding to their survey were initially uncomfortable with nurses removing the cervical collar of low-risk trauma patients (Clement et al., 2016). In the same survey, 20 of the 151 physician respondents (13.2%) felt that the nurse training to utilize this clinical decision

rule in practice was inadequate. However, 30 physicians (19.8%) noted that during the 30-month period where nurses removed the cervical collar of low-risk trauma patients, they learned that their nursing colleagues were capable of appropriately applying the clinical decision rule in practice and 28 of the physicians (18.5%) surveyed believed that application of the Canadian C-Spine Rule by nurses improved care by decreasing patient length of stay in busy EDs (Clement et al., 2016; Stiell et al., 2018). Identifying, understanding and addressing physician concerns early and providing physicians with evidence from research conducted in Ontario where this practice change was successfully implemented, may be beneficial in helping to gain early physician support.

Nurse Education

Educating nurses to utilize the Canadian C-Spine Rule in VGH ED will take significant commitment from nurse educators and leaders. Substantial costs will be associated with developing educational tools such as online media training, education days, visual reminders, and dedicating time to train frontline nurses. In addition, developing educational tools to aid with skill retention will be paramount for long term success and sustainability. Key stakeholders noted that competing educational priorities within VGH ED and the cost associated with educating nurses to this extent, combined with a lack of support from local physicians may hinder the ability to commit to the education needed to add this skill to nursing practice.

In Ontario, to ensure comprehensive education with the Canadian C-Spine Rule, researchers trained nurse educators to become local site experts through a combination of video and interactive presentations followed by simulation sessions (Stiell et al., 2018, 2010). Nurse educators used their new knowledge and skills to oversee the training of ED nurses at their local hospitals utilizing computer-based learning and practical interactive sessions (Stiell et al., 2018,

2010). Online learning modules included a presentation of the research evidence supporting use of the Canadian C-Spine Rule in practice, video demonstrations, case studies, and answers to common questions (Stiell et al., 2018, 2010). Online learning was reinforced with small group sessions where local nurse educators could review the Canadian C-Spine Rule, demonstrate techniques for applying this rule in practice, provide hands on training and answer nurses' questions (Stiell et al., 2018, 2010). To achieve certification for cervical spine assessment, nurses were required to demonstrate their understanding of this skill by successfully completing a performance evaluation during the practical session and passing a written test at the conclusion of the education day (Stiell et al., 2018, 2010). After completing the required classroom education, nurses demonstrated their assessment skills in the practice setting by documenting their assessments of ten low-risk trauma patients utilizing the Canadian C-Spine Rule and performing three assessments while simultaneously being evaluated by a nurse educator (Stiell et al., 2018). Under a local medical directive approved by the ED physicians, certified nurses were then able to utilize this new skill in practice and remove immobilization of appropriate low-risk trauma patients (Stiell et al., 2018).

Skill Retention

Due to the recent implementation of the SMR guideline by BCEHS paramedics, physicians and nurses surveyed raised concerns regarding a lack of low-risk trauma patients presenting to VGH ED with cervical collars leading to difficulties sustaining nurse competency in this skill. Both physicians and nurses felt that due to research regarding poor patient outcomes with extensive time in cervical collars, fewer low-risk patients were presenting to the ED immobilized in cervical collars. Respondents felt that patients presenting to VGH ED immobilized in a cervical collar were primarily high-risk patients who would not benefit from

this new protocol. Concerns were raised that the resources and education needed to implement the Canadian C-Spine Rule in nursing practice would be far greater than the number of low-risk patients presenting to the VGH ED immobilized in a cervical collar.

Nurses surveyed in Ontario provided similar feedback after implementing the Canadian C-Spine Rule in practice with 21% of respondents stating that they felt there was a lack of appropriate low-risk trauma patients presenting to the ED to maintain skill competency (Clement et al., 2016). Miller et al. (2006) suggest that plans for reinforcement, or frequent refresher training following implementation, would aid in the retention of education despite minimal use of this skill. Clement et al. (2011) found that nurses felt visual aids at triage, frequent education reminders and the ability to consult physician colleagues would aid in retaining skill competency.

Liability Concerns

Physicians and nurses surveyed both raised concerns about nursing liability when introducing the Canadian C-Spine Rule into nursing practice. Nurses within the VGH ED already practice within their autonomous scope of practice utilizing nurse-initiated activities and clinical decision support tools when ordering nurse-initiated radiographs of distal extremities. This clinical decision support tool enables nurses to identify those patients who would benefit from extremity radiographs and provides an evidence-based protocol ED nurses who have completed the required education can follow to order the appropriate radiographs prior to physician assessment (Vancouver Coastal Health, 2019). Creating a decision support tool ED nurses could reference after appropriate training to utilize the Canadian C-Spine Rule in practice would enable nurses to further expand their autonomous scope of practice.

Decision support tools are evidenced-based documents supporting nurses to provide standardized, safe patient care when acting within their autonomous scope of practice (British Columbia College of Nursing Professionals, 2020). The British Columbia College of Nursing Professionals (BCCNP) recognizes registered nurse-initiated activities as those interventions performed under the autonomous scope of nursing practice that are guided by clinical decision support tools (British Columbia College of Nursing Professionals, 2020). In Vancouver Coastal Health (VCH), decision support tools are created by an interdisciplinary team with the support of the Professional Practice Office (Vancouver Coastal Health, 2020). Decision support tools can be created when a need is identified to introduce a new practice or change an existing practice (Vancouver Coastal Health, 2020). The Professional Practice Office supports developing a team of experts to create the decision support tool, determine the education required and collaboratively develop an implementation plan (Vancouver Coastal Health, 2020). Decision support tools are formatted utilizing templates provided by the Professional Practice Office and drafts are sent out to key stakeholders for review and feedback prior to implementation (Vancouver Coastal Health, 2020).

Clement et al. (2011) found that prior to implementing the Canadian C-Spine Rule into nursing practice, 14% of nurses surveyed were concerned about legal liability if they interpreted the Canadian C-Spine Rule incorrectly. Interestingly, after implementing the Canadian C-Spine Rule into nursing practice, concerns regarding legal liability had decreased to just 3.9% of nurses surveyed and only 5.3% of physicians had legal or liability concerns at this time (Clement et al., 2016). As nurses became more comfortable utilizing the Canadian C-Spine Rule in practice, and physicians learned that nurses could reliably apply the clinical decision rule in practice, concerns regarding liability decreased.

Nursing Workload

Respondents identified high nursing workloads and other competing priorities as a barrier to the successful implementation of this change project. Respondents also acknowledged that VGH ED has a large percentage of high-acuity patients combined with a significant daily volume of patients presenting for care increasing daily nursing workload. As a result, key stakeholders were hesitant to advance this project without first addressing the real or perceived increase in nursing workload associated with the implementation of the Canadian C-Spine Rule to assess low-risk trauma patients at triage.

Concerns regarding increasing nursing workload at triage when assessing patients utilizing the Canadian C-Spine Rule were similar to concerns voiced by nurses in Ontario. Clement et al. (2011, 2016) found in both their surveys that nurses noted the most common barriers to applying the Canadian C-Spine Rule in practice was that they were too busy, the workload was already too heavy, or they did not have time to apply the clinical decision rule at triage. Miller et al. (2006) argue that while the triage process may be prolonged by assessing patients utilizing the Canadian C-Spine Rule, the increased time spent triaging patients would be offset by the overall reduction in workload when these patients could later be assessed in lower acuity areas.

Emergency Department Overcrowding

When engaging key stakeholders within VGH ED, it was noted that nurse clearance of cervical spine of low-risk trauma patients is a band-aid solution to a greater healthcare system problem. Overcrowding is a widespread problem within EDs and results in increased length of patient stay, delayed care for seriously ill patients, and poor patient outcomes (Innes et al., 2019). The main cause of overcrowding is the prolonged length of stay of admitted patients in the ED

due to a lack of inpatient care spaces in the hospital (Innes et al., 2019). Overcrowding has resulted in decreased availability of acute care stretcher space and has forced emergency staff to look for creative solutions to manage more patients with fewer available stretchers (Innes et al., 2019). While ED overcrowding is predominately an organizational problem caused by lack of inpatient care spaces, department leaders can help reduce overcrowding by improving internal processes leading to improved patient flow (Innes et al., 2019).

When low-risk trauma patients present to triage in a cervical collar, they are moved to a high-acuity stretcher space for close observation until they are assessed by a physician, adding to the burden of overcrowded EDs (Stiell et al., 2018). ED overcrowding is larger system level issue that will need system level solutions; however, improving department efficiency and patient flow can lead to improved patient outcomes. While nurses clearing the cervical spine of low-risk trauma patients may be considered a band-aid solution to a larger problem by some, it has also been shown to decrease patient length of stay in the ED, which is an important issue in overcrowded departments (Stiell et al., 2018). Utilization of the Canadian C-Spine Rule by nurses is an innovative solution aimed at improving internal processes within the ED to help mitigate overcrowding while improving patient care.

Recommendations

Both nurses and physicians reported concerns regarding a lack of low-risk patients presenting to the VGH ED in cervical collars due to a new paramedic protocol allowing them to transport low-risk trauma patients immobilized in cervical collars to the ED with the head of the bed raised at 30 degrees. Respondents also believe that due to increasing evidence regarding poor outcomes associated with prolonged time spent in cervical collars, less patients are being transported to the hospital in cervical collars. At this time the number of low-risk trauma

patients presenting to VGH ED immobilized in cervical collars is unknown. Furthermore, it is unknown whether patients transported to VGH ED with paramedic crews under the SMR guideline are triaged to high acuity areas or remain on a stretcher with their head of the bed elevated. Anecdotally, the author has noted that these patients are generally triaged to high-acuity areas, placed supine on a spine board and remain immobilized while awaiting physician assessment.

Prior to implementing nurse clearance of the cervical spine in low-risk trauma patients, conducting a one-year retrospective chart review and a one-year prospective chart review will help collect important data regarding the frequency of eligible patients presenting to the VGH ED. It has been noted that implementing a nurse-driven protocol to clear the cervical spine of low-risk trauma patients at triage will take significant time and effort and nurses will need to apply the skill consistently in practice to retain the education. Retrospective and prospective chart reviews would provide valuable data regarding the number of patients presenting to VGH ED immobilized in a cervical collar and would help determine if this is an adequate number to maintain nurse competency in the new skill. In addition, these chart reviews would provide data indicating the number of patients transported to VGH ED immobilized in a cervical collar according to current BCEHS SMR guidelines. This data could be used to determine the alignment of VGH ED policies for care of the low-risk trauma patient in cervical immobilization with BCEHS SMR practice guidelines. Better aligning VGH ED and BCEHS practice guidelines could include allowing patients to remain on stretchers with their head of bed elevated at thirty degrees while awaiting physician assessment.

A summary of key recommendations to help determine the feasibility of implementing the Canadian C-Spine Rule into nursing practice in VGH ED are shown in Table 11.

Table 11*Key Recommendations*

Recommendations
<ol style="list-style-type: none">1. Conduct a one-year retrospective and one-year prospective review of low-risk trauma patients presenting to VGH ED immobilized in a cervical collar2. Determine the number of low-risk trauma patients transported to VGH ED with BCEHS paramedics using current SMR practice guidelines3. Determine if these patients are placed in high-acuity areas of the ED while awaiting physician assessment

Conclusion

Previous research demonstrates that with appropriate education and support, ED nurses can reliably use the Canadian C-Spine Rule to assess low-risk trauma patients and feel comfortable utilizing this tool to determine those patients at risk of cervical fracture (Clement et al., 2011, 2016; Miller, et al., 2006; Stiell et al., 2010, 2018). Utilization of the Canadian C-Spine Rule by ED nurses improves the patient experience by decreasing the time patients spend immobilized in a cervical collar and increasing patient flow through busy EDs (Miller et al., 2006; Stiell et al., 2018). This SPAR explored the feasibility of developing a clinical practice guideline implementing the use of the Canadian C-Spine Rule by nurses working in VGH ED. Before this change can be implemented into clinical practice key recommendations based on data collected from surveys and interviews with key stakeholders and a SWOT analysis should be addressed. These recommendations address internal and external factors facilitating or impeding practice change and help to better understand the local practices and context of care.

References

- Baulcomb, J. S. (2003). Management of change through force field analysis. *Journal of Nursing Management, 11*(4), 275–280. <https://doi.org/10.1046/j.1365-2834.2003.00401.x>
- BC Emergency Health Services. (2017). *Spinal Motion Restriction Treatment Guideline Change. Practice Update.*
- Berwick, D. M. (2003). Disseminating Innovations in Health Care. *Journal of the American Medical Association, 289*(15), 1969–1975. <https://doi.org/10.1001/jama.289.15.1969>
- Chan, G. K., Barnason, S., Dakin, C. L., Gillespie, G., Kamienski, M. C., Stapleton, S., ... Li, S. (2011). Barriers and Perceived Needs for Understanding and Using Research Among Emergency Nurses. *Journal of Emergency Nursing, 37*(1), 24–31. <https://doi.org/10.1016/j.jen.2009.11.016>
- Clement, C. M., Stiell, I. G., Davies, B., O'Connor, A., Brehaut, J. C., Sheehan, P., ... Beland, C. (2011). Perceived facilitators and barriers to clinical clearance of the cervical spine by emergency department nurses: A major step towards changing practice in the emergency department. *International Emergency Nursing, 19*(1), 44–52. <https://doi.org/10.1016/j.ienj.2009.12.002>
- Clement, C. M., Stiell, I. G., Lowe, M. A., Brehaut, J. C., Calder, L. A., Vaillancourt, C., & Perry, J. J. (2016). Facilitators and barriers to application of the Canadian C-spine rule by emergency department triage nurses. *International Emergency Nursing, 27*, 24–30. <https://doi.org/10.1016/j.ienj.2015.11.008>
- Fontaine, G., Forgione, M., Lusignan, F., Lanoue, M. A., & Drouin, S. (2018). Cervical Spine Collar Removal by Emergency Room Nurses: A Quality Improvement Project. *Journal of Emergency Nursing, 44*(3), 228–235. <https://doi.org/10.1016/j.jen.2017.07.018>

Gorman, V. L. A. (2019). Future Emergency Nursing Workforce: What the Evidence Is Telling Us. *Journal of Emergency Nursing*, 45(2), 132–136.

<https://doi.org/10.1016/j.jen.2018.09.009>

Greenlaugh, T. (2014). *How to read a paper: The basics of evidence-based medicine* (5th ed). Oxford: Wiley Blackwell.

Hilton, K., & Anderson, A. (2018). *IHI Psychology of Change Framework to Advance and Sustain Improvement. IHI White Paper*. Retrieved from

<http://www.ihl.org/resources/Pages/IHIWhitePapers/IHI-Psychology-of-Change-Framework.aspx>

Hollingsworth, A., & Reynolds, M. (2020). The ED Nurse Manager's Guide to Utilizing SWOT Analysis for Performance Improvement. *Journal of Emergency Nursing*, 46(3), 368–372.

<https://doi.org/10.1016/j.jen.2020.02.006>

Innes, G. D., Sivilotti, M. L. A., Ovens, H., McLelland, K., Dukelow, A., Kwok, E., ...

Chochinov, A. (2019). Emergency overcrowding and access block: A smaller problem than we think. *Canadian Journal of Emergency Medicine*, 21(2), 177–185.

<https://doi.org/10.1017/cem.2018.446>

Kelly, A. M., Bradshaw, L., & Kerr, D. (2004). Can nurses apply the Canadian C-Spine Rule? A pilot study. *Canadian Journal of Emergency Medicine*, 6(3), 161–164.

<https://doi.org/10.1017/S1481803500006850>

MacPhee, M. (2007). Strategies and tools for managing change. *Journal of Nursing*

Administration, 37(9), 405–413. <https://doi.org/10.1097/01.NNA.0000285138.34247.5b>

- Miller, P., Coffey, F., Reid, A. M., & Stevenson, K. (2006). Can emergency nurses use the Canadian cervical spine rule to reduce unnecessary patient immobilisation? *Accident and Emergency Nursing*, *14*(3), 133–140. <https://doi.org/10.1016/j.aaen.2006.03.003>
- Polit, Denise & Beck, C. (2017). *Nursing Research: Generating and Assessing Evidence for Nursing Practice* (10th ed). Philadelphia: Wolters Kluwer.
- Roberts, M., & Miller, S. A. (2019). Implementation of an Innovative Nurse-Driven Resuscitation Protocol. *Journal of Nursing Administration*, *49*(7–8), 372–376. <https://doi.org/10.1097/NNA.0000000000000770>
- Song, J. W., & Chung, K. C. (2010). Observational studies: Cohort and case-control studies. *Plastic and Reconstructive Surgery*, *126*(6), 2234–2242. <https://doi.org/10.1097/PRS.0b013e3181f44abc>
- Stiell, I. G., & Bennett, C. (2007). Implementation of Clinical Decision Rules in the Emergency Department. *Academic Emergency Medicine*, *14*(11), 955–959. <https://doi.org/10.1197/j.aem.2007.06.039>
- Stiell, I. G., Clement, C. M., Grimshaw, J., Brison, R. J., Rowe, B. H., Schull, M. J., ... Wells, G. A. (2009). Implementation of the Canadian C-spine rule: Prospective 12 centre cluster randomised trial. *BMJ (Online)*, *339*(7729), 1071. <https://doi.org/10.1136/bmj.b4146>
- Stiell, I. G., Clement, C. M., Lowe, M., Sheehan, C., Miller, J., Armstrong, S., ... Vaillancourt, C. (2018). A Multicenter Program to Implement the Canadian C-Spine Rule by Emergency Department Triage Nurses. *Annals of Emergency Medicine*, *72*(4), 333–341. <https://doi.org/10.1016/j.annemergmed.2018.03.033>

- Stiell, I. G., Clement, C. M., O'Connor, A., Davies, B., Leclair, C., Sheehan, P., ... Wells, G. A. (2010). Multicentre prospective validation of use of the Canadian C-Spine Rule by triage nurses in the emergency department. *Cmaj*, *182*(11), 1173–1179.
<https://doi.org/10.1503/cmaj.091430>
- Stiell, I. G., Wells, G. A., Vandemheen, K. L., Clement, C. M., Lesiuk, H., De Maio, V. J., ... Worthington, J. (2001). The Canadian C-spine rule for radiography in alert and stable trauma patients. *Journal of the American Medical Association*, *286*(15), 1841–1848.
<https://doi.org/10.1001/jama.286.15.1841>
- Vancouver Coastal Health. (2019, September 30). *Radiographs (X-rays): Nurse requisitioning of distal upper and distal lower extremity (adult age 17 years and older)*.
<http://shop.healthcarebc.ca/PHCVCHDSTs/BD-00-13-40102.pdf>
- Vancouver Coastal Health (2020, March). *VCH Decision support tool (DST) developer instructions*. <https://my.vch.ca/learning-practice-site/Decision-Support-Tools/Documents/VCH%20DST%20Developer%20Instructions.pdf>

Appendix A: Abbreviations and Definitions

Abbreviations

BCEHS: British Columbia Emergency Health Services

ED: Emergency Department

SMR: Spinal Motion Restriction

SWOT: **S:** internal strengths; **W:** internal weaknesses; **O:** external opportunities; **T:** external threats

VCH: Vancouver Coastal Health

VGH: Vancouver General Hospital

Definitions of Terms

Canadian C-spine Rule: A clinical decision rule utilizing three high-risk criteria, five low-risk criteria and a clinical exam focused on neck range of motion, allowing clinicians to remove cervical immobilization without radiography

Glasgow Coma Scale: a neurological scale which aims to give a reliable and objective way of recording the state of a person's consciousness for initial as well as subsequent assessments.

NEXUS Criteria: A clinical decision rule utilizing five low-risk criteria allowing clinicians to clinically clear the cervical spine without radiography. Low-risk criteria include the absence of: posterior midline cervical spine tenderness on exam; evidence of intoxication; decreased level of consciousness; focal neurological deficits; and painful distracting injuries.

Triage: the sorting of patients (as in an emergency department) according to the urgency of their need for care.