IHWC Papers: Comparisons of the Restructured Primary Care in the IMWC Countries- Canada

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Primary Healthcare Reform in Canada and its Impact on HHR

Context:
Canada. Canadian healthcare is intimately intertwined with federal-provincial relationships. Canada’s 1867 constitution delegates most healthcare responsibilities to provincial jurisdiction. Since Canada comprises 10 provinces and three northern territories, consequently, Canada counts 13 jurisdictions whose healthcare financing is dependent both on federal transfers and on the fiscal capacity of each province. Healthcare delivery, on the other hand, is the responsibility of each jurisdiction.

Following the 1867 constitution, a number of Acts have defined how and what the federal government would contribute financially to each jurisdictional healthcare system. Cost-sharing between federal and provincial governments for physician services were included through the Medical Care Act (1966) and by 1971, all provinces had plans insuring their populations for hospital and physician services. (1) Another important Act is the 1985 Canada Health Act (1); it is widely considered as inadequate for the delivery of healthcare services almost 30 years later since this Act essentially defines a hospital-physician centric model of delivering healthcare. In order for jurisdictions to receive their federal cash contribution, they need to comply with a number of criteria: 1) Public administration: the health care insurance plan must “be administered and operated on a non-profit basis by a public authority appointed or designated by the government of the province”; 2) Comprehensiveness: provincial coverage must include “all insured health services provided by hospitals, medical practitioners or dentists, and where the law of the province so permits, similar or additional services rendered by other health care practitioners.”; 3) Universality: the plan must entitle “one hundred per cent of the insured persons of the province to the insured health services provided for by the plan on uniform terms and conditions.”; 4) Portability: interprovincial agreements define provisions for coverage of insured people when moving between provinces and for periods of less than three months. The out-of-province care is the responsibility of the home province and reimbursed at the rates of the province where the services have been rendered (unless defined differently between the two concerned provinces). When the services are received outside of Canada, reimbursement is done according to the rates of the home province; and 5) Accessibility: provincial plans must “provide for reasonable access to the insured services by insured persons.” Hospitals and health providers (usually physicians) must receive “reasonable compensation.” (2)

Primary Healthcare. Primary healthcare (PHC) is the foundation of Canada’s health care system. A strong PHC foundation leads to positive population health outcomes including: increased knowledge about health and health care; reduced risk, duration and effects of acute and episodic conditions (3-7); and reduced risk and effects of continuing health conditions. (8-10) Consumers with a regular PHC provider show improved medication adherence (11, 12), reduced use of emergency services (13-15), shorter hospital stays (11), and lower overall health-care utilization. (12) More recent work has shown that those with a chronic disease (e.g., diabetes) who have a regular provider have lower health system costs. (16) However, there is a lack of agreement on the definition of primary healthcare; (17-21) therefore, for the purposes of this paper, we define PHC as the first level of care (21, 22), where individuals first make contact with the health care system. A major focus of PHC is the resolution of short-term health issues and the management
of chronic health conditions. PHC also includes an emphasis on health promotion and education and where individuals can be referred to for specialist care. (23-25)

Canadians have become increasingly concerned about their PHC system; they are increasingly concerned with access to and the quality of their care from family physicians, whether for a first contact or for routine care. (26) Beginning in the mid-1990s, full-service family practice saw a decline across Canada. A variety of reasons contributed to this decline, including increasing dissatisfaction with workloads, higher compensation for specialists versus family physicians, an increasingly complex family physician workload, and fiscal and cost restraints that affected health care service delivery across the country. (27) Some of the consequences from this decline were that family physicians were not accepting or restricting their accessibility to new patients (28) and poor physician morale. (27) The situation is further complicated because fewer medical students are choosing a future in family medicine (29), while those who do are taking on lower workloads than their predecessors. (30) Today, less than 50% of Canadians are satisfied with access to care or the timeliness of access. (31) These concerns held by Canadians, a shortage of family physicians and a lack of investment in PHC, created an environment ripe for reform.

PHC reform in Canada began over a decade ago. Provincial commissions and committees recommended PHC reforms targeting the accessibility (both in-person and by telephone), continuity, comprehensiveness and appropriateness of primary health care. (32-36) The recommendations also suggested PHC reforms in providing care through interprofessional teams (and not limited to family physician – nurse dyad), increased emphasis on wellness and health promotion activities, and a move away from a solely fee-for-service funding environment to alternative funding models that could include capitation, salaried positions, and blended funding. In September 2000, Canada’s First Ministers agreed upon the “Action Plan for Health System Renewal,” which included investments to catalyze PHC reform and to provide regular, comprehensive and public reporting to Canadians using jointly agreed upon comparable indicators on health status, health outcomes and quality of service. In response, the Federal government established the $800 million Primary Health Care Transition Fund (PHCTF) to “support the transitional costs of implementing sustainable, large-scale, primary health care renewal initiatives.” (37)

**PHC workforce.** This infusion of funds was distributed by the Federal government to the 10 provinces and three territorial governments. Each province and government used these funds to lever PHC reform in different ways since they are their own insurers and deliverers of health services. The delivery of PHC services in Canada has been, and continues to be, mainly carried out by family practice physicians. Most family physicians across the country are self-employed in private solo or group practices (27), working on a fee-for-service basis, although there are increasing numbers who receive alternate forms of payment, such as a salary or incentive payments and salary.

The ratio of practicing family physicians across Canada is 98 per 100,000 population; however, this number varies across provinces. For example, in 2004/05 in BC there were 4,405 family physicians, or approximately 105 physicians per 100,000 population (38), whereas in 2007 in Ontario, there were approximately 11,000 family physicians, or approximately 85 physicians per
In Nova Scotia, a smaller, mostly rural province compared to either BC or Ontario, there were 1,269 family physicians in 2008 (40), or 116 per 100,000.

Nurse practitioners (NPs) are a more recent PHC provider addition in Canada. They are licensed in all 13 of Canadians provincial and territorial jurisdictions with Quebec only recently (as of 2010) passing this legislation. There are much fewer practicing in PHC compared to family physicians. However, most NPs work in PHC (41) with the numbers of NPs more than doubling between 2004 and 2008 from 800 to 1,900. (42, 43) Most NPs in PHC work in the province of Ontario, while less than 150 NPs work in BC, and less than 60 NPs work in Nova Scotia in PHC.

There are relatively few registered nurses (RNs) working in PHC when compared to those working in the acute care sector. If all registered nurses working in places such as community health centres, Aboriginal Health Access Centres, Public Health Units, and Primary Care Networks are included, this workforce ranges from 8% (n=approximately 9,600 in Ontario) to 12% (n=approximately 4,200 in BC) of all RNs. However, the number of RNs working directly with family physicians in clinics and offices is even fewer. For example, in Ontario, there were about 400 in 2008 identifying themselves as working in physician offices and community health centres (44), while in Nova Scotia, RNs identifying themselves as working in these sample places was closer to 150. (45)

Although there are other kinds of providers, such as midwives, pharmacists, social workers, and nutritionists who work in PHC, their numbers remain small compared to those of physicians, nurse practitioners, and registered nurses. Notably, Ontario, in 1994, was the first province to introduce and fund midwives; they have grown by 150 percent since 2002 and attend 10 percent of all births in Ontario. (46)

Primary Healthcare Reform

Given that Canadian provinces and territories are responsible for the organization and delivery of PHC, reform in PHC has varied across the country. In broad strokes, there are two areas where reform affected “who” was delivering PHC services. First, there was and continues to be reform of the organizational structure of PHC. Problems with the current organization of PHC include: fragmentation of care and inefficient use of providers due to lack of coordination; limited management and follow-ups of vulnerable groups; access problems; low priority given to health promotion and disease prevention; and problems related to the quality, collection and sharing of patient information. (47) Second, there was and continues to be reform through quality improvement initiatives. (48)

Reform through organizational change. The majority of provinces and territories have agreed upon the necessity to offer PHC services on a 24/7 basis through interdisciplinary teams who work with information technologies and electronic medical records, who undertake health promotion and prevention activities, and who share links with public health and local governing bodies. (47) As a result, new models and innovations in PHC delivery have been implemented to improve the quality of care provided to the Canadian population. New models of primary care delivery are more predominant in Quebec, Ontario and Alberta, while the focus in British Columbia, Manitoba, and Nova Scotia has been more on quality improvement initiatives. (46)
While certainly not exhaustive, Table 1 provides examples of the main types of PHC delivery models in different provinces.

While organizational changes are voluntary for family physicians (48), levers to encourage these changes included financing by the provincial and territorial governments and legislation. Funding for family physicians to work in new models of care (e.g., interdisciplinary teams) were jointly negotiated between medical associations and provinces/territories, rather than imposed. (46) In order to access new funds, family physicians were paid in a blended funding model (e.g. fee-for-service with incentive funding or complement-based funding) and were required to work on an interprofessional team that included, at a minimum, an RN. For physicians who embraced the organizational changes, their yearly income increased by as much as 40%. (47) One factor that supported PHC organizational changes was legislation, such as the Health Professions Act, that introduced other health professions, such as registered nurses, nurse practitioners, and pharmacists, to be part of these interprofessional teams. (49) In some cases, such as the legal redefinition of the Quebec Professional Code (PL 90) in 2003, the legislative changes have led to an expanded scope of practice of the nursing role to designated nurse clinicians. (47)

There has been variation in the adoption of different PHC delivery models across the country. Consequently, the incorporation of health professionals to supplement the family physician – nurse dyad has also varied. For example, in Quebec, there are approximately 224 GMFs (Groupe de Médecine de Famille) representing almost 40% of family physicians with 0 nurse practitioners, some nurses, and few “other” health professionals. In Ontario, there are almost 200 Family Health Teams which represent less than 18% of family physicians and include about 1,400 other health care professionals (50) and there are approximately 45 nurse practitioner led clinics whose mandate is to provide PHC to those remain “unattached”. In Alberta, over 75% of family physicians practice within the Primary Care Networks with about 450 other types of health care professionals. (51) In New Brunswick, there are less than 10 Community Health Centres consisting of a physician, nurse practitioner, and nurse with some combination of a dietician, occupational therapist, social worker, and respiratory therapist. (52)

Reform through quality improvement initiatives. PHC reform, particularly in the provinces of British Columbia (BC), Manitoba, and Nova Scotia, has focussed more on quality improvement of the existing system rather than trying to implement new models of PHC delivery. As Tregillus and Cavers (2011) point out, “The province of British Columbia has chosen to revitalize its primary healthcare sector by focusing on financial incentives to promote evidence-based care by full-service family physicians (i.e., an enhanced and modified fee-for-service system) and by offering clinical, office management and structural support to family doctors to increase job satisfaction and to enable them to obtain more skills to address gaps in patient care. British Columbia appears unique in Canada in that it is opting to systemically and explicitly address an operational problem (i.e., the decline in family practice) with an operational response, by improving the existing system….” Many of these supports came in the form of incentive payments, such as the ability to bill for telephone consultations or delivery of a group medical visit. In BC, a governance structure consisting of four members of the BC Medical Association and four members of the provincial government known as the General Practice Services Committee is responsible for allocating a growing budget worth $200 million for 2011-12 toward strengthening PHC delivered by family physicians. (53)
In addition to working with family physicians, health authorities within BC began developing Integrated Health Networks to target patients who were vulnerable because of mental health conditions, substance use, and those with two or more chronic conditions. (52) In Manitoba and Nova Scotia, quality improvement initiatives has been primarily driven by the provincial government by investing in demonstration sites to promote characteristics associated with performance and improved quality of care. (47)

Positive impacts of PHC quality improvement initiatives include increasing family physician morale and remuneration; the yearly salary of family physicians increased by as much as 27 percent. (27) Another positive impact seen in Manitoba following the launch of the Physician Integrated Network (PIN) was addressing issues of family physicians’ isolation and work life issues and monitoring the performance of patient care using indicators. Some negative impacts of these initiatives include: the reinforcement of a biomedical model of PHC; a physician-only dominant PHC delivery system; and not necessarily seeing any improvement in access to care. Although both BC and Manitoba have PHC NP programs, graduates have challenges finding work in either province. Moreover, there has been less incorporation of health professionals, with the exception of nurses, to supplement family physicians in provinces focused mainly on quality improvement initiatives.

**Barriers to PHC reform.** There are a number of reasons that PHC reform has continued to move slowly across Canada. Four main reasons are outlined here. First, comprehensive evaluation of these new models of care delivery needs to be completed. Early work suggests that compared to fee-for-service practices, different models (e.g. GMFs in Quebec and Primary Care Networks in Alberta) there is improvement in patients’ accessibility, coordination, and comprehensiveness of care (54) and higher rates of prevention (55) and screening. (56)

Second, using NPs and PAs to substitute for physicians while working under their supervision was seen to be a solution both to expand access to PHC and reduce its costs. The addition of NPs and PAs to the PHC workforce in Canada has been a more recent occurrence, taking a more permanent hold in the last 10 years. Given the barriers witnessed to implementing these providers into PHC in other countries, such as the U.S., it is not clear that adding these providers in PHC will gain much momentum in Canada. In part, more work is needed to examine the complementarity of these providers within PHC. Much work has focused on whether NP, in particular, can substitute for family physicians which has led to “turf” battles and attention turned away from the goal of overall strengthening the PHC system.

Sibbald, Laurant, and Scott suggest that the main purpose of physician substitutes is to reduce physician workload, increase service capacity, and/or reduce costs; that is, by giving up services that can be performed by other providers, physicians achieve gains in service efficiency and are freed up to invest their time in activities that only physicians can perform. (57) On the other hand, the use of physician supplements results in provision of additional or added value services, with the purpose of improving the quality of care and extending the range of services available to patients. This generally involves additional costs up front, but these are assumed to reduce longer-term case costs.
In a recent review of the NP and PA literature (58) numerous individual studies and reviews published since the mid-1970s have substantiated that NPs can substitute for 80 to 90% of primary care provided by physicians with commensurate levels of quality and safety, and often associated with higher levels of patient satisfaction. Despite this evidence, NPs in particular are reported to face a number of barriers to practicing and to optimizing their role, including a lack of government leadership, physician attitudes, role confusion, and issues associated with payment models.

Third, systems of reimbursement to providers remain problematic. While no single funding or payment method holds the key to transforming PHC, a majority fee-for-service system for paying physicians while other types of providers are salaried is a barrier to reform. These “other” providers are typically reliant on employers (e.g., health authorities, private practices, etc). Fee-for-service (FFS) billing was (and largely still is) an efficient method for health system surveillance, but it is the vestige of a Medicare system conceived for providing Canadians with access to medical care in the face of catastrophic health events and predominantly episodic and acute conditions. Past work has shown that the built-in incentives and disincentives within an FFS system are poorly adapted for effectively managing the current epidemic of chronic illnesses.(59) There are a small but growing percentage of alternate physician payment models and more recently, there was an integration of a broader set of professionals into PHC. Other levers are needed to enable PHC reform, such as provincial legislation and incentives for providers to work as part of a team (e.g., Ontario Family Health Teams) rather than as solo or group practices.

Finally, although over $1 billion has been spent across Canada to “support the transitional costs of implementing sustainable, large-scale, PHC renewal initiatives,” (37) little has been done to build capacity to measure and report on the performance of PHC activities, provincially or nationally. Continued investment in PHC is needed, but without a regularized reporting system, innovation in delivery and effectiveness of the PHC system will remain largely unknown. Monitoring information about patients’, providers’, and practices’ experiences is essential to stimulating innovation, tracking changes in quality, and helping Canadians and stakeholders become more informed about their health care system. (18)

“Emerging” models of PHC. Table 1 shows different models of PHC delivery. In this section we suggest there are other models of PHC delivery that have started to take hold in Canada. However, by no means is this section exhaustive. In the example of urban Aboriginal health centres and the Social Pediatrics initiative, delivery of PHC is through interprofessional teams. Health professionals (e.g., social worker, pharmacist, drug and alcohol counselor) are hired in order to try and ensure the “right provider at the right time to deliver the right care.”

There are non-governmental organizations (NGOs) that contract with health authorities to provide PHC. In countries such as Canada, New Zealand, and Australia, indigenous organizations have taken the initiative to become providers of PHC, and have developed agencies such as urban Aboriginal health centres to aid in PHC delivery. (60) These organizations tend to be ‘alternative’ because of their commitment to relational approaches to care. (61) Relational approaches emphasize not only the physical aspects of health, but also the emotional and spiritual aspects, such as patients’ historical, economic, social, and cultural
contexts, along with issues of identity and self-determination. (61) These NGOs share the same mandates: (a) to specifically reach out to Aboriginal and non-Aboriginal people who are most severely affected by poverty, historical trauma, social exclusion, racialization and discrimination; and (b) to base their model of service delivery on indigenous approaches to health and healing. For example, two Urban Aboriginal Health Centers provide an important coordination role, helping patients to navigate through the complex networks of health and social services. They also uphold an explicit social justice agenda and work in close partnership with community agencies (e.g., low-income housing services, Aboriginal Head Start programs, shelters, and training programs) to address patients’ health and social needs. As alternate points of entry into the PHC sector, these organizations are largely funded through a patchwork of project-based and short-term funding, and are governed by particular policies and accountability frameworks that shape service delivery. (62, 63) They are in fact ‘patches’ in the system tasked with addressing persistent inequities in access and making the system seem seamless, particularly for those who ‘fall through the cracks.’(61)

Another “newer” model of PHC developed to meet the needs of vulnerable children is the collaboration between tertiary care centers and primary care. **Social pediatrics** is an approach to PHC pioneered in Canada over the past three decades by pediatrician Gilles Julien in Montreal. (64) It is concerned with providing PHC for those “groups of children who are experiencing extreme difficulty on the physical, social and psychological levels, as well as families experiencing an alarming level of stress, (p. 91).” (65) It is an intervention that provides access to PHC services and referral for assessments or treatment while considering the social conditions that contribute to ‘vulnerabilities’. Social pediatrics seeks to recognize the social roots of inequities by looking at the ways relationships are constituted and the nature of resources mobilized to respond to the needs of children and families. This model attempts to divert vulnerable children, the majority of whom have the need for specialized health care services, from dangerous trajectories through sustained involvement with the child and family, in collaboration with existing services.

Finally, another emerging model of PHC is that of health authorities collaborating with private primary care practices within a specified geographic region. Two newer projects in BC have demonstrated that this is possible and that the benefits to physicians, NPs, patients, and the health system are not insignificant. Several physician practices in both Interior Health (IH) and Vancouver Island Health Authority (VIHA) have added health authority-employed NPs working to their full scope of practice (i.e. assuming the role of primary care provider). In addition to salary and benefit costs, the HA also compensates the practices for overhead costs and assumes professional liability associated with the NPs. With cost barriers eliminated, these physicians have been able to develop mutually respectful collaborative working relationships with NPs, who in turn have been able to practice to their full scope of practice. There is early evidence that this has contributed to reduced system utilization and increased practice panels size, in turn leading to increased revenue for the physicians and reductions in avoidable system costs. (58)

The second project in BC is the development of Divisions of Family Practice in approximately 18 communities, with plans to extend this concept to any community or region in the province where there is a desire to establish a division (46, 49). These divisions are create a voluntary loose network of physicians who commit to working together at the community level to improve clinical practice, offer comprehensive services to patients, and work in partnership with the
regional health authority and provincial Ministry of Health Services in health service delivery decision-making. (46)

**Conclusions**

In conclusion, Canada’s main PHC provider remains family physicians, who focus on throughputs rather than outputs or patient outcomes. In part, this is due to a funding system that does not place any economic pressure on physicians to limit the number of services offered. However, PHC reforms since 2000 have had a positive impact on HHR workforce across the country. There are increased numbers of interprofessional PHC teams that have been established across Canada which are designed to increase access to care and improve continuity and coordination of healthcare services. Newer providers are slowly becoming more integrated into PHC with training programs that have been substantially expanded for family physicians, midwives, and NPs across the country. Moreover, the use of blended funding mechanisms has increased substantially, allowing for better alignment with health system goals such as supporting the development of appropriate infrastructure and provision of priority services. (46) There is still ample room for improvement in strengthening the PHC workforce by introducing greater inter-professional care for targeted populations, reform of reimbursement system, and transformation of PHC practice through alternate modes of service delivery (e.g. group medical visits, telephone and email consultations), increased focus on those who have the highest risk of the health care system not being able to meet their health care needs. Moreover, transformation of PHC needs increased investment in supportive structures such as increased interprofessional collaboration, intersectoral partnerships, and an electronic patient health record.
## Table 1: Selected Examples of Primary Healthcare Models Across Canada

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>Professional Fee-for-service solo or group providers</th>
<th>Provincial/Regionwide</th>
<th>Divisions of Family Practice</th>
<th>Professional Fee-for-service solo or group providers</th>
<th>Management</th>
<th>Physician Remuneration</th>
<th>Patient’s Enrollment</th>
<th>Multidisciplinary Teams</th>
<th>Vision</th>
<th>Responsibility</th>
<th>Context of Change</th>
<th>Local Health Authorities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure</td>
<td>Private</td>
<td>Private</td>
<td>Private</td>
<td>Private</td>
<td>Public</td>
<td>Fee-for-service, salary</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Community</td>
<td>Transformations of primary care based on quality based funding and educational programs.</td>
<td>14 Local Health Integration Networks and 31 Public Health Units. Telehealth services also available 24/7.</td>
</tr>
<tr>
<td>Governance</td>
<td>Public agreements with local authorities and ministry</td>
<td>Public Virtual network of providers</td>
<td>Public Virtual network of providers</td>
<td>Public Virtual network of providers</td>
<td>Public Virtual network of providers</td>
<td>Fee-for-service, quality based funding and pay for performance</td>
<td>Yes Collaborative Practice</td>
<td>Yes</td>
<td>Yes</td>
<td>Individually</td>
<td>Numerous and far-reaching initiatives with organizational models of primary care. Favourable economic climate and physician dissatisfaction.</td>
<td>95 Local Service Network (divided between 16 Regional Health Authorities) headed by a CEO, and including residential and long-term care centres, CHCs, general and specialized hospitals and primary care providers such as FMMs. Telehealth services also available 24/7.</td>
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References


7. Weinberger M, Oddone E, Henderson W. Veterans affairs cooperative study group on primary care and hospital readmission. Does increased access to primary care reduce hospital readmissions? Medical Care 1996;334


32. Clair M. Commission d'etude sur les services de sante et les services sociaux: les solutions emergentes, rapport et recommentaions. Quebec: Gouvernement du Quebec; 2000


47. Grimard D, Levesque J-F, Pineault R. Forum on Knowledge synthesis and exchange on the impact of primary care organizational models and contexts. Montreal, QU: Equipe Sante des populations et services de sante; 2010


53. Tregillus V, Cavers W. General practice services committee: improving primary care for BC physicians and patients. Healthcare Quarterly 2011;14(special issue)


56. Cook L, Kokesch A, Heninger N, et al. Regional average of clinical indicators from Chinook Primary Care Network: results from four years of measurement. Primary Care Initiative Forum; 2010


59. Starfield B, Mangin D. An international perspective on the basis of payment for performance. Quality in Primary Care 2010;18:399-404


63. Lavoie J. Governed by contracts: the development of indigenous primary health services in Canada, Australia, and New Zealand. Journal of Aboriginal Health 2004;1:6-24


Full-service family physicians are general practitioners who provide primary care throughout patients’ life span. They coordinate care and maintain longitudinal, comprehensive patient records. Services include: health risk assessments, referrals to specialists and follow-up care, primary reproductive care, prenatal, obstetrical, postnatal, and newborn care, primary palliative care, patient education and preventive care, clinical support for hospitals, home care, and rehabilitation and long-term care facilities, care and support of the frail elderly, chronic disease management, diagnosis, treatment, and management of acute ailments. (Mazowita & Cavers, 2011)