

Benchmarking for Nurse Practitioner Patient Panel Size and Comparative Analysis of Nurse Practitioner Pay Scales: Update of a Scoping Review

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Optimizing
Nurse Practitioner
Patient Panel Size in
Primary Health Care

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Contributors

Ruth Martin-Misener, RN-NP, PhD

Associate Professor, School of Nursing, Dalhousie University

Co-Director, Canadian Centre for Advanced Practice Nursing Research, McMaster University

Address correspondence to ruth.martin-misener@dal.ca

Faith Donald, NP-PHC, PhD

Associate Professor, Daphne Cockwell School of Nursing, Ryerson University

Faculty, Canadian Centre for Advanced Practice Nursing Research

Kelley Kilpatrick, RN, PhD

Assistant Professor, Faculty of Nursing, Université de Montréal

Research Center Hôpital Maisonneuve-Rosemont

Faculty, Canadian Centre for Advanced Practice Nursing Research

Denise Bryant-Lukosius, RN, PhD

Associate Professor, School of Nursing & Dept of Oncology, McMaster University

Co-Director, Canadian Centre for Advanced Practice Nursing Research

Jennifer Rayner, PhD

Post-doctoral Fellow, Daphne Cockwell School of Nursing, Ryerson University

Véronique Landry, NP-PHC,

Doctoral Student Faculty of Nursing, Université de Montréal

Virginia Viscardi, BSc

Research Assistant, Canadian Centre for Advanced Practice Nursing Research

R. James McKinlay

Research Coordinator, Canadian Centre for Advanced Practice Nursing Research

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Executive Summary

Identification of an appropriate workload for nurse practitioners (NPs) who work in primary healthcare has important implications for the quality and safety of patient care. Patient panel size refers to the number of patients regularly under the care of a primary healthcare provider. We conducted a scoping review of the international literature on patient panel size for NPs in primary healthcare from 2000 to 2013 and updated the review in 2014.

There are several methods for determining patient panel size in team-based care. To be counted in a patient panel the patient must have seen a primary care provider (physician, NP or physician assistant) within a two year period. When determining panel size, it is important to consider patient factors, such as age, sex, socioeconomic status and morbidity, and adjust patient panel size so that patients for whom the required pattern of care is of higher intensity and complexity receive the care they need. Organizational factors that impact on the number of patients for whom primary care providers can serve include the number of examination rooms, support personnel and the presence and type of learners. Other factors that influence NP panel size include team dynamics, role clarity, types of patient visit offered (for example, house calls, group visits, street health), and legislated scope of practice.

The range in the average number of patients seen by NPs per day varies considerably within and between countries; an average of 9-15 patients per day is common. With some exceptions, most of the data that documents the panel size of NP practices in Canada reports experiences from single practice settings or uses recommendations based on experience elsewhere. Almost no practices track and adjust NP patient panel sizes systematically. Panel size projections vary widely (400 to 1100 in Canada) and may represent ideal goals or benchmarks that are not achievable for NPs in all primary healthcare settings given the dynamic contexts of patient, provider, organization and system factors that influence NP workload, productivity and efficiency.

Many Canadian jurisdictions do not use a rostering system to organize primary healthcare much less roster by provider types other than family physicians. Workload measurement is a problem as well. Some but not all NPs shadow bill within provincial medical services systems, however, such systems were designed for physician remuneration, not to determine patient panel size or to provide indicator of NP practice. As a result these shadow billing systems do not capture all of the work that NPs do.

Some important gaps in determining NP patient panel size for primary healthcare are identified in this scoping review. These gaps include the lack of validated tools to measure NP activities and workload and the lack of observational studies to determine actual rather than perceived

NP practice. A pan-Canadian initiative to develop standardized tools and benchmarks for NP panels in primary healthcare, facilitate annual reviews, and to monitor and document trends in NP practice and workload would accelerate our understanding of best practice models for determining patient panels and optimal models of primary healthcare delivery that include NP roles.

Introduction

Identification of an appropriate workload for nurse practitioners (NPs) who work in primary healthcare has important implications for the quality and safety of patient care. Analyses of health human resources productivity requires that health human resource inputs are linked to health outcomes (Evans, Schneider, & Barer, 2010). Administrators currently use metrics such as the number of physicians, number of new patients, scheduled patient visits, wait times and procedure volumes to determine adequate staffing in ambulatory care settings (Dickson, Cramer, & Peckham, 2010; Rhoads, Ferguson, & Langford, 2006). In primary healthcare, frequently used metrics of productivity and efficiency include patient panel size and number of daily patient visits.

Panel size refers to the number of patients regularly under the care of a full time equivalent (FTE) primary healthcare provider (Murray, Davies, & Bouchon, 2007). NP productivity represents the measure of the work completed during a specific period of time (Rhoads et al., 2006). Productivity depends on a variety of factors, including the intensity of work, how work is

organized, technological contributions, and involvement by other professionals (Birch et al., 2009). The determination of the appropriate NP workload or benchmarking of NP productivity must also take into account different aspects of care provided by NPs in primary healthcare (e.g., clinical care, education, disease prevention, and health promotion). Information about patient panel size and productivity can inform resource allocation and health human resource planning (Dickson et al., 2010).

The purpose of this report is to update the scoping review, *Benchmarking for Nurse Practitioner Caseload and Comparative Analysis of Nurse Practitioner Pay Scales*, conducted in 2013 for the Nursing Policy Unit of Health Canada (Martin-Misener et al., 2013). The update of this scoping review is the first study in a program of research funded by the Ontario Ministry of Health and Long-term Care that investigates the factors that influence NP activities and the implications for optimizing NP patient panel size in primary healthcare settings (Donald et al., 2014).

Research Objectives

The scoping literature review was updated to inform a structured consultation with key stakeholders in Ontario that considered the results in the Ontario context. The objectives of the original scoping review were twofold: 1) Present a summary of the findings of a scoping review regarding the workload/caseload, patient panel size and salaries for NPs in the context of primary

healthcare, community and other non-acute care settings and 2) Based on evidence and information secured through the scoping review identify the essential elements to inform future efforts to document and monitor NPs' productivity (i.e. workload, caseload, patient panels etc.) including barriers and facilitators to the measurement of NPs' productivity.

Research Questions

The following research questions were developed for the original review in consultation with decision makers at Nursing Policy Unit, Health Canada.

1. How are patient panels/caseloads for nurse practitioners in a community-based primary healthcare all-ages practice being determined in Canada and internationally?
2. What individual, organizational and systemic factors should be considered in the determination of the patient panel/caseload for nurse practitioners in a community-based primary healthcare practice all-ages practice?
3. What principles should guide the determination of the patient panel/caseload for nurse practitioners

in a community-based primary healthcare practice all-ages practice?

4. What are the recommended patient panels/caseloads in Canada and internationally?
5. What are the strengths and limitations of the approaches and metrics that are being used to determine patient panels/caseloads for nurse practitioners in a community-based primary healthcare all-ages practice in Canada and internationally?
6. What are the current pay scales of nurse practitioners in Canada, and how do the pay scales of NPs in different primary healthcare community-based practices across Canada compare?

Design and Methods

Our scoping literature review methods followed those described by Arksey and O'Malley (2005) and Valaitis et al. (2012). The search strategy involved four separate activities: 1) an electronic database search; 2) a search of Canadian and international professional and governmental websites;

3) a literature search using Google and Google Scholar and a manual search of reference lists of relevant research publications; and 4) correspondence with recognized experts and leaders of provincial and national professional associations.

Inclusion/Exclusion Criteria

To be included papers had to (a) address caseload, patient panels and or pay scales for NPs in community-based primary healthcare settings serving an all-ages population (pay scales for acute care NPs were also included for comparison purposes); (b) be published in English or French; (c) be published between January 2000 and February 2013 for the original review and updated to July 2014. We included two papers published later in 2014 because they were known to our review team and directly relevant to the study's purpose. Papers were excluded if they

(a) addressed advanced practice nursing roles or professions other than NPs in primary healthcare; (b) addressed NPs in settings other than community-based primary healthcare settings (e.g. emergency departments); (c) addressed NPs that do not serve an all-ages population (e.g. long-term care); (d) were published in a language other than English or French or; e) were published before 2000. In the context of this report, "published" includes sources available in peer reviewed journals and grey literature source.

Electronic Database Search

The search strategies were reviewed with a Faculty of Health Sciences Librarian at McMaster University. Working with Canadian Centre for Advanced Practice Nursing Research (CCAPNR) staff, the librarian developed a series of unique search strategies for the various databases.

An electronic search of CINAHL, EMBASE, Medline (which includes HealthStar, HEED, DARE, and the Cochrane Database), and the Canadian Health Research Collection was conducted. See Table 1 for the details of the search terms used. This strategy was repeated for the updated review.

Table 1. *Search Terms Used in the Four Database Searches*

Topic	Search Terms
Nurse Practitioner	Nurse practitioner, family nurse practitioner, advanced practice nurse, APN, NP
Primary care	Primary health care, primary care, outpatient care, outpatient clinic, outpatient service, ambulatory care, ambulatory care facilities, ambulatory clinic, walk-in clinic, nursing station, community health services, community health nursing, family, rural health, rural health services, rural health nursing, rural population, rural, remote
Workload	Workload, caseload, benchmark, benchmarking, diagnosis-related groups, health care manpower, health manpower, workforce planning, organization and administration, management, administration, organizational efficiency, productivity, organization and manpower, organizational decision making, decision making, organizational model, personnel management, refusal to treat, patient centred care, health transition, hand off (patient safety), continuity of patient care
Patient panel	Patient panel, patient population, roster, case-mix, patient mix
Salary	Salary, salaries, salaries and fringe benefits, fee schedules, fees and charges

Relevance Testing

Overall, 2248 references were identified through the electronic database searches in 2013 and another 442 in the 2014 update (Figure 1). These results were uploaded to a web-based reference management program (Reworks) and duplicates removed. The same strategies were used for relevance testing for the initial review and update. For the first level of review, four researchers working in teams of two, reviewed the title and abstract of each reference and a decision was made to

include or exclude the citation. Articles were excluded if both reviewers were in agreement. Two researchers reviewed the full text of remaining articles to determine if the article should be included or excluded. During this stage, language duplicates (i.e., English or French versions of the same document) were deleted. When agreement could not be reached between two researchers during any stage of the review, a third researcher was consulted.

Professional and Governmental Websites

A list of 107 relevant English and French websites was identified by the CCAPNR research group. Websites of provincial, national and international nursing associations, provincial and national and international medical, research, and government organizations were included (See Appendix A). On each website, the content was searched using the search terms used for the published literature. If there was not an inherent search function on the website, a search was conducted of

all webpages and their weblinks. Seventy-seven English language and 60 French language reports and documents were identified. Duplicate documents were removed. A full text review yielded 19 relevant documents including two peer-reviewed journal articles and 17 unpublished documents that had not been previously identified. For the update in 2014, we searched those websites that yielded articles in 2013; however, no new articles were identified.

Google and Google Scholar

A search of Google and Google Scholar was undertaken using the search terms “nurse practitioner”, “patient panel”, “caseload”, “workload”, “salary”, “pay scale” and “list

size.” Three peer-reviewed published articles and one unpublished document were obtained that had not been previously identified.

Personal Contacts

In April 2013, 40 emails were sent to researchers conducting research relevant to this project as well as professional associations and organizations (Appendix B). We contacted Marie-Dominique Beaulieu, Isabelle Brault, Damien Contandriopoulos, Simone Dahrouge, Danielle D’Amour, Carl-Ardy Dubois, Rick Glazier, William Hogg, Emmanuelle Jean, Irene Koren, Julie Lajeunesse, Jean-Frédéric Lévesque, Laura Muldoon, Ivy Bourgeault, Mary van Soeren, Raynald Pineault, Lusine Poghosyan, and Arthur Sweetman.

Our email correspondence provided a brief summary of the project and requested their assistance with identifying relevant documents. There were 22 responses and five additional individuals/organizations were identified through snowball sampling. Thirty-eight peer-reviewed articles and unpublished documents were received. Twenty-one of these were included in our report. Eleven additional articles were identified by members of the research team in 2013 and an additional six in 2014. Table 2 summarizes the 2013 and 2014 search and relevance testing results.

Figure 1. Scoping Literature Review Methods and Results

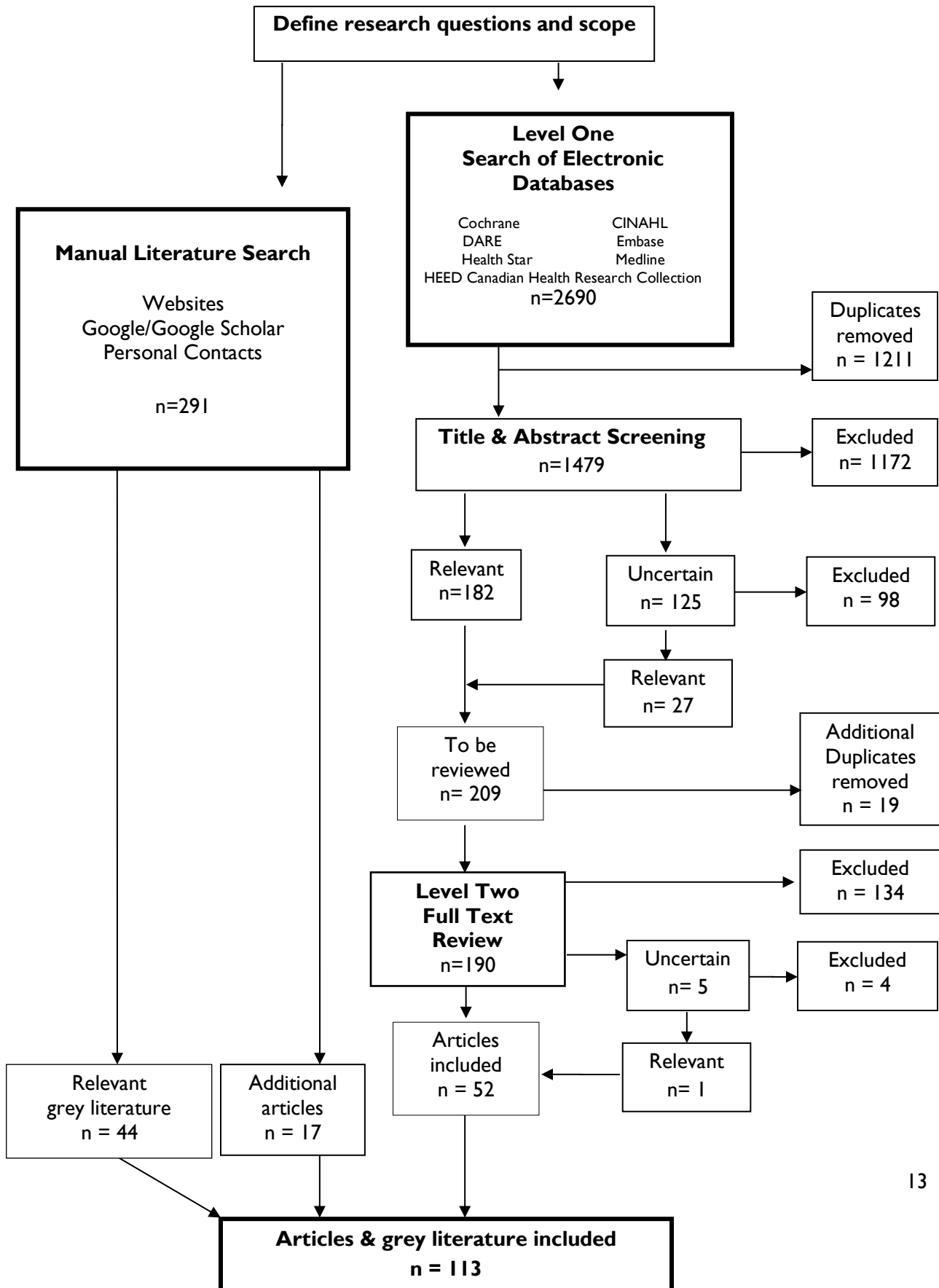


Table 2. Search and Relevance Results 2013 and 2014

	2013 Scoping Review	2014 Scoping Review	Total
Level 1	2248	442	2690
Search of Electronic Databases	Duplicates Removed: 1127	Duplicates Removed:84	Duplicates Removed: 1211
Title and Abstract Screening	1121 Excluded: 990 Included: 131	358 Excluded: 299 Included: 59	1479 Excluded: 1289 Included: 190
Level 2	131	59	190
Full Text Review	Excluded: 90 Included: 41	Excluded: 48 Included: 11	Excluded: 138 Included: 52
Manual Literature Search*	285 Excluded: 229 Included: 56	6 Excluded: 1 Included: 5	291 Excluded: 230 Included: 61
Total Papers (Published and Grey Literature)	97	16	113

*Includes personal contacts

Data Extraction and Analysis

Data extracted from each relevant article (n=113) included the year of publication, country of origin, focus of the paper (e.g., workload, caseload, salary, etc.), type of study, specific details regarding the practice (e.g., type of community-based practice, patient panel size, patient population), specific information about the NPs' work (e.g., patients seen per day, time spent in various role dimensions), facilitators and barriers to workload determination, salary information, and other relevant information. French articles and reports

were translated to English by a member of our team (KK). See Appendix C for the data extraction form. The extracted data were uploaded into NVivo 10. The coding scheme was developed by the researchers. Content analysis was utilized to identify preliminary themes (Hsieh & Shannon, 2005). The preliminary findings of the original and updated review were reviewed and discussed through web conferences and email communication with the research team.

Results

One hundred and thirteen peer-reviewed articles and grey literature documents were identified through this scoping review. The list of included articles can be found in the bibliography in Appendix D. As Figure 2 shows, the number of publications addressing NP workload, patient panel and productivity matters has remained high for the past five years. Most of the publication activity has occurred in North America with similar numbers of publications in the United States (US) and Canada (Figure 3). Over a third of the papers focused on NP

patient panels and or caseload (Figure 4) and unpublished reports were the most common type of paper (Figure 5). Published papers using quantitative methods other than randomized controlled trials were next common followed by descriptive studies. The majority of papers discussed NP roles in primary healthcare settings that were team-based; however, few described the type of services the NP was providing.

Figure 2. *Number of Publications by Year*

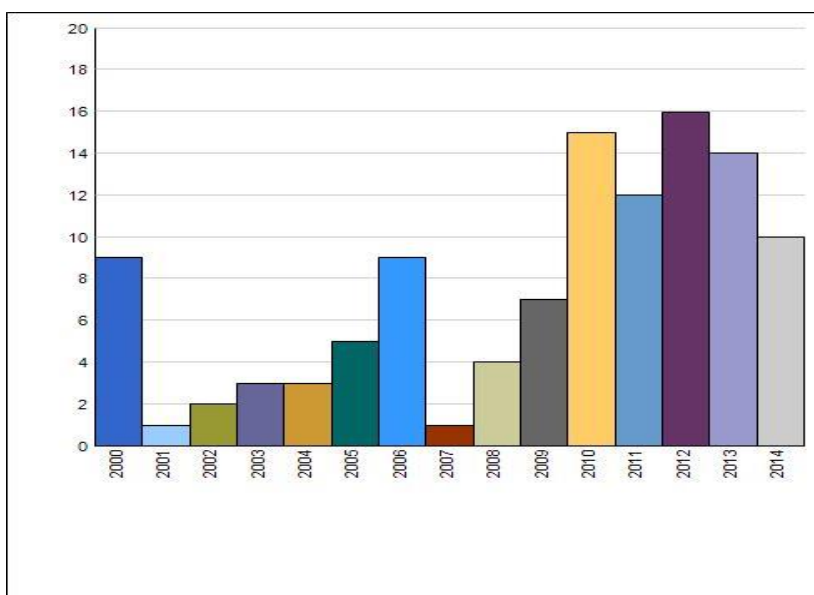


Figure 3. *Country of Publication*

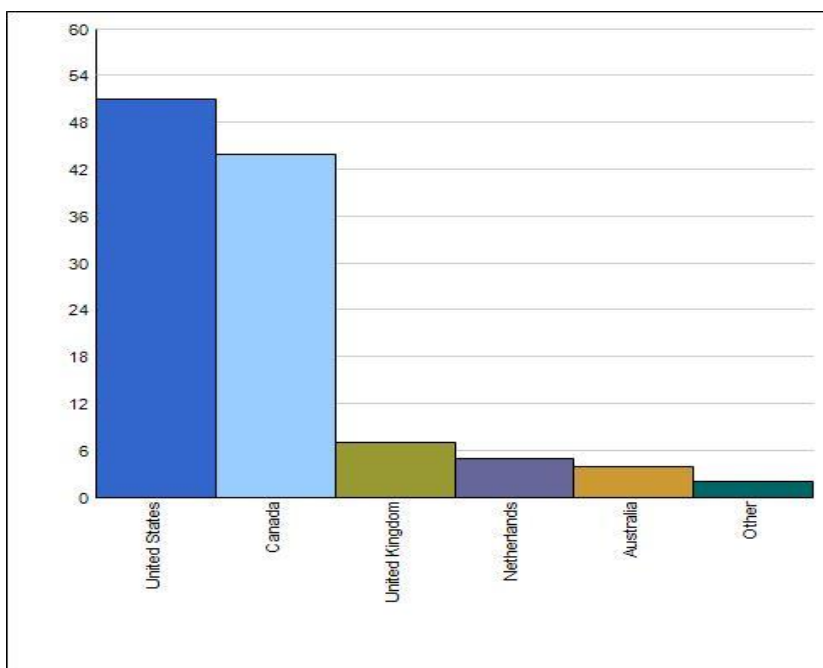


Figure 4. Focus of Paper

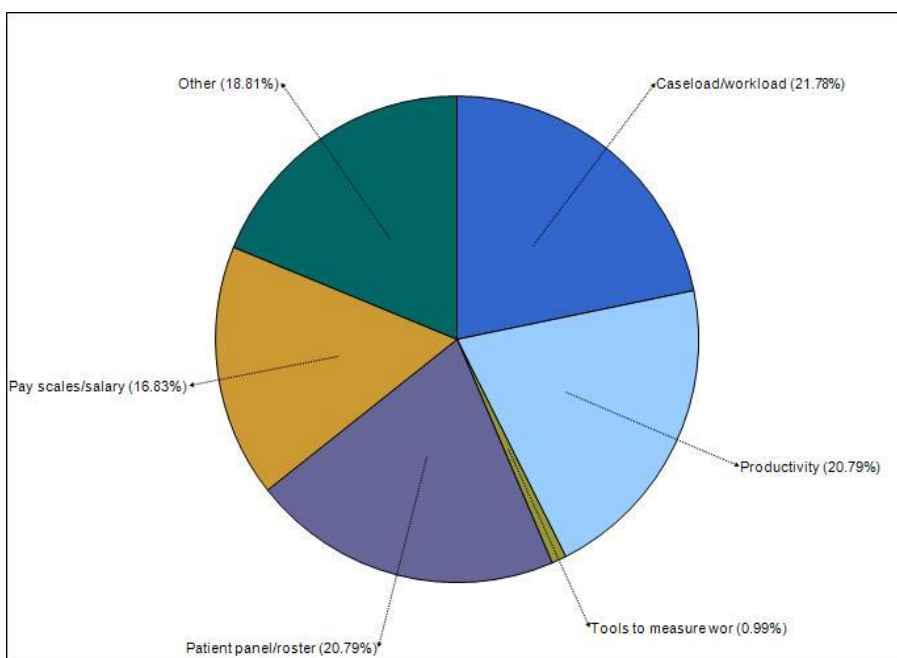
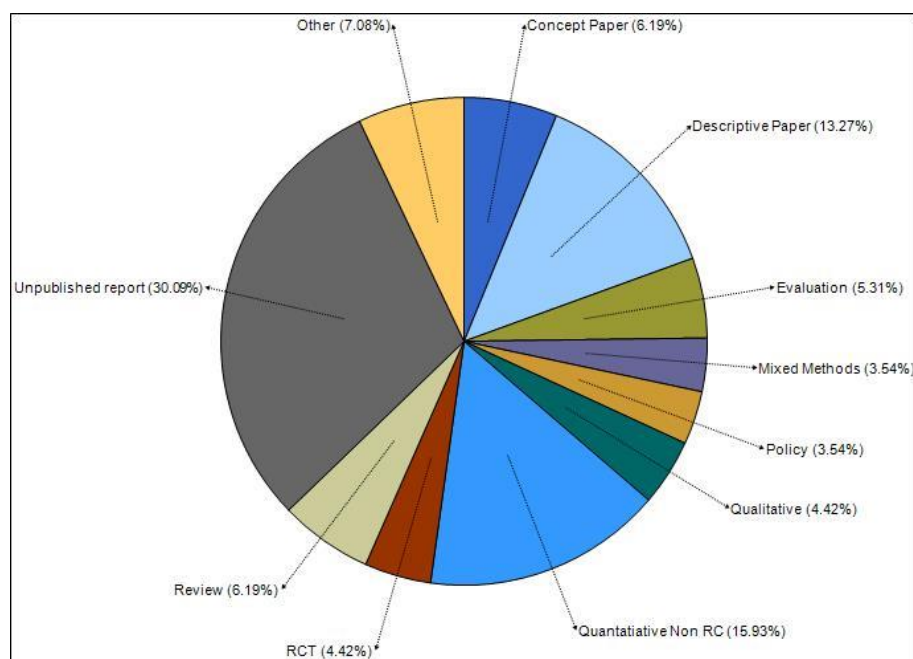


Figure 5. Type of Paper



Methods of Determining NPs' Patient Panel Size

Determining panel size is anything but simple, and productivity, quality, and outcomes ought to be considered concurrently (Muldoon, Dahrouge, Russell, Hogg, & Ward, 2012). Panel size determination is a longstanding subject of interest for family physicians in fee-for-service practices who must also consider the financial consequences associated with a particular patient panel (College of Family Physicians of Canada, 2012). It is also of interest to organizations, responsible for managing primary healthcare services for large populations of patients. In the US the Department of Veterans Affairs has guidelines to determine and adjust the panel size for primary care providers depending on patient and organizational characteristics (Department of Veterans Affairs, Veteran Health Administration, 2009; 2014). Similarly, in Canada, the Association of Ontario Health Centres has guidelines for this purpose (Rayner, 2013; 2014a; 2014b). Both organizations include NPs in their guidelines.

The expansion in inter-professional team approaches in primary healthcare presents new challenges and opportunities for panel size determination. Several authors caution that there is insufficient evidence to establish benchmarks or recommendations for the number of patients a physician or inter-professional team should be responsible (College of Family Physicians of Canada, 2012; Muldoon et al., 2012). That

caveat notwithstanding, methods for calculating panel size exist along with recommendations for adjusting panel size for specific patient and organizational factors (College of Family Physicians of Canada, 2012; Muldoon et al., 2012; Department of Veterans Affairs, Veteran Health Administration, 2009; 2014; Rayner, 2013; 2014a; 2014b).

Muldoon et al. (2012) describe the following three methods of determining panel size for family physicians in team-based care:

- Attributing all patients to family physicians; the number of patients associated with the practice is divided by the number of family physician FTEs in the practice;
- Attributing patients equally to all primary care provider types; the number of patients associated with the practice is divided by the number of primary care provider FTEs in the practice; and
- Attributing patients to the provider type principally responsible for their care; the number of patients seen by family physicians and NPs divided by the number of family physician and NP FTEs in the practice.

The College of Family Physicians of Canada (2012) identifies three methods to calculate panel size in multi-disciplinary practices, the last being their preferred method:

- Using a number of patients per 1 family physician FTE and 1 NP FTE; the example they provide is 1200 patients per family physician FTE but 1800 patients per family physician FTE and nurse practitioner FTE;
- Assigning the number of patients to FTE physician and including the number of patients per other healthcare provider; and
- Calculating the provider visits per day multiplied by the number of days worked per year and divided by the visits per patient per year.

Rayner (2014b) identifies that panel size in team-based primary healthcare can be determined by:

- Adding the number of patients receiving care from a family physician in a practice and the number of patients receiving care from an NP in the same practice; or
- Dividing the total number of patients by the number of primary care providers in a practice.

To be counted in a patient panel the patient must have seen a primary care provider (physician, NP or physician assistant) within a two year period.

An Ontario-based study designed to describe the roles and models of practice of NPs and family physicians in community health centres used the pattern of patient visits to assign patients to one of three groups based on patients' percentage of

encounters with each provider (Dahrouge et al. (2014). Patients with more than 70% of documented visits with an NP were assigned to the NP group, effectively the NPs' panel, and similarly, those patients with more than 70% of their visits with a family physician were assigned to the physicians' panel. Those whose visits were not with either provider for more than 70% were identified as being in a shared care group. Although the purpose of the study was not to define patient panels for NPs or family physicians, the method of attribution used is novel.

The Department of Veterans Affairs in the US has a well-defined approach to defining primary care provider patient panel size (Department of Veterans Affairs, 2009; 2014) and has been using NPs in their practice settings for decades (Huang et al., 2004). The Department calculates a Primary Care Intensity Score to assist in deciding on patient panel size for a primary care provider. Other considerations include the availability of support staff and examination rooms. For the most part, expected patient panels for primary care providers are in the range of 1000 to 1400 and NPs are expected to carry 75% of the panel size of a physician but with the same ratios of support staff and examination rooms (Department of Veterans Affairs, 2009; 2014). Norms for an undifferentiated clinic with a usual patient population for every 1.0 FTE provider are 2.17 support staff and 3.0 clinic rooms. Depending on the patient population these ratios could increase.

Altschuler et al. (2012) estimated panel sizes by developing models using data from studies done to estimate the time needed to meet the preventive, chronic and acute care needs of a hypothetical panel of 2500 patients. They combined the estimated amount of task delegation to NPs or other non-physician providers. A non-delegated model with one physician could service a panel of 983 patients. In the model with the most delegation, which included 77% of preventive care, 47% of chronic care and no acute care delegation, the estimated patient panel size was 1947, an increase of 964 patients.

Potts, Adams, and Spadin (2011) describe a model used to calculate the number of NPs needed to meet the needs of a patient population and reduce the large unmanageable panel size of physicians in Ohio Permanente Medical. Prior to implementing the NP roles, the following steps were taken to calculate how many NPs were needed to adjust physician panel size.

- A score was developed for the disease burden of the 6 most common chronic diseases seen in primary healthcare;
- Using this score, a “disease score factor” was calculated;
- This factor was applied to the projected member visits (annual projection based on patient age, sex, and historical average visit rate) to calculate the adjusted member visit projection;

- The adjusted projection was compared to the estimated physician visit capacity;
- If the adjusted projection exceeded the visit capacity, an NP equivalent was calculated.

Other methods to estimate panel size include using an expert panel (Wand, White, & Patching, 2008) and queuing theory (Liu & D’Aunno, 2012), an advanced mathematical modeling technique that can be used to estimate waiting times in a system. Administrative data from the US States and modeling were used in Nova Scotia to estimate the panel size of a primary healthcare team consisting of a family physician, NP and family practice nurse (Social Sector Metrics Inc. and Health Intelligence Inc., 2011; 2012). The authors’ estimated panel size for this grouping is 2100-2300 patients and for the NP it is 800 patients.

In the US, new models of care are being implemented to address the expected demand from previously uninsured patients. One study described a model that involved NPs as leaders of inter-professional teams in primary care (Klein, 2010). The composition and caseload of these teams varies with the condition and acuity of patients. For patients with one or more physical disabilities, the NP-led team composition includes a physician, physical therapist and social worker and the NP is expected to provide care for 40 patients. For the frail elderly patients, the NP-led

team includes a physician, social worker and personal care attendant and the expected ratio is 1:45. For Medicaid-eligible patients with complex chronic illness(es) and behavioral health or substance abuse issues, the NP-led team includes a

physician, social worker and community health worker and the expected NP to patient ratio is 1:90. These ratios seem to have been developed through experimentation.

Adjusting Patient Panel Size

When determining panel size, it is important to consider the age and sex of the patients. There are a number of different formulas can be applied to calculate panel size (Altschuler, Margolius, Bodenheimer, & Grumbach, 2012; College of Family Physicians of Canada, 2012; Muldoon et al., 2012). Panel size is adjusted for the disease severity of a population and this is measured in a number of ways. The Department of Veterans Affairs (2009; 2014) uses a Primary Care Intensity Score that takes into account age, sex, priority group, insurance status and Diagnostic Cost Groups. Panel sizes are adjusted up or down based on the number of clinic rooms and support staff (includes registered nurses, licensed practical nurses, pharmacists, medical assistants, health technicians and health clerks) based on defined adjustment parameters. Panel sizes are adjusted down if they are dominated by patient

populations for whom the pattern of care required is of higher intensity and complexity, for example, people who are homeless. Other groups with higher care needs include women, older adults, spinal cord injured and HIV-affected. The patient panels of newly-hired primary care providers who are building a new patient panel or who are taking over an existing patient panel are adjusted for defined time periods ranging from nine to 15 months.

The Association of Ontario Health Centres uses the Standardized Adjusted Clinical Group Morbidity Index (SAMI) (Rayner 2013; 2014a; 2014b). Developed by the Manitoba Centre for Health Policy and Evaluation, the SAMI has been adapted for use in Ontario and is used as a predictor of primary healthcare utilization. The index is standardized at 1 with scores lower than 1 indicating less patient complexity and higher than 1 indicating more complexity.

Patient Panel Size in Canada

There is some data that documents the panel size of NP practices in several Canadian jurisdictions (Table 3). Most of the data are the reported experiences from a single practice setting or recommended panel sizes based on experience elsewhere. There is limited information about the factors affecting the panels identified in these papers such as the case-mix of age, gender, complexity and morbidity. Most articles do not describe how the panel size was calculated or describe the population served or context of care. These and other factors related to the NPs (e.g., experience) may account for the variability in panel size seen across the country.

The articles about the panel size determination for Ontario's Community

Health Centers are an exception (Rayner, 2013; 2014a; 2014b). The target patient panel for primary care providers in Ontario's Family Health Teams is 1300 patients assuming a 40 hour work week. This is prorated to 1137.5 for Community Health Centers' primary care providers (physicians, NPs and physician assistants) who work a 35 hour work week. This baseline number divided by the SAMI (explained above) is the targeted adjusted patient panel size (Rayner, 2013; 2014a; 2014b). Panel sizes are also calculated using data from the Community Health Centres' data warehouse Business Intelligence and Reporting Tools (BIRT).

Table 3. *Patient Panel Size of NPs in Primary Healthcare in Canadian Provinces*

Province	Panel Number	Reference
British Columbia	Increased access for new patients & retention of existing patients resulting in increased total patient capacity for the practice of 400 - 800 patients per clinic	Roots (2013)
	The mean number of patients rostered to full-time NPs was 334 patients	Sangster-Gormley et al. (2012)
	Combined physician and NP in one BC practice have 1,800 patients. NP increased physician's panel by about 600 patients and is the most responsible provider for over 400 patients	DiCenso et al. (2010)
Saskatchewan	NP in Spiritwood saw a caseload of 1,000 patients in a year	Prince Albert Parkland Regional Health (2008)

Ontario	Medical homes typically have panels of 800 patients per NP	Phillips et al. (2014)
	Each FTE NP in Ontario's Community Health Centre is expected to carry a patient panel of 1137.5. This number assumes a fully staffed team with 3 examination rooms/provider and is adjusted based on the patient population's calculated morbidity index (SAMI). Average patient panel size is 789 patients.	Rayner (2013; 2014a; 2014b)
	An NP in Ontario has built a caseload of over 400 patients	Nurse Practitioner Association of Ontario (2012b)
	Each FTE NP in an NP-led clinic is expected to roster 800 patients	DiCenso et al. (2010); Rosser et al. (2010); Thibeault (2011)
	Recommended number of enrolled individuals per provider (NP or family physician) in a practice setting: Urban 1,874; Rural 1,331; Remote 1, 178	Health Services Restructuring Committee (1999)
Quebec	500-1000 patients	Charland (2013)
New Brunswick	FTE NPs have a panel of a minimum of 800 patients depending on practice setting and their experience	Horizon Health Network (2012)
Nova Scotia	Based on experience in the U.K., U.S. Veterans Administration, a study in Ontario, and analysis in Nova Scotia suggest an NP functioning to full scope of practice can add 626 patients in a practice with a family physician	Social Sector Metrics Inc. et al. (2011)

Workload and Productivity

Workload and productivity are terms that are closely related but distinct from panel size. Workload refers to the amount of time that it takes to do activities and productivity to how often the activities occur (Muldoon et al., 2012).

A systematic review in the United Kingdom (UK) found that NP appointment time for routine visits including return visit time was 16 minutes (Hollinghurst, Horrocks, Anderson, & Salisbury, 2006). In randomised controlled trials in the UK and Netherlands, time for an initial appointment for a patient with a common complaint was an average of 12 minutes (Venning, Durie, Roland, Roberts, & Leese, 2000; Kinnarsley et al., 2000; Dierick-van Daele et al., 2010; Wijers et al., 2012). A survey of UK NPs found length of appointments varied according to setting but typically was 15 to 20 minutes depending on whether it was an initial appointment or not (Royal College of Nursing (UK), 2006).

Surveys of NPs in the US indicate that NPs see an average of 2 to 4 patients per hour (Johnson, 2005) or 3 to 4 patients per hour (American Association of Nurse Practitioners, 2013). In managed care settings some sources report that NPs are expected to have 10 to 15 minute appointment times for episodic care (Johnson, 2005), while others indicate the allotted time is 15 to 30 minutes for episodic or complex care and 30 to 45

minutes for well-person care (Hayes, 2007). Appointment times are reported to be challenging to sustain. The Department of Veterans Affairs (2009, 2014) identifies that primary care providers (NPs and physicians) vary in their appointment times with some preferring 15-20 minutes and others 30 minutes. They stress that the aim for providers is to manage their patient panel not the number of visits.

In Canada, NP average appointment times are 30 to 60 minutes in Quebec, depending on the experience of the NP and whether it is an initial visit or not (Chapados, 2013), an average of 30 minutes (range 10 minutes to 2 hours) in Ontario (Mian, Lacarte, & Koren, 2012) and 20 to 30 minutes in British Columbia (Roots, 2013). In one setting in New Brunswick, the expectation is that routine appointments should be planned not to exceed 20 minutes (Horizon Health Network, 2012).

By analyzing administrative data a recently conducted study of salaried NPs and salaried family physicians in Ontario community health centre's determined that the average appointment length (calculated from the weighted average of the booking interval for and proportion of four different types of appointments) was 34 minutes (range 22 to 45 minutes) (Dahrouge et al., 2014). For family physicians, the average appointment length was 28 minutes (range 22 to 38 minutes). Compared to family

physicians the patient panels of NPs in this study had larger proportions of women, were younger and were more socially complex. Nurse practitioners provided more off-site and walk-in care than family physicians but both provider groups spent similar amounts of time in direct care and administrative work.

As Table 4 shows, a number of sources reported the average number of patients NPs see per day in the UK, US and Canada. The average number of patients seen by NPs per day varies within and between countries but overall 9-15 patients per day is common. The average across Canadian provinces was fairly consistent at 12 to 15 patients per day.

Factors reported to impact the daily patient volume were NPs' experience (Charland, 2013; Horizon Health Network, 2012; Department of Veterans Affairs, 2009; 2014), rural location and type of practice setting (Martin, 2000). Many papers did not describe patient characteristics known to lengthen appointment times such as age, gender and health condition. In addition to reporting face-to-face appointments, two sources reported the NPs' number of telephone calls with patients (Koren et al., 2010; Mian & Koren, 2011).

A number of papers described approaches to measuring productivity (Chumbler, Geller, & Weier, 2000; Duck, DeLia, & Cantor, 2001; Hooker, 2006; Liu et al., 2011; Larson, Palazzo, Berkowitz, Pirani, & Hart, 2003). While a detailed discussion of productivity is beyond the scope of this report, we include the following measures of NP productivity suggested by Rhoads et al. (2006, p. 37) because of their specificity to NP practice:

- 1) Patient visits – are they consistent or have they decreased? Are patients returning because treatment didn't work?
- 2) New patients – are you getting new patients into your practice?
- 3) Total MD referrals – is this percentage consistent or is the number of MD referrals rising?
- 4) Diagnoses – numbers rising?
- 5) Average visits per diagnoses – how many visits does it take to make a diagnosis?
- 6) Percentage of cancellations – how many cancellations per week? Are the numbers increasing?
- 7) Cancellations or no-show numbers – are the numbers increasing each month?
- 8) Reasons for no-shows?
- 9) Average wait time per patient?

Table 4: Average Number of Daily NP Patient Appointments in Primary Healthcare

Country	Patient Appointments	Reference
UK/ Netherlands	Daily number of patients seen in 4 different practices: 20; 15-20; 4-10; 20-37	Offredy & Townsend (2000)
	12.75/day	Wijers et al. (2012)
US	64/wk; 8.5/day	Donelan (2013)
	15/day	Brown et al. (2009)
	45.24/week; 9/day	Chumbler et al. (2000)
	50.79 (45.65) for urban versus 62.14 (56.09) for rural, $F = 11.910$, $p = .001$ 10/day for urban, 12/day for rural	Martin (2000)
	2647 visits per NP per year seen on average 51/week, 10/day	Hing et al. (2011)
	17.23/ day	Holcomb (2000)
	15 to 40/day with the mean being 22	Johnson (2005)
	14-28/day	AANP (2011)
	64/week; 12.5/day	Donelan (2013)
	15/day	Brown et al. (2009)
Canada		
BC	14 patients in 8-hour work day	Sangster-Gormley et al. (2012)
ON	13 (range 2–30) in-person appointments & 5 (range 1–35) phone consultations. NPs in physicians' offices had more appointments than NPs in community health centers (14 vs. 11; $p = 0.00$).	Koren et al. (2010)
	14/day	Donald et al. (2010); van Soeren et al. (2009)
	14/day; Range 1 to 60. The 25% who saw the least number of clients saw 10 or less on a typical day, and the 25% who saw the most saw about 18 or more clients per day	Sloan et al. (2006)
	12 in-person appointments/day (range 3 to 50). On average, 3 issues addressed/in-person appointment (range 1 to 8 issues)	Mian et al. (2012)
	15 face-to-face appointments and 4 telephone consultations daily	Mian & Koren (2011)
	13 patients per day; range is 0 to 30	Ontario MOHLTC (2005)
QC	9 per 8 hour shift after the NP has 6 months of experience	Charland (2013)
	12 – 15/ day	Chapados (2013)
NB	15 to 18 patients/ 7.5 hours depending on factors e.g. practice setting & NP experience. Benchmark expected in 18- 24 months	Horizon Health Network (2012)
NS	Average of 14 patients/8-hour day	Martin-Misener et al. (2010)

Factors to Consider When Determining NPs' Patient Panel in Primary Healthcare

Several individual (patient and provider), organizational and systemic factors appear to affect the patient panel size of NPs. Tables 5, 6 and 7 outline key characteristics and how they are perceived to affect panel size. Many articles identified the importance of taking into account patient characteristics when considering NP patient panel size; overall the evidence for these patient factors is strong (Table 5).

Having NPs practice to their full scope of practice is essential to optimize the potential of inter-professional primary healthcare teams to be realized (Social Sector Metrics Inc. et al., 2012). Factors such as the non-clinical components (e.g., consultation, community development, education) of the NP role are important to consider because they affect the quality of the care provided to patients, families and communities (Dierick-van Daele et al., 2011). These activities may reduce NPs' patient panel size in the short term but patients may be better equipped to manage their health condition and subsequently require fewer healthcare services (Waszynski, Murakami, & Lewis, 2000). In turn, this could potentially allow for an increase in NPs' panel size.

Key patient and system outcomes identified in the scoping review include perceived and actual improvement in access to care

(Donelan, DesRoches, Dittus, & Buerhaus, 2013; Gambino, Planavsky, & Gaudette, 2009; Liu, Ozen, & Balasubramanian, 2013; Martin-Misener et al., 2010; Potts et al., 2011; Prince Albert Parkland Regional Health Authority, 2008; Roots, 2013; Sangster-Gormley et al., 2012), decreased wait time (Donelan et al., 2013; Parker, Forrest, Desborough, McRae, & Boyland, 2011; Potts et al., 2011; Roots, 2013), patient satisfaction with care (DiCenso et al., 2010; Dierick-van Daele et al., 2010; Gambino et al., 2009; Haber et al., 2009; Reay, Patterson, Halma, & Steed, 2006; Venning et al., 2000; Waszynski et al., 2000; Wijers et al., 2012), chronic disease management (Barkauskas, Pohl, Benkert, & Wells, 2009; Gambino et al., 2009; Muldoon et al., 2012; Wong, Stewart, & Gillis, 2000) and fewer hospital visits (DiCenso et al., 2010; Glazier et al., 2012; Miller, Zantop, Hammer, Faust, & Grumbach, 2004; Reay et al., 2006).

Few provider outcomes were assessed in relation to patient panel size. One study found improved retention rates of clinicians (Potts et al., 2011) and three studies assessed provider perceptions of processes in the healthcare team that improved collaboration and communication among team members when an NP was a member of the team (Haber et al., 2009; Martin-Misener et al., 2010; Roots, 2013).

Access to data that identify NP activities, workload and the number of patients remains a challenge (Dierick-van Daele et al., 2010; Glazier et al., 2012; Muldoon et

al., 2012; Poghosyan, Lucero, Rauch, & Berkowitz, 2012; Pohl, Tanner, Barkauskas, Gans, Nagelkerk, & Fiandt, 2010).

Table 5. *Patient and Provider Characteristics Affecting Determination of NP Panel Size in Primary Healthcare*

Characteristic		Key Finding	Effect on panel size	Source
Patient	Age	Increased workload with increasing age of patients	↓	Department of Veterans Affairs (2009; 2014); Dierick-van Daele et al. (2010); Koren et al. (2010); Rayner (2014a; 2014b); Roots (2013)
	Gender	Higher proportion of female patients	↓	Dahrouge & Hogg (2013); Department of Veterans Affairs (2009; 2014); Dierick-van Daele et al. (2010); Hing et al. (2011); Koren et al. (2010); Ortiz et al. (2010); Rayner (2014a; 2014b); Sloan et al. (2006)
	Socio-economic status	Lower socio-economic status decreases health status and increases patients' social concerns and need for more visits and coordination of care	↓	Dahrouge & Hogg (2013); Dahrouge et al. (2014); Donald et al. (2010); Department of Veterans Affairs (2009; 2014); Duck et al. (2001); Glazier et al. (2012); Koren et al. (2010); Muldoon et al. (2012); Oritz et al. (2010); Poghosyan et al. (2012); Rayner (2014a; 2014b)
	Health status	Chronic conditions (e.g., hypertension, diabetes, renal disease, congestive heart failure, mental health and addictions), and co-morbidities require more visits and care coordination	↓	Dahrouge et al. (2014); Department of Veterans Affairs (2009; 2014); Glazier et al. (2012); Koren et al. (2010); Muldoon et al. (2012); Potts et al. (2011); Rayner (2014a; 2014b); Sangster-Gormley et al. (2012); Way et al. (2001)

Provider	Experience	Year of experience as an NP and/or in the current position	↑	Department of Veterans Affairs (2009; 2014); Dierick-van Daele et al. (2009); Dierick-van Daele et al. (2011); Johnson (2005)
	Employment status	Full-time employment	↑	Donelan (2013); Ortiz et al. (2010)
	Role clarity-physician colleague		↑	Donald et al. (2010); Health Services Restructuring Committee (1999); Koren et al. (2010); Martin-Misener et al. (2010); Miller et al. (2004); Sloan et al. (2006); van Soeren et al. (2009); Waszynski et al. (2000); Way et al. (2001)

Table 6. *Organizational Characteristics Affecting Determination of NP Panel Size in Primary Healthcare*

Characteristic	Key Finding	Reported Effect on Panel Size	Source
Multi-disciplinary team	Teams increase patient panel size	↑	Chumbler et al. (2000); Department of Veterans Affairs (2009, 2014); Duck et al. (2001); Health Services Restructuring Committee (1999); Muldoon et al. (2013); Poghosyan et al. (2012); Rayner, (2014a; 2014b); Roots (2013); Sangster-Gormley et al. (2012)
	Work as a team, equal role status Supervision and or consultation requires time and could impact the capacity of the team to increase panel size	↑	Altschuler et al. (2012); Dierick-van Daele et al. (2011); Duck et al. (2001); Hay Group (2011); Koren et al. (2010); Liu & D'Aunno (2012); Miller et al. (2004); Muldoon et al. (2012); Ontario MOHLTC (2005)
	No difference after addition of social worker	-	Muldoon et al. (2013)
	Continuity of care may decrease as patient panel sizes increase	-	Phillips et al. (2014)
Time NP spends in role components	Direct care Chronic disease management	↑	Dahrouge & Hogg (2013); Deshefy-Longhi et al. (2008); Dierick-van Daele et al. (2011); Holcomb (2000); Humbert et al. (2007); Koren et al. (2010);

		Martin-Misener et al. (2010); Mian et al. (2012); Mian & Koren (2011); Ontario MOHLTC (2005); Roots (2013); Sloan et al. (2006); van Soeren et al. (2009); Venning et al. (2000)
Innovative types of visits, e.g., group visits, tele-health; email	↑	Guey-Chi Chen et al. (2014); Yoshida et al. (2014)
Administration, consultation, community development, illness prevention, home visits, on-call, research, teaching, walk in	↓	Chapados (2013); Chumbler et al. (2000); Dahrouge & Hogg (2013); Deshefy-Longhi et al. (2008); Dierick-van Daele et al. (2011); Haber et al. (2009); Hing et al. (2011); Holcomb (2000); Humbert et al. (2007); Koren et al. (2010); Martin-Misener et al. (2010); Mian et al. (2012); Ontario MOHLTC (2005); Reay et al. (2006); Sangster-Gormley et al. (2012); Sloan et al. (2006); Venning et al. (2000)
In Family Health Teams in Ontario, NPs spend more time in direct care	↑	Koren et al. (2010)
In Ontario Community Health Centres, NPs provide more off-site visits and walk-in services compared with physicians. No difference in their time spent on direct care and administrative responsibilities	↓	Dahrouge et al. (2014)
Insufficient time to determine non-medical needs of patients	↓	Muldoon et al. (2013)
In NP-led organizations, NPs spent twice as much time in administrative activities and work in multiple sites	↓	Koren et al. (2010); Thibeault (2011)
Teaching students and other learners requires additional clinic rooms	↓↑	Department of Veterans Affairs (2009; 2014)
In substitution role when NPs spend most of their time in direct care they can replace 70 to 80% of MD activities	↑	Dierick-van Daele et al. (2011); Liu & D'Aunno (2012)
In complementary role, NP time spent less on substitutive activities; these activities may decrease patient panel size but be important to improve	↓	Dierick-van Daele et al. (2009); Dierick-van Daele et al. (2011); Liu & D'Aunno (2012)

	quality of care		
Level of NP Autonomy	Sharing decisions Provider capacity pooling	↑	Abood (2005); Chumbler et al. (2000); Duck et al. (2001); Hay Group (2011); Johnson (2005); Koren et al. (2010); Liu et al. (2013); Ontario MOHLTC (2005); Poghosyan et al. (2013); Roots (2013); Tomblin Murphy (2004b); van Soeren et al. (2009); Vonderheid et al. (2009); Waszynski et al. (2000); Way et al. (2001); Guey-Chi Chen et al. (2014)
	NP has own patient panel/caseload	↑	Abood (2005); Chumbler et al. (2000); Department of Veterans Affairs (2009; 2014); Rayner (2014a; 2014b)
Practice Location	NPs in rural locations work longer hours and see more patients	↑	Koren et al. (2010); Martin (2000)
	Urban locations have more NPs	↑	Huang et al. (2004)
	Work in multiple locations	↓	Koren et al. (2010)
Practice Type and Size	NPs in Family Health Teams see more patients on average than NPs in Community Health Centres (14 vs 11 patients)	↑	Ontario MOHLTC (2005); Ortiz et al. (2010)
	Larger practices	↑	Dierick-van Daele et al. (2011); Ortiz et al. (2010)
Exam Rooms	Increased number of examination rooms per provider increases patient panel size	↑	Dahrouge et al. (2014); Department of Veterans Affairs (2009; 2014); DiCenso et al. (2010); Duck et al. (2001); Hayes (2007); Liu et al. (2012); Muldoon et al. (2012); Rayner (2014a; 2014b); Sloan et al. (2006)
Personnel/ Staff Support	Adequate nursing & reception and administrative supports increase patient panel size	↑	Dahrouge et al. (2014); Department of Veterans Affairs (2009; 2014); DiCenso et al. (2010); Duck et al. (2001); Hayes (2007); Liu et al. (2012); Muldoon et al. (2012); Rayner (2014a; 2014b); Sloan et al. (2006)

Table 7. *System Level Factors Affecting Determination of NP Panel Size in Primary Healthcare*

System	Characteristic	Key Finding	Effect on panel size	Source
Legislation and regulation	Scope of practice	NPs with limited prescribing privileges spent an average of 1.33 minutes per patient to get prescriptions signed	↓	Clendon (2003); Dahrouge & Hogg (2013); Dierick-van Daele et al. (2009); Donald et al. (2010); Humbert et al. (2007); Koren et al. (2010); Liu & D'Aunno (2012); Liu et al. (2013); Mian & Koren (2011); Muldoon et al. (2012); Parker et al. (2011); Poghosyan et al. (2012); Social Sector Metrics Inc. et al., (2012); van Soeren et al. (2009); Venning et al. (2000); Wijers et al. (2012)
		List of medications that NPs can prescribe rapidly outdates Restrictions on NPs' ability to prescribe/order the full range of medications and diagnostic tests required by their patients increases time needed for NPs to obtain physicians' signature	↓	
	Funding	Non-reimbursement of collaborative practice, complex or unclear billing for activities, NP salary below \$50,000	↓	DiCenso et al. (2010); Donald et al. (2010); Johnson (2005); Vonderheid et al. (2009)

Strengths and Limitations of Approaches and Metrics

Specific patient characteristics (e.g., age, gender) and health and social conditions (e.g., multiple chronic conditions, poverty) affect workload and patient panel size. Very few studies have used validated tools to accurately classify patient acuity levels or disease burden scores (Glazier et al., 2012; Muldoon et al., 2013; Potts et al., 2011). Current methods to assess panel size have used large databases, provider work hours, and average number of patient visits based on past utilization of healthcare resources rather than actual healthcare needs (Muldoon et al., 2012). These methods may

not capture relevant NP activities, caseload, case-mix and outcomes of care. Only one European study was identified that used observations and a stopwatch to measure the activities of a novice NP (Dierick-van Daele et al., 2010). Similar methods could be used to measure NP activities in different practices and jurisdictions in Canada. In addition, very few studies have examined provider outcomes and little is known about the effects of larger or smaller patient panels on providers and their perceptions of providing optimal patient care.

Pay Scales of Canadian NPs

The majority of the information regarding the salaries of Canadian NPs was obtained through the grey literature search using organizational websites. Additional information was secured through personal communication (NPAO, 2013). Surveys of NPs in Ontario, British Columbia and Nova Scotia found in the grey literature provided summaries of self-reported salaries (Martin-Misener et al., 2010; Mian & Koren, 2011; Mian et al., 2012; Sangster-Gormley et al., 2012; Sloan, et al., 2006). Information from one peer-reviewed publication was utilized (Koren et al., 2010). The majority of the data is dated 2010 or later. Table 8 outlines the unionized and non-unionized salary

scales that were retrieved. Despite our efforts, we were unable to access non-unionized salaries in many provinces.

There is considerable variation in salaries and funding models noted across the country and also within provinces (e.g., Ontario). Differences are noted across unionized and non-unionized sectors, and across acute care and primary healthcare settings. The highest salaries are found in Alberta where NPs are not unionized and the salaries range from a minimum of \$80, 975 to a maximum of \$124, 247. The Hay Report (2011) analyzed role responsibilities and recommended salaries

for Ontario NPs should range from a minimum of \$114, 750 to a maximum of \$135, 000 based on trend line analysis. All

Canadian annual salaries fall below this proposed minimum rate.

Table 8. Canadian Jurisdictions: Nurse Practitioner Salaries 2012-2013

Province	# of NPs in 2012	Minimum per annum Union scale	Maximum per annum Union scale	Levels	Wage Non-Unionized	Source	Notes
Newfoundland & Labrador	100	\$68,991	\$85,351	6		NLNU	
P.E.I.	3	\$86,919	\$101,337	7		PEI NU	PHC
Nova Scotia	143	\$80,837	\$98,750	7	\$69,000 to \$88,000	Martin Misener et al. (2010)	
New Brunswick	113	\$84,135	\$98,750	7		NBNU	
Quebec	185	\$48,029	\$85,635	18		FIQ	
Ontario	2082	\$101,185	\$115,108	5		ONA	
Ontario NPLC					\$74,038 to \$89,203	MOHLTC (2010); Baker, Aggarwal, & Barnsley (2013)	Wages frozen
Ontario FHT/NPLC					\$78,054 to \$89,203	MOHLTC/NPAO (2006)	Wages frozen
Ontario CHC/AHAC					\$74,038 to \$92,200	MOHLTC/NPAO (2009)	No increase since 2009
Manitoba	110	\$83,988	\$103,587	7	\$69,741 to \$84,330	CNFU (2011)	
Saskatchewan	161	\$92,831	\$113,255	6		SUN	Primary and acute care NPs
Alberta	315				\$80,975 to \$124,247 1 job posting was \$185,380	Alberta Health (NPAO, 2013)	NPs prohibited from belonging to a trade union
British Columbia	251	\$74,665	\$107,328		\$97,698	Sangster-Gormley (2012) CFNU	Average salary \$119,000

Yukon	1					
NWT/ Nunavut	?	\$99,806.50	\$117,955	8	UNW	Northern allowance supplement varies depending on location

Note: NLNU: Nfld and Labrador Nurses' Union; PEI NU: Prince Edward Island Nurses' Union

NSNU: Nova Scotia Nurses' Union; NSNU: Nova Scotia Nurses' Union; FIQ: Fédération interprofessionnelle de la santé du Québec; MOHTLC: Ministry of Health and Long-term Care (Ontario); ONA: Ontario Nurses' Union; CCAC: Community Care Access Centre (Ontario); SUN: Saskatchewan Union of Nurses; CFNU: Canadian Federation Nurses' Union; UNW: Union of Northern Workers—\$50.67 per hour to \$60.49: assuming 37.5 hour work week =1950 hours per year; FHT: Family health team; NPLC: Nurse practitioner-led clinic; CHC: Community health centre; AHAC: Aboriginal health access centre

Discussion

The determination of an appropriate caseload and patient panel size for NPs in primary healthcare is critical to ensure safe and effective care for patients, families and communities. This scoping review of international literature indicates that while there are an increasing number of papers addressing the topic of patient panels and case-mix for NPs in primary healthcare, the information is descriptive and largely experientially based. The range in the average number of patients seen by NPs per day varies considerably within and between countries; an average of 9-15 patients per day is common. Panel size projections also vary and may represent ideal goals or benchmarks that are not achievable for NPs in all primary healthcare settings given the dynamic contexts of patient, provider, organization and system factors that influence NP workload, productivity and efficiency.

We found limited research to estimate the appropriate patient panel size for NPs in primary healthcare and inform decisions about patient panel size. Specific patient characteristics (e.g., age, gender, socioeconomic status) and health conditions (e.g., multiple chronic conditions), provider (e.g., years of experience) and organizational characteristics (e.g., rural location, number of exam rooms, support staff) are reported to affect the workload and patient panel

size of NPs. Factors inherent to the patient population being served, the organization of work, the scope of inter-professional and nursing team member roles and the number of patients requiring care have been found to affect nurses' workload in other settings such as ambulatory care, homecare and community care (Bain & Baguley, 2012; Swan & Griffin, 2005; Willis et al., 2012). Some of these factors also affect patient panel size for family physicians in primary healthcare (Muldoon et al., 2012).

To determine appropriate panel size, practice settings require systems such as rosters or registries, to identify and describe the number and characteristics of the patient population being served (Muldoon et al., 2012). However, many Canadian jurisdictions do not use a rostering system to organize primary healthcare, much less roster by provider types other than family physicians. Workload measurement is a problem as well. Some, but not all NPs shadow bill within provincial medical services systems; however, such systems were designed for physician remuneration, not determination of patient panel size or as accurate indicators of NP practice. As a result billing systems do not capture all of the work that NPs do.

Panel size formulas being used by the Department of Veterans Affairs in the US

(2009; 2014), and more recently by the Association of Ontario Health Centres in Ontario, Canada (Rayner, 2013; 2014a; 2014b) provide calculations for NP panel size that take into account important patient characteristics known to have an impact on patient panel size. Both organizations use indices of morbidity to calculate panel size for NPs and physicians in their primary healthcare practices. Both recognize the influence of organizational factors such as the number of examination rooms and support staff on productivity and the Department of Veterans Affairs has a method to calculate and adjust for these factors.

Morris and colleagues (2007) suggest reconceptualizing workload to make nursing work more visible. These researchers propose including direct care, indirect care, and non-patient care activities such as administrative and educational activities in the estimation of nursing workload. Thus for NPs, workload measurement should capture activities in multiple role dimensions including clinical practice, education, consultation, leadership/administration, and research. Workload measurement must also capture the breadth of clinical activities (e.g., house calls, group health education, outreach services to shelters, teen health services in high-schools) that are often neglected when considering panel size for NPs in primary care. Further, Upenieks, Akhavan and Kotlerman (2008) argue that it is important to distinguish between the value-added,

necessary and unnecessary (i.e., waste) activities that are undertaken by healthcare providers when providing care.

Differences in actual versus estimated or ideal panel size may be contextually driven. Therefore, it may not be possible to determine one best practice panel size model relevant to all NP roles in primary healthcare. Dynamic patient, provider, organization and system factors influence NP workload, productivity and efficiency and need to be considered in panel size calculations. To promote the safety, quality, accessibility and efficiency of primary healthcare, documentation and yearly reviews of these factors and comparison of actual versus expected NP panel size is recommended. Modifications to panel size can then be made to reflect changes in these contextual factors for optimal care delivery.

Figure 6 provides an illustration of relevant factors and NP role activities to consider when determining patient panel size in primary healthcare. The model depicts the importance of considering population needs within a specific context, as well as the patient, provider, organizational/practice and system factors that affect the NP role and scope of practice. This in turn affects the optimal patient panel size for that setting. The links between patient panel size and patient, provider, organizational and system outcomes are critical and panel size should be adjusted accordingly. Bidirectional

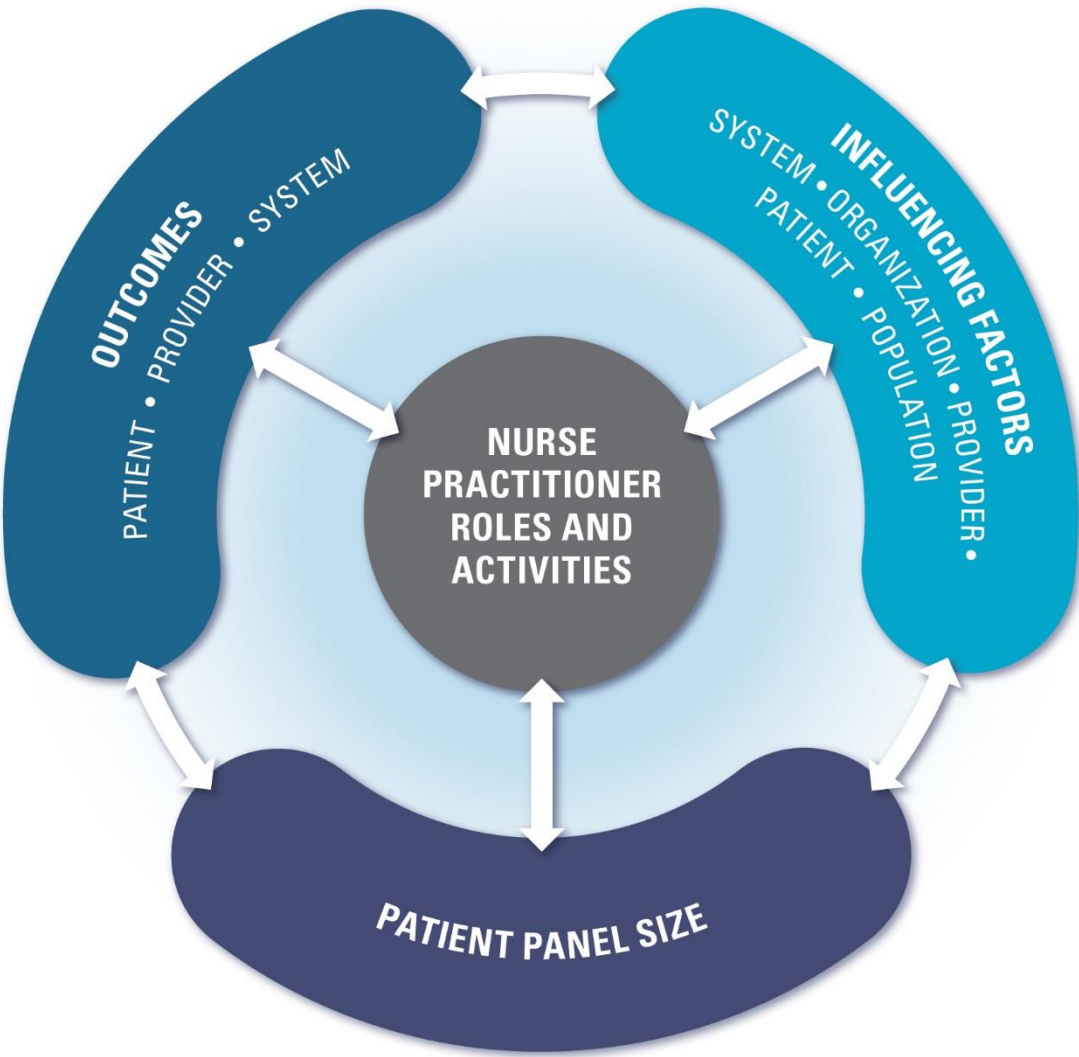
arrows throughout the model indicate the dynamic interaction between the model elements.

Some important gaps in determining NP patient panel size for primary healthcare have been identified in this scoping review. They include the lack of validated tools to measure NP activities and workload and the lack of observational studies to determine actual rather than perceived NP practice. A pan-Canadian initiative to develop standardized tools and benchmarks for NP panels in primary healthcare, to facilitate annual reviews and to monitor and document trends in NP practice and workload would accelerate our understanding of best practice models for determining patient panels and optimal models of primary healthcare delivery that include NP roles. Standardized approaches for measuring NP activity and workload necessary to determine NP patient panels would also facilitate outcome assessment

and the ability to link NP activities to patient, provider and system outcomes. Future research should examine the effects of different panels and case-mixes on patient, provider, practice and system outcomes as well as document NP care activities using observational studies (e.g., work sampling, time and motion studies) to assess the effect of the NP care activities on caseload and patient panel size.

Finally, significant salary discrepancies across practice settings, within provinces and across the country are present. Salary differences may negatively impact on access to and the quality of primary healthcare services by stimulating workforce shortages in those practice settings and jurisdictions with lower NP wages. Standardization of funding models and remuneration is necessary for recruiting, retaining and optimizing the use of NPs in primary healthcare (Tomblin Murphy, 2004b).

Figure 6. Model for Estimating Nurse Practitioner Patient Panel Size in Primary Healthcare



Strengths and Limitations

The strengths of this study are its comprehensive examination of the peer reviewed and grey literature, including French and English papers and the rigorous methods used to determine study inclusion and for data extraction. However, the study results related to caseload, case-mix and patient panels are limited to NP roles in primary healthcare settings serving an all ages population. We did not examine NP panel size and caseload in other settings

where primary healthcare/family/all ages NPs are known to work such as long-term care and emergency departments. Different methods to estimate caseload may have been used in these settings and could inform decisions about optimal patient panel size. As this is a literature review, it does not capture developments in methods that may be in use to track NP panel size or workload that are not in the public domain.

Conclusion

NPs practice in primary healthcare settings in every province and territory in Canada. The emergence of new interprofessional team models across the country and the attention within healthcare systems to accountability is fueling a need to determine an appropriate patient panel size for NPs as well as other team members. This scoping literature review identifies that NP panel size is dependent on a number of

factors. These factors need to be considered when estimating panel size in a particular context. Methods to weight the importance of these factors in determining NP panel size do not yet exist. The inadequacy or absence of provincial/territorial systems to track and measure NP activities presents additional challenges.

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Note: Please refer to the Bibliography for references that are the results of the scoping review.

Appendix A

List of Websites Accessed

Provincial Nurse Practitioner Associations

British Columbia Nurse Practitioner Association <http://www.bcnpa.org/>
Nurse Practitioner Association of Manitoba (NPAM): <http://www.nursepractitioner.ca/portal/>
Nurse Practitioner Association of Ontario (NPAO): <http://www.npao.org/>
Association des infirmières praticiennes spécialisées du Québec (AIPSQ) :
[http://www.aipsq.com / infos/accueil.php/](http://www.aipsq.com/infos/accueil.php/)
Nurse practitioners of New Brunswick <http://www.site.npnb.ca/>
Nurse Practitioners' Association of Nova Scotia <http://www.npans.ca/>
Newfoundland and Labrador Nurse Practitioner Special Interest Group <http://www.nlnpsig.ca/>
Nurse Practitioner Association of Alberta <http://www.albertanps.ca/>
Saskatchewan Association of Nurse Practitioners <http://www.sasknursepractitioner.org/>

Provincial /Territorial Nurse Regulators

Association of Registered Nurses of Prince Edward Island (ARNPEI): <http://www.arnpei.ca/>
Association of Registered Nurses of Newfoundland and Labrador (ARNNL):
<http://www.arnnl.nf.ca/>
Canadian Council of Regulated Nurse Regulators (CCNR) <http://www.ccnr.ca/>
College of Registered Nurses of British Columbia (CRNBC): <http://www.crnbc.ca/>
College & Association of Registered Nurses of Alberta (CARNA):
<http://www.nurses.ab.ca/Carna/index.aspx>
College of Registered Nurses of Manitoba (CRNM): <http://www.crnmb.mb.ca/>
College of Nurses of Ontario (CNO): <http://www.cno.org/>
College of Registered Nurses of Nova Scotia (CRNNS): <http://www.crnns.ca/>
Ordre des infirmières et infirmiers du Québec <http://www.oiiq.org/>
Nurses Association of New Brunswick (NANB): <http://www.nanb.nb.ca/>
Saskatchewan Registered Nurses Association (SRNA): <http://www.srna.org/>
Yukon Registered Nurses Association (YRNA): <http://www.yrna.ca/>
Registered Nurses Association of Northwest Territories and Nunavut (RNANTNU):
<http://www.rnantnu.ca/>
Registered Nurses Association of Ontario: <http://rnao.ca/>

Canada: National Nursing Associations

Canadian Association of Advanced Practice Nurses (CAAPN): <http://www.caapn.com/>
Canadian Nurses Association (CNA): <http://www.cna-nurses.ca/>
Academy of Canadian Executive Nurses (ACEN): <http://www.acen.ca/>
Community Health Nurses of Canada <http://www.chnc.ca/>
Canadian Family Practice Nurses Association <http://www.cfpna.ca/>
Canadian Association for Rural and remote Nursing: <http://www.carrn.com/>
Canadian Federation of Nurses Union specifically:
http://www.nursesunions.ca/sites/default/files/contract_comparison_english.pdf

International Nursing Associations

American Nurses Association (ANA): <http://www.nursingworld.org/>
American Academy of Nurse Practitioners <http://www.aanp.org/AANPCMS2>
Australian College of Nurse Practitioners <http://www.acnp.org.au/>
Australian College of Nurses <http://acn.edu.au/>
The International Council of Nurses (ICN). Nurse Practitioner/Advanced Practice Nurse Network (INPAPNN) <http://icn-apnetwork.org/>
Royal College of Nursing <http://www.rcn.org.uk>
Royal College of Nursing, Australia <http://www.rcna.org.au/>

Canada: National Medical Associations and others

Health Canada & First Nations Health (publications): <http://www.hc-sc.gc.ca/fniah-spnia/pubs/index-eng.php>
Canadian Health Leadership Network specifically <http://chl.net.ca/wp-content/uploads/PHSI-Ontario-Node-Case-Study-Dec-2013.pdf>
Canadian Medical Association (CMA) <http://www.cma.ca/>
College of Family Physicians of Canada <http://www.cfpc.ca/global/splash/default.asp?s=1>
Canadian Public Health Association (CPHA) <http://www.cpha.ca/en/default.aspx>
Public Health Agency of Canada (PHAC) <http://www.phac-aspc.gc.ca/index-eng.php>
Collège des médecins du Québec : <http://www.cmq.org/>
Fédération des médecins omnipraticiens du Québec : <http://www.fmoq.org/fr/default.aspx>
Fédération des médecins résidents du Québec : <http://www.fmrq.qc.ca/formation-medicale/index.cfm>

Provincial /Territorial Medical Associations

British Columbia Medical Association
Alberta Medical Association
Saskatchewan Medical Association
Doctors Manitoba
Ontario Medical Association
Quebec Medical Association
New Brunswick Medical Society
Doctors Nova Scotia
Medical Society of Prince Edward Island
Newfoundland and Labrador Medical Association
Northwest Territories Medical Association
Yukon Medical Association

Provincial/Territorial Health Ministries

British Columbia Ministry of Health: <http://www.gov.bc.ca/health/>
Government of Alberta: Health and Wellness <http://www.health.alberta.ca/>
Government of Saskatchewan: Health <http://www.health.gov.sk.ca/>
Manitoba Health <http://www.gov.mb.ca/health/>
Ontario Ministry of Health and Long-Term Care (MOHLTC): <http://www.health.gov.on.ca/>
Ministère de la Santé et des Services sociaux <http://www.msss.gouv.qc.ca/en/>
Publications available at : <http://msssa4.msss.gouv.qc.ca/fr/document/publication.nsf/vdocdate?OpenView>
Government of New Brunswick Health <http://www.gnb.ca/0051/index-e.asp>
Government of Nova Scotia: Department of Health <http://www.gov.ns.ca/health/>
Government of Prince Edward Island: Department of Health <http://www.gov.pe.ca/health/index.php3>
Government Newfoundland and Labrador :Health and Community Services – <http://www.health.gov.nl.ca/health>
Government of the Northwest Territories: Department of Health and Social Services <http://www.hlthss.gov.nt.ca/>
Government of Nunavut: Health and Social Services <http://www.gov.nu.ca/health/>
Yukon Government: Yukon Health and Social Services <http://www.hss.gov.yk.ca/>

Research Units and Organizations

Canadian Health Services Research Foundation (CHSRF) <http://www.chsrf.ca/>
Canadian Institutes of Health Research (CIHR) <http://www.cihr-irsc.gc.ca/>
Canadian Institutes for Health Information (CIHI) <http://secure.cihi.ca/cihiweb/splash.html>
Canadian Health Human Resources Network <http://www.hhr-rhs.ca>

Center for Health Economics and Policy Analysis (CHEPA) <http://www.chepa.org/>
Center for Health Services and Policy Research (CHSPR) <http://www.chspr.ubc.ca/>
Center for Public Health and Primary Care Research <http://www.chs.med.ed.ac.uk/cphpcr/>
Chaire de recherche Sadok Besrour: http://www.medfam.umontreal.ca/recherche/chaire_sadok_besrour.html
Community Health Nursing Unit_ <http://aix1.uottawa.ca/~nedwards/chru/>
Health and Social Service Utilization Research Unit
<http://www.fhs.mcmaster.ca/slru/home.htm>
Groupe de recherche sur l'équité d'Accès et l'organisation des services de santé de première ligne <http://www.greas.ca/>
Institute of Health Services and Policy Research (IHSPR) <http://www.cihr-irsc.gc.ca/e/13733.html>
Institut national d'excellence en santé et en services sociaux du Québec <http://www.inesss.qc.ca/>
Nursing Health Services Research Unit (NHSRU)_ <http://www.nhsru.com/>

International Associations

Agency for healthcare research and quality <http://www.ahrq.gov/>
American Medical Association (AMA) <http://www.ama-assn.org/>
American Public Health Association (APHA) <http://www.apha.org/>
Community Toolbox: Bringing Solutions to Light <http://ctb.ku.edu/>
Department of Health, Australia <http://www.health.vic.gov.au/>
The European Observatory on Health Systems and Policies
<http://www.euro.who.int/observatory>
Evidence for Policy and Practice Information and Coordinating Center (EPPI-Centre)
<http://eppi.ioe.ac.uk/cms/>
Evidence Network: The Focus Point for Evidence Based Policy and Practice Research in the UK (United Kingdom): <http://www.evidencenetwork.org>
Graham Center for Policy Studies in Family Medicine (US) <http://www.graham-center.org/>
Guide to Community Preventive Services: Systematic Reviews and Evidence Based Recommendations <http://www.thecommunityguide.org/>
Health Policy Guide: Evidence-Based Policies to Improve the Public's Health
<http://www.healthpolicycoach.org/default.asp>
MAPP: Mobilizing for Action through Planning and Partnerships [NACCHO (National Association of County and City Health Officials)] http://mapp.naccho.org/mapp_introduction.asp
Ministry of Health, New Zealand <http://health.govt.nz/>
National Primary Care Research and Development Center, Manchester, England
<http://www.npcrdc.ac.uk/>
National Institute for Health and Clinical Excellence (NICE) www.nice.org.uk/
North American Primary Care Research Group <http://www.napcrg.org/>

Primary Healthcare Research and Information Strategy (PHCRIS), Australia
<http://www.phcris.org.au/>
Network Towards Unity for Health (TUFT)
http://www.the-networktufh.org/publications_resources/positioncontent.asp?id=8&t=Position+Papers
World Health Organization (WHO) <http://www.who.int/en/>
World Health Organization: Regional Office for Europe: Evidence (Access to WHO's Evidence-Based Information and Policy
http://www.euro.who.int/InformationSources/vidence/20010827_1
Organization for Economic Co-operation and Development (OECD) <http://oecd.org/>
Robert Wood Johnson Foundation <http://www.rwjf.org/>

Appendix B

Agencies Contacted by Email

1.	Canadian Association of Advanced Practice Nurses (CAAPN)
2.	British Columbia Nurse Practitioner Association
3.	Yukon Registered Nurses Association
4.	Registered Nurses Association of the Northwest Territories and Nunavut
5.	Nurse Practitioner Association of Alberta
6.	Nurse Practitioner Association of Ontario
7.	College and Association of Registered Nurses of Alberta
8.	Saskatchewan Association of Nurse Practitioners
9.	Saskatchewan Registered Nurses Association
10.	Nurse Practitioner Association of Manitoba
11.	College of Registered Nurses of Manitoba
12.	Registered Nurses Association of Ontario
13.	Ordre des infirmières et infirmiers du Québec
14.	Association des infirmières praticiennes spécialisées du Québec
15.	Ministère de la santé et des services sociaux du Québec
16.	Association of Registered Nurses of Newfoundland and Labrador
17.	The Nurses Association of New Brunswick
18.	Nurse Practitioners' Association of Nova Scotia
19.	Association of Registered Nurses of Prince Edward Island
via snowball sampling	
20.	Primary Care Network, Health Prince Edward Island
21.	Nurse Practitioner Council, CAAPN
22.	Ministry of Health, Primary Care, Saskatchewan
23.	Faculty at Aurora College, Northwest Territories
24.	Public Health and Primary Health Care, Manitoba Health

Appendix C

Review of Workloads, Patient Panels, and Salary - Data Extraction Collection Form

Title:

Authors:

Year:

 Include

 Exclude

Comments:

Study purpose:

Format:

 Journal article

 Report:

Retrieved via:

 Website search

 Google/Google Scholar search

 Personal contacts

Other: explain

1) Province/Country:

☐ Canada/ Province: _____

☐ United States: _____

☐ United Kingdom: _____

☐ Other: Specify: _____

3) What type of article is it? (Select only one)

☐ Review (systematic review, meta-analysis, scoping review, literature review, or qualitative systematic review/meta-analysis)

☐ Primary study

☐ RCT

☐ Evaluation

- ☐ Qualitative
- ☐ Quantitative (non-RCT)
- ☐ Mixed methods
- ☐ Descriptive paper
- ☐ Concept / theory/simulation/mathematical modeling
- ☐ Policy/workforce planning...staffing
- ☐ Unpublished report
- ☐ Other (editorials, viewpoints, etc)

4) Type of community-based primary care practice: (Select only one)

- ☐ NP only in primary care (e.g. NP-led clinic)
- ☐ NP and fee for service physician(s) in primary care
- ☐ NP and salaried (alternate fee plan) physician(s) in primary care
- ☐ NP, physician, and other healthcare providers in primary care (e.g. Family Health Team, Community Health Center)
- ☐ Ambulatory care
- ☐ Nursing station
- ☐ Walk-in clinic
- ☐ Other, describe: _____
- ☐ Not specified: _____

5) Type of service(s) provided by the NP (Select all that apply)

- ☐ Regular scheduled appointments
- ☐ Weekend scheduled appointments
- ☐ Evening scheduled appointments
- ☐ Same day access (fit in appointments for urgent care)
- ☐ On call

6) Outreach activities (Select all that apply)

- ☐ House calls/home visits
- ☐ Shelter
- ☐ Nursing home
- ☐ Other, describe_____

7) Practice size: (please specify number of patients in practice: if not reported indicate NR)

Number of patients: _____

8) Patient population specified by:

☐ Age group (Select all that apply (Select all that apply))

- ☐ All ages
- ☐ Infants
- ☐ Pediatric (1 to 17 years)
- ☐ Antenatal
- ☐ Adult (18-64 years)
- ☐ Older adult (65 years and older)
- ☐ Other - Describe: _____

☐ Health status (Select all that apply):

- ☐ High prevalence of cancer
- ☐ High prevalence of diabetes
- ☐ High prevalence of hypertension
- ☐ High prevalence of healthy/ well
- ☐ High prevalence of mental health concerns
- ☐ High prevalence of multiple comorbidities
- ☐ Other - Describe: _____

☐ Socioeconomic status (Select all that apply):

- ☐ High prevalence of poverty
- ☐ High prevalence of unemployed
- ☐ High prevalence of homelessness
- ☐ Other - Describe: _____

9) Focus of Paper: (Select all that apply)

- ☐ Caseload / workload
- ☐ Productivity
- ☐ Tools to measure workload
- ☐ Patient panel / roster
- ☐ Pay scales / salary
- ☐ Other _____

10) Model / framework discussed? ☐ Yes ☐ No

If yes, specify: _____

11) Level of NP Autonomy or Physician Supervision (Select only one)

- ☐ Autonomous NP decision-making
- ☐ MD signs all prescriptions written by NP
- ☐ MD supervises all of NP practice (i.e. diagnosis, ordering diagnostic tests, prescribing etc)
- ☐ Other: Specify _____

12) Key findings and specific information: Copy and paste information deemed important in the determination of caseload/ patient panel/salary scales

Indicate NR (not reported) in the each section of the key findings if no data are extracted

Theme	Key finding
NP Demographics (e.g. education, years of experience, unionized, etc.)	
Goal of NP Role (e.g. first contact / longitudinal primary care	
Time spent in APN role dimensions (e.g. education, administration, research, etc)	
Team members working with NP (e.g. physicians, other nurses, other healthcare professionals)	
Ave. number of patients/day seen by NP	
Ave. number of patients/day seen by physician	
Total number of patients NP expected to serve	
Total number of patients physician expected to serve	
Time scheduled per patient for NP	
Time scheduled per patient for physician	

Method (s) of Workload determination/measurement (who was involved, how is it done?)	
Barriers to workload determination/measurement	
Facilitators to workload determination/measurement	
Factors important to take into account with Workload determination/measurement	
Patient outcomes (e.g., HbA_{1c}, BP monitoring, depression, etc)	
Provider outcomes (e.g., satisfaction, continuity of care or redirections to other providers)	
System outcomes (e.g., wait times, access to care)	
Physician payment model (salary/fee for service/ rostered, capitation, HMO)	
NP pay scales or salary, benefits	

13) Additional Information or Comments:

Appendix D. Bibliography of Included Articles

- Abood, S. A. (2005). *Analysis of the compensation arrangements experienced by primary care nurse practitioners in the managed care environment*. (Unpublished doctoral dissertation). George Mason University, Fairfax, Virginia.
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