Electronic Record Adoption and Usage Among Nurse Practitioners in British Columbia

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Introduction

Worldwide, electronic medical records (EMRs) are being implemented in an effort to modernize health care delivery. EMRs allow clinicians, at the individual or clinic level, to enter and access patient data electronically and also allow for integration with decision support and regionally stored health data (Hodge, 2011). Globally, there has been significant interest in understanding the factors that promote physician adoption of EMRs as well as documenting the rate of adoption of this technology in health care. International reports of physician adoption of EMRs have provided benchmarks and insights as to the types of eHealth and public policy strategies that can be employed by national and regional governments to increase the rate of uptake and use of this technology (Jha, DesRoches, Campbell, Donelan, Sowmya, Rao, Ferris, Shields, Rosenbaum & Blumenthal, 2009; McCarthy et. al., 2011; National Physician Survey, 2011). Less attention has been given in the literature to reporting on adoption rates involving EMRs where other health professionals are concerned—for example, nurse practitioners (NPs).

NPs are an important group of health professionals who work in primary care settings. They sometimes work with physicians, and they provide health care to families and chronically ill individuals. In Canada, NPs are defined as RNs with additional education and experience “who possess and demonstrate the competencies to autonomously diagnose, order, and interpret diagnostic tests, prescribe pharmaceuticals, and perform specific procedures within their legislated scope of practice” (Canadian Nurse Practitioner Initiative 2006: 26). There is very little literature documenting the current rate of adoption and use of EMRs among NPs either in Canada or internationally. Yet, in North America there are over 170,000 NPs who provide care for over 600 million patient visits per year (American Association of Nurse Practitioners, 2013). NPs would also benefit from the decision support and population health management features and functions embedded within an EMR as well as the ability of EMRs to connect to electronic health record (EHR) information stored locally or regionally (i.e. EMR interoperability with a national EHR) (Canada Health Infoway, 2012).

In this paper we report on NPs’ adoption and use of electronic records in British Columbia (BC). To date, little research has been reported on NP adoption and usage of EMRs. This paper represents a new contribution to the Canadian and international literature, as in it we attempt to determine the extent NPs’ use electronic records in a region where they practice. Such research will inform international and Canadian policy makers in those countries where NPs represent a
significant portion of the health care workforce (e.g. United States) and in those health care regions that are introducing this role.

The findings reported in this paper are part of a larger multi-year mixed methods study of NP role integration in the health care system in BC, Canada. The study is funded by the Michael Smith Foundation for Health Research.

We begin by providing background about the Province of BC and the history of NPs as a profession in the Province to provide context for this paper. We follow this with a discussion of the current state of the research involving nurse and NP adoption of electronic records. Finally, we discuss the implications for future research and policy initiatives involving NP use of EMRs.

Background
At 944,735 square kilometres, BC is the third largest province in Canada and is larger than the countries of France, Germany and the Netherlands combined. Most of the Province’s population lives in two cities: Vancouver and Victoria. The Okanagan Valley represents the most populated inland region in the Province (BC Stats, 2011). Health care delivery takes place across a wide variety of urban, rural and remote settings. This is reflected in the fact that NPs practice in each of these settings within BC. To address the unique needs of differing regions within BC, health care delivery and management are divided into five regional health authorities. Additionally, there is a Provincial Health Authority that manages and delivers Province-wide programs such as cancer care (BC Ministry of Health, n.d.), as well as a new First Nations Health Authority that is dedicated to improving the health of communities by advancing the quality of health care delivered to BC First Nations and Aboriginal people (FNHA).

History of Nurse Practitioners in British Columbia
In the early 1990s, the BC Ministry of Health became interested in implementing the NP role as a cost effective means to increase access to primary health care (Haines, 1993), and in 2005 legislation enabling the role was proclaimed. Because the role is new in BC, the number of NPs is relatively small; as of 2013, there are just 226 NPs registered in the province. There are approximately 2800 NPs in Canada (Canadian Institute for Health Information, 2013). NPs have been hired by health authorities throughout BC over the past seven years, and practice in acute, long-term, and primary health care settings. The implementation of the NP role represents a significant shift in the delivery of primary health care, and with it, a need to identify those technologies, such as EMRs, that would best support NP practice.

eHealth and Policy Initiatives Involving EMR Adoption
Worldwide, there has been considerable work undertaken by researchers and governments in an attempt to understand how EMR adoption and use can be accelerated among physicians. Some countries, for example, the Netherlands, Denmark, Sweden, Australia and New Zealand, have been successful in achieving nearly 100% adoption among physicians (McCarthy et al., 2011). Other countries, such as Canada and the US, have been less successful and are still working on getting the majority of physicians to adopt this technology (Jha et al., 2009; McCarthy et al., 2011; National Physician Survey, 2010). In an effort to understand the links between eHealth, policy initiatives and physician adoption and use of EMRs, surveys have taken place at a country level, and comparisons have been made across countries using these data (Jha et al., 2009;
McCarthy et al., 2010; Nohr & Boyes, 2008). To illustrate, the Commonwealth Survey’s focus on EMR adoption among industrialized nations has led to significant policy shifts in Canada and the US in terms of: developing eHealth strategies aimed at incentivizing physicians to adopt EMRs and identifying ways of measuring EMR use (McCarthy et al., 2011). Some countries, such as Canada, have borrowed eHealth strategies from other countries that have high rates of EMR adoption, such as Denmark and Sweden. For example, some Scandinavian countries have pioneered approaches that have helped to encourage physician use of EMRs, such as ensuring that EMRs in physician offices can exchange data across a country-wide secure network. Physicians in these countries have been motivated to use EMRs because of the opportunities afforded to them to improve the quality and safety of patient care as well as communication between physician offices and acute care facilities (Nohr & Boye, 2008; Protti, 2008; Protti, 2009). Such information has been used to inform Canada’s work on the interoperable electronic health record and the United States’s (US) work on regional health information exchanges (McCarthy et al., 2010; Protti, 2008; Protti, 2009).

In North America, surveys have been conducted by researchers about EMR adoption. These surveys have focused on physician adoption in Canada (National Physician Survey, 2010) and on physician and nurse adoption in the US (DesRoches, Campbell, Rao, Donelan, Ferris, Potter, Zhonghe, 2008; Jha, Kaushal, Levey, Rosenbaum, Shields, Blumenthal, 2008; DesRoches, Donelan, Buerhaus, Jha et al., 2009; McCarthy et al., 2011). In response to these surveys, the US Office of the National Coordinator has developed a eHealth strategy where physicians are incentivized to use EMRs over time (Office of the National Coordinator for Health Information Technology, 2011). In Canada, the National Physician Survey, which has been used to build knowledge about physician-related current and future health care issues and trends, has seen the inclusion of questions specific to physician adoption and use of EMRs in recent years (National Physician Survey, 2012a). Information from this survey has helped researchers, policy makers and chief information officers to understand how EMRs are adopted over time (by physicians) as well as to determine the strategies that can be used to promote EMR adoption and use (National Physician Survey, 2012a). Canada Health Infoway, the organization responsible for the creation of a pan-Canadian EHR, and facilitating adoption of health technologies across Canada, has used information from this survey to drive their eHealth strategy (Canada Health Infoway, 2012). Despite the usefulness of this type of survey, it should be noted that no equivalent survey has been given to NPs regarding their adoption and use of this technology in Canada or other countries.

EMR Strategy in British Columbia
In BC, the Physician Information Technology Office program (PITO) was created in 2006 to “co-ordinate, facilitate and support information technology planning and implementation for physicians, including the development and implementation in BC of standardized systems of electronic medical records (EMR)”. PITO is funded by the BC government and Canada Health Infoway (PITO, 2009a). PITO has a steering committee that is composed of practicing physicians from the BC Medical Association and representatives from the BC government. The PITO Steering Committee reports to the e-Health Steering Committee which in turn reports to the BC Health Leadership Council (a membership that includes CEOs from the health authorities and senior executives from the MOH) (PITO, 2009a). Most of PITO’s programs are focused on physician and physician specialist adoption of EMRs. PITO gives funds to physicians on a cost-
shared basis: government (70%); physicians (30%) to purchase EMRs. Four vendors are currently approved by PITO: Intrahealth, Med Access, Osler Systems and Wolf (Telus Health Solutions) (PITO, 2009b). According to Smith (2011), “around 60% of physicians in private practice offices are using an EMR” (p. 460). In fact, 90% of full-service, large family practice clinics in BC have adopted an EMR. For small to medium family practice clinics (i.e. those with 2-5 physicians) adoption rates are approximately 50% and for solo family physicians the adoption rates are between 5% and 10% (Smith, 2010, p. 289). More recently, PITO has extended its work to NPs by providing NPs with self-assessment, educational and tailored practice support opportunities around electronic records (PITO, 2012). In summary, physicians with large, full service family practices have the highest adoption rates. Solo practice physicians have the lowest adoption rates. EMR adoption is an important issue at the national and jurisdictional level in Canada. For NPs it is also becoming an important issue.

NPs as Stakeholders in EMR Initiatives
More recently, NPs have emerged as important stakeholders and key users of EMRs in clinics, physician offices and hospital ambulatory care settings. NPs have been identified by some governments as health professionals who should also receive support so they can learn about the technology and effectively use it (e.g. Saskatchewan, BC) (PITO, 2012). Unfortunately, there is little published research literature that specifically reports on NPs’ adoption and use of EMRs in clinics, physician offices and hospitals in Canada and internationally. There is even less literature available documenting how NPs adopt EMRs and use this new technology in their day-to-day practice. Only a few countries have attempted to conduct nationwide studies in an effort to determine the rate of adoption of electronic records among nurses and to learn about how nurses are currently using this technology in their practice (e.g. US). The focus of these studies has been on nurses (e.g. DesRoches et al., 2008) and not NPs who are the predominant users of EMRs.

Much of the nursing research has been conducted in the US, alongside physician EMR adoption studies (DesRoches et al., 2008; Jha et al., 2009). In addition, research in this area is intended to learn about how nurses’ use EMRs (in outpatient settings) and electronic patient records (EPRs) (in hospitals). Earlier studies have attempted to: a) determine the proportion of registered nurses who use minimally functional electronic records; b) examine the relationship between nurse beliefs involving quality of care and quality improvement and electronic records; c) assess the impact of electronic records upon time spent in documentation versus patient care (DesRoches et al., 2008); and d) document the impact of electronic records upon hospital costs, staffing levels, patient mortality rates, and patient development of complications (Furukawa et al., 2011). There has been less research focusing upon NP adoption and usage of electronic records. Instead, the focus of the research involving NPs has been upon understanding how NPs use electronic records within the context of the “meaningful use” work instituted by the Office of the National Coordinator in the US (Office of the National Coordinator, 2011; Maxson, Jain, Kendall, Mostashari & Blumental, 2010) Meaningful use involves the use of a certified electronic record and its components in the process of patient care in order to improve the “quality, safety, efficiency of health care”, “reduce health disparities”, engage patients and their families, “improve care coordination, and population and public health” while at the same time
“maintaining the privacy and security of patient health information”. Much of this work, for the most part, takes the form of anecdotal reports (Office of the National Coordinator, 2011).

In Canada, to the best of our knowledge there has been little research at the national or jurisdictional level focusing upon NP adoption of EMRs. Even less research has been conducted to determine the nature and quality of meaningful EMR use among NPs or clinical value associated with EMR use. Little is known about the current rate of adoption of this technology and how it is being used for patient care and practice management. Further, there is little research that reports on the requirements and needs of NPs who use EMRs. Instead, the focus of the nursing informatics survey research in Canada has been upon determining the current state of nursing informatics education and competency integration in college and university schools of nursing throughout the country (see Nagle & Clarke, 2004).

Methods
In this section the authors outline the methods that were used to conduct the survey.

Participants
NPs in the province of BC who were: a) registered and b) had previously consented to be contacted about participating in research, were invited to participate in the Nurse Practitioner Practice Patterns Survey (NPPPS) in the Fall of 2011. As the researchers were interested in learning more about the adoption rate and usage of EMRs among NPs, they included questions relating to the features and functions of the EMR.

Setting
The survey took place in one Canadian jurisdiction – BC, the third largest province in Canada.

Survey and Pilot Testing.
The NPPPS was used to collect data for this portion of the research. Originally developed by Martin-Misener et al. (2010), the NPPPS has been used in Ontario and Nova Scotia to collect data about NP practice. The instrument has been used to collect data about NP characteristics, practice models, settings of practice, the practice populations attended to by NPs, the services NPs provide and the barriers/facilitators to implementing the NP role. Before the tool was used in BC, (and with the permission of the author), three researchers reviewed the NPPPS in order to ensure the questions in the tool were appropriate for the BC context. For example, modifications were made to collect information about what health authorities the NP’s were employed with, a section was added on reporting of codes and electronic data and the top five diagnoses and diseases for BC were added. The researchers were also interested in NP EMR adoption and use in BC. To investigate EMR adoption and usage, questions developed by Jha et al. in 2009 were added to the survey. The survey was then pilot tested on two NPs working in the Province and found to be appropriate, though long.

Electronic Record Questions
Questions about NP EMR usage were added to the survey by the researchers. In selecting the NP electronic record use questions to be added to the NPPPS, the researchers reviewed several survey tools that had been used in North America (see DesRoches et al., 2005 and Jha et al., 2009 tools) to assess the level of electronic record use among NPs and other health professionals.
Questions used to assess NP adoption of EMRs and their use of the technology were drawn and modified from a survey instrument developed by Jha et al. in 2009. Jha and colleagues used the survey to determine the level of adoption of electronic records in hospitals across the United States. The focus of Jha and colleagues’ work (2009) was to determine the degree to which base functionalities of electronic records were used. Jha and colleagues (2009) developed their survey by “examining and synthesizing prior hospital-based surveys of electronic-records systems or related functionalities (e.g., computerized provider-order entry) that have been administered in the past 5 years” (p.1629). Following this, the researchers shared an initial draft of the survey with other researchers who work in the area, chief information officers, hospital leaders, and survey experts. Lastly, in this process a consensus panel of health informatics, health services research, survey research, and health policy experts were asked to review the survey, leading to further modifications.

The researchers reviewed Jha’s et al.’s (2009) survey and extracted key questions that would allow for the measurement of NP adoption and use of key functions of this technology and added them to the NPPPS survey. The full survey (NPPPS including the EMR components) was then pilot tested with two experienced NPs for clarity, appropriateness and usability. We obtained permission from Jha et al. (2009) to use parts of the electronic record survey tool that was developed. Ethics approval for the larger study and use of the survey was obtained from the Human Research Ethics Board at the University of Victoria, Victoria, BC.

Data Collection Procedures
Several recruitment methods were used to increase the response rate for the online survey. This was done in accordance with Jackson (2003) and Eysenbach (2005), who note that several methods of recruitment may be needed to improve online survey response rates.

The full, revised NPPPS (including EMR components) was built into Fluid Surveys®, an online survey application. NPs were invited to complete the online survey in several ways to increase response rate. The NPs who had indicated their willingness to participate in research were sent invitation letters by the College of Registered Nurses of BC (CRNBC) using the postal services in Canada. The letter of invitation included a link to the online survey that could be entered as a url in a web browser and would direct the potential participant to the survey website. The invitation to participate, along with the survey url, was also posted on the BC Nurse Practitioner website. Here, NPs could click on the link to automatically be directed to the online survey. Finally, an email with an invitation to participate and the link to the survey were sent to the University of Victoria NP alumni listserve. NPs wishing to participate in the survey were asked to click on the survey link in their email to be connected to the online survey.

Findings
Thirty-seven of the 226 NPs registered in BC completed the survey and submitted their responses. Data collected from six NPs were excluded from the analyses (i.e. three did not complete the survey and another three were practicing outside of BC). Data presented in the findings section of this paper are based on survey responses from 31 NPs, that is, approximately
14% of NPs in BC completed the survey. According to Eysenbach (2005, p. 138), online survey response rates range from 9 to 98%. Thus, our response rate is consistent with the published literature on online surveys, and is similar to that reported by the 2011 National Physician Survey (i.e. 18%), the primary source of physician EMR adoption and usage data in Canada (National Physician Survey, 2010). Therefore, our response rate was within the expected range. NP demographic data and EMR use data were analyzed using descriptive statistics appropriate for use in analyzing survey data (Backstrom & Hursh-Cesar, 1981).

Demographic Data
NPs who completed the survey ranged in age from 28 to 60 years (mean=45). Most were female (n=27, 87%) and all were prepared at the Masters level (n=31, 100%), the standard in BC. The mean number of practice years as an RN by participants was 19 years, and as NPs, 3.6 years. The NPs were registered as either family NPs (n=27, 87%) or adult/pediatric NPs (n=4, 13%). Most of the survey respondents (n=21, 68%;) held permanent full-time positions, while some (n=6, 19%) held part-time positions at the time that they completed the survey.

The majority of the survey respondents were employed by a regional health authority in the Province. Most practiced in community/primary health care centre settings, ambulatory clinics and outpatient settings, physician offices, long-term care/residential care, and hospital settings (Table 1). Only nine participants (29%) worked in an inpatient setting. However, of those participants who worked in an inpatient setting, seven (n=7, 78%) also worked in an outpatient setting.

Table 1. Practice Settings

<table>
<thead>
<tr>
<th>Practice Settings*</th>
<th>n =31</th>
<th>%</th>
</tr>
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<tbody>
<tr>
<td>Community/Primary Health Care Centre</td>
<td>15</td>
<td>48%</td>
</tr>
<tr>
<td>Ambulatory Clinic/Outpatient Department</td>
<td>9</td>
<td>29%</td>
</tr>
<tr>
<td>Other (e.g. mental health, addictions, homeless shelters, hospice centres)</td>
<td>7</td>
<td>23%</td>
</tr>
<tr>
<td>Physician Office</td>
<td>7</td>
<td>23%</td>
</tr>
<tr>
<td>Long-term Care Facility/Residential Care</td>
<td>5</td>
<td>16%</td>
</tr>
<tr>
<td>Hospital - in patients</td>
<td>3</td>
<td>10%</td>
</tr>
<tr>
<td>Home Care</td>
<td>2</td>
<td>6%</td>
</tr>
<tr>
<td>Aboriginal Health Centre</td>
<td>2</td>
<td>6%</td>
</tr>
<tr>
<td>Outpost Nursing Health Centre</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>Public Health</td>
<td>1</td>
<td>3%</td>
</tr>
</tbody>
</table>

*Multiple responses allowed

NPs were, for the most part, co-located with other members of the health care team. Most respondents were co-located with physicians (n=27, 87%), registered nurses (n=24, 77%) and/or medical office assistants (n=24, 77%).

Nurse Practitioner Electronic Record Use
Survey respondents were initially asked to indicate their method of record keeping, that is, did they use a hybrid EMR, where part of the patient record is electronic and part of it is paper based, or a full EMR (Borycki et al., 2009; Urowitz et al., 2008). Twenty-seven NPs responded to this question. Nineteen percent (n=5) of participants who responded to this question used paper charts, 63% (n=17) used hybrid records, and 19% (n=5) used fully electronic records. In other words, 82 percent of NPs (n=22) who responded to the question were using either hybrid or full electronic records. These data are consistent with prior North American research suggesting most health professionals use a hybrid electronic record, and that in Canada, 50% of Canadians have at least one component of an electronic record with the remainder being paper-based (Canada Health Infoway, 2011; DeRoches et al., 2008; Jha et al., 2009).

From our survey, we found that NPs are using a wide range of electronic records. Only 22% (n=6) of respondents were using Physician Information Technology Office (PITO) qualified EMRs. Financial and implementation support is provided for PITO electronic record products used by physicians and NPs in the Province (PITO, 2009). Some NPs use PITO Qualified EMRs, such as Intrahealth (4%; n=1), MedAccess (4%; n=1), Osler Systems (7%; n=2) and Wolf (7%; n=2) (which is a Telus product) (PITO, 2009; Telus, 2012), while others are using other EMR software products. A few NPs are using EPRs such as Cerner (n=1, 4%) and Meditech (7%; n=2). The type of electronic record used may vary by type of organization and care setting where NPs practice (e.g. hospital, community, clinic, physician office). For example, EMRs are used by NPs working in physician office settings, and EPRs are used by NPs who work in hospital-based settings.

Twenty-five participants (80%) rated the extent to which they are satisfied with their EMR system. Sixty percent (n=15) of participants were either very satisfied or somewhat satisfied with the system they used. However, 20% (n=5) were very dissatisfied and 16% (n=4) were somewhat dissatisfied with their electronic record. Therefore, further study is needed to understand the underlying reasons for 36% of NPs’ being dissatisfied with electronic records.

Participants were asked to identify the features and functions that are available within their EMR. Not all participants responded to this question, therefore the value of n changes. The features that were reportedly most available were patient demographics (22/22, 100%), clinical notes (21/23, 91%), electronic lists of patients’ medications (19/21, 91%), viewing laboratory results (18/24, 75%), viewing radiology results (16/21, 76%), and patient problem lists (16/20, 80%). A summary of the features available in the EMR are presented in Table 2.

Table 2. Available EMR Functions and Features
In addition to identifying the features and functions available within their EMR, participants were also asked if they used these features and functions. Participants reported using the following features and functions most of the time or some of the time: patient demographics (16/22, 73%), clinical notes (14/21, 67%), electronic lists of what medications the patient is taking (13/21, 62%), viewing laboratory results (13/18, 72%), and patient problem lists (13/16, 81%). Missing data refers to cases where the participant noted that the feature/function was available, but did not specify if they used the feature. A summary of these results are presented in Table 3.

Table 3. Nurse Practitioner Use of Functions and Features
Finally, most NP participants rated their electronic records as having a positive impact on the quality and efficiency of their work. In particular, 67% (16/24) of participants felt the electronic record had a positive effect on their communication with other health care providers, and that it had a positive effect on their timely access to medical records; 54% (13/24) felt it improved their practice patterns.

Participants indicated that EMRs improved the consistency of communication between practitioners, the legibility of patient information, remote access or access from another health care site, follow up and reminders, and ease of refilling prescriptions. Challenges described included slow computers and technical failures, lost or difficult-to-access data when hybrid electronic records were used, and missing or suboptimal electronic record features that would allow for better support of NP practice.

Discussion
In this paper, we reported on the findings of the NPPPS related to understanding the current state of adoption and use of EMRs by NPs in BC. Over the past several years, there have been
significant financial investments and policy changes at the national and jurisdictional level in Canada aimed at fostering EMR adoption by health professionals, specifically physicians. These initiatives have been undertaken by national organizations such as Canada Health Infoway and more local jurisdictional organizations such as PITO and OntarioMD. Much of investment and policy work has been aimed at helping physicians to select and implement EMRs in their office settings in an effort to accelerate physician adoption of EMRs. The expected outcome of this work would be the introduction of the technology and improvements in the quality and safety of health care. As mentioned, there have been several publications comparing physician adoption rates between countries (e.g. Canada, US, Denmark, Germany, UK) and jurisdictions within Canada (e.g. BC, Alberta, Saskatchewan) in terms of progress towards 100% adoption of EMRs. This work has involved physician surveys with questions added specific to EMR adoption and use (e.g. the National Physician Survey in Canada). These surveys allow for comparison of EMR adoption rates and eHealth strategies across countries and jurisdictions, however, to date, this work has focused primarily on physicians.

This paper represents a first attempt to characterize EMR adoption by NPs. There are a number of new and interesting findings in this work. NP adoption of electronic records is high, with 82% of respondents indicating that they were using the technology, that is, 19% of NPs are using fully electronic records and an additional 63% are using hybrid records, with only components of the electronic record available for use. These data are consistent with published North American reports that suggest most health professionals use some form of hybrid electronic record (Borycki et al., 2009; Urowitz et al., 2008). This is also consistent with the work of DesRoches et al. (2008a) involving physicians and nurses, who found that 4% of physicians have a full electronic record, 13% have components of the electronic record (i.e. part of the electronic record is electronic and part of it is paper-based), and 83% continued to use paper patient charts. This finding is consistent with another study conducted by DesRoches et al. (2008b), focused on nurses. In our study, only 25% of NPs were using a basic electronic record relying on both electronic and paper-based sources of information.

NPs appear to be in the very late part of the late majority stage, that is, on the verge of entering the laggard stage of the diffusion of innovation as outlined in Rogers’ Innovation Theory (see Table 4 for adopter categories and corresponding descriptions of types of adopters) (Rogers, 1962).

Table 4: Rogers Adopter Category as adapted from Rodgers (1962).

<table>
<thead>
<tr>
<th>Adopter Category</th>
<th>Description of Type of Adopter</th>
<th>Percentage of Individuals in this Stage</th>
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<tbody>
<tr>
<td>Innovators</td>
<td>Those individuals who are among the first to adopt an innovation. These individuals are more likely to be younger, take risks, have a higher social class and have contact with the innovators.</td>
<td>2.5%</td>
</tr>
<tr>
<td>Early Adopters</td>
<td>These individuals are opinion leaders. They may adopt a new innovation if it helps them to maintain a central</td>
<td>13.5%</td>
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According to Rogers’ Theory (2003), there would still be some NPs who are still skeptical of the innovation, but most average members of this group would have already adopted the technology. As NPs are on the very cusp of sinking to the laggard stage, it appears that only a small percentage of NPs have not adopted the technology, that is, those who are averse to change (Rogers, 2003). These results differ significantly from those of physicians and their use of EMRs. According to the 2010 National Physician Survey, only 33.6% of physicians in BC use EMRs (National Physician Survey, 2009). In 2009, this survey data placed physician use of EMRs in the early majority phase of Rogers’ Innovation Diffusion Theory (2003) with the members of the physician community adopting EMRs only after some time had passed. There may be a number of explanations for this: (a) physicians are slow to adopt EMRs, (b) the organizations where physicians practice may be slow to adopt EMRs.

There may be several reasons for the difference in the percentage of NP versus MD adopters of EMRs, a difference of approximately 48%. According to Smith, adoption rates among physicians vary according to practice size. In a recent report, Smith (2010) identified that physicians who work in full service practices in BC have an EMR adoption rate of 90%, with 33% of those in small to medium practices having adopted an EMR, and 5-10% of physicians in solo practices adopting the technology. Our findings suggest that our NP respondents work in many settings, with the majority of NPs working in primary care, clinic and ambulatory outpatient settings. These settings often provide a number of services. As employees, rather than private practitioners, NPs work within the systems provided by their employers and are unable to make choices about EMR usage. It may be that the EMR rate among NP’s is high as they are more likely to work in organizations that have implemented EMRs. As well, physician EMR adoption rates may have improved since 2009. Ideally, the NP data should be compared to physician EMR adoption data collected in 2012. Unfortunately, the National Physician Survey was not held in 2012. More research is needed to understand NPs’ use of EMRs, and whether working in full service practice settings is a reason for high adoption rates.

According to our survey, 60% of NPs who use EMRs were somewhat to very satisfied with the technology. In contrast, 36% were somewhat to very dissatisfied with the technology. There may be a number of reasons for this high rate of dissatisfaction with EMRs among NPs. Participants noted a number of challenges with EMRs, including: a) slow and inconsistent
computer or internet access, b) use of EMRs is time consuming, c) their EMRs had incomplete patient records, d) that the system dictates clinical practice, and e) that the system does not have features and functions that support NP work activities such as ordering lab tests or producing requisitions. Other contributing factors that may have led to a high dissatisfaction rate with the EMR include poor interface design, inability of the technology to fully support NP practice requirements or practice based workflows (Kushniruk et al., 2006), a lack of a terminology interface that represents all aspects of NP practice, and/or poor implementation services. This last factor includes a lack of customization of the interface design/workflows emerging from the technology, as well as inadequate training (Walker et al., 2005). Future research is necessary to refine and customize existing EMR terminology, interface designs, workflows imposed by the technology, and implementation services. Researchers may wish to explore the similarities and differences between NP and physician workflows to inform future EMR design and implementation.

Our findings are congruent with previous research; several researchers have identified poor electronic record design as a concern. Health professionals are increasingly cognizant of the impact that poor systems usability has on workflow (Kushniruk et al., 2006) and on practice. In some cases, this has led to no improvement in patient outcomes or errors associated with the technology’s use, that is, technology-induced errors (Borycki & Kushniruk, 2008; Kushniruk et al., 2005; Kushniruk et al., 2006). Furthermore, electronic records that do not support NP workflow may lead to inefficiencies and may impact the quality of care provided (Kushniruk et al., 2006), because many EMRs were developed with the intent that physicians use these systems rather than NPs. Less attention has been given to identifying the user requirements, workflow processes, and terminologies employed by NPs. Inadequate attention to NP-specific aspects of work during the requirements gathering, design and development phases of EMR design, in conjunction with a greater focus on physician aspects of work to be supported by the technology, may have led some NPs to become dissatisfied with EMRs. Research is needed to determine if EMR vendors incorporated NP-specific terminology, workflow, and practice needs into commercially available EMRs, as NP practice patterns differ from those of physicians and many EMR designs have been modeled upon physician work. Such information should also be posted on public websites so that NPs are better informed when procuring, recommending or selecting EMRs for their practice. This is currently done for physicians in some Canadian jurisdictions, for example, in Ontario. Currently, some provinces, including Ontario, provide publically available user ratings of EMR attributes, and encourage physicians to post information about their experiences implementing and using the technology.

In our study, NPs used differing EMR functions in their day-to-day work. For example, 73% of participants used EMRs most of the time or sometimes to store patient demographic information, 67% of participants used EMRs to record clinical notes, 72% to view laboratory tests, 62% to maintain patient medication lists, and 81% used patient problem lists. In most cases participants employed the technology to support day-to-day practice activities. Here, participants primarily used the technology to view test results, record information, and document clinical notes. These basic or minimum EMR functions involve using the EMR as a source of information and as a
documentation tool (Jha et al., 2009). Only a limited number of participants used the EMR as a source of reminder information, to generate screening lists and/or to manage large groups of patients at a practice level. Given the high adoption rates for EMRs, it is important for policy makers to develop supports for NPs that enable full usage of the technology to support their practice. NPs are adept at using the EMR as a source of information and a documentation tool. The next important step in the NP’s use is to provide them with educational opportunities to identify population-based issues in their practices. NPs need to be able to use EMRs to help them identify individuals who have uncontrolled chronic illnesses, such as diabetes, or individuals at risk for illness, such as individuals who are not immunized for pertussis. In this case, NPs could identify at-risk individuals and begin the process of helping them address their health issues in a proactive manner.

Limitations
Although this work took place in one of the largest jurisdictions in Canada, the study is limited to only one region of the country. Further work in other Canadian jurisdictions and countries is needed to compare policy initiatives and impacts on NP EMR adoption and usage rates. In addition, there is a need to examine the effects of setting (e.g. clinic, hospital) and location (e.g. urban versus rural) on EMR adoption rates and EMR feature and function usage. This study included participants who worked in multiple roles in inpatient and outpatient settings. Distinguishing between EMR used in the inpatient and outpatient settings would be important for future researchers to examine for any differences. The study is limited from a sample size (n=31) perspective, even though all NPs in the Province were invited to complete the survey (Jackson & Verberg, 2006). Nonetheless, the number of respondents is consistent with that of other surveys attempting to gauge health professionals’ use of electronic records, such as the National Physician Survey (National Physician Survey, 2013). It must be noted that there are a number of reasons for the small number of respondents, among the most important is the relative newness of the role in BC, as compared to other provinces, such as Ontario. Other factors, such as the time taken to educate NPs, and the time taken for organizations to integrate the new role, have also influenced the number of NPs practicing in the Province.

Conclusions
The findings from this research can be applied to other jurisdictions in Canada and to other countries where NPs are currently practicing or where governments are about to embark on introducing the NP role to the health care system. NPs, unlike their physician counterparts, are in the late stages of adoption of EMRs (Rogers, 2003). There may be a number of reasons for this, among them the nature of the settings where NPs work and their co-location with other health professionals in full service practice settings. It may be that in large practice settings where NPs work that NP’s are more easily supported by EMR vendors, and the nature of the large practice setting where there is more need for clear communication and documentation support for which the EMR is well suited. It may also be a result of the employee status of NPs, in contrast to that of most physicians, who are independent practitioners.
Even so, a significant number of NPs continue to be dissatisfied with their EMRs. There may be a number of reasons for this, including cases where the EMRs are designed, developed and implemented to support physician practice alone, rather than the practice of other health professionals such as NPs. Throughout the health care literature there is a recognition that physician and NP practice differs. These differences should be echoed in the technology’s terminology interfaces, user interfaces, design and implementation where NPs are concerned. EMR vendors need to begin customizing existing EMR systems and designing future EMR systems to support the unique and differing aspects of physician and NP practice. EMRs support specific types of workflows and practice activities; if those workflows and activities are not fully supported, then the efficiencies, level of productivity, and patient outcomes (or clinical value) expected of introducing EMRs as a technological support for NP practice will not be achieved (Kushniruk et al., 2006). Lastly, this research represents a first attempt in Canada and internationally to learn more about NP use of EMRs. More research is needed to report on the rate of use of EMRs by NPs in other jurisdictions and countries. BC’s high adoption rate of EMRs by NPs over a short period of time, since the introduction of the role in 2005, suggests there is much to be learned from this Province about the influence of context and EMR eHealth strategies upon EMR adoption among NPs.
References


