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How are Electronic Medical Records Used by Nurse Practitioners?

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Abstract. In this paper we describe how nurse practitioners (NPs) use electronic medical records (EMR) features and functions at: (1) an individual and (2) a clinic level to support patient wellness and chronic disease management activities. Fifteen NPs from British Columbia (BC), Canada participated in a qualitative, semi-structured interview study. NPs used EMRs with individual patients and at a clinic level to support wellness and chronic disease management activities. NP's used clinic notes, reminders, tasks and careplans to support wellness and disease management activities in individual patients while reports were used to manage patients at a clinic level.

Keywords. nurse practitioners, electronic medical records, adoption, nursing informatics

Introduction

Nurse practitioners (NPs) represent a growing group of healthcare providers in North America. NPs care for and support well individuals and those with chronic and complex medical conditions. Yet, as a group they represent one of the least studied health professionals in terms of their use of EMRs. To date, most studies involving EMRs have focused on physician and nurse adoption and use of the technology. Fewer researchers have attempted to understand NPs adoption and use of EMRs [1]. In this paper we describe how NPs have employed EMR features and functions at: (1) an individual and (2) a clinic level to support patient wellness and chronic disease management activities.

1. Review of the Literature

1.1. What is a Nurse Practitioner?

NPs are Masters or Doctorally prepared advanced practice nurses that can "diagnose and treat diseases and health conditions, educate and support patients who have health issues that range from simple to complex, and acute to chronic" [2]. NP's were

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introduced to BC by the Ministry of Health to improve patient access to primary healthcare. In 2005 legislation was proclaimed formalizing the role in the BC healthcare system [3]. Today, there are 574 NPs who are registered in BC (i.e. currently practicing and provisional) [2]. They work in regional health authorities across the province in acute, long-term, and primary healthcare practice settings. Across Canada there are 2800 NPs who are providing healthcare [4].

1.2. The Electronic Medical Record Use and Nurse Practitioners

NPs have become key stakeholders and users of EMRs. Federal, provincial, state and territorial governments in North America have identified that NPs need aid and support in using EMRs. To date federal government funding in North America has focused upon physician adoption of EMRs [1]. Little research has been published about NPs' use of EMRs at a country level. Researchers in BC, Canada have begun to study NPs' use of EMRs [see 1]. In Canada there has emerged an interest in understanding how EMRs can be customized and implemented to support NP's. Canada Health Infoway is investing $380 million to help physicians and NPs implement EMRs [6]. In BC the Physician Information Technology Office has begun to determine best practices around EMR data management and storage in NP-physician practices [7].

2. Methods

2.1. Participants and Recruitment

NPs who were practicing in the province of BC, and who used an EMR in their practice, were invited to participate in this study. Email invitations were sent to those NPs who had participated in a provincial Nurse Practitioner Practice Pattern survey [8] and had consented to be contacted to participate in further research about NPs.

2.2. Nurse Practitioner Practice Settings

The study took place in the province of BC which is the third largest province in Canada (larger than the countries of France, Germany and the Netherlands combined). Healthcare delivery in BC occurs across urban, rural and remote settings. Most NP's are employees and work in clinics as part of healthcare teams (i.e., with physicians, social workers, therapists and medical office assistants).

2.3. Procedure

NP's who were using EMRs in their practice were emailed and asked to participate in the semi-structured interview study. Those NPs who expressed an interest in participating in the study emailed a member of the research team who then sent a consent form, and set up dates and times to conduct the interview by telephone. During the telephone interview, the researcher first obtained the NP's verbal consent to participate in the study. Following this, NP participants were asked a series of demographic and interview questions. Interviews took 30 to 45 minutes to complete and were audio recorded. Many of the questions focused on how NPs use EMRs in

their practice. A subset of questions were aimed at learning more about how NPs used EMRs with individual patients and at a clinic level to support wellness and chronic disease management activities across patient groups. The study received ethical approval from the University of Victoria Human Research Ethics Board.

2.4. Analysis

Descriptive statistics were used to learn about the demographic characteristics of the study participants. Qualitative semi-structured interviews were transcribed and imported into NVivo9®. A coding scheme was developed by two health informatics researchers using constant comparison. Initially, the researchers coded three interview transcripts separately and then reviewed the developed coding schemes together. The coding schemes were reviewed and all discrepancies in coding were resolved through discussion between the two researchers. Once the inductively derived coding scheme was agreed upon by the researchers, a researcher coded the remaining transcripts.

3. Results

In this section of this paper we present data on the demographic characteristics of our study participants and the results of our analyses of the telephone interview data.

3.1. Participant Demographic Characteristics

Fifteen NPs who were practicing in a primary care setting participated in the study and saturation was reached in the data [9]. Participants were either using a paperless EMR system (8/15; 53%) or an electronic-paper hybrid system (7/15; 46%). The majority of participants worked with at least one physician (14/15; 93%), RN (9/15; 60%) and NP (8/15; 53%). The mean time NPs spent on a computer for work purposes was between 23 to 25 hours per week, of which a mean of 16 to 18 hours were spent on their EMR. These participants also completed in the Nurse Practitioner Practice Patterns survey, where the majority of the people that took part were female (29/34; 85%) with an average age of 46 years. Participants were educated at the Masters level in Nursing. On average, participants had 19 years of nursing experience prior to becoming an NP with a mean length of time practicing as an NP of about three years [1].

3.2. Semi-structured Interview Data

Two themes emerged during the analysis of the data. NPs used the EMR for: (1) individual patient management, and (2) clinic patient population management. Clinical notes, reminders, tasks and careplans were used to promote individual patient wellness activities and manage patient chronic illnesses. EMR search, list generation and report functions were used to manage the clinic's patient population (see Table 1).

Table 1. NP Use of EMR Features and Functions

Individual Patient Management	Clinic Patient Population Management
Clinical Notes	Reports (also referred to as Searches and Lists)
Reminders	• Example: Type of medications
Tasks	• Example: Laboratory test results
Careplans	

NP participants used EMRs for individual patient management and described using clinical notes and reminder functions embedded in the EMR to care for and support individual patient needs (see left side of Table 1). Here, NPs noted patient wellness and chronic illness management issues that required NP follow-up in individual patient records. NPs used clinic notes for follow-up on patient wellness and chronic disease management issues. Here, some NPs made clinical notes in the EMR about specific health issues that required further patient follow-up, for example:

"I would just make a note…you're over 50 so you need to come for a physical, you need blood work ... and different things depending on if they're male or female." (NP)

Reminders were used by NPs to ensure physical exams (e.g. Papanicolaou test - Pap tests, prostate exams), laboratory tests (e.g., bloodwork) and diagnostic tests (e.g., mammograms) were undertaken and followed up on as described by one NP below:

"We enter all of their results in there and we use it to create reminders. So then when they're due for their Pap for example, every time their chart is open the reminder pops up saying "patient overdue for Pap test" (NP)

Alternatively, NPs used tasks and careplans to initiate chronic disease or wellness interventions as illustrated by the following statement:

"You might send a task to yourself or you might generate a careplan in order to be able to have the record flag you (to discuss health concerns) when the person comes in the next time" (NP)

NPs used other EMR functions to manage patients with similar health issues in the clinic (see right hand column of Table 1 – Clinic Patient Population Management). Sometimes this work would be done by the NP and in other cases the healthcare team did this (i.e. the NP was part of the healthcare team). Individually, NPs used EMR searches (sometimes referred to as list generation or report functions) to manage clinic patients. EMR searches/lists/reports involved querying the systems databases using specific information requests to identify patients who might require specific types of interventions or follow-up [5]. For example, the NP or the healthcare team might be interested in obtaining a list of patients who are taking a particular medication, have a specific physiologic problem (e.g., hypertension) or a laboratory result that was outside of a normal range. For example, some participants indicated:

"You could search that…extrapolate from that, that those people on Warfarin may need, ….annual or regular blood work to monitor their Warfarin levels" (NP)

Others identified:

"I want a list of all my patients who have a blood pressure over 150 and then if I get that list and it would be based on their last office visit. I get that list and I could choose to call those people in because that's outside of the target and have a follow-up visit with them" (NP)

Clinic teams (including the NP) would use reports to identify vulnerable or at risk patients. The following interview excerpt illustrates this:

"At the practice (or clinic) level with the other people on the team, you might identify specific groups of patients, that have issues and you might look at what's actually been

done with them, and use that information to follow-up on things that have been missed, like hemoglobin A1C (glycated hemoglobin)". (NP)

NPs not only used the EMR to track an individual patient's actual or potential health issues, they also used the EMR to identify patients that visited the clinic that would benefit from a wellness or a chronic disease management intervention or one that was missed. In some cases these reports helped NPs deliver programs that would improve patient health at a clinic population level. Overall, EMR functions were used by NPs to support their own practice as well as the collective work undertaken by the healthcare team. NPs used differing EMR features and functions when managing individual patients versus managing patients that received services at the clinic.

4. Discussion

NPs are important members of the healthcare team as they represent a growing and significant group of providers that are responsible for supporting and managing patients in primary care settings. Even as national governments are promoting physician adoption of EMRs in primary care practice settings throughout North America, there is little known about how NPs adopt and use this technology in their practice. Research emerging from Canada has shown that NPs are adopting EMRs at a rapid rate, yet a significant group of these NPs believe the technology does not adequately support their practice [1]. In this qualitative study we begin to develop an understanding of how NPs use EMRs to support patient wellness and clinic population management. Specifically, NPs are using clinical notes, reminders, tasks and careplans to support/manage individual patient health needs, while EMR reports are being used to identify vulnerable or at risk patients who are visiting the clinic. A limitation of this study is its generalizability: there were only 15 participants, it occurred in only one province in Canada and participants self-selected for participation in the study [9]. Future research will need to examine the challenges and issues that NPs encounter when adopting the technology, including developing a better understanding about NP user EMR interface, usability, workflow and interoperability needs with several vendor and open source EMRs. Additional research may involve comparing and contrasting physician versus NP EMR user needs. Such research is needed to design, develop and implement EMRs that can effectively support other health professionals.

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