Interprofessional Teams in the Context of Primary Care Reform in Ontario, Canada: Selection Factors and Association with Access to Care and Health Services Utilization

by

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A thesis submitted in conformity with the requirements for the degree of Doctor of Philosophy (Health Services Research)

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Abstract

Background: Countries throughout the world have been exploring new models to deliver primary care. Ontario has undergone a primary care reform that includes the introduction of interprofessional teams. The purpose of this thesis was to investigate the association between receiving care from interprofessional versus non-interprofessional primary care teams and access to care and health services utilization. The first study investigated selection factors into interprofessional teams. The second and third studies compared interprofessional teams and non-interprofessional teams on access and health services utilization measures.

Methods: The three studies linked provincial administrative datasets (second study included a provincial healthcare experience survey as well) to assess outcomes of interest over time. The first study was cross-sectional and the last two were retrospective cohort studies.

Results: The first study identified that there are selection factors into interprofessional teams. The second study findings highlighted that as compared to Health Care Experience Survey respondents in non-interprofessional teams, respondents in interprofessional teams self-reported more timely access to care and less walk-in clinic use but no significant difference in self-reported access to after-hours care and emergency department use. The third study found that there was no difference in the change over time in Ambulatory Care Sensitive Conditions admissions and all cause hospital re-admission between interprofessional and non-interprofessional teams between the pre- and post-implementation periods.

Conclusion: Ontario has made a major investment in interprofessional team-based care. The findings from this thesis indicate that there are selection factors into interprofessional teams. Interprofessional teams perform better than non-interprofessional teams on some but not all investigated processes and outcomes of care. Our findings can inform other jurisdictions aiming to expand voluntary participation in interprofessional primary care teams regarding expectations about the relationship between primary care policy, organization and delivery and patient experience and health services utilization.

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I would like to dedicate this thesis to my family:

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Chapter 1. Introduction

1.1 Overview and Thesis outline

This thesis assesses the relationship between the introduction of interprofessional primary care teams in Ontario and access to care and health services utilization. More specifically, the assessment occurred within the dominant blended capitation patient enrolment models in Ontario: Family Health Organizations (FHOs), which will be referred to as "physician group" in this thesis. Within these FHOs, the assessment compared two groups to each other: FHOs that became Family Health Teams (FHTs), which provide interprofessional team-based care, and FHO's that did not become interprofessional teams. The thesis comprises three connected studies.

The first study investigated the characteristics associated with becoming an interprofessional team. It then compared physician group, physician and patient characteristics among early and late adopters of interprofessional primary care teams. The results from this study informed the next two studies in terms of selection factors to interprofessional teams that should be considered while investigating the different outcomes of interest.

The second study investigated differences in patient self-reported timely and after-hours access to care, walk-in clinic visits and emergency department use between interprofessional to non-interprofessional teams. The hypothesis was that interprofessional teams have more timely and easier after-hours access to care, less walk-in clinic use and fewer emergency department visits compared to non-interprofessional teams.

The third study compared ambulatory care sensitive conditions hospital admission and all cause hospital readmissions between patients cared for by interprofessional and non-interprofessional teams, with a focus on multi-morbid patients. The hypothesis was that teams are better positioned to care for multi-morbid patients resulting in fewer hospital admissions and readmissions among the population of interest.

1.2 Primary health care versus primary care

In theory and practice, the terms Primary Care (PC) and Primary Health Care (PHC) are often used interchangeably but describe different concepts.

In 1978, the World Health Organization brought the discussion of PHC to the forefront at the International Conference on Primary Health Care convened at Alma-Ata, in the former Union of So

viet Socialist Republic of Kazakhstan. The Alma-Ata declaration defined PHC as the "essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation, and at a cost that the community and country can afford to maintain at every stage of their development in the spirit of self-reliance and self-determination." The declaration added that primary health care is "the first level of contact for the individual, family and community with the national health system bringing health care as close as possible to where people live and work, and constitutes the first element of a continuing health care process."[1, 2]

In Canada, it is accepted that PC and PHC are two distinct concepts. Health Canada defines PHC as an approach to health and a spectrum of services beyond the traditional health care system. It includes all services that play a part in health, such as income, housing, education, and environment. PC is the element within PHC that focuses on health care services, including health promotion, illness and injury prevention, and the diagnosis and treatment of illness and injury.[3]

The late Barbara Starfield, a noted health services and policy researcher, defined PC as "that level of a health service system that provides entry into the system for all new needs and problems, provides person-focused (not disease-oriented) care over time, provides care for all but very uncommon or unusual conditions, and integrates care provided elsewhere by others."[4] While commenting on the difference between PHC and PC, Muldoon et al. recommended using the term "primary care" to refer to clinical services delivered to individuals, whereas the term "primary health care" should be reserved to describe an approach to health policy and services provision of public-health-type functions that are derived from the core principle articulated by the WHO Alma-Ata declaration. In line with those definitions, this thesis was focused on primary care and investigated the research questions using this lens.

1.3 The focus on primary care and its contribution to the health care system

Primary care is considered the cornerstone and point of entry to any health care system. A robust primary care system is recognized to be associated with improved health outcomes, greater satisfaction and lower cost.[5,6] It is worth noting that more recent evidence from Europe suggests that strong primary care systems are linked to better population health but also to higher health spending and slower growth of overall expenditures.[7]

Studies consistently show a relationship between better primary care physician supply and health outcomes, measured by all-cause mortality, heart disease mortality, stroke mortality, low birth weight, life expectancy and self-rated health.[8,9,10,11] Consistent with its relationship with better health outcomes, a higher supply of primary care physicians is associated with lower cost of health services, likely due to improved preventive care and lower hospitalization rates.[12,13,14,15,16] Also, primary care has been shown to help reduce disparities in health. Higher ratios of primary care physicians per population are associated with relatively greater effects in deprived areas.[17,18,19,20,21] Similarly, studies in developing countries show considerable potential for primary care to reduce disparities associated with economic deprivation.[22,23]

In their research into the impact that primary care has on overall system performance, Starfield, Shi and Macinko concluded that "a greater emphasis on primary care can be expected to lower the costs of care, improve health through access to more appropriate services and reduce inequities in population's overall health."[24] In this same research, Starfield et al. also showed that internationally, primary care is associated with a more equitable distribution in population health. The beneficial impact of primary care was explained through six mechanisms: "(1) greater access to needed services, (2) better quality of care, (3) greater focus on prevention, (4) early management of health problems, (5) cumulative effect of the main primary care delivery characteristics, and (6) the role of primary care in reducing unnecessary and potentially harmful specialist care."[23]

1.4 Primary care reform in Canada

Many industrialized countries invested in improving their primary care system during the 1980s and 1990s.[25] However, during the 1990s, federal and provincial governments in Canada faced fiscal challenges and an economic recession. This led to constrained health care spending, limited investment in primary care innovation, and failure to address the lack of infrastructure in areas of information technology, staffing and quality improvement.[26] As a result, primary care infrastructure suffered during that period and limited patients' access to primary care.[24] The dominant model of primary care across Canada has been physicians practicing solo and in small groups, and largely reimbursed through fee-for-service.[27], In 2000, a new policy environment started to emerge favouring primary care reform, aligned with the recommendations of various federal and provincial reports.[28,29] As a result, funding, organization and delivery of primary care emerged as priorities for federal, provincial and territorial governments.

On September 11, 2000, First Ministers agreed that "improvements to primary health care are crucial to the renewal of health services" and emphasized the importance of team-based care. In response, the federal government established a Primary Health Care Transition Fund (PHCTF) of $800 million. The fund supported provinces to introduce new approaches to primary health care delivery over a six-year period (2000-2006). All governments agreed on five common objectives of the PHCTF: "1) to increase the proportion of the population with access to primary health care organizations which are accountable for the planned provision of comprehensive services to a defined population; 2) to increase the emphasis on health promotion, disease and injury prevention, and chronic disease management; 3) to expand 24/7 access to essential services; 4) to establish multi-disciplinary teams, so that the most appropriate care is provided by the most appropriate provider; and 5) to facilitate coordination with other health services (such as specialists and hospitals)."[30]

In 2003, the First Ministers Health Accord resulted in a federal investment of $16 billion in the Health Reform Fund, which was targeted at primary health care, home care and catastrophic drug coverage. Building from this agreement, governments in different provinces began taking measures designed to improve the quality, accessibility and sustainability of the public healthcare system. The goals and objectives of the provinces and territories for primary care reform touched on recurrent themes include[31]: improved access to primary care services, better coordination and integration of care, improved quality and appropriateness of care, greater emphasis on patient engagement and self-management and the implementation and use of electronic medical records. A central part of the reform initiative has been the promotion of primary care groups and networks in most provinces and territories, initiatives in Quebec, Alberta and Ontario.[32] Also, several provinces have implemented blended payment arrangements that combine fee-for-service with capitation or incentives payments. The main differences in primary care reform across provinces and territories relate to physician payment, type of primary care providers included in the model, governance type, enrolment type, degree of patient self-management emphasis, extent of quality improvement support, scope of services provided, nature of the population being served and approach to planning and delivering services.[33]

In the 2003 First Ministers Health Accord, provinces and territories agreed to the goal that 50% of Canadians would have access to an appropriate primary care provider 24/7 by 2011. Subsequently, in 2004, during their meeting on the future of health care, the First Ministers specified the goal as 50% of Canadians having 24/7 access to primary care teams by the year 2011. Since then, many provinces in Canada have moved towards team-based models to deliver primary care services in a more integrated

approach by increasing the number of primary care providers, including primary care physicians, nurse practitioners and midwives. These increases were made possible by changes in licencing requirements and regulations for non-physicians, and new training opportunities, including offering primary care physicians training to integrate with other providers.[34] Although interprofessional primary care teams are being implemented across several provinces, only Alberta, Quebec and Ontario have made substantial progress on meeting the First Ministers' goal of providing 50% of Canadians access to multi-disciplinary teams by the year 2011.[29]

1.5 Primary care delivery and funding models in Ontario

Since 2000, Ontario has undergone three major policy initiatives: new physician reimbursement and organizational models, patient enrolment with a primary care provider and support for interprofessional team-based care.[24]

New primary care delivery and funding models have been described in detail.[35] The following table from Hutchison and Glazier 2013 provides a snapshot of the different organization and funding models in Ontario.

Table 1.1: Primary Care Organizational and Funding Models

MODEL (year introduced)	Community Health Centre (1979)	Family Health Network (2002)	Family Health Group (2003)	Rural and Northern Physician Group Agreement (2004)	Comprehensive Care Model (2005)	Family Health Team (2005)	Family Health Organization * (2007)	Blended Salary Model (2007)	Nurse Practitioner-Led Clinic (2007)
PHYSICIAN REIMBURSEMENT	salary	blended capitation	blended fee-for-service	blended salary	blended fee-for-service	blended capitation or blended salary	blended capitation	blended salary	salary (nurse practitioners)
TARGETED FINANCIAL INCENTIVES	no	yes	yes	yes	yes	yes	yes	yes	yes
FORMAL PATIENT ENROLMENT	no	yes	yes	yes	yes	yes	yes	yes	yes, to clinic
MINIMUM GROUP SIZE	none	3 physicians	3 physicians	1 physician	1 physician	3 physicians	3 physicians	none	none
GOVERNANCE	community board	physician-led	physician-led	physician-led	physician-led	physician-led or community board or mixed	physician-led	community board	provider and community board
INTER-PROFESSIONAL TEAM MEMBERS	yes	yes, limited	yes, limited	no	no	yes	yes, limited	yes	yes
AFTER-HOURS CARE REQUIREMENTS	yes	yes	yes	yes	optional	yes	yes	yes	yes

* Created through the harmonization of two pre-existing models: Health Service Organizations (introduced in 1978) and Primary Care Networks (introduced in 1999).
Source: Ontario Ministry of Health and Long-Term Care

(Source Hutchison & Glazier 2013)

This thesis has taken a novel approach to assessing interprofessional team-based care by focusing on the major blended capitation funding model: Family Health Organizations (FHOs). This focus provided a better understanding of the contribution of interprofessional teams in relation to the quality of care provided. Family Health Networks (FHNs), the other blended capitation model available in Ontario, is an older and smaller model and is not part of this thesis. We chose to focus on one core funding model to eliminate differences in physician payment arrangements when comparing interprofessional teams to non-teams.

FHOs as a patient enrolment model were established in 2006 to harmonize the former Primary Care Networks (PCNs) and Health Services Organizations (HSOs) as part of the models' reform and this model was subsequently made available to all primary care physician groups. FHOs are physician-governed group practices with a minimum of three primary care physicians. Physicians in this model commit to provide a defined set of services and are required to provide after-hours access to care. After-hours care is provided through telephone triage and on-call services.

Physicians in FHOs are paid based on a blended capitation and fee-for-service model. Physicians receive an annual age- and sex-adjusted capitation payment with an average base rate originally set at $126.04.[36] There is no FFS limit for a group in the group's first year. After the first year, the FFS limit for the group's services is currently set at $55,950 per doctor per group for "in-basket" services provided to non-rostered patients. For "out-of-basket" services, there is no limit to FFS payments. Physicians in FHOs receive an access bonus calculated at 18.59% of the base rate, paid monthly. The access bonus is reduced if an enrolled patient receives in-basket services from a primary care physician outside of the group. FHOs receive funding for an administrator but are not required to employ non-physician health care providers. FHOs were offered the opportunity to apply for additional funding and become a FHT throughout several waves of interprofessional team[37] formation between 2005 and 2012.[38,39]

Since then, 184 FHTs have been operationalized to serve over 3 million Ontarians across 200 communities.[40] Applications for new FHTs have not been open since 2010. FHT is an interprofessional team model financed through global block grants which are separate from physician compensation. Applications to become FHTs were available for groups of physicians who were part of a harmonized model, such as FHOs and FHNs, and blended salary models .[35]

FHTs were built on the assumption that different disciplines bring a blend of skills and expertise in a coherent setting to enrich the care of the patient, who is also an integral member of the team.[41] FHT governance can be community-based, provider-based or a mix of both, with a small proportion of community-based FHTs governed by community boards. Collaborative care in a FHT occurs through the day-to-day contact between different providers from multiple disciplines which include family physicians, nurse practitioners, registered nurses, mental health counsellors, dietitians, pharmacists, social workers, peer support workers and other health professionals. FHTs offer a core set of comprehensive primary care services to their enrolled population. They focus on chronic disease management, health promotion and disease prevention activities in collaboration with community-based organizations. Determinants of health are a priority in community sponsored FHTs that are based on blended salary but are not necessarily a priority in blended capitation models.[35]

1.6 International evidence on team-based care and FHTs in Ontario

There is a flourishing body of evidence on interprofessional team-based care internationally. The National Academy of Medicine (formerly known as the Institute of Medicine) defined interprofessional team-based care as "...the provision of health services to individuals, families, and/or their communities by at least two health providers who work collaboratively with patients and their caregivers—to the

extent preferred by each patient to accomplish shared goals within and across settings to achieve coordinated, high-quality care."[42]

Many developed countries have adopted interprofessional primary care teams internationally (such as the Patient-centered medical home in the United states and the primary care home in the UK) and nationally (Quebec Family Medicine Groups, Alberta Primary Care Networks). Based on what defines interprofessional team-based care, Family Health Teams in Ontario mirror the principles of patient-centered medical home—personal physician; physician-directed medical practice; whole-person orientation; care coordination and integration; quality and safety; enhanced access; and payment recognizing added value provided to patients.[43] A typical FHT includes at least three family physicians and an interprofessional team that provides a broad range of services with extended access hours. Physicians sign a contract with the Ministry of Health to provide a basket of services based on a renumeration package. Services provided focus on patient advocacy and coordination of care. Physician payment is based on age- and sex-based capitation.[44]

In the literature, on one hand, team-based primary care is positioned to provide many benefits. Expanded accessibility to services and less wait time; additional scope of services such as self management support and educational behavioral health; skills mix of professionals with job duties matching their abilities; and enhanced job satisfaction. Larger interprofessional teams can boost quality improvement and problem solving.[45,46,47,48,49] Evidence from Australia suggest that interprofessional collaboration can improve the quality of care delivered to patients and reduce hospital admissions.[50] On the other hand, Peikes et al. in 2012 reviewed 498 studies from the United States on patient-centered medical homes. The systematic review was inconclusive around the effectiveness of the medical home model.[51] In Norway, interprofessional team members were found to play an important role in delivering mental health services. The qualitative focus group study concluded that team members such as nurses, psychologists, pharmacists, case managers can help primary care physician in delivering better services to patients when coupled with right coordination.[52]

A systematic review that covered studies from Canada, United Kingdom, Australia and New Zealand identified key features for effective interprofessional team-based care—shared space, common vision/goals, clear roles definitions and leadership.[53]

In Ontario there has been a growing body of evidence around the association between interprofessional team-based care and quality of care. The next section will provide an overview of that evidence.

1.7 Ontario-specific studies on team-based care

Several studies have been conducted to date to assess and evaluate team-based care in Ontario. In this section, we review relevant studies conducted in Ontario's context starting with the most recent.

Kiran et al. 2015 evaluated the relationship between physician payment reform and chronic disease management and prevention. This population-based longitudinal evaluation used data from administrative databases between 2001 and 2011 in Ontario, comparing team-based capitation to non-team-based capitation to enhanced fee-for-service. The authors concluded that the transition to capitation payment and team-based care were associated with moderate improvements in processes related to diabetes care, but the effects on cancer screening were less clear.[54]

Glazier et al. 2015 compared characteristics of FHT patients in relation to other major models of primary care over time in Ontario. The study found that FHTs and other capitation models have somewhat wealthier and healthier population than other models of care. FHTs were found to be mainly in non-major urban centres and serving few recent immigrants. Similar to previous findings, Community Health Centres (CHCs) were found to serve more low-income newcomers in line with their mandate to provide access to care for disadvantaged people. Health care utilization increased over time with minimal differences across the different models of care. FHTs were found to improve over time on cancer screening and diabetes care – more than fee-for-service models but not consistently more than other blended capitation models or CHCs.[55]

Kiran et al. 2014 evaluated a large-scale pay-for-performance scheme introduced in Ontario in 2006 aimed at improving cancer screening in primary care. They conducted a longitudinal analysis using administrative data from 1999/2000 to 2009/2010. The results did not find significant change in screening rates after the incentives were introduced. The results showed that colon cancer screening was increasing at a rate of 3.0% per year before the incentives were introduced and 4.7% per year after the incentives began. The cervical and breast cancer screening rates did not change significantly from year to year before and after the incentives were introduced. The authors concluded that policymakers should consider other strategies for improving rates of cancer screening, since there was little or no improvement with the pay-for-performance scheme, despite substantial expenditures associated with it.[56] A study by Hurley et al. in 2011 assessing the same pay-for-performance scheme compared physicians practicing in all primary care reform models to those practicing in traditional FFS practices. The study examined if performance-based incentive payments for five preventive services increased provision of these services within the eligible population. Using a difference in differences design the

study period covered years 1998-99 to 2017-08. Contrary to Kiran et al. 2014, the results indicated that the incentives were related to an increase in the provision of four out of the five preventative care services – senior flu shot, Pap smear, mammography and colorectal cancer screening. [57,58]

Another study by Kiran et al. in 2014 examined the association between Ontario's different primary care models and the receipt of recommended testing for patients with diabetes. The results showed that people with diabetes enrolled in a non-team blended capitation model and those enrolled in a team-based blended capitation model were more likely to receive an optimal number of the three recommended monitoring tests than those enrolled in a blended fee-for-service model. Patients assigned to the traditional FFS model were least likely to receive optimal monitoring compared to those enrolled in blended fee-for-service model. The biggest gap was seen among patients not enrolled in any primary care model.[59]

The Conference Board of Canada conducted an external evaluation of Family Health Teams in Ontario in 2014. The evaluation demonstrated that FHTs have achieved improvements at the organizational and service-delivery levels. Changes in terms of patient experience and outcomes were not evident at that time.[60]

Glazier et al. in 2012 examined if there are differences in Ontario's primary care models in terms of people served and their use of emergency department. Administrative databases and Community Health Centres' electronic-record encounter data were used to explore sociodemographic composition, case mix and emergency department use among CHCs, blended fee-for-service groups (FHGs), blended capitation models (FHNs/FHOs), FHTs and other smaller models combined. The results showed that CHCs had lower-than-expected emergency department rates in both rural and urban areas, even though they cared for disadvantaged, sicker patients. Capitation models were found to serve more advantaged populations and had higher emergency department rates than expected. Ontarians not belonging to a model of care had higher-than-expected emergency department use, possibly reflecting difficulties in accessing primary care.[61]

Liddy et al. in 2011 evaluated and compared preventive cardiovascular disease care in different family practice models, namely fee-for-service, blended capitation and Community Health Centres (team-based care). The results showed that overall quality of diabetes care was higher in Community Health Centres, while smoking cessation care and weight management were higher in the blended-capitation models. The fee-for-service model had the poorest performance, noticeably in diabetes care and weight

management. The authors concluded that the findings from this study support the primary care reform decision to move away from the traditional fee-for-service model towards team-based care.[62]

This review of literature that focused on studies that assessed the relationship between the introduction of interprofessional team-based care in Ontario and quality of care highlight two gaps in the literature. First, all studies compared interprofessional team-based care to other models of care that are based on a different physician payment arrangement. Those different models of payment comparisons present a limitation in firmly assessing the interprofessional effect on the different quality domains that have been investigated in these studies because the relationship is confounded by differences in payment method. Second, none of the studies to date have looked at patient and physician selection factors into interprofessional teams that could explain processes and outcomes variation that were under investigation. Work by Rudoler et al. 2015 examined selection factors into payment models (but not interprofessional teams) – fee for service, enhanced fee for service, and blended capitation. The results showed that primary care physicians self-select into payment models based on existing practice characteristics where those with more complex patient populations were less likely to switch into capitation-based payment models.[63]

To address these issues, this thesis focused on one funding model—the Family Health Organization—while comparing interprofessional to non-interprofessional teams. The first study in this thesis investigated selection factors into interprofessional teams before investigating processes and outcomes in the two subsequent studies.

1.8. Conceptual framework

Identifying a conceptual framework was necessary to guide the design and connect the three investigated studies to the general theme of the thesis. Based on a scoping review of potential frameworks, the Donabedian framework was recognized as suitable to guide this thesis.

The scoping review was conducted using main research engines (Google Scholar and PubMed) and identified the main conceptual frameworks that could serve the health services research questions at hand. Using the key terms conceptual framework(s), primary care, primary health care, evaluation, we came across a number of conceptual frameworks that can serve the design and framework of this thesis.[64,65,66,67,68,69]

Many of the identified frameworks were either too high-level[70] or too specific with an extensive number of variables to measure.[71] Some of the frameworks were relevant to the topic being explored but were

more evaluation oriented.[72,73] Although the Donabedian framework was old, it landed itself as appropriate framework to guide this work.

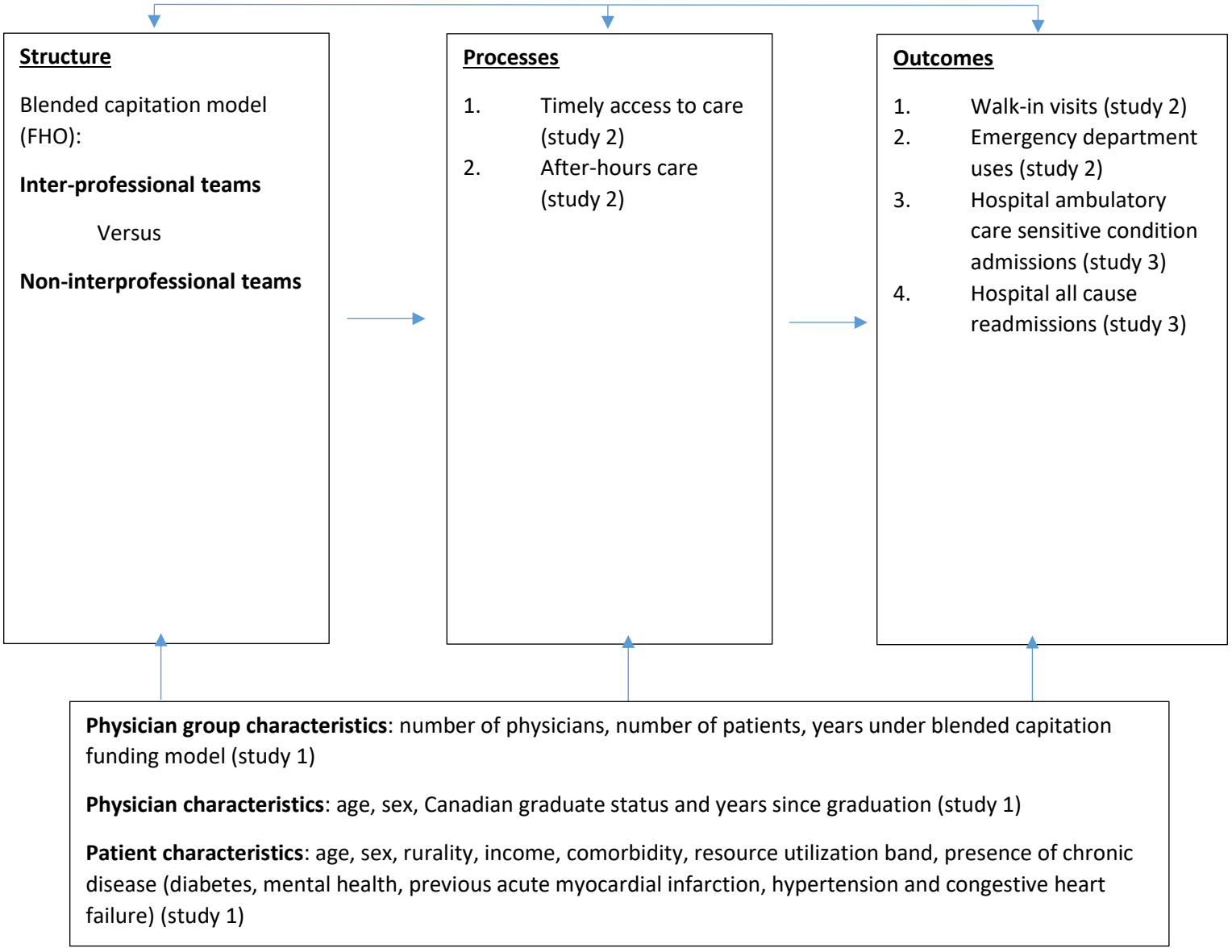
In his classic 1997 paper, Avedis Donabedian suggested a new approach to assess quality of care by drawing information from three main domains – structures, processes and outcomes. Investigating the relationship between the three components of the framework provides the chance to comprehensively assess quality of care. Structure refers to the setting in which care is delivered and includes materialistic resources such as human resources, equipment and reimbursement. Process refers to the transactional process of providing and receiving care between providers and patients. Providers' activities include diagnosis and recommending treatment. Patients' activities refer to the process of seeking and receiving care, and implementing recommended treatments. Outcomes refers to the results of care including improvement in patients' knowledge, health status and degree of satisfaction with care.[38]

The underlying theory that links the three components of quality implies that good structures are linked to improved processes and good processes increase the likelihood of good outcomes. However, processes and outcomes of care are often subject to patients and environmental factors. To address this issue, an extended Donabedian framework that includes environmental factors has been used in the health services research literature.[74] To that end, the extended Donabedian framework that guided this thesis included physician group, physician and patient characteristics to assess relationships between structures, processes and outcomes of care.

Being an interprofessional team is the structure that is believed to be associated with improved processes of care and better outcomes. The first study investigated selection factors to transition to an interprofessional team structure and covered physician group, physician and patient characteristics. The improved structure of interprofessional teams implies more resources (allied healthcare professionals) that can deliver care. In terms of processes, the second study investigated the relationship between being an interprofessional team and timely access to care and after-hours care. The second study also assessed the differences in two health services utilization outcomes— patient visits to walk-in clinics and emergency department use. The enhanced structure of interprofessional teams is though to be linked to enhanced ways to deliver care where allied healthcare professionals can free some of the physicians time to focus on core medical activities and offer extended services that enhances the scope and quality of processes to deliver care. The third study focused on investigating the relationship between having the structure of an interprofessional team and unplanned hospital admissions for ACSCs and hospital all

cause readmissions among multi-morbid patients. As a result of the enhanced structure of interprofessional teams, the improved processes of care are hypothesised to be linked to improved outcomes. Figure 1 below shows an outline of the adopted framework.

Figure 1.1: Conceptual framework



Chapter 2. Study 1: Physician Group, physician and patient characteristics associated with joining interprofessional team-based primary care in Ontario, Canada.

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2.0 Abstract

PURPOSE: Countries throughout the world have been experimenting with new models to deliver primary care. We investigated physician group, physician and patient characteristics associated with voluntarily joining interprofessional team-based primary care in Ontario.

METHODS: This cross-sectional study linked provincial administrative datasets to form data extractions of interest over time with the earliest in 2005 and the latest in 2013. We generated mixed, generalized chi-square and multivariate models to compare the characteristics of teams and non-teams, both with blended capitation reimbursement, and to examine characteristics associated with joining a team.

RESULTS: Having more physicians per group, being a female physician, having more years under the blended capitation model, having more patients in the lowest income quintile and more patients residing in rural areas were positively associated with joining an interprofessional team. Being a female physician and having more patients who are males, recent immigrants and living in rural areas were positively associated with the outcome of joining interprofessional teams in the late phase.

CONCLUSIONS: Our study findings indicate that there are differences in physician group, physician and patient characteristics when comparing interprofessional teams to non-interprofessional teams. Other jurisdictions aiming to expand physician participation in interprofessional care should note those factors. Researchers looking to understand the impact of interprofessional team-based care should be aware of pre-existing differences and the need to address selection bias associated with participation in team-based care.

KEYWORDS: Primary care reform, interprofessional team-based care, multi-disciplinary primary care, policy development, Canada

2.1 Introduction

A strong primary care sector is the cornerstone of a high performing health system and has been linked to better health outcomes, lower cost and fewer inequities [1].[75] Around the world, countries have introduced reforms to improve delivery of primary care. In Canada, the establishment of interdisciplinary primary care teams was an objective of national reform in the early 2000's [2].[76] Ontario's reform included options for primary care physicians to transition from fee-for-service to blended capitation and apply for additional funding for additional health professionals to join their practice.

During the last two decades, more than one third of primary care physicians have voluntarily transitioned from traditional fee-for-service practice to blended capitation payment and in some cases received additional funding to support interprofessional team members. These teams are "groups of professionals from different disciplines who communicate and work together in a formal arrangement to care for a patient population in a primary care setting [77][3]." They typically include primary care physicians and nurses or nurse practitioners and at least one allied health care professional such as pharmacist, social worker or dietitian. Teams are also eligible for funding an administrator or executive director and electronic medical records. These models are described in detail elsewhere [4].[78] There are many similarities between Ontario Family Health Teams, Quebec Family Medicine Groups, Alberta Primary Care Networks and the Patient-Centered Medical Home in the United States [5-7]. [79,80,81] Effective interprofessional teamwork is regarded as essential to realize improvement in care through better communication, reducing error, and enhancing the delivery of patient care [8-9].[82,83] Several studies conducted in Ontario have compared capitation-based interprofessional teams to other funding and delivery models of care on specific measures of quality [10-16].[84,85,86,87,88,89,90] However, only physicians participating in specific funding models—blended capitation or blended salary—were eligible to apply to the Ontario Ministry of Health and Long-Term Care and have their application accepted to become interprofessional teams. To date, no studies have examined selection factors associated with joining interprofessional teams. The first objective for this study was to assess if physician group, physician and patient characteristics are different between physician practices that joined inter-professional teams and those who did not. The second objective was to examine if physician group, physician and patient characteristics were different between early and late adopters of interprofessional teams. To our knowledge, this is the first study in Canada that focused on one funding model within which interprofessional teams are compared to non-teams. Additionally, our study generated evidence

on early and late adopters of interprofessional team-based primary care. Lessons learned from this large-scale primary care reform initiative will be relevant to other jurisdictions aiming to innovate in primary care delivery and adopt team-based care.

2.2 Methods

2.2.1 Setting

The setting for this study was Ontario, Canada, the country's most popular province with a population of 14.3 million people in 2018 [17].[91] Permanent residents of Ontario are fully insured for primary care services through the Ontario Health Insurance Plan (OHIP) with no co-payments or deductibles. Primary care organization and payment has shifted over the course of the last 17 years. In 2002, most of primary care physicians billed fee-for-service and worked independently. Today, most physicians are paid through some form of blended payment and many are part of an organised model with formal patient enrolment. The three dominant practice models in Ontario are: non-group enhanced fee-for-service (85% fee-for-service, 15% capitation and bonuses, no funding for non-physician health professionals); group practices with team-based blended capitation (20% fee-for-service, 80% capitation and bonuses, and funding for non-physician health professionals), and group practices without team blended capitation (20% fee-for-service, 80% capitation and bonuses, no funding for non-physician health professionals). Approximately one in six Ontarians is not formally enrolled to a physician practicing in a new model [18].[92] The focus of this study was on group practices in the dominant blended capitation model—Family Health Organization (FHO)—within which physicians can be practicing in either interprofessional teams or a more traditional family practice (non-interprofessional teams). FHO groups have formal patient enrollment, electronic medical records, physician-led governance and a minimum of three physicians practicing together. They offer comprehensive care, including preventive health care services, chronic disease management and health promotion, through a combination of regular physician office hours and after-hours services.

2.2.2 Study design and patient population

Several population-based administrative databases were linked using unique encoded identifiers at ICES (formerly known as the Institute for Clinical Evaluative Sciences) to form data extractions of interest with the earliest in 2005 (first year before teams' formation) and the latest in 2013 (last year of teams' formation). To address the first objective—comparing teams to non-teams—we compared these two groups shortly after all teams had formed, which was by March 31st, 2013. To address the second objective, we compared early to late adopters of teams. Early teams were defined as ones that formed

in the first three waves of team formation which occurred between 2005 and 2009 and were identified on March 31st, 2009. Late team adopters were defined as teams that formed in the last two waves of team formation that occurred between 2009 and 2013 and were identified on March 31st, 2013. Early teams' characteristics were identified on March 31st, 2007, the mid-point of early team formation while late teams' characteristics were identified on March 31st, 2011, the mid-point of the late team formation period (See Figure 1).

The study population included all practicing primary care physicians in Ontario and all Ontarians eligible to receive health care who could be assigned by roster or usual source of care to primary care physicians within each specified annual data extraction between March 31st, 2005 and March 31st, 2013. The population of physicians compared included only physicians paid by the same funding model (blended capitation). The study population excluded individual with invalid OHIP coverage, invalid gender or date of birth; people <18 or >105 years old; people with OHIP eligibility but no health care use within 5 years; physicians who had been in practice for less than two years. The study was approved by the Research Ethics Board at the University of Toronto.

2.2.3 Measures and data sources

The primary outcome was joining an interprofessional primary care team. The secondary outcome was joining an interprofessional primary care team in the late versus early phase.

Group characteristics included the number of physicians and patients. Information on the number of rostered patients was obtained through a registry of patient enrolment in primary care groups available at ICES. Non-rostered patients who received services from a FHO were virtually rostered to a family physician who billed the largest dollar amount of core primary care services for that patient.

Physicians characteristics included age, gender, years since graduation, Canadian graduate status and number of years under the blended capitation model. Those variables were derived from a health care providers data registry available at ICES.

Patients characteristics included age, gender and recent OHIP registration as a proxy for immigration which were captured in a population and demographics data registry available at ICES. Neighborhood income quintiles were derived by linking patient postal codes to census data. Income levels, adjusted for household size and specific to each community, were used to order postal codes into quintiles, with quintile 1 having the lowest relative income and quintile 5 the highest. Rurality was identified using the Rurality Index of Ontario (RIO) [19].[93] The RIO is based on community characteristics including travel

time to different levels of care, community population, presence of providers, hospitals and ambulance services, social indicators and weather conditions. RIO scores range from zero to 100 (zero indicating the most urban and 100 the most rural). RIO scores are divided into three main categories, major urban centres (0 to 9), semi-urban centres (10 to 39) and rural areas (≥40). We used the Johns Hopkins Adjusted Clinical Groups (ACGs) case-mix system software to assign patients into expected Resource Utilization Bands (RUBs) categories [20].[94] The RUBs are a simplified ranking system of each person's overall sickness level, so that individuals who are expected to use the same level of resources are grouped together. They are based on all the diagnoses attributed to patients from physician claims, emergency department visits or hospitalizations in the past year. Individuals are assigned an RUB based on sorting their ACG value into one of six categories that range from 0 indicating no utilization to 5 indicating very high expected utilization.

2.2.4 Statistical analysis

We aggregated patient characteristics at the physician level because the decision to join an interprofessional team was a physician decision; patients joined with their physician.

For the descriptive results, we generated frequencies, means and standard deviations to describe the characteristics of teams and non-teams. To account for physicians clustering within groups when comparing differences between teams and non-teams and early versus late adopters of teams, we used mixed effects models and generalized/adjusted chi-square tests for continuous and categorical variables respectively (Tables 1 & 2) [21].[95] To examine the relationship between group, physician and patient characteristics and the outcome of joining an interprofessional team, we ran bivariate and multivariate logistic regression models where the outcome was binary—joining a team (yes/no)—and the independent variables were the respective group, physician and patient characteristics (Table 3). To examine the relationship between group, physician and patient characteristics and the outcome of joining an interprofessional team late versus early, we ran bivariate and multivariate logistic regression models where the outcome was joining an interprofessional team in the late period and independent variables were the respective group, physician and patient characteristics (Table 4). When random effects were not significant, ordinary least square logistic regression were used. All study analyses were conducted using SAS v.9.4 and statistical significance was assessed at a p-value <0.01 to account for the large number of comparisons in this study [22].[96]

2.3 Results

As of March 31st, 2013, there were 394 FHO physician groups of which 41.6% were interprofessional teams and 3,365 physicians of whom 47.2% were practicing in interprofessional teams. In this period, 4,269,506 patients were attributed to these groups, of whom 44.3% were assigned to physicians who practice in interprofessional teams. As compared to non-interprofessional teams, interprofessional teams had: more physicians per group (means=9.7 versus 7.7 for teams and non-teams, respectively p-value 0.01); fewer patients per physician (means=1,191.1 versus 1,338.3 for teams and non-teams, respectively p-value 0.0009); more physicians in the younger age category (<40 years old 5.3% versus 3.9% for teams and non-teams, respectively p-value 0.0064); more physicians that graduated from Canadian universities (84.0% versus 78.4% for teams and non-teams respectively p-value 0.0070); physicians with more years under a capitation funding model (means=4.7 versus 3.6 for teams and non-teams respectively p-value < 0.0001); physicians with fewer immigrant patients (means=4.2% versus 5.6% for teams and non-teams respectively p-value 0.0012); physician with fewer patients in the highest income quintile (income quintile 5 mean=22.3% versus 25.0% for teams and non-teams respectively p-value 0.0011); physicians with more patients that live in rural areas (means=13.1% versus 5.5% for teams and non-teams respectively p-value <0.0001); physicians with more patients with the highest level of expected health care use (means=5.6% versus 5.1% for teams and non-teams respectively p-value<0.0001). We did not find significant differences between interprofessional teams and non-interprofessional teams for the following variables: physician's sex, physician's years in practice, patient's sex and patient's age (see Table 1).

A total of 105 and 60 groups transitioned to interprofessional team-based care in the early and late time periods respectively. Early interprofessional teams included a total of 1,056 physicians with 1,295,104 patients and late teams included 480 physicians with 508,676 patients. As compared to early interprofessional teams, late interprofessional teams had: fewer patients per physician (means=1,066 versus 1,227.2 for late and early respectively p-value 0.0058); older physicians (>=65years old age category 7.9% versus 5.5% for late and early respectively p-value 0.0071). We did not find significant differences between early and late interprofessional team adopters for the following variables: number of physicians per group, physician's sex, and physician's country of graduation, physician's years in practice, patient's sex, patient's age, patient's recent immigration status, patient's income, patient's rurality and patient's expected resource utilization band (see Table 2).

When we examined the outcome of joining an interprofessional team while adjusting for physician group, physician and patient characteristics, we found that: for each additional physician per group, the likelihood of joining a team increased by 17% (OR=1.17 CI=1.14 to 1.21 p-value <0.0001); being a male physician decreased the likelihood of joining an interprofessional team by 32% (OR=0.68 CI=0.51 to 0.90 p-value 0.0082); for each one-year increase in the number of years under the capitation model, the likelihood of a physician joining an interprofessional team increased by 29% (OR=1.29 CI=1.24 to 1.35 p-value <0.0001); for each one percent increase in the percentage of patients in the lower income quintile, the likelihood of a physician joining an interprofessional team increased by 4% (OR=1.04 CI=1.02 to 1.05 p-value <0.0001); and for each one percent increase in the percentage of patients living in major cities, the likelihood of a physician joining an interprofessional team decreased by 2% (OR=0.98 CI=0.98 to 0.99 p-value <0.0001) (see Table 3).

When we examined the outcome of joining an interprofessional team in the late versus early phase while adjusting for physician group, physician and patient characteristics, we found that: being a male physician decreased the likelihood of joining a team in the late phase by 60% (OR 0.40 CI=0.26 to 0.60 p-value <0.0001); for each one percent increase in the proportion of male patients, the likelihood that a physician joined an interprofessional teams in the late phase increased by 4% (OR=1.04 CI=1.02 to 1.05 p-value <0.0001); for each one percent increase in the percentage of recent immigrant patients, the likelihood of a physician joining an interprofessional team in the late phase increased by 5% (OR=1.05 CI=1.02 to 1.07 p-value <0.0001); and for each one percent increase in the percentage of patients living in major urban cities the likelihood of a physician joining an interprofessional team decreased by 1% (OR=0.99 CI=0.98 to 0.99 p-value <0.0001) (see Table 4).

2.4 Discussion

We used administrative databases to assess if there were differences in group, physician and patient characteristics between those who became part of interprofessional teams and those who did not, and to compare early to late adopters. The multivariate results showed that having more physicians in the group, being a female physician, having more years under the blended capitation model, having more patients in the lowest income quintile and residing in rural areas were all positively associated with joining an interprofessional team. Being a female physician and having more patients who are males, recent immigrants and living in rural areas were characteristics positively associated with the outcome of joining interprofessional teams in the late versus earlier phase.

The larger group size association with joining an interprofessional team may be related to economies of scale in maximizing the benefits of interprofessional team. Having more years in practice under the blended capitation model among physicians who joined an interprofessional team may be attributed to new physicians who joined the non-team practices later in the study period. We found that geography influenced the decision of joining an interprofessional team. Physician in interprofessional teams had more patients in rural and semi-urban areas. Our results are in line with the findings by Glazier et al., 2009 who found that geography is closely tied to physicians' and patients' characteristics as well as the physicians' likelihood of joining new primary care models [12].[97] Our study results suggest that teams are caring for relatively poorer patient populations when compared with non-teams. Those results are not perfectly comparable to other Ontario studies that included more than one funding model in their comparison and found that teams have slightly wealthier populations than the Ontario population [15,16].[98,99] Our results are similar to evidence from Quebec that investigated physicians' and patients' characteristics associated with in Family Medicine Groups (FMG) and reported that FMG patients were more likely to be female, reside outside of an urban region, have a lower socio-economic status as compared to patients in non-team practices. Physicians who joined a FMG were less likely to be located in urban locations, had fewer years in medical practice and had patients with lower morbidity [5].[100]

Interprofessional team-based care has expanded considerably over that last 15 years in Ontario. Evidence regarding broader impact of primary care reform has started to materialise in multiple studies [14,23,24,25,26].[101,102,103,104,105] However, we should be careful in comparing our findings to other studies. By focusing on one funding model, our study presented the opportunity to examine team-based care using a finer lens. There are selection factors related to participating in a blended capitation payment model in Ontario, an important context worth acknowledging as we interpret our study results. The capitation formula in Ontario only accounts for patients' age and sex but doesn't account for complexity or social vulnerability. Hence, physicians with sicker patient populations paid through fee-for-service were less likely to select capitation-based payment, a pre-condition for participation in the team-based funding initiative. As a result, eligibility to join capitation was likely biased toward physicians with healthier patient populations. In fact, evidence from Rudoler et al., 2015 suggested that primary care physicians self-selected into payment models based on existing practice characteristics. Physicians with more complex patient populations were less likely to switch from fee-for-service to capitation-based payment models [27].[106] Kiran et al. found that a voluntary approach to transition to a medical home model risked leaving behind more deprived patients in Ontario [18].[107] Setting up appropriate system incentives at the time would have been prudent to help the reform objective in the most desired

direction. Given that physician participation in interprofessional primary care teams in Ontario has been conditional on being remunerated through blended capitation (adjusted for age and sex), our finding that physicians serving higher needs populations (rural, low income) are attracted to team-based practice, together with findings from earlier studies showing that physicians serving healthier, wealthier populations are attracted to the blended capitation model, highlights the need to consider physician selection factors when designing primary care reforms. In the Ontario context, a interprofessional team-based practice model targeting high needs populations, would likely benefit from a physician payment model based on remuneration through salary, needs-adjusted capitation, or a heavier weighting of fee-for-service and/or bonus payment elements in a blended capitation model.

Our study has limitations. First, administrative databases have not been originally set up for research purposes, which presented a potential for measurement error. However, many of the databases used in our study have been validated in the Ontario context. Additionally, any potential measurement error in patient or physician practice characteristics would likely be non-differential between teams and non-teams and would not bias the results in a meaningful way. Second, our study lacked a longitudinal approach. There may have been changes in group and patient characteristics between the time the physician transitioned to interprofessional team-based care and the point at which group and patient characteristics were measured. The essential challenge for adopting a longitudinal approach lay in the fact that the shift to team-based care happened at different points in time for different groups and physicians. However, we have addressed this limitation as much as possible by conducting multiple cross-sectional studies at different points in time where teams formed throughout the study period. Third, there was a potential presence of unmeasured factors that could influence the decision to join an interprofessional team such as alternative access to interdisciplinary teams and social and professional networks. Nonetheless, we aimed to capture all measured factors that can be traced through administrative databases. Fourth, there is a potential influence of larger contextual changes that could have occurred in the study period and could have influenced the results. However, such changes would have affected both interprofessional teams and non-interprofessional teams equally and did not present an internal validity concern to our study. Lastly, the most recent data point included in this study was in 2013, the year in which the last wave of interprofessional primary care teams' formation ended. Since then, very few interprofessional teams have formed.

2.5 Conclusion

Our study findings indicate that there are differences in physician group, physician and patient characteristics when comparing interprofessional teams to non-interprofessional teams. Other jurisdictions aiming to expand physician participation in patient centred medical homes or other forms of interprofessional care should note the factors associated with participation in interprofessional team-based care including the number of physicians in the group and geography. It was notable that physicians with patients with lower socio-economic status and higher expected healthcare resources use were more likely to participate. Researchers looking to better understand the impact of interprofessional team-based care should be aware of pre-existing differences and the need to address selection bias associated with participation in team-based care. Future qualitative research to understand physicians' voluntary decision to join interprofessional teams would add to understanding why these factors are important.

2.6 Results tables

Table 2.1: Comparing physician group, physician and patient characteristics between interprofessional teams and non-interprofessional teams—March 31st, 2013

Variable	Teams	Non-Teams	Total	p-value
Group characteristics				
Groups No. (%)	164 (41.6)	230 (58.4)	394 (100)	N/A
Physicians per group, Mean (SD)	9.7 (8.0)	7.7 (6.9)	8.54 (7.45)	P = 0.01*
Physician characteristics				
Physicians No. (%)	1,588 (47.2)	1,777 (52.8)	3,365 (100)	---
Patients per physician, Mean (SD)	1,191.1 (553.8)	1,338.3 (550.5)	1,268.8 (556.9)	0.0009*
Sex Male No. (%)	944 (59.5)	1,112 (62.6)	2056 (61.1)	0.1416
Age group No. (%) in Yrs. < 40 40 – 64 >=65	 84 (5.3) 1,316 (82.9) 188 (11.8)	 70 (3.9) 1,451 (81.7) 256 (14.4)	 154 (4.6) 2,767 (82.2) 444 (13.2)	0.0064*
Country of Medical Graduation Canada No. (%)	1,334 (84.0)	1,393 (78.4)	2,727 (81.0)	0.0070*
Years in Practice No. (%) < 5 5-15 15-25 > 25	 53 (3.3) 334 (21.0) 769 (48.4) 432 (27.2)	 66 (3.7) 323 (18.2) 899 (50.6) 489 (27.5)	 119 (3.5) 657 (19.5) 1,668 (49.6) 921 (27.4)	0.3095
Years under the Capitation Model, Mean (SD)	4.7 (2.7)	3.6 (1.7)	4.1 (2.3)	< 0.0001*
Patients characteristics aggregated at the physician level				
Patients No. (%)	1,891,434 (44.3)	2,378,072 (55.7)	4,269,506 (100.0)	N/A
Percent Male, Mean (SD)	45.2 (12.5)	45.4 (13.5)	45.3 (13.1)	0.3648

Age distribution, Mean (SD)				
18-44	40.7 (9.7)	41.2 (9.2)	41.0 (9.5)	
45-64	36.6 (5.6)	37.1(4.9)	36.9 (5.2)	0.0313
65-84	19.3 (7.4)	18.6 (6.9)	18.9 (7.1)	
85+	3.5 (4.9)	3.0 (2.7)	3.3 (3.9)	
Percent new OHIP Registrants, Mean (SD)	4.2 (6.1)	5.6 (8.0)	4.7 (7.2)	0.0012*
Income Quintile distribution, Mean (SD)	17.4 (9.0)	15.7 (9.0)	16.5 (9.0)	
1 (lowest)	19.1 (7.0)	18.1 (6.8)	18.5 (6.93	
2	19.7(5.1)	19.2 (4.9)	19.4 (5.0)	0.0011*
3	21.5 (7.1)	22.1 (6.2)	21.8 (6.7)	
4	22.3 (11.1)	25.0 (12.1)	23.7 (11.7)	
5 (highest)				
Rurality distribution, Mean (SD)				
Major Urban	56.4 (41.1)	73.9 (33.6)	65.7 (38.3)	
Semi-Urban	30.5 (34.4)	20.6 (28.3)	25.3 (31.7)	<0.0001*
Rural	13.1 (26.9)	5.5 (16.1)	9.1 (22.2)	
Resource Utilization Band distribution, Mean (SD)				
0 (no utilization)	5.6 (2.4)	4.9 (2.1)	5.2 (2.2)	
1	6.3 (2.3)	5.9 (2.2)	6.1 (2.2)	
2	18.4 (4.1)	17.9 (3.5)	18.1 (3.8)	<0.0001*
3	50.1 (5.1)	52.3 (4.3)	51.3 (4.8)	
4	14.1 (3.6)	13.9 (3.1)	14.0 (3.4)	
5 (high utilization)	5.6 (3.1)	5.1 (2.5)	5.4 (2.8)	

Note: *p-value significant <0.01

Table 2.2: Comparing group, physician and patient characteristics between early and late interprofessional teams' adopters			
Variable	**Early teams**	**Late teams**	**P-value Early team versus late teams**
Group characteristics			
Number of groups (%)	105 (63.6)	60 (36.4)	N/A
Physicians per group, Mean (SD)	10.1 8.4	8.0 6.4	0.1582
Physician characteristics			
Physicians No. (%)	1056 (68.8)	480 (31.25)	N/A
Number of patients per physician, Mean (SD)	1227.2 (560.5)	1066.0 (561.3)	0.0058*
Sex Male, No. (%)	651 (61.7)	279 (58.1)	0.3154
Age group No. (%) in Yrs. < 40 40 – 64 >=65	 178.0 (16.9) 820.0 (77.7) 58.0 (5.5)	 54 (11.3) 388 (80.8) 38 (7.9)	 0.0071*
Country of Medical Graduation Canada No. (%)	902 (85.4)	407 (84.8)	0.6343
Years in Practice No. (%) < 5 5 – 15 15 – 25 25+	 79.0 (7.5) 245.0 (23.2) 601.0 (56.9) 131.0 (12.4)	 26.0 (5.4) 101.0 (21.0) 278.0 (57.9) 75.0 (15.6)	 0.1997
Years under the Capitation Model mean (SD)	1.4 (2.1)	1.1469 (0.53)	0.4618
Patients characteristics aggregated at the physician level			
Patients No. (%)	1,295,104	508,676	N/A

Percent Male, Mean (SD)	44.2 (12.1)	45.3 (14.0)	0.2585
Age distribution, Mean (SD)			
18-44	44.7 (10.2)	42.3 (11.6)	
45-64	35.8 (5.2)	36.3 (6.6)	0.0320
65-84	17.1 (6.8)	18.5 (8.8)	
85+	2.4 (2.9)	2.9 (4.5)	
Percent new OHIP Registrants, Mean (SD)	5.4 (6.6)	6.2 (8.2)	0.7013
Income Quintile distribution, Mean (SD)			
1 (lowest)	17.1 (8.4)	18.5 (10.3)	
2	19.0 (6.3)	19.5 (7.2)	0.2832
3	19.3 (4.7)	20.4 (5.5)	
4	22.1 (7.0)	19.9 (7.1)	
5 (highest)	22.6 (11.1)	21.8 (12.6)	
Rurality distribution, Mean (SD)			
Major Urban	60.3 (40.4)	49.0 (44.0)	
Semi-Urban	28.9 (33.6)	31.4 (36.9)	0.0112
Rural	10.8 (24.4)	19.5 (33.4)	
Resource Utilization Band distribution, Mean (SD)			
0 (no utilization)	4.3 (2.3)	4.0 (2.0)	
1	6.4 (2.4)	5.7 (2.3)	
2	18.7 (3.6)	17.6 (3.9)	0.1032
3	51.6 (4.7)	52.3 (5.6)	

4	14.3 (3.5)	14.9 (4.2)	
5 (high utilization)	4.9 (2.6)	5.5 (3.7)	

Notes:
- * p-value significant <0.01
- Early teams were identified on March 31st 2009 and their characteristics are based on the March 31st 2007 data extraction, the mi-point of early teams' formation period.
- Late teams were identified between April 1st 2009 and March 31st 2013 and their characteristics were based on the March 31st 2011 data extraction, the mi-point of late teams' formation period.

Table 2.3: Association between joining an interprofessional team and group physician and patient characteristics—March 31st, 2013 data extraction

	Bivariate analysis		**Multivariate analysis**	
	Teams (reference: Non-Teams)			
	OR (95% CI)	**P-value**	**OR (95% CI)**	**P-value**
Group characteristics				
Number of physicians per group	1.02 (1.01 , 1.03)	<0.0001*	1.17 (1.14 , 1.21)	<0.0001*
Physician characteristics				
Number of patients per physician	1 (1.00 , 1.00)	<0.0001*	1.00 (1.00 , 1.00)	0.2333
Sex Male	0.88 (0.76 , 1.00)	0.0628	0.68 (0.51 , 0.90)	0.0082*
Age group) in Yrs. < 40 40 – 64 >=65	 1.63 (1.13 , 2.37) 1.23 (0.81 , 1.51) ----------	 0.02 0.73 -------	 1.42 (0.88 , 2.29) 1.22 (0.94 , 1.58) ----------	 0.2475 0.831 ---
Country of Medical Graduation Canada	1.45 (1.22 , 1.73)	<0.0001*	1.1 (0.87 , 1.39)	0.4356
Years in Practice				
< 5 5-15 15-25 25+	0.99 (0.62 , 1.33) 1.17 (0.96 , 1.43) 0.97 (0.83 , 1.14) ----------	0.4663 0.0523 0.0523 -----	1.04 (0.63 , 1.71) 0.88 (0.67 , 1.16) 0.82 (0.68 , 1.00) ------	0.5412 0.5279 0.1426 -----
Number of years under the Capitation Model	1.31 (1.26 , 1.36)	<0.0001*	1.29 (1.24 , 1.35)	<0.0001*
Patients characteristics aggregated at the physician level				
Sex, Male	1 (0.99 , 1.00)	0.6107	1.01 (1 , 1.02)	0.2561

Age Group					
18-44	0.99	(0.99 , 1.00)	0.0740	0.98 (0.94 , 1.01)	0.1605
45-64	0.98	(0.97 ,0.99)	0.0028 *	0.97 (0.93 , 1)	0.0477
65-84	1.01	(1.00 , 1.02)	0.0051*	0.97 (0.93 , 1.01)	0.1047
85+	1.03	(1.03 , 1.06)	0.0021*	-----	-----
New OHIP Registrants	0.97	(0.96 ,0.98)	<.0001*	0.99 (0.98 , 1.01)	0.2536
Income Quintile					
1 (lowest)	1.02	(1.014 ,1.029)	<0.0001*	1.04 (1.02 ,1.05)	<0.0001*
2	1.02	(1.01 , 1.03)	<0.0001*	1.01 (0.99 , 1.03)	0.2214
3	1.02	(1.01 , 1.04)	0.0020*	1.04 (1.02, 1.06)	<0.0001*
4	0.99	(0.98 , 0.99)	0.0186	1.03 (1.01, 1.05)	0.0005*
5 (highest)	0.98	(0.97 , 0.99)	<0.0001*	----------	----
Rurality					
Major Urban	0.99	(0.98 , 0.99)	<0.0001*	0.98 (0.98 , 0.99)	<0.0001*
Semi-Urban	1.01	(1.01 , 1.01)	<0.0001*	0.99 (0.99 , 1.00)	0.0004*
Rural	1.02	(1.01, 1.02)	<0.0001*	--------	-----
Resource Utilization Band					
0 (no utilization)					
1	1.14	(1.10 , 1.17)	<0.0001*	1.02 (0.95 , 1.09)	0.6759
2	1.09	(1.05 , 1.12)	<0.0001*	0.98 (0.92 , 1.05)	0.5509
3	1.04	(1.02 , 1.06)	0.0002*	0.99 (0.93 , 1.05)	0.7416
4	0.90	(0.88 , 0.91)	<0.0001 *	0.94 (0.88 , 0.99)	0.0182
5 (high utilization)	1.02	(0.99 , 1.04)	0.1115	1.01 (0.93 , 1.09)	0.8677
	1.07	(1.05 , 1.10)	<0.0001*	-------	------

Note:
- *p-value significant <0.01

Table 2.4: Association between group, physicians and patient characteristics and joining an interprofessional team in the late versus early period

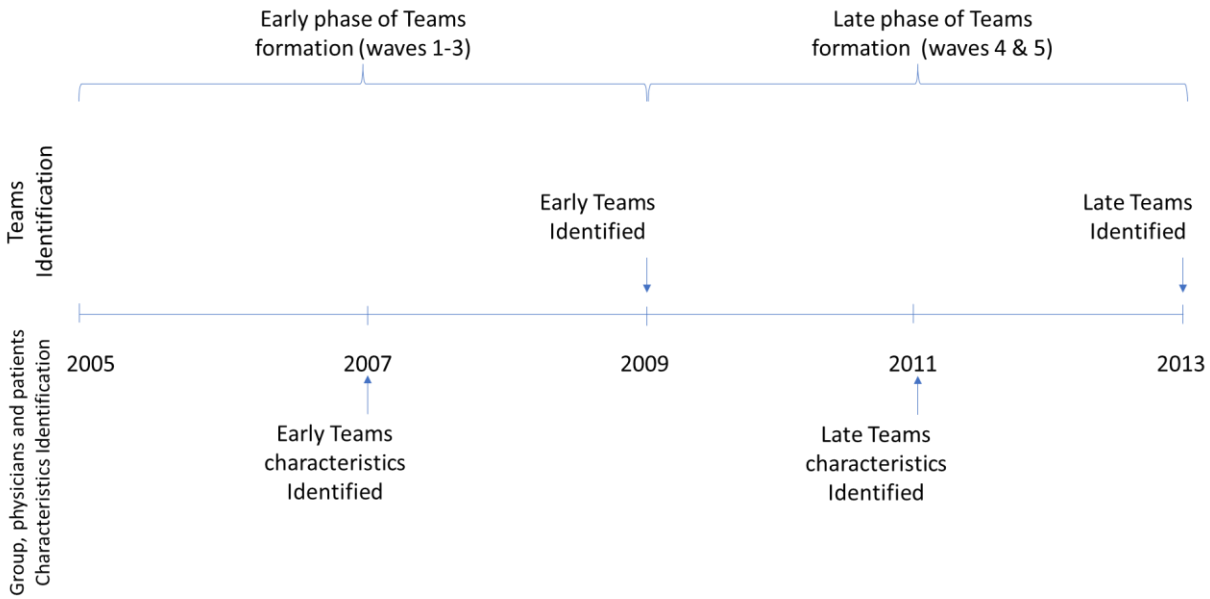
	Late (reference: early)			
	Bivariate analysis		Multivariate analysis	
	OR (95% CI)	P-value	OR (95% CI)	P-value
Group characteristics				
Number of physicians per group	0.96 (0.92 , 1.01)	0.1083	1.12 (1.02 , 1.50)	0.9734
Physician characteristics				
Number of patients per physician	0.99 (0.99 , 1.0)	<0.0001*	1.00 (1.00 , 1.01)	0.3222
Sex Male	0.86 (0.69 , 1.08)	0.1906	0.40 (0.26 , 0.60)	<0.0001*
Age group				
< 40	0.46 (0.28 , 0.77)	0.0014*	0.48 (0.24 , 0.95)	0.0179
40 – 64	0.72 (0.47 , 1.11)	0.6801	0.81 (0.49 , 1.33)	0.3695
>=65	-----	----	-------	----
Country of Medical Graduation Canada	0.95 (0.70 , 1.29)	0.7475	0.92 (0.64 , 1.33)	0.6742
Years in Practice				
< 5				
5 – 15	0.57 (0.34 , 0.97)	0.1137	0.47 (0.24 , 0.93)	0.0517
15 – 25	0.72 (0.50 , 1.04)	0.6279	0.68 (0.42 , 1.11)	0.6509
25+	0.81 (0.59 , 1.11)	0.5074	0.85 (0.6 , 1.22)	0.1707
	------	-----	------	-----
Number of years under the Capitation Model	0.91 (0.85 , 0.97)	0.0045*	0.98 (0.91 , 1.06)	0.6455
Patients characteristics aggregated at the physician level				
Sex Male	1.0 (0.99, 1.01)	0.1467	1.04 (1.02 , 1.05)	<0.0001*
Age Group				
18-44	1.02 (1.01 , 1.03)	<.0001*	0.96 (0.91 , 1.01)	0.0966
45-64	1.02 (0.99 , 1.04)	0.1178	0.99 (0.94 , 1.04)	0.5784
65-84	1.03 (1.01 , 1.04)	0.0005*	0.95 (0.9 , 1.01)	0.1244
85+	1.04 (1.00 , 1.07)	0.0250	------	----
New OHIP Registrants	1.01 (0.99 , 1.03)	0.0677	1.05 (1.02 , 1.07)	<0.0001*
Income Quintile				
1 (lowest)	1.02 (1.00 , 1.03)	0.0041*	0.99 (0.98 , 1.01)	0.4786
2	1.01 (0.99 , 1.03)	0.1545	0.98 (0.95 , 1.00)	0.0209
3	1.4 (1.02 , 1.07)	0.0001*	1.07 (1.04 , 1.1)	<0.0001*
4	0.95 (0.40 , 0.97)	<0.0001*	0.95 (0.93 , 0.97)	<0.0001*

5 (highest)	0.99 (0.98 , 1.00)	0.2075	---------	-----
Rurality				
Major Urban	0.99 (0.99 , 0.99)	<.0001*	0.99 (0.98 , 0.99)	<0.0001*
Semi-Urban	1.00 (0.99 , 1.00)	0.1870	1 (0.99 , 1.00)	0.1878
Rural	1.01 (1.00 , 1.01)	<.0001*	-----	---
Resource Utilization Band				
0 (no utilization)	0.94 (0.89 , 0.99)	0.0161	1.00 (0.91 , 1.10)	0.9979
1	0.91 (0.9 , 0.96)	0.0003*	1.05 (0.95 , 1.16)	0.3068
2	0.92 (0.89 , 0.95)	<0.0001*	0.96 (0.88 , 1.03)	0.2589
3	1.03 (1.00 , 1.05)	0.0190	1.04 (0.97 , 1.11)	0.3225
4	1.04 (1.01 , 1.07)	0.0044*	1.05 (0.96 , 1.15)	0.2543
5 (high utilization)	1.07 (1.03 , 1.11)	0.0004*		

Notes:

- * p-value significant <0.01
- Early teams were identified on March 31st 2009 and their characteristics are based on the March 31st 2007 data extraction.
- Late teams were identified between April 1st 2009 and March 31st 2013 and their characteristics were based on the March 31st 2011 data extraction.

Figure 2.1: Data extractions for identification of early and late interprofessional teams and their respective group, physicians and patient characteristics.



Chapter 3. Study 2. Comparing Primary Care Interprofessional and Non-interprofessional Teams on Access to Care and Health Services Utilization in Ontario, Canada: A Retrospective Cohort Study

3.0 Abstract

Background: Many countries, including Canada, have introduced primary care reforms to improve health system functioning and value. The purpose of this study was to examine the association between receiving care from interprofessional primary care teams and access to care and health services utilization.

Methods: We conducted a retrospective cohort study linking population-based administrative databases to Ontario's Health Care Experience Survey (HCES) between 2012 and 2018. We adjusted for physician group characteristics as well as individual physician and patient characteristics while assessing the relationship between receiving care from interprofessional teams and the outcomes of interest.

Principle findings: As of March 31st, 2015, there were 465 physician groups with HCES respondents of which 177 (38.0%) were interprofessional teams and 288 (62.0%) were non-interprofessional teams in the same blended capitation reimbursement model. In this period, there were 4,518 physicians with HCES respondents, of whom 2,131 (47.2%) were in interprofessional teams and 2,387 (52.8%) were in non-interprofessional teams. There were 10,102 HCES respondents included in this study, of whom 42.4% were in interprofessional teams and 42.3% were in non-interprofessional teams. After adjustment, we found that being in an interprofessional team was associated with an increase in the odds of patients reporting same/next day access to care by 12.0% (OR=1.12 CI=1.00 to 1.24 p-value 0.0436) and a decrease in the odds of patients reporting walk-in clinic use by 16% (OR=0.84 CI=0.75 to 0.94 p-value 0.0019). After adjustment, there were no significant differences in patient-reported after-hours access to care and emergency department use.

Conclusion: Ontario has invested heavily in interprofessional primary care teams. As compared to patients in non-interprofessional teams, patients in interprofessional teams self-reported more timely access to care and less walk-in clinic use but no significant difference in self-reported access to after-hours care or in emergency department use. For jurisdictions aiming to expand physician voluntary participation in interprofessional teams, our study results inform expectations around access to care and health services utilization.

3.1 Introduction

Improving health system performance and efficiency have been the focus of many jurisdictions internationally.[108] The pursuit of providing value-based health care revolves around three aims: improving the experience of care, improving the health of populations, and reducing per capita costs. A strong primary care system is recognized as the cornerstone of health systems and is associated with better outcomes, improved patient experience and lower cost.[109] Many countries around the world, including Canada, have introduced primary care reform to deliver on those goals.

During the economic recession in the 1990s, there has been limited investments in primary care innovation in Canada. [110] A decade later, primary care reform initiatives started to emerge in Canada in response to various federal and provincial committees' recommendations.[111,112] In line with the Canadian healthcare reform movement, Ontario has undergone three major primary care policy initiatives: new physician reimbursement and organizational models, patient enrolment with a primary care provider and support to interprofessional team-based care.[113]

During the last two decades, more than one third of primary care physicians have voluntarily transitioned from traditional fee-for-service practice to blended capitation payment and some of them have received additional funding to deliver interprofessional care. Currently, the dominant blended capitation model in Ontario is called Family Health Organization (FHO). FHOs have formal patient enrollment, electronic medical records, physician-led governance and a minimum of three physicians practicing together. They offer comprehensive care, including preventive health care services, chronic disease management and health promotion, through a combination of regular physician office hours and after-hours services. FHOs were eligible to apply for additional funding for allied health professionals to join their practice and become interprofessional primary care teams called Family Health Teams. Interprofessional teams are "groups of professionals from different disciplines who communicate and work together in a formal arrangement to care for a patient population in a primary care setting."[114] They typically include primary care physicians, nurses or nurse practitioners, and at least one other health care professional (e.g., pharmacist, social worker, dietitian or physiotherapist). Interprofessional teams are also eligible for funding an administrator or executive director. There are many similarities between Ontario interprofessional family health teams, Quebec Family Medicine Groups, Alberta Primary Care Networks and the Patient-Centered Medical Home in the United States.[115,116,117]

The government's priorities in establishing interprofessional teams were to increase access to primary care and appropriate healthcare services utilization.[118] Physicians in FHO models in Ontario are required to provide after-hours access to care and receive a bonus when their patients do not seek services from physicians outside of their group, such as in walk-in clinics. The bonus is not affected if their patients visit the emergency department. Interprofessional team-based care is thought to free up some of the physicians' time by delegating tasks to other health care professionals within their scope of practice.[119] Access to quality primary care can reduce the need for unnecessary and more expensive services.[120] Treating less-urgent conditions in primary care could improve continuity of care and patient experience.[121,122] Evidence from international jurisdiction suggests that the availability of interprofessional members within a team can support the availability of the primary care provider by shifting some of their duties to other team members.[123,124,125,126,127,128,129]

Several studies conducted in Ontario have compared capitation-based interprofessional teams to other funding and delivery models of care on specific measures of quality.[130,131,132,133,134,135,136] However, little research to date has evaluated the association between the interprofessional aspect of primary care teams and access to care and health services utilization. Our study examined the association between receiving care from interprofessional versus non-interprofessional primary care teams and patient-reported timely and after-hours access to care, patient-reported walk-in clinic visits and emergency department use. We hypothesised that interprofessional teams would be better performers on these measures given their enhanced capacity and structure. Evidence from our setting that underwent large-scale primary care reform will be relevant to other jurisdictions contemplating innovations in primary care delivery and, specifically, the adoption of interprofessional team-based primary care.

3.2. Methods

3.2.1 Setting

The setting was Ontario, Canada, the country's most populous province with a population of 14.4 million people in 2019.[137] Permanent residents of Ontario are fully insured for physician primary care services through the Ontario Health Insurance Plan (OHIP) with no co-payment or deductible. Primary care organization and payment models have evolved over the course of the last 18 years. Currently, the three dominant practice models in Ontario are: enhanced fee-for-service (85% fee-for-service, 15% capitation and bonuses, no funding for non-physician health professionals); non-team-blended capitation (20% fee-for-service, 80% capitation and bonuses, no funding for non-physician health professionals), and team-based blended capitation (20% fee-for-service, 80% capitation and

bonuses, and funding for non-physician health professionals). These models are described in detail elsewhere.[138] [139] [140]

The focus of this study was on the dominant blended capitation model—FHO—within which physicians practice in either interprofessional or non-interprofessional teams. When patients seek primary care services outside the practice in which they are enrolled, for example in walk-in clinics, the FHO loses a bonus payment equal to the fee-for-service payments to the physician who treated the patient, to a maximum bonus of 18.59% of the practice's total capitation.[141] There is no deduction if an enrolled patient visits an emergency department for non-emergency care. FHOs are required to provide at least one three-hour block of after-hours services per week for each physician in the group, to a maximum of five three-hour blocks per week for practices with five or more physicians. Contracts define "after-hours" as Monday to Thursday after 5 p.m. or any time on the weekend—that is, any time from Friday after 5pm through Sunday.[142]

3.2.2 Design and Population

We conducted a retrospective cohort study where we linked several population-based administrative databases to the Health Care Experience Survey (HCES) using encoded identifiers at ICES (formerly known as the Institute for Clinical Evaluative Sciences) to form data extractions and identify the population of interest (Figure 1).

The study population comprised respondents to the HCES over six fiscal years (April 1 – March 31) from 2012/13 to 2017/18. The study included respondents from 20 quarterly waves of the HCES that were conducted between October 2012 and October 2017. Once households were sampled in the HCES, they were removed from the sampling frame for 2 years. Respondents who responded to the survey more than once throughout the study period were excluded.

For each of the data extractions, we identified respondent to the HCES at the end of the fiscal year. To be included in the study, respondents had to be consistently in an FHO blended capitation model throughout the observation period for the fiscal year they responded to the HCES. We captured patients' characteristics at the beginning of the fiscal year they responded to the HCES. Self-reported timely access to care, after-hours access to care and walk-in clinic visits were captured during the fiscal year the patient responded to the HCES and ED visits were captured at the end of that fiscal year from health administrative data. Physician group and physicians' characteristics were captured at the mid-point of the study timeframe, March 31st, 2015 (Figure 2).

3.2.3 Measures and data sources

3.2.3.1 Exposure

Enrolment in a FHO blended capitation model, with an interprofessional team was the exposure. The exposure variable was retrieved from a population and demographics database—the Client Agency Program Enrolment tables that identify the patient enrolment model and the physician with whom patients are enrolled. A separate file provided by the Ontario Ministry of Health (MOH) to ICES identified physicians who are part of an interprofessional team versus a non-interprofessional team.

3.2.3.2 Outcomes

The outcomes included patient-reported timely access to care, patient-reported after-hours access to care, patient-reported walk-in clinic use and emergency department use. Patient-reported timely access to care, after-hours access to care and walk-in clinic use were derived from the HCES (How many days did it take from when you first tried to see your provider to when you actually saw them or someone else in their office? (sick_3); The last time when you needed medical care in the evening, on a weekend, or on a public holiday, how easy or difficult was it to get care without going to the emergency department? (access_5); Have you been to a walk-in clinic because you were sick or for a health-related problem in the 12 months? (wi_1)). The HCES is a quarterly survey of a random sample of the Ontario population, 16 years and older, conducted on behalf of the MOH by the Institute for Social Research at York University. The survey focuses on Ontarians' primary care experience, including access to care, to generate regional and province-level data. The HCES questionnaire is shown in Appendix A. The National Ambulatory Care Reporting System (NACRS) was used to derive emergency department visits.

3.2.3.3 Physicians Groups and Physicians Characteristics

Physician group characteristics included the number of physicians per group and number of years under the capitation model. Physicians' characteristics included age, sex, years since graduation, Canadian graduate status and number of years in practice. Those variables were derived from a health care providers data registry available at ICES.

3.2.3.4 Patient Characteristics

Patients' characteristics included age, sex and recent OHIP registration as a proxy for immigration, which were identified from a population and demographics data registry available at ICES. By linking patients' postal code to census data we were able to derive neighborhood income quintiles. Income levels, adjusted for household size and specific to each community were used to order postal

codes into quintiles, with quintile 1 having the lowest relative income and quintile 5 the highest. Rurality was identified using the Ontario Medical Association Rurality Index of Ontario (RIO).[143] The RIO is based on community characteristics including travel time to different levels of care, community population, presence of health care providers, hospitals and ambulance services, social indicators and weather conditions. RIO scores range from zero to 100 (zero indicating the largest urban and 100 the most rural). We divided RIO scores into four main categories: largest urban centers (0); large urban centres (1 to 9); semi-urban centres (10 to 39); and rural areas (≥40). We used the Johns Hopkins Adjusted Clinical Groups (ACGs) case-mix system software to assign patients into expected Resource Utilization Band (RUB) categorizes.[144] The RUBs range from 0 indicating no utilization to 5 indicating very high expected utilization.

3.2.4 Analysis

For the descriptive results, we generated counts and percentages for categorical variables and means and standard deviations for continuous variables to describe the characteristics of physician groups and physicians who were either in interprofessional or non-interprofessional teams in relation to the outcomes of interest. For the patient variables, we generated sample weighted descriptive statistics. The probability weights assigned to respondents in the HCES were dependent on the probability of being selected, which was determined from the sampling design.

For the outcomes, we ran sample weighted survey logistic regressions to model each of the outcomes while adjusting for the respective physician group, physician and patient characteristics.

All study analyses were conducted using SAS v.9.3 and statistical significance was assessed at a p-value <0.05.

3.3 Results

3.3.1 Baseline Group, physician and patient characteristics comparing HCES respondents in interprofessional teams versus non-interprofessional teams

As of March 31st, 2015, there were 465 FHO physician groups with HCES respondents of which 177 (38%) were interprofessional teams and 288 (62%) were non-interprofessional teams. Interprofessional teams with HCES respondents had more physicians per group as compared to non-interprofessional teams (means= 13.1 versus 8.84, respectively) and more years under the capitation model (means= 6.0 versus 4.3 respectively).

In this period, there were 4,518 FHO physicians with HCES respondents of whom 2,131 (47.2%) were practicing in interprofessional teams and 2,387 (52.8%) were practicing in non-interprofessional teams. Interprofessional teams compared to non-interprofessional team physicians had: fewer patients per physician (mean=1,366 versus 1,555, respectively); more female physicians (46.3% versus 43.8%, respectively); more physicians in the younger age group under 40 years old (15.4% versus 9.3%, respectively); more physicians who were Canadian graduates (80.9% versus 74.4%, respectively); fewer years in practice (29.1% versus 17.6%, respectively in the 5 to 15 years category) (Table 1A).

There were 10,102 HCES respondents included in this study of whom 42.4% were in interprofessional teams and 42.3% were in non-interprofessional teams. Interprofessional as compared to non-interprofessional teams had fewer HCES respondents who were immigrants (3.1% versus 5.1 %, respectively); fewer HCES respondents in the highest income quintile (23.3% versus 26.4%, respectively); more HCES respondents residing in rural areas (14.2% versus 5.8%, respectively) and fewer patients with two or more comorbidities (42.6% versus 44.3%, respectively) (Table 1B).

3.3.2 Patient-reported timely access to care and after-hours access to care comparing HCES respondents in interprofessional teams versus non-interprofessional teams

HCES respondents in interprofessional teams were slightly more likely to report timely access to care (same/next day) when compared to patients in non-interprofessional teams (39.9% versus 39.1%). HCES respondents in interprofessional teams were less likely to report easy or somewhat easy access to after-hours care compared to patients in non-interprofessional teams (30.8% versus 35.2%).

3.3.3 Patient-reported walk-in clinic visits and emergency department use comparing HCES respondents in interprofessional teams versus non-interprofessional teams

HCES respondents in interprofessional teams reported a lower percent of walk-in clinic visits compared to patients in non-interprofessional teams (19.7% versus 28.2%, respectively) (Table 4 B). A higher percent of HCES respondents in interprofessional teams had emergency department visits as compared to patients in non-interprofessional teams (26.7% versus 23.5%, respectively) (Table 5B).

3.3.4 Association between enrollment in an interprofessional team and the outcomes

When we examined timely access to care while adjusting for physician group, physician and patient characteristics, we found that being in an interprofessional team was associated with an increased odd of patient-reported timely (same/next day) access to care of 12% (OR=1.12 CI=1.00 to 1.24 p-value 0.0436) and decreased odds of self-reporting walk-in clinic use of 16% (OR=0.84 CI=0.75 to

0.94 p-value 0.0019). We did not find significant differences after adjustment between interprofessional and non-interprofessional teams in patient-reported after-hours access to care or in emergency department use (Tables 6).

When we stratified the analyses by sex and by rurality, we did not find a consistent pattern across the outcomes when comparing interprofessional teams with non-interprofessional teams (Appendix B)

3.4 Discussion

We linked the HCES to administrative databases to examine the association between receiving care from interprofessional primary care teams and patient-reported timely access and after-hours access to care, patient-reported use of walk-in clinics and emergency department use. We found that HCES respondents receiving care from interprofessional teams self-reported more timely access to care and less walk-in clinic use. We did not find a significant difference in patient-reported after-hours access to care or in emergency department visits.

The professional management and clinical structure available through interprofessional teams, such as having an Executive Director and allied health professionals can theoretically support access to care. One mechanism by which teamwork in primary care could increase access and effectiveness is through task shifting where clinical and non-clinical tasks are reassigned from physicians to non-physician health care professionals.[145,146,147] Many physicians report that up to 50% of their tasks can be delegated to other professionals.[148] Some evidence suggest that task delegations reduce physicians' workload allowing them to focus on more complex tasks.[149,150,151,152]Although more timely access to care among patients in interprofessional teams is not an expectation in the contractual agreement between teams and the Ministry of Health, previous evidence indicates that enhanced interprofessional team structure can support the availability of the primary care provider by shifting some of their duties to other team members.[153,154,155,156,157,158] The evaluations of Patient-Centered Medical Homes in the United States related to timely access to care suggest that greater availability of providers can free more of their time for patient encounters.[159] Our findings of generally low timely access to care are comparable to other reports that found only 43% of Canadians report that they were able to have same- or next-day appointment at their regular place of care and identified that Canada continues to perform below the average on timely access to care when compared to other counties included in the Commonwealth Fund International Health Surveys.[160]

Our findings showed a non-significant difference in patient-reported after-hours access to care between interprofessional and non-interprofessional teams. The provision of after-hours care is an expectation that all FHOs need to meet as part of their contractual agreement with the Ministry of Health.[161] Although some interprofessional teams operate out of multiple locations, the after-hours services only need to be offered at one location, which may not be convenient for many of the enrolled patients. Also, only one physician is required to be available during each after-hours block which might not be sufficient evening and weekend availability to meet patients' needs. Previous evidence that compared a slightly different after-hours access to care measure (asking if respondents providers have an after-hours clinic as opposed how easy or difficult was it to get care without going to the emergency department) found that respondents in interprofessional teams self-reported more after-hours access to care.[162]

Although both interprofessional and non-interprofessional teams get penalised equally if their patients visit a walk-in clinic, our finding of significantly lower patient-reported walk-in clinic visits by HCES respondent among interprofessional teams may be explained by the higher patient-reported timely access to care in interprofessional teams, which can contribute to the lower walk-in clinic use. Patients may be less likely to seek care elsewhere if their provider is accessible to them in a timely manner. Additionally, the enhanced administrative structure of interprofessional teams can support reinforcing to patients the need to refrain from walk-in visits as part of being on the group roster. Our findings of a non-significant difference in emergency department use between interprofessional and non-interprofessional teams is consistent with evidence from Canada that looked at utilization in relation to interprofessional team-based care and found differences in quality but not in healthcare utilization.[163,164,165,166]

Some of our findings are not fully consistent with an Ontario provincial analysis where throughout the investigated years (2014 to 2017) timely access to care ranged between 44.3% and 39.9% (compared to 39.5% in our study population), easy or somewhat easy after-hours access to care ranged between 48.0% and 46.0% (vs. 33% in our sample) and walk-in clinic use ranged between 29.6% and 30.5% (vs. 24% in our study).[167] Those differences can be explained by the slightly different timeframe, inclusion of respondents from all primary care models and slightly larger sample that includes people who declined to have their data linked (6%) for the provincial analysis. Additionally, for the timely access to care question, the provincial analysis included respondents with and without a family doctor whereas our study includes only respondents with a family doctor. Through a personal

communication with the Ministry of Health representative who is responsible for the survey, we have confirmed that our study results can be mainly explained by those differences.

Interprofessional teams in Ontario had access to several quality improvement initiatives that hypothetically can contribute to improved outcomes over non-interprofessional teams. The Association of Family Health Teams of Ontario through an initiative called Data to Decisions (D2D) supported interprofessional teams in informing quality improvement through performance measurement. D2D was made possible through the investment in more than 30 Quality Improvement Decision Support Specialists (QIDS Specialists) across Ontario to help interprofessional teams to access and use better data to improve care.[168] Timely access to care and emergency department use were among the measurement areas monitored through this initiative.[169] The Quality Improvement and Innovation Partnership (QIIP) was another province wide quality-improvement program implemented between 2008 and 2010 to support interprofessional teams to improve the care they provide.[170] The learning collaboratives used the Institute for Healthcare Improvement's Breakthrough Series learning model and interprofessional teams were provided with a quality improvement coach who supported and mentored participants throughout the program.[171] Improved access to care was one of the supported quality improvement areas through QIIP.[172] Those investments should theoretically be reflected in better outcomes among interprofessional teams. The government's first priority in establishing interprofessional teams was to increase access to primary care and health services utilization.[173] Our results show that interprofessional teams perform better than non-teams in some but not all aspects related to access to care and health services utilization.

Our study has limitations. First, this is an observational study that cannot address causation. It is also cross-sectional so it is not possible to distinguish whether the outcomes examined were pre-existing or were the result of joining or not joining an interprofessional team. Self-reported timely and after-hours access to care are subject to limitations as measures of performance, respondent recall bias being one of them. People living in institutions, people with non-residential phone numbers, and people with invalid/missing household addresses in the Registered Persons Database (RPDB) are not captured in the HCES. Respondents who were unable to speak English or French or were not healthy enough (physically or mentally) to complete the interview were not surveyed. Second, there are other unmeasured factors that might contribute to the decision of having a walk-in clinic visit or using the emergency department that this study cannot capture. These could include personal preference or judgment during the time the service was needed. Emergency department visits are not always inappropriate nor preventable.

Third, access to care can be measured in many different ways. The access questions we investigated in this study provide a specific perspective restricted to timely and after-hours access to care. Previous evidence suggests that different measures of timely access are needed to understand health care system performance.[174] Fourth, joining interprofessional team-based care was voluntary and our findings could be influenced by some unmeasured factors for physicians who chose to join this model of primary care delivery. Nonetheless, we aimed to capture all measured factors that can be traced through administrative databases. Finally, administrative databases have not been originally collected for research purposes, which presents a limitation in generating and interpreting the information. However, all the databases used for deriving the emergency department measure used in this study have been validated in the Ontario context.

Ontario has made a major investment in interprofessional team-based care. As compared to patients in non-interprofessional teams, patients in interprofessional teams self-reported more timely access to care and less walk-in clinic use but there was no significant difference in self-reported access to after hours to care and in emergency department use.

Our findings can inform other jurisdictions aiming to expand voluntary participation in interprofessional team-based primary care regarding expectations about the relationship between primary care policy, organization and delivery and patient experience and health services utilization. Careful consideration should be given to contractual and policy levers that can incentivise interprofessional team-based care in delivering on intended outcomes such as improving health services utilization.

3.6 Results tables

Table 3.1A: Physician Group and physicians characteristics (on March 31st, 2015) – comparing HCES respondents in interprofessional teams to respondents in non-interprofessional teams				
	Interprofessional Teams		Non-interprofessional teams	
Physician Group characteristics				
Physician Groups No. (%)	177	38.0	288	62.0
Number of physicians per group, Mean (SD)	13.1	10.7	8.8	7.6
Years under the capitation model, Mean (SD)	6.0	3.0	4.2	2.6
Physicians characteristics				
Physicians No. (%)	2,131	47.2	2,387	52.8
Number of patients per physician, Mean (SD)	1,366	615.1	1,555	665.2
Sex No. (%)				
Female	987	46.3	1,045	43.8
Age group in Yrs. No. (%)				
<40	329	15.4	222	9.3
40-64	1,417	66.5	1,607	67.3
> 64	358	16.8	534	22.4
Missing	27	1.3	24	1.0
Country of medical graduation Canada No. (%)				
Yes	1,724	80.9	1,775	74.4
Years in practice No. (%)				
<5	47	2.2	41	1.7
5_15	620	29.1	420	17.6
16-25	495	23.2	606	25.4
>25	969	45.5	1,320	55.3
Missing	0	0	0	0

Table 3.1B: Patients' characteristics comparing HCES respondents in interprofessional teams to respondents in non-interprofessional teams in the year they responded to the survey				
	Interprofessional Teams		Non-interprofessional Teams	
Patients total	12,988	52.7	11,648	47.3
Sex No. (%)				
Female	7,678	57.6	6,856	57.7
Age group, yr. No. (%)				
16-44	3,819	33.0	3,653	34.9
45-64	5,272	42.4	4,661	41.4
65-84	3,602	23.1	3,071	22.1
84+	295	1.5	263	1.6
Missing	0	0	0	0
New OHIP registrants (within 10 years) No. (%)	355	3.1	460	5.1
Income quintile, No. (%)				

1 (low)	2,089	13.8	1,764	13.9
2	2,468	18.6	2,228	17.9
3	2,697	21.2	2,295	19.6
4	2,822	22.8	2,550	22.0
5 (high)	2,888	23.3	2,784	26.4
Missing	24	0.3	27	0.2
Rurality Index of Ontario, No. (%)				
Largest Urban (0)	3,759	33.6	4,000	42.6
Large urban (1 to 9)	2,388	17.1	4,078	29.4
Small-urban (10 to 39)	4,823	34.2	2,737	21.7
Rural (≥40)	1,892	14.4	763	5.8
Missing	126	0.7	70	0.4
Resource utilization band (RUB), No. (%)				
1	629	5.4	471	4.3
2	2,128	17.7	1,802	16.5
3	6,746	51.0	6,417	54.6
4	2,031	15.0	1,869	15.4
5 (very high user)	823	5.4	674	5.1
Non-user and Missing	631	5.5	415	4.2
Patients with Chronic disease				
2 + Co-morbidity No. (%)	6,096	42.6	5,628	44.3
3+ comorbidities No. (%)	3,482	23.3	3,207	24.5
4+ comorbidities No. (%)	1,828	11.9	2,686	12.4
5+ comorbidities No. (%)	894	5.8	791	6.1

Table 3.2A: Patient-reported timely access to care (same/next day) in the year patients responded to the HCES by physicians' characteristics identified on March 31st, 2015				
	Interprofessional Teams		Non-interprofessional Teams	
	Denominator	Percentage	Denominator	Percentage
Physicians characteristics				
Sex				
Female	2,621	39.5	2,256	35.5
Male	3,880	39.3	3,614	37.4
Missing	36	19.4	31	29.0
Age group				
<40	761	40.6	433	33.5
40-64	4,381	39.1	3,973	35.9
> 64	1,243	40.3	1,369	40.6
Missing	152	27.6	126	25.4
Country of medical graduation Canada				
No	1,176	36.6	1,318	35.9
Yes	5,209	40.2	4,457	37.2
Missing	152	27.6	126	25.4
Years in practice				
<5	151	35.1	110	30.0
5_15	1,553	40.5	892	33.0
16-25	1,469	35.5	1,483	34.1
>25	3,328	40.7	3,385	39.0
Missing	36	19.4	31	29.0

Table 3.2B: Patient-reported timely access to care (same/next day) by patients' characteristics identified at the year they have responded to the HCES				
	Interprofessional Teams		Non-interprofessional Teams	
	Denominator	Weighted Percentage	Denominator	Weighted Percentage
Overall self-reported timely Access to care	6,537	39.9	5,901	39.1
Sex				
Female	4,159	40.5	3,681	39.6
Males	2,378	38.8	2,220	38.2
Missing	0	--	0	--
Age group, yr.				
16-44	1,964	41.0	1,840	38.1
45-64	2,781	36.8	2,467	38.1
65+	1,680	44.5	1,479	42.5
Missing	112	40.0	115	43.1
New OHIP registrants (within 10 years)				
No	6,351	39.9	5,659	38.6

Yes	180	36.7	238	47.1
Income quintile				
1 (low)	1,030	37.6	862	35.8
2	1,239	39.7	1,132	40.3
3	1,340	41.1	1,193	37.1
4	1,419	38.9	1,254	37.9
5 (high)	1,500	41.2	1,445	42.2
Missing	9	29.3	15	32.9
Rurality Index of Ontario				
Largest Urban (0)	2,010	42.8	2,133	42.9
Large urban (1 to 9)	1,276	42.2	2,077	37.1
Small-urban (10 to 39)	2,375	39.1	1,312	36.1
Rural (≥40)	832	30.1	345	29.5
Missing	44	18.7	34	31.3
Resource utilization band (RUB)				
1	234	42.1	167	42.0
2	868	38.4	700	36.7
3	3,625	39.5	3,421	39.3
4	1,172	42.6	1,114	39.2
5 (very high user)	508	40.5	425	41.7
Non-user and Missing	130	44.4	74	24.1
Patients with Chronic disease				
2 + Co-morbidity				
No	3,221	38.2	2,817	37.8
Yes	3,316	41.8	3,084	40.4
3+ comorbidities				
No	4,602	40.0	4,087	37.8
Yes	1,935	39.4	1,814	42.6
4+ comorbidities				
No	5,505	39.7	4,931	38.6
Yes	1,032	41.1	970	41.9
5+ comorbidities				
No	6,022	39.8	5,444	38.8
Yes	515	40.8	457	43.1

Table 3.3A: Patient-reported after-hours access to care (very easy and somewhat easy) in the year patients responded to the HCES by physicians' characteristics identified on March 31st, 2015				
	Interprofessional Teams		Non-interprofessional Teams	
	Denominator	Percentage	Denominator	Percentage
Physicians characteristics				
Sex				
Female	4,917	32.3	4,246	34.5
Male	7,769	29.9	7,145	34.0
Missing	83	27.7	65	29.2
Age group				
<40	1,385	31.2	829	36.4
40-64	8,542	31.3	7,605	33.9
> 64	2,523	29.4	2,791	34.6
Missing	319	26.6	231	29.0
Country of medical graduation Canada				
No	2,324	27.6	2,572	33.7
Yes	10,126	31.6	8,653	34.4
Missing	319	26.6	231	29.0
Years in practice				
<5	285	27.0	205	34.1
5-15	2,907	31.9	1,679	33.7
16-25	2,865	31.7	2,791	33.0
>25	6,629	30.1	6,716	34.8
Missing	83	27.7	65	29.2

Table 3.3B: Patient-reported after-hours to care (very easy and somewhat easy) by patients' characteristics identified in the year they have responded to the HCES				
	Interprofessional Teams		HCES Respondents in Non-interprofessional Teams	
	Denominator	Weighted Percentage	Denominator	Weighted Percentage
Overall patient-reported after-hours access to care	12,769	30.8	11,456	35.2
Patients characteristics				
Sex				
Female	7,584	33.4	6,765	37.0
Males	5,185	30.9	4,691	32.8
Missing				
Age group, yr.				

16-44	3,703	38.9	3,544	39.3
45-64	5,199	30.9	4,602	34.2
65+	3,575	26.0	3,051	31.1
Missing	292	28.5	259	33.9
New OHIP registrants (within 10 years)				
Yes	346	30.4	445	40.0
NO	12410	32.4	10997	35.0
Missing	13	42.8	14	47.9
Income quintile				
1 (low)	2,038	32.3	1,718	34.5
2	2,427	29.6	2,187	33.8
3	2,655	32.1	2,268	33.2
4	2,777	34.7	2,511	35.6
5 (high)	2,849	32.4	2,745	37.8
Missing	23	44.4	27	33.2
Rurality Index of Ontario				
Largest Urban (0)	3,700	38.3	3,931	37.8
Large urban (1 to 9)	2,344	41.5	4,010	39.0
Small-urban (10 to 39)	4,752	28.0	2,699	28.6
Rural (≥40)	1,852	18.4	746	23.2
Missing	121	23.4	70	24.6
Resource utilization band (RUB)				
1	609	33.4	457	38.4
2	2,073	35.8	1,771	37.9
3	6,671	30.9	6,334	35.1
4	2,013	32.0	1,845	34.4
5	816	30.8	671	33.7
Non-user and Missing	587	39.6	378	37.7
Patients with Chronic disease				
2 + Co-morbidity				
No	6,732	34.0	5,875	36.1
Yes	6,037	30.1	5,581	34.2

3+ comorbidities				
No	9,322	33.2	8,274	35.3
Yes	3,447	29.4	3,182	35.0
4+ comorbidities				
No	10,963	32.6	9,784	35.2
Yes	1,806	30.2	1,672	35.7
5+ comorbidities				
No	11,886	32.5	10,672	35.0
Yes	883	29.8	784	38.4

Table 3.4A: Patient-reported walk-in clinic use in the year patients responded to the HCES by physicians' characteristics identified on March 31st, 2015				
	Interprofessional Teams		**Non-interprofessional Teams**	
	Denominator	Percentage	Denominator	Percentage
Physicians characteristics				
Sex				
Male	7,909	17.3	7,279	26.1
Female	4,994	20.3	4,302	28.8
Missing	85	17.6	67	23.9
Age group				
<40	1,418	19.3	842	27.8
40-64	8,670	18.7	7,717	26.8
> 64	2,573	17.4	2,852	28.1
Missing	327	16.5	237	20.7
Country of medical graduation Canada				
Yes	10,286	18.2	8,771	26.3
No	2,375	19.8	2,640	30.3
Missing	327	16.5	237	20.7
Years in practice				
<5	294	17.3	210	20.5
5_15	2,971	19.1	1,703	27.2
16-25	2,903	19.7	2,835	26.7
>25	6,735	17.7	6,833	27.4
Missing	85	17.6	67	23.9

Table 3.4B: Patient-reported walk-in clinic by patients' characteristics identified at the year they have responded to the HCES				
	Interprofessional Teams		**Non-Interprofessional Teams**	
	Denominator	Weighted Percentage	Denominator	Weighted Percentage
Overall patient-reported walk-in clinic	12,988	19.7	11,648	28.2
Patients characteristics				
Sex				
Males	5,310	17.7	4,792	26.1
Female	7,678	21.2	6,856	29.7
Missing	0	--	0	--
Age group, yr.				
16-44	3,819	29.5	3,653	37.6
45-64	5,272	17.1	4,661	27.4
65-84	3,602	11.3	3,071	15.9
85+	295	10.1	263	14.9
Missing	0	--	0	--

New OHIP registrants (within 10 years)				
Yes	355	23.6	460	34.2
No	12620	19.6	11174	27.8
Missing	13	21.0	14	40.8
Income quintile				
1 (low)	2,089	19.2	1,764	27.1
2	2,468	17.4	2,228	27.6
3	2,697	20.6	2,295	28.7
4	2,822	20.4	2,550	30.4
5 (high)	2,888	20.4	2,784	26.8
Missing	24	12.6	27	36.3
Rurality Index of Ontario				
Largest Urban (0)	3,759	21.8	4000	30.2
Large urban (1 to 9)	2,388	32.0	4078	34.8
Small-urban (10 to 39)	4,823	16.2	2737	19.8
Rural (≥40)	1,892	9.3	763	10.9
Missing	126	11.2	70	34.9
Resource utilization band (RUB)				
1	629	18.5	471	26.8
2	2,128	17.4	1,802	27.8
3	6,746	20.2	6,417	29.6
4	2,031	23.0	1,869	30.9
5	823	18.2	674	20.6
Non-user and Missing	631	18.5	415	25.7
Patients with Chronic disease				
2 + Co-morbidity				
Yes	6,096	17.5	5,628	25.9
No	6,892	21.4	6,020	30.0
3+ comorbidities				
Yes	3,482	16.8	3,207	24.7
No	9,506	20.6	8,441	29.3
4+ comorbidities				
Yes	1,828	17.0	1,686	22.7
No	11,160	20.1	9,962	28.9

5+ comorbidities				
Yes	894	17.3	791	20.1
No	12,094	19.9	10,857	28.7

Table 3.5A: All Emergency Department (ED) visits in the year patients responded to the HCES by physicians' characteristics identified on March 31st 2015				
	Interprofessional Teams		Non-interprofessional Teams	
	≥1 ED visits		≥1 ED visits	
	Denominator	Percentage	Denominator	Percentage
Physicians characteristics				
Sex				
Male	7909	27.8	7279	24.4
Female	4994	24.8	4302	21.9
Missing	85	29.4	67	20.9
Age group				
<40	1418	26.0	842	27.4
40-64	8670	26.4	7717	22.7
> 64	2573	27.6	2852	24.7
Missing	327	30.9	237	19.8
Country of medical graduation Canada				
Yes	10286	26.1	8771	23.2
No	2375	28.6	2640	24.9
Missing	327	30.9	237	19.8
Years in practice				
<5	294	31.6	210	20.0
5_15	2971	26.4	1703	25.3
16-25	2903	25.5	2835	22.9
>25	6735	27.1	6833	23.4
Missing	85	29.4	67	20.9

Table 3.5B: All ED visits by patients' characteristics identified in the year they responded to the HCES				
	HCES Respondents in Interprofessional Teams		HCES Respondents in Non-interprofessional Teams	
	≥1 ED visits		≥1 ED visits	
	Denominator	Weighted Percentage	Denominator	Weighted Percentage
Overall ED visits	12988	26.7	11648	23.5
Sex				
Males	5310	26.7	4792	22.9
Female	7678	26.7	6856	23.9
Missing	0	--	0	--
Age group, yr.				
16-44	3819	26.8	3653	22.3
45-64	5272	24.1	4661	21.8
65-84	3602	29.2	3071	26.1

85+	295	40.0	263	38.4
Missing	0	--	0	--
New OHIP registrants (within 10 years)				
Yes	355	20.3	460	22.0
No	12620	26.9	11174	23.6
Income quintile				
1 (low)	2089	33.3	1764	27.7
2	D/S	D/S	D/S	D/S
3	2697	26.4	2295	23.8
4	2822	24.8	2550	21.9
5 (high)	2888	22.6	2784	21.6
Missing	D/S	D/S	D/S	D/S
Rurality Index of Ontario				
Largest Urban (0)	3759	23.5	4000	20.9
Large urban (1 to 9)	2388	22.0	4078	20.3
Small-urban (10 to 39)	4823	27.8	2737	28.0
Rural (≥40)	1892	35.3	763	37.5
Missing	126	38.1	70	30.0
Resource utilization band (RUB)				
1	629	19.9	471	15.7
2	2128	19.2	1802	15.2
3	6746	25.7	6417	22.7
4	2031	34.6	1869	31.7
5 (very high user)	823	48.5	674	42.7
Non-user and Missing	631	15.5	415	13.5
Patients with Chronic disease				
2 + Co-morbidity				
Yes	6096	32.0	5628	23.5
No	6892	22.0	6020	23.5
3+ comorbidities				
Yes	3482	36.4	3207	32.6
No	9506	23.1	8441	20.0
4+ comorbidities				
Yes	1828	40.6	1686	37.9
No	11160	24.4	9962	21.0
5+ comorbidities				
Yes	894	47.0	791	41.6
No	12094	25.2	10857	22.2

D/S= Data suppressed where counts are between 1 and 5; additional suppression may be applied where counts are greater than 5 to prevent residual disclosure of suppressed values—in compliant with the Personal Health Information Protection Act (PHIPA) privacy legislation.

Table 3.6: Association between enrolment in an interprofessional team-based model and timely access, after-hours access to care, walk-in clinic use and emergency department visits in the year responded to the survey				
	Timely access to care Reference: non-interprofessional teams			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	1.03	0.91	1.15	0.6764
†**Adjusted for:**				
Physician group characteristics	1.01	0.90	1.13	0.8397
Group and physicians' characteristics	1.02	0.92	1.14	0.7041
Physician group, physician and patients	1.12	1.00	1.24	0.0436*
	After-hours care at the year responded to the survey Reference: non-interprofessional teams			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	0.87	0.79	0.96	0.0068*
†**Adjusted for:**				
Physician group characteristics	0.81	0.73	0.89	<0.0001*
Group and physicians' characteristics	0.81	0.73	0.90	<0.0001*
Physician group, physician and patients	1.01	0.91	1.12	0.8251
	Walk-in clinic visits at the year responded to the survey Reference: non-interprofessional teams			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	0.63	0.57	0.69	<0.001*
†**Adjusted for:**				
Physician group characteristics	0.67	0.60	0.74	<0.001*
Group and physicians' characteristics	0.68	0.61	0.76	<0.001*
Physician group, physician and patients	0.84	0.75	0.94	0.0019*
	Emergency department uses at the year responded to the survey Reference: non-interprofessional teams			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	1.17	1.08	1.28	<0.0002*
†**Adjusted for:**				
Physician group characteristics	1.20	1.10	1.31	<0.001*
Group and physicians' characteristics	1.20	1.10	1.30	<0.001*

Physician group, physician and patients	1.05	0.95	1.15	0.3234

*p-value significant <0.05
† Adjustment used physician groups and physicians' characteristics identified on March 31st, 2015 and patients' characteristics at the year they have responded to the HCES

Figure 3.1: Study Population Flow Diagram

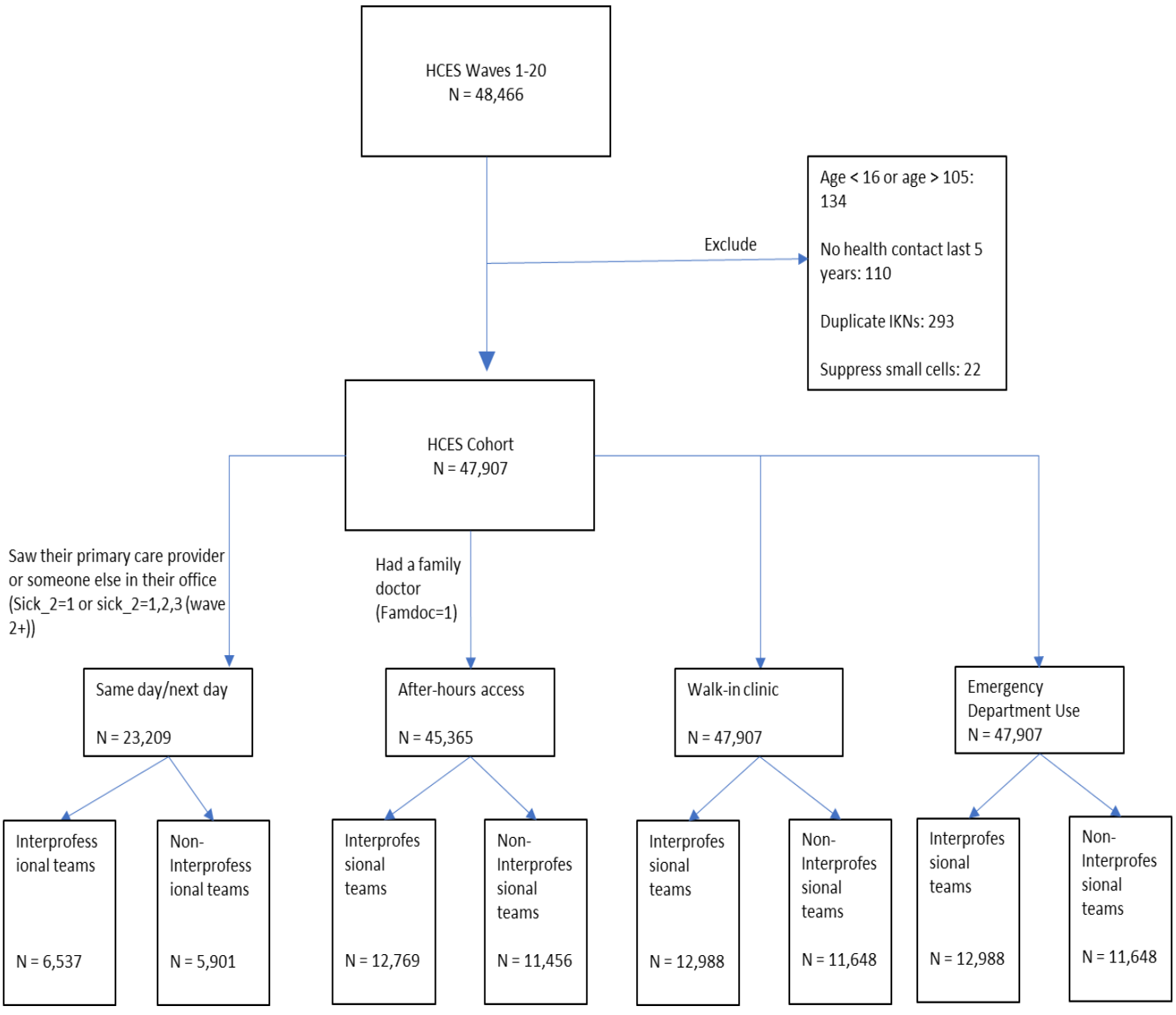
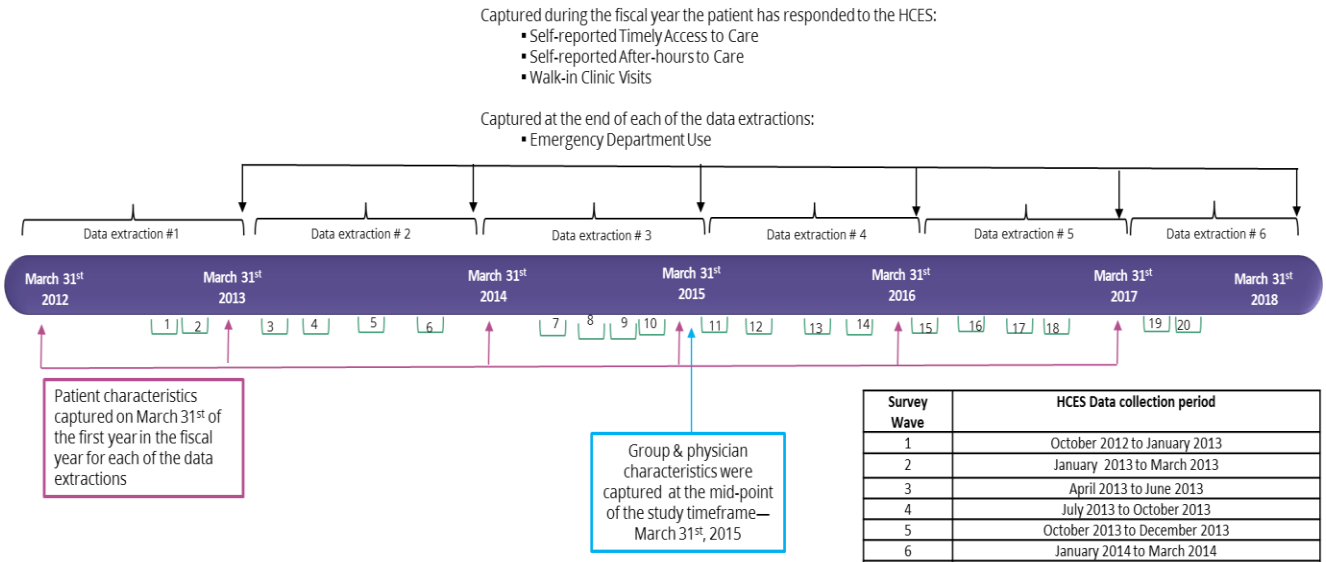


Figure 3.2: Data Extractions and Cohort Generation



Survey Wave	HCES Data collection period
1	October 2012 to January 2013
2	January 2013 to March 2013
3	April 2013 to June 2013
4	July 2013 to October 2013
5	October 2013 to December 2013
6	January 2014 to March 2014
7	April 2014 to June 2014
8	July 2014 to October 2014
9	October 2014 to January 2015
10	January 2015 to April 2015
11	April 205 to July 2015
12	July 2015 to October 2015
13	October 2015 to January 2016
14	January 2016 to April 2016
15	April 2016 to June 2016
16	June 2016 to September 2016
17	September 2016 to December 2016
18	January 2017 to April 2017
19	March 2017 to July 2017
20	July 2017 to October 2017

Chapter 4. Study 3: Role of Interprofessional Primary Care Teams in Preventing Avoidable Hospitalizations and Hospital Readmissions in Ontario, Canada: A Retrospective Cohort Study

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4.0 Abstract

Background: Improving health system value and efficiency are considered major policy priorities internationally. Ontario has undergone a primary care reform that included introduction of interprofessional teams. The purpose of this study was to investigate the relationship between receiving care from interprofessional versus non-interprofessional primary care teams and ambulatory care sensitive condition (ACSC) hospitalizations and hospital readmissions.

Methods: Population-based administrative databases were linked to form data extractions of interest between the years of 2003-2005 and 2015-2017 in Ontario, Canada. The data sources were available through ICES. The Study Design was a Retrospective longitudinal cohort. We used a "difference-in-differences" approach for evaluating changes in ACSC hospitalizations and hospital readmissions before and after the introduction of interprofessional team-based primary care while adjusting for physician group, physician and patient characteristics.

Principle Findings: As of March 31st, 2017, there were a total of 778 physician groups, of which 465 were blended capitation Family Health Organization (FHOs); 177 FHOs (22.8%) were also interprofessional teams and 288 (37%) were more conventional group practices ("non-interprofessional teams"). In this period, there were a total of 13,480 primary care physicians in Ontario of whom 4,848 (36%) were affiliated with FHOs—2,311 (17.1%) practicing in interprofessional teams and 2,537 (18.8%) practicing in non-interprofessional teams. During that same period, there were 475,611 and 618,363 multi-morbid patients in interprofessional teams and non-interprofessional teams respectively out of a total of 2,920,990 multi-morbid adult patients in Ontario. There was no difference in change over time in ACSC admissions between interprofessional and non-interprofessional teams between the pre- and post-

intervention periods. There were no statistically significant changes in all cause hospital re-admissions between the post- and pre-intervention periods for interprofessional and non-interprofessional teams.

Conclusion: Our study findings indicate that the introduction of interprofessional team-based primary care was not associated with changes in ACSC hospitalization or hospital readmissions. The findings point for the need to couple interprofessional team-based care with other enablers of a strong primary care system to improve health services utilization efficiency.

KEYWORDS: Primary Care Reform, Primary Health Care, Avoidable Hospitalizations, Health Services Delivery, Ontario, Canada

4.1 Introduction

Improving health system value and efficiency are considered major policy priorities internationally.[175,176] While health system costs continue to be a challenge across jurisdictions, hospitalizations for ambulatory care sensitive conditions (ACSCs) and hospital readmissions have been a focus for policymakers.[177,178,179, 180] ACSC hospitalizations are potentially avoidable by preventing the inception of disease, controlling an acute episodic illness, or managing a chronic condition effectively.[181] When care is delivered to patients when and where they need it, hospital readmissions can sometimes be prevented.[182] Evidence has suggested a link between the burden of multi-morbidity and health services use, particularly hospitalizations.[183,184,185,186] Hence, multi-morbid patients continue to be a key focus from a clinical care and population health perspective.[187,188,189,190] Interprofessional team-based care may have an important role to play in caring for multi-morbid patients by offering a collaborative approach to prevent ACSC hospitalization and hospital readmissions.

During the 1990s, federal and provincial governments in Canada faced fiscal challenges that resulted in limited healthcare spending and investments in primary care innovation.[191] In the 2000s, Ontario introduced primary care reform in response to the recommendations of various federal and provincial reports.[192,193] Primary care reform movement in Ontario included three major policy initiatives: new physicians' reimbursement and organizational models, patient enrolment with a primary care provider and support to interprofessional team-based care.[24] During the last twenty years, more than one third of Ontario primary care physicians have voluntarily transitioned from traditional fee-for-service practice to blended capitation payment and in some cases received additional funding

to support interprofessional team members to join their practice. These models are described in detail elsewhere.[194] There are many similarities between Ontario interprofessional Family Health Teams, Quebec Family Medicine Groups and Alberta Primary Care Networks.[195,196,197,198] In Ontario, reducing hospitalization for ACSC conditions and all-cause re-admission are strategic priorities.[199,200] In this study, we examined the association between the introduction of primary care interprofessional teams and unplanned ACSC hospital admissions and all cause hospital re-admissions among multi-morbid patients. We compared changes in those outcomes over time among physicians remunerated through the same physician payment model, some of whom transitioned to interprofessional team-based practice. We hypothesised that multi-morbid patients who receive care from an interprofessional teams will have lower ACSC hospital admissions and all-cause readmissions over time when compared to patients receiving care from non-interprofessional teams.

4.2 Methods

4.2.1 Setting

The setting was Ontario, Canada, the country's most populous province with a population of 14.4 million people in 2019.[201] Permanent residents of Ontario are fully insured for primary care services through the Ontario Health Insurance Plan (OHIP) with no co-payment or deductible. Primary care organization and payment has shifted over the course of the last 18 years. In 2002, primary care physicians billed fee-for-service and worked independently. Today, most Ontario physicians are paid through some form of blended payment and are part of an organised model with formal patient enrolment. The three dominant practice models in Ontario are: enhanced fee-for-service (85% fee-for-service, 15% capitation and bonuses, no funding for non-physician health professionals); non-interprofessional team blended capitation (20% fee-for-service, 80% capitation and bonuses, no funding for non-physician health professionals), and interprofessional team blended capitation (20% fee-for-service, 80% capitation and bonuses, and funding for non-physician health professionals). Approximately one in six Ontarians is not formally enrolled to a physician practicing in a new model.[202] The focus of this study was on the dominant blended capitation patient enrolment model—Family Health Organization (FHO)—within which groups of physicians can be practicing in either interprofessional or non-interprofessional teams. FHO have formal patient enrollment, electronic medical records, physician-led governance and a minimum of three physicians practicing together. They offer comprehensive care, including preventive health care services, chronic disease management and health promotion, through a combination of regular physician office hours and after-hours services. FHOs were eligible to apply

for additional funding to become interprofessional teams and typically include primary care physicians and nurses or nurse practitioners and at least one allied health care professional such as pharmacist, social worker or dietitian. Interprofessional teams are also eligible for funding an administrator or executive director and electronic medical records.

4.2.2 Study design and population

We conducted a retrospective cohort study with longitudinal design given the importance of temporal effect on interprofessional teams formation and maturation and their relationship to the outcomes under investigation. We used the "difference in differences" approach, an econometric method for evaluating changes in outcomes after policy implementation.[203] We compared outcomes of interest before and after the implementation of interprofessional teams.

Several population-based administrative databases were linked using unique encoded identifiers at ICES (formerly known as the Institute for Clinical Evaluative Sciences) to form data extractions of interest. We generated a cohort that included the same patients at two different points in time, pre- and post-teams' formation. The study population included patients between 18 and 105 years old, who had two or more of a list of 17 chronic conditions as identified at the beginning of the pre-teams' formation period, March 31st 2003 and who were part of a FHO blended capitation model as identified at the beginning of the post-teams formation period, March 31st, 2015. The chronic condition selection was based on clinical relevance and impact on the outcomes being investigated as described in previous literature.[204,205,206,207,208,209] These conditions have been adopted in previous studies [210,211] and are consistent with the parameters outlined by the Department of Health and Human Services for defining and measuring chronic conditions.[212] The conditions include: cancer, diabetes, asthma, chronic obstructive pulmonary disease (COPD), hypertension, chronic coronary syndrome (CCS), cardiac arrhythmia, congestive heart failure (CHF), stroke, acute myocardial infarction (AMI), renal failure, arthritis (excluding rheumatoid arthritis), rheumatoid arthritis, osteoporosis, depression, dementia and mental health conditions (full list of diagnostic information for defining the 17 selected chronic conditions under investigation in this study are included in Appendix A).

The baseline study population included people identified on March 31st, 2003 who were still identifiable on March 31st, 2015 and were part of the FHO blended capitation model. People in the baseline population were followed-up to February 28th, 2005 for first unplanned ACSC admission and up to March 31st, 2005 for first all-cause readmission and in the follow up period up to February 28th, 2017 for the first ACSC admission and up to March 31st, 2017 for all-cause readmission. Given that teams did not

exist during the baseline period, assignment of patients to interprofessional and non-interprofessional teams was based on their post-intervention assignment. We excluded individuals who died and individuals who were in long term care or complex continuing care.

4.2.3 Measures and data sources

ACSC Admission and Hospital Re-admission

The primary outcome was hospital admissions for ACSCs, defined as the first hospital non-elective admission with a most responsible diagnosis code of: grand mal status and other epileptic convulsions, chronic obstructive pulmonary disease (COPD), asthma, diabetes, heart failure and pulmonary edema, hypertension and angina.

The secondary outcome was hospital readmissions, defined as the first subsequent non-elective all-cause readmission to an acute care hospital within 30 days of discharge, among hospitalisation for selected Case Mix Group (CMG) groups: stroke, COPD, pneumonia, congestive heart failure, diabetes, cardiac conditions, gastrointestinal conditions (List of CMGs codes in Appendix B). The primary and secondary outcomes were derived from the OHIP database and the Discharge Abstract Database (DAD) and the Registered Patient Database (RPDB) available at ICES. Both outcomes excluded people without a valid date of admission/discharge; and people who died during their hospital stay (relevant to admission but not readmission).

Physician Group and Physicians Characteristics

Physician group characteristics included the number of physicians per group and number of years under the capitation model. Physicians' characteristics included age, gender, Canadian graduate status and number of years in practice. Those variables were derived from a health care provider data registry available at ICES.

Patient Characteristics

Patients' characteristics included age, gender and recent OHIP registration as a proxy for immigration which were identified from a population and demographics data registry available at ICES. By linking patients' postal code to census data we were able to derive neighborhood income quintiles. Income levels, adjusted for household size and specific to each community, were used to order postal codes into quintiles, with quintile 1 having the lowest relative income and quintile 5 the highest. Rurality was identified using the Ontario Medical Association Rurality Index of Ontario (RIO).[213] The RIO is based on community characteristics including travel time to different levels of care, community population,

presence of providers, hospitals and ambulance services, social indicators and weather conditions. RIO scores range from zero to 100 (zero indicating the most urban and 100 the most rural). RIO scores are divided into three main categories, major urban centres, semi-urban centres and rural areas. We used the Johns Hopkins Adjusted Clinical Groups case-mix system software to assign patients into expected Resource Utilization Bands (RUBs) categories.[214] The RUBs range from 0 indicating no utilization to 5 indicating very high expected utilization.

Six chronic diseases conditions (AMI, asthma, CHF, COPD, hypertension, diabetes) were defined based on previously validated population-derived ICES cohorts.[215,216,217,218,219,220] For the conditions where a derived ICES cohort was not available (cancer, cardiac arrhythmia, chronic coronary syndrome, dementia, depression, arthritis (excluding rheumatoid arthritis), osteoporosis, renal failure, rheumatoid arthritis, and stroke), a similar approach for the derivation was adopted—at least one diagnosis recorded in acute care, or two diagnoses recorded in physicians' records within a two-year period. The conditions were derived using the DAD and OHIP databases available at ICES.

4.2.4 Statistical analysis

For the descriptive results, we generated frequencies, percentages, means and standard deviations to describe the characteristics of physician groups, physicians and patients who are either in interprofessional teams or non-teams and their respective admission and re-admission rates.

For the admission and readmission models, as a first step we tested for patient clustering within physicians using a random effects logistics regression. Clustering was not significant. Consequently, we ran ordinary logistic regression models with binary outcomes of ACSC admission and all-cause readmission. The independent variables added to the models were the respective physician group, physician and patient characteristics.

To estimate the difference in differences we used Generalized Estimating Equations method to account for repeated measures within patients. The independent variables added to the models were the respective physician group, physician and patient characteristics.

All study analyses were conducted using SAS v.9.3 and statistical significance was assessed at a p-value <0.05.

4..3 Results

Baseline physician group, physician and patient characteristics comparing interprofessional teams to non-interprofessional teams

As of March 31st, 2017, there were a total of 778 physician groups in Ontario, of which 465 were FHOs; 177 FHOs (22.8%) were also interprofessional teams and 288 (37%) were non-interprofessional teams. Compared to non-interprofessional teams, interprofessional teams had: more physicians per group and more years under the capitation model.

In this period, there were a total of 13,480 primary care physicians in Ontario of whom 4,848 (36%) were affiliated with FHOs, 2,311 (17.1%) practicing in interprofessional teams and 2,537 (18.8%) practicing in non-interprofessional teams. Compared to non-interprofessional teams, interprofessional teams had: fewer patients per physician, more female physicians, more physicians in the younger age group, more physicians who were Canadian graduates and fewer years in practice (Table 1A).

During the same period, there were 475,611 and 618,363 multi-morbid patients in interprofessional and non-interprofessional teams respectively out of a total of 2,920,990 multi-morbid adult patients in Ontario. Overall interprofessional teams had fewer new immigrant patients and more patients who reside in rural areas. Other patient characteristics were relatively similar between interprofessional and non-interprofessional teams. When compared to all physician groups, both interprofessional and non-interprofessional teams had less patients with high number of co-morbidities (Table 1B).

ACSC hospital admissions and all cause 30-day re-admissions in interprofessional teams and non-interprofessional teams by physician and patient characteristics

During the period of April 1st, 2015 to March 31st, 2017, interprofessional teams were found to have higher ACSC admission rates when compared to non-interprofessional teams (2.5% versus 2.1%, respectively). When we investigated ACSC admissions during the same period across interprofessional and non-interprofessional teams by physician characteristics identified on March 31st, 2015, we found that the following were associated with higher ACSC admission rates: being a male, being in the older age group, and being a non-Canadian graduate (Table 2A).

During that same period, when we investigated ACSC admission across interprofessional and non-interprofessional teams in relation to the patient characteristics identified on March 31st, 2003, we found that the following patient characteristics were associated with higher ACSC admission rate: being a male, being in the older age category, being a non-immigrant, being in the lowest neighborhood

income quintile, being a resident of a rural area, being in the highest expected resource utilization band, and having five and plus co-morbidities (Table 2B).

During that same period, interprofessional teams were found to have slightly higher all cause hospital 30-day re-admission rate when compared to non-interprofessional teams (15.0% versus 14.6%, respectively).

When we investigated hospital re-admission during the same period across interprofessional and non-interprofessional teams by physician characteristics identified on March 31st, 2015, being a non-Canadian graduate physician was associated with higher re-admission rate (Table 3A).

During that same period, when we investigated hospital re-admission across interprofessional and non-interprofessional teams in relation to the patient characteristics identified on March 31st, 2003, we found that the following were associated with higher 30-day re-admission rate: being a male, being in the older age category, residing in major urban areas, being in the highest expected resource utilization band, and having five or more co-morbidities (Table 3B).

When we stratified the results by males and females for both outcomes, we did not identify sex differences (results not presented but can be made available on request).

Association between enrolment in an interprofessional team model and ACSC hospital admission and all cause hospital re-admission

During the post-intervention period, when we adjusted for physician group, physician and patient characteristics, being in an interprofessional team increased the likelihood of having ACSC hospital admission by 7%. For the same period, we did not find significant difference between interprofessional and non-interprofessional teams for hospital all cause readmission (Table 4).

When we examined change over time between the post- and pre-intervention periods, there was a significant increase in the ACSC hospital admission rate: 1.34% for both interprofessional and non-interprofessional teams. There was no difference between interprofessional and non-interprofessional teams in the change in ACSC admissions across the pre- and post-intervention periods.

For the same period, when we compared for change over time between the post- and pre intervention there was a significant difference in hospital all cause re-admission rate with an increase of 4.90% for interprofessional teams and an non-significant increase for non-interprofessional teams of 1.47%. We found a non-significant difference between interprofessional and non-interprofessional teams in the

change in hospital all cause re-admissions between the pre- and post-intervention periods, 3.43% (Table 5).

4.4 Discussion

We used administrative databases to assess the association between receiving care from interprofessional and non-interprofessional primary care teams and unplanned ACSC hospitalizations and all cause hospital readmissions among multi-morbid patients. We followed the same patients before and after teams were implemented which allowed an assessment of the effect of the intervention—introduction of interprofessional team-based care. When we investigated the outcomes during the most recent available period of April 1st, 2015 to March 31st, 2017 interprofessional teams were found to have higher ACSC admission and hospital re-admission rates as compared to non-interprofessional teams. However, when we compared the outcomes over time, interprofessional teams were not associated with either an increase or a reduction of ACSC hospital admission and hospital re-admission.

The results are consistent with previous evidence that looked at utilization in relation to interprofessional team-based care and found differences in quality but not in healthcare utilization and cost.[221,222,223,224] One US study that evaluated the effect of multiplayer patient-centred medical home on healthcare utilization did not find a significant reduction in inpatient admissions.[225] In contrast, several studies from the US assessed multiple components of the medical home model on health services utilization and found significant lower rates of avoidable hospitalization when more medical homeness was incorporated in the health system.[226,227,228] Implementation of Family Health Teams appeared to contribute to a reduction in ACSC hospitalizations in a Brazilian metropolis, Belo Horizonte.[229]

There is a body of evidence that links chronic disease management programs to lower preventable hospitalizations.[230,231,232,233] In Ontario, patients being served by both interprofessional and non-interprofessional teams have access to certain chronic disease programs including diabetes education and heart failure clinics. This could be one of the reasons for the absence of difference in our study between receiving care from interprofessional and non-interprofessional teams in ACSC hospitalizations. Additionally, there is heterogeneity of interprofessional teams features across Ontario. For instance, some interprofessional teams are co-located others are not. Hence, some interprofessional teams might not be ideally set up for care coordination and continuity of care. Continuity of care might be reduced within interprofessional teams if they are not well coordinated and might present a potential for fragmented care. Available evidence from a systematic review suggests that having an accessible and a long-term relationship with a primary care provider appeared to be more important in reducing

potentially avoidable hospitalizations than how the primary care delivery is organized. Long-term relationships between primary care physicians and patients reduces hospitalizations for chronic ACSCs and continuity of care has been associated with both reduced health services utilization and patient satisfaction.[234,235,236] Continuity of care is critical to ensuring that everyone with chronic medical needs receive effective, timely and safe health care.[237]

Based on Startfield's model a strong primary care system should be the first contact for care, as well as continuous, comprehensive and well-coordinated to reduce unwanted outcomes such as preventable hospitalizations.[238] It is important for any jurisdiction that has embarked on or is planning to set up primary care interprofessional team-based care to nurture all these enablers for a strong primary care system.

Our study has several limitations that should be acknowledged. First, administrative databases have not been originally set up for research purposes, which presented a potential for measurement error. However, all the databases used in our study have been validated in Ontario's context. Additionally, any potential measurement error will be non-deferential between interprofessional and non-interprofessional teams and should not bias the results in a meaningful way. Second, this is an observational study and is susceptible to unmeasured confounding. However, by comparing the outcomes over time, potential risk of bias from unmeasured confounders was limited. Third, due to the adopted study design, to be included in the study population, patients had to survive throughout the study period—April 1st, 2003 to March 31st, 2017. However, a potential survival bias would have affected both interprofessional and non-interprofessional teams' patients equally and does not present a threat to internal validity. Fourth, ACSC medical admissions and all-cause readmissions are not all unnecessary and preventable.

4.5 Conclusion

Our study findings indicate that the introduction of interprofessional team-based primary care was not associated with reduction in avoidable hospitalizations and hospital readmissions. Those results were not in-line with our hypothesis as we expected that, over time, interprofessional teams would reduce the likelihood of ACSC admissions and re-admissions. For jurisdictions aiming to expand physician participation in teams, our study results point to the need to couple interprofessional team-based care with other enablers of a strong primary care system such as access, continuity, comprehensiveness and coordination. Policies and practices that enhance those features will help to

implement interprofessional team-based care in a way that it is best able to deliver on intended outcomes such as improving health services utilization efficiency.

4.6 Results Tables

Table 4.1A: Physicians group and physicians characteristics by enrolment model of care – comparing interprofessional teams to non-interprofessional teams to all groups (patient enrolment models) in Ontario based on March 31st, 2015

	Interprofessional Teams		Non-interprofessional teams		All Ontario physician groups (patient enrolment models) and physicians	
Physicians' Group characteristics						
Groups No. (% of all PEMs)	177	22.8	288	37.0	778	100.0
Number of physicians per group, Mean (SD)	13.11	10.7	8.8	7.6	17	188.9
Years under the capitation model, Mean (SD)	6.00	3.0	4.3	2.6	6	3.3
Physicians characteristics						
Physicians No. (% of all physicians)	2,311	17.1	2,537	18.8	13,480	100.0
Number of patients per physician, Mean (SD)	1,303	638.9	1,517	675.9	1,020	944.6
Sex No. (%)						
Male	1,212	52.4	1,391	54.8	7,270	53.9
Female	1,099	47.6	1,146	45.2	5,864	43.5
Missing	0	0.0	0	0.0	346	2.6
Age group No. (%) in Yrs.						
<40	546	23.6	364	14.4	2,518	18.7
40-64	1,499	64.9	1,773	69.9	7,930	58.8
> 64	232	10.0	373	14.7	2,031	15.1
Missing	34	1.5	27	1.1	1,001	7.4
Country of medical graduation						

Canada No. (%)						
Yes	1,874	81.1	1,871	73.8	8,974	66.6
No	403	17.4	639	25.2	3,505	26.0
Missing	34	1.5	27	1.1	1,001	7.4
Years in practice No. (%)						
<5	60	2.6	48	1.9	667	5.0
5_15	701	30.3	465	18.3	3,145	23.3
16-25	531	23.0	645	25.4	3,047	22.6
>25	1,019	44.1	1,379	54.4	6,275	46.6
Missing	0	0.0	0	0.0	346	2.6

Table 4.1B: Patients' characteristics comparing patients in interprofessional teams, non-interprofessional teams, all multi-morbid patients and all Ontarians adults on March 31st, 2003

	Multi-morbid patients in interprofessional teams		**Multi-morbid patients in Non-interprofessional teams**		**All multi-morbid patients in Ontario**		**All Ontarians**	
Patients total	**475,611**		**618,363**		**2,920,990**		9,397,586	
Sex No. (%)								
Males	186,729	39.3	246,882	39.9	1,240,516	42.5	4,576,936	48.7
Female	288,882	60.7	371,481	60.1	1,680,474	57.5	4,820,650	51.3
Missing	-	0.0	-	0.0	-	0.0	-	0.0
Age group, yr. No. (%)								
18-44	138,965	29.2	184,059	29.8	654,813	22.4	4,863,276	51.8
45-64	227,930	47.9	296,914	48.0	1,127,265	38.6	2,981,705	31.7
65-84	107,821	22.7	136,227	22.0	999,353	34.2	1,389,782	14.8
84+	895	0.2	1,163	0.2	139,559	4.8	162,823	1.7
Missing	-	0.0	-	0.0	-	0.0	-	0.0
New OHIP registrants (within 10 years) No. (%)	13,742	2.9	29,981	4.9	157,488	5.4	1,200,951	12.8
Income quintile, No. (%)								
1 (low)	84,198	17.7	101,739	16.5	583,685	20.0	1,799,279	19.2
2	96,387	20.3	115,903	18.7	605,293	20.7	1,884,459	20.1
3	95,925	20.2	125,618	20.3	588,141	20.1	1,892,274	20.1
4	96,214	20.2	132,243	21.4	570,140	19.5	1,903,560	20.3
5 (high)	101,596	21.4	141,926	23.0	565,536	19.4	1,888,811	20.1
Missing	1,291	0.3	934	0.2	8,195	0.3	29,203	0.3
Rurality Index of Ontario, No. (%)								
Major urban (0 to 9)	257,792	54.2	475,286	76.9	2,026,660	69.4	6,698,329	71.3

Semi-urban (10 to 39)	150,810	31.7	111,986	18.1	608,960	20.9	1,852,225	19.7
Rural (≥40)	63,866	13.4	28,970	4.7	260,936	8.9	761,861	8.1
Missing	3,143	0.7	2,121	0.3	24,434	0.8	85,171	0.9
Resource utilization band (RUB), No. (%)								
0 (non-user)	2,157	0.5	2,431	0.4	30,338	1.0	938,240	10.0
1	2,252	0.5	2,595	0.4	11,227	0.4	555,466	5.9
2	23,325	4.9	27,403	4.4	114,781	3.9	1,588,712	16.9
3	306,213	64.4	399,620	64.6	1,691,226	57.9	4,685,817	49.9
4	109,010	22.9	146,389	23.7	734,298	25.1	1,253,298	13.3
5 (very high user)	32,654	6.9	39,925	6.5	339,120	11.6	376,053	4.0
Missing								
Patients with Chronic disease								
2 + Co-morbidity No. (%)	475,611	100.0	618,363	100.0	2,920,990	100.0	2,920,990	31.1
3+ comorbidities No. (%)	194,828	41.0	257,141	41.6	1,481,098	50.7	1,481,098	15.8
4+ comorbidities No. (%)	71,285	15.0	95,323	15.4	723,296	24.8	723,296	7.7
5+ comorbidities No. (%)	23,824	5.0	323,368	5.2	344,685	11.8	344,685	3.7

Table 4.2A: ACSC hospital admissions between April 1st, 2015 and February 28th, 2017 among multi-morbid adults by physician characteristics identified on March 31st, 2015						
	Interprofessional Teams			Non-interprofessional teams		
	Numerator	Denominator	Rate per 100	Numerator	Denominator	Rate per 100
ACSC admissions and patients totals	**11,963**	**475,611**	**2.5**	**13,160**	**618,363**	**2.1**
Physicians characteristics						
Sex						
Male	8,183	298,763	2.7	9,547	407,328	2.3
Female	3,780	176,848	2.1	3,613	210,599	1.7
Missing					436	0.0
Age group						
<40	2,013	80,487	2.5	1,098	54,012	2.0
40-64	8,170	332,177	2.5	9,242	445,990	2.1
> 64	1,648	58,240	2.8	2,730	114,424	2.4
Missing	132	4,707	2.8	90	3,937	2.3
Country of medical graduation Canada						
Yes	9,389	379,843	2.5	9,459	456,855	2.1
No	2,442	91,061	2.7	3,611	157,571	2.3
Missing	132	4,707	2.8	90	3,937	2.3
Years in practice						
<5	246	9,457	2.6	180	6,971	2.6
5_15	2,650	105,104	2.5	1,464	71,094	2.1
16-25	2,571	107,080	2.4	3,047	144,860	2.1
>25	6,496	253,970	2.6	8,460	395,002	2.1
Missing		-		9	436	2.1
Table 4.2B: ACSC hospital admissions between April 1st, 2015 and March31st, 2017 among multi-morbid adults by patient characteristics from March 31st, 2003						
Patients characteristics						
ACSC admissions and patients totals	11,963	475,611	2.52	13,160	618,363	2.13
Sex						
Males	5,265	186,729	2.8	5,869	246,882	2.4
Female	6,698	288,882	2.3	7,291	371,481	2.0
Missing	-	-		-	-	0.0

Age group, yr.						
18-44	1,229	138,965	0.9	1,288	184,059	0.7
45-64	5,213	227,930	2.3	5,665	296,914	1.9
65+	5,521	108,716	5.1	6,207	137,390	4.5
Missing		-			-	0.0
New OHIP registrants (within 10 years)						
Yes	294	13,742	2.1	470	29,981	1.6
No	11,669	461,869	2.5	12,690	588,382	2.2
Income quintile						
1 (low)	2,742	84,198	3.3	2,859	101,739	2.8
2	2,710	96,387	2.8	2,815	115,903	2.4
3	2,338	95,925	2.4	2,631	125,618	2.1
4	2,161	96,214	2.2	2,545	132,243	1.9
5 (high)	1,972	101,596	1.9	2,290	141,926	1.6
Missing	40	1,291	3.1	20	934	2.1
Rurality Index of Ontario						
Major urban (0 to 9)	5,741	257,792	2.2	9,396	475,286	2.0
Semi-urban (10 to 39)	4,062	150,810	2.7	2,809	111,986	2.5
Rural (≥40)	2,060	63,866	3.2	881	28,970	3.0
Missing	100	3,143	3.2	74	2,121	3.5
Resource utilization band (RUB)						
0 (non-user)	37	2,157	1.7	56	2,431	2.3
1	40	2,252	1.8	27	2,595	1.0
2	399	23,325	1.7	382	27,403	1.4
3	6,410	306,213	2.1	7,081	399,620	1.8
4	3,370	109,010	3.1	3,773	146,389	2.6
5 (very high user)	1,707	32,654	5.2	1,841	39,925	4.6
Missing						
Patients with Chronic disease						
2 + Co-morbidity						
Yes	11,963	475,611	2.5	13,160	618,363	2.1

No	-	-		-	-	
3+ comorbidities						
Yes	7,635	257,141	3.0	8,657	257,141	3.4
No	4,328	280,783	1.5	4,503	361,222	1.2
4+ comorbidities						
Yes	4,213	71,285	5.9	4,841	95,323	5.1
No	7,750	404,326	1.9	8,319	523,040	1.6
5+ comorbidities						
Yes	1,949	23,824	8.2	2,329	32,368	7.2
No	10,014	451,787	2.2	10,831	585,995	1.8

Table 4.3A: All cause hospital re-admissions among multi-morbid adults between April 1st, 2015 and March 31st, 2017 by physician characteristics based March 31st, 2017

	Interprofessional Teams			Non-interprofessional teams		
	Numerator	**Denominator**	**Rate per 100**	**Numerator**	**Denominator**	**Rate per 100**
All-cause re-admissions and patient totals	1,796	11,963	15.0	1,917	13,160	14.6
Sex No. (%)						
Male	1,231	8,183	15.0	1,375	9,547.00	14.4
Female	565	3,780	14.9	542	3,613.00	15.0
Missing	0	0	0.0	0	0.00	0.0
Age group No. (%) in Yrs.						
<40	320	2,013	15.9	156	1,098.00	14.2
40-64	1,208	8,170	14.8	1,346	9,242.00	14.6
65+	255	1,648	15.5	404	2,730.00	14.8
Missing	13	132	9.8	11	90.00	12.2
Country of medical graduation Canada No. (%)						
Yes	1,405	9,389	15.0	1,369	9,459.00	14.5
No	378	2,442	15.5	537	3,611.00	14.9
Missing	13	132	9.8	11	90.00	12.2
Years in practice No. (%)						
<5	36	246	14.6	24	189.00	12.7
5_15	406	2,650	15.3	204	1,464.00	13.9

16-25	385	2,571	15.0	437	3,047.00	14.3
>25	969	6,496	14.9	1,252	8,460.00	14.8
Missing	0	0	0.0	0	0.00	0.00
Table 4.3B: All cause hospital re-admissions between April 1st, 2015 and March31st, 2017 among multi-morbid adults by patient characteristics from March 31st, 2003						
Patients characteristics						
All cause re-admissions and patient totals	**1,796**	**11,963**	**15.0**	**1,917**	**13,160**	**14.6**
Sex No. (%)						
Males	**807**	**5,265**	**15.3**	**893**	**5,869**	**15.2**
Female	**989**	**6,698**	**14.8**	**1,024**	**7,291**	**14.0**
Missing		-			-	
Age group, yr. No. (%)						
18-44	**159**	**1,229**	**12.9**	**156**	**1,288**	**12.1**
45-64	**774**	**5,213**	**14.8**	**787**	**5,665**	**13.9**
65+	**863**	**5,521**	**15.6**	**974**	**6,207**	**15.7**
Missing						
New OHIP registrants (within 10 years) No. (%)						
Yes	**36**	**294**	**12.2**	**78**	**470**	**16.6**
No	**1,760**	**11,669**	**15.1**	**1,839**	**12,690**	**14.5**
Income quintile, No. (%)						
1 (low)	**404**	**2,742**	**14.7**	**453**	**2,859**	**15.8**
2	**423**	**2,710**	**15.6**	**396**	**2,815**	**14.1**
3	**D/S**	**D/S**	**D/S**	**D/S**	**D/S**	**D/S**
4	**349**	**2,161**	**16.1**	**360**	**2,545**	**14.1**
5 (high)	**294**	**1,972**	**14.9**	**340**	**2,290**	**14.8**
Missing	**D/S**	**D/S**	**D/S**	**D/S**	**D/S**	**D/S**
Rurality Index of Ontario, No. (%)						
Major urban (0 to 9)	**886**	**5,741**	**15.4**	**1403**	**9,396**	**14.9**
Semi-urban (10 to 39)	**D/S**	**D/S**	**D/S**	**D/S**	**D/S**	**D/S**
Rural (≥40)	**310**	**2,060**	**15.0**	**115**	**881**	**13.1**
Missing	**D/S**	**D/S**	**D/S**	**D/S**	**D/S**	**D/S**

Resource utilization band (RUB), No. (%)						
0 (non-user)	**D/S**	**D/S**	**D/S**	**D/S**	**D/S**	**D/S**
1	**6**	**40**	**15.0**	**7**	**27**	**25.9**
2	**56**	**399**	**14.0**	**54**	**382**	**14.1**
3	**D/S**	**D/S**	**D/S**	**D/S**	**D/S**	**D/S**
4	**524**	**3,370**	**15.5**	**534**	**3,773**	**14.2**
5 (very high user)	**289**	**1,707**	**16.9**	**302**	**1,841**	**16.4**
Missing						
Patients with Chronic disease						
2 + Co-morbidity No. (%)						
yes	**1,796**	**11,963**	**15.0**	**1,917**	**13,160**	**14.6**
No	**0**	**0**		**0**	**-**	
3+ comorbidities No. (%)						
yes	**1,226**	**7,635**	**16.1**	**1,335**	**8,657**	**15.4**
No	**570**	**4,328**	**13.2**	**582**	**4,503**	**12.9**
4+ comorbidities No. (%)						
yes	**697**	**4,213**	**16.5**	**770**	**4,841**	**15.9**
No	**1,099**	**7,750**	**14.2**	**1,147**	**8,319**	**13.8**
5+ comorbidities No. (%)						
yes	**344**	**1,949**	**17.7**	**378**	**2,329**	**16.2**
No	**1,452**	**10,014**	**14.5**	**1,539**	**10,831**	**14.2**

D/S refers to data supressed for observations with a count between 1 and 5 and have been suppressed to comply with Personal Health Information Protection Act privacy legislation

Table 4.4: Association between enrolment in an interprofessional team-based model and ACSC admissions and all cause hospital readmissions post intervention April 1st, 2015 to March 31st, 2017

	Interprofessional team ACSC Admissions (Reference: Non-Interprofessional teams)		
	OR	**95% CI**	**P-Value**
Unadjusted (null model)	1.19	1.16 1.22	<.0001
Adjusted* for**:**			
Physician group characteristics	1.15	1.12 1.18	<.0001
Group and physician characteristics	1.17	1.13 1.18	<.0001
Group, physician and patients		1.04 1.18	

	1.07		<.0001
	Interprofessional team re-admissions (Reference: non-teams)		
	OR	**95% CI**	**P-Value**
Unadjusted (null model)	1.31	0.98 1.75	0.073
Adjusted* for**:**			
Physician group characteristics	1.17	0.86 1.60	0.323
Group and physician characteristics	1.17	0.84 1.60	0.323
Group, physician and patients	1.20	0.84 1.65	0.260
*Adjustment used physician groups and physicians' characteristics from March 31st, 2015 (post-intervention) and patients' characteristics from March 31st, 2003 (pre-intervention)			

Table 4.5: Difference in differences model: difference in change over time in ACSC admissions and all cause re-admissions between interprofessional teams and non-interprofessional teams from pre-intervention (April 1st, 2003 to March 31st, 2005) to post-intervention (April 1st, 2015 to March 31st, 2017) periods.

	Interprofessional Teams						Non- Interprofessional teams							
	2015-17		2003-05		Difference (2015 to 2017 – 2003 to 2005)		2015-17		2003-05		Difference (2015 to 2017 – 2003 to 2005)		Difference in differences (diff. Teams – diff. non-teams)	
Unplanned ACSC admission	**Rate per 100**	**P-value**	**Rate per 100**	**P-value**	**Rate per 100**	**P-value**	**Rate per 100**	**P-value**	**Rate per 100**	**P-value**	**Rate per 100**	**P-value**	**Rate per 100**	**P-value**
Unadjusted model	2.52	<.0001	1.07	<.0001	1.44	<.0001	2.13	<.0001	0.84	<.0001	1.29	<.0001	0.15	0.0008
*Adjusted for physician group characteristics	2.48	<.0001	1.06	<.0001	1.42	<.0001	2.15	<.0001	0.85	<.0001	1.30	<.0001	0.12	0.0008
*Adjusted for physician group and physician characteristics	2.43	<.0001	1.04	<.0001	1.39	<.0001	2.07	<.0001	0.82	<.0001	1.25	<.0001	0.14	0.0011
*Adjusted for physician group and physician and patient characteristics	2.31	<.0001	0.97	<.0001	1.34	<.0001	2.20	<.0001	0.86	<.0001	1.34	<.0001	0.00	0.0016
Unplanned all cause hospital re-admission	**Rate per 100**	**P-value**	**Rate per 100**	**P-value**	**Rate per 100**	**P-value**	**Rate per 100**	**P-value**	**Rate per 100**	**P-value**	**Rate per 100**	**P-value**	**Rate per 100**	**P-value**
Unadjusted model	17.71	<.0001	10.90	<.0001	6.81	0.0002	14.26	<.0001	11.96	<.0001	2.30	0.2191	4.51	0.1066
*Adjusted for physician group characteristics	17.36	<.0001	10.66	<.0001	6.70	0.0002	14.55	<.0001	12.21	<.0001	2.34	0.219	4.36	0.1062
*Adjusted for physician group and physician characteristics	20.30	<.0001	12.73	<.0001	7.57	0.0003	16.76	<.0001	14.39	<.0001	2.37	0.2806	5.20	0.0972
*Adjusted for physician group and physician and patient characteristics	12.38	<.0001	7.48	<.0001	4.90	0.0003	9.67	<.0001	8.20	<.0001	1.47	0.2798	3.43	0.0975

*Adjustment used physician groups and physicians' characteristics from March 31st, 2015 (post-intervention) and patients' characteristics from March 31st, 2003 (pre-intervention)

Chapter 5. Discussion

5.1 Summary of study findings

The aim of this thesis was to assess the relationship between the introduction of interprofessional primary care teams and access to care and health services utilization while taking into consideration physician group, physician and patient selection factors. We hypothesized that as compared to non-interprofessional teams, interprofessional teams with their enhanced structure through allied healthcare professionals and administrative staff would perform better on access to care and reduce utilization of health services.

The first study investigated physician group, physician and patient characteristics associated with voluntarily joining interprofessional team-based primary care in Ontario. This cross-sectional study linked provincial administrative datasets to form data extractions of interest over time with the earliest in 2005 and the latest in 2013 (pre- and post-interprofessional team formation). The results showed that having more physicians per group, being a female physician, having more years under the blended capitation model, having more patients in the lowest income quintile and more patients residing in rural areas were positively associated with joining an interprofessional team. Being a female physician and having more patients who are males, recent immigrants and living in rural areas were positively associated with the outcome of joining interprofessional teams in the late phase.

The second study was a retrospective cohort study that examined the association between receiving care from interprofessional primary care teams and access to care and health services utilization. We linked different population-based administrative databases to a Health Care Experience Survey between 2012 and 2018 to form the population of interest. When we examined timely access to care while adjusting for physician group, physician and patient characteristics, we found that being in an interprofessional team increased the odds of patients reporting same/next day access to care and decreased the odds of reporting walk-in clinic use. We did not find a significant difference between interprofessional and non-interprofessional teams in patient-reported after-hours access to care and emergency department use.

The third study was a retrospective longitudinal cohort study that investigated the relationship between receiving care from interprofessional versus non-interprofessional primary care teams and ambulatory care sensitive condition (ACSC) hospitalizations and hospital readmissions among multi-morbid patients. Administrative databases were linked to form data extractions of interest between the years of 2003–2005 and 2015–2017 (pre- and post-team formation). We used a “difference-in-differences” approach for

evaluating changes in ACSC hospitalizations and hospital readmissions before and after the introduction of interprofessional team-based primary care while adjusting for physician group, physician and patient characteristics. The results showed that there was no statistically significant difference in change over time in ACSC admissions between interprofessional and non-interprofessional teams between the pre- and post-intervention periods. There were also no statistically significant changes in all cause hospital re-admissions between the post- and pre-intervention periods for interprofessional and non-interprofessional teams.

Ontario has significantly invested in interprofessional team-based care. The findings from this thesis indicate that there are differences in physician group, physician and patient characteristics when comparing interprofessional teams to non-teams. Interprofessional teams perform better on some but not all investigated processes and outcomes of care. Exploring the results from an integrated lens across the three studies highlight three key takeaways. First, making interprofessional team-based care voluntary will enable system incentives to influence who will and will not join interprofessional teams. This presents a risk that physicians that care for the patient population that may benefit the most from the interprofessional aspect of care might not be the first ones to join or might not join at all. Physicians with sicker patient populations paid through fee-for-service were less likely to select capitation-based payment, a pre-condition for participation in the interprofessional team-based funding initiative. As a result, eligibility to join capitation was likely biased toward physicians with healthier patient populations. Second, access to care can be enhanced through the structure of interprofessional team-based care reflected in improved timely access to care and less walk-in clinics use. In fact, patients may be less likely to seek care elsewhere if their provider is accessible to them in a timely manner. Also, the enhanced administrative structure of interprofessional teams can support reinforcing to patients the need to refrain from walk-in visits as part of being on the group roster. Third, improved health services utilization reflected in lower hospital admission and readmission is sensitive to additional factors that are beyond the interprofessional aspect of teams. This is reflected in the findings of the third study which were not in-line with our hypothesis that expected that, over time, interprofessional teams would reduce the likelihood of ACSC admissions and re-admissions. Those findings highlight the need to couple interprofessional team-based care with other enablers of a strong primary care system.

Connecting and synthesizing the three studies results together suggest that proper system incentives should be in-place to have patients in need of interprofessional care join those teams. The interprofessional aspect of teams is not enough to enhance processes and outcomes of care by itself. There

are several additional key factors that improve the care delivery model and are linked to enhanced outcomes—continuity of care being one of them.

Making the link to the conceptual framework that guided this study, the investment in the structure (interprofessional teams) was associated with improvements in some but not all processes and outcomes of cares examined in this thesis. Based on the Donabedian framework, the hypothesis was that the enhanced structure of interprofessional teams through additional allied healthcare professionals and improved administrative function via an Executive Director will improve the quality of care processes delivered to the patients. Consequently, improved processes of care will be reflected in accessibility of healthcare providers on timelier basis and after-hours. As a result, proper health services utilization will be manifested in lower walk-in clinic use, emergency departments visits and lower ACSC admission and re-admission rates. However, the results form the three studies culminated to the conclusion that the interprofessional aspect of teams by itself is not enough to delivered on the hypothesised outcomes. Continuity and coordination of care are important contributing factors to strengthen structure and processes of care to improve health services utilization.

5.2 Limitations

This thesis has limitations. First, administrative databases have not been originally set up for research purposes, which presented a potential for measurement error. However, all of the measures from the databases used in our three studies have been validated in the Ontario's context. Additionally, any potential measurement error will be non-deferential between interprofessional and non-interprofessional teams and should not bias the results in a meaningful way. Second, all three studies are observational and cannot address causation. However, we have designed the studies in the best way to address the research questions we have raised while acknowledging their limitations. The final study made use of a longitudinal difference-in-difference method and used data that cover a decade of time which helped to address the limitations of cross-sectional studies. Third, joining interprofessional team-based care was voluntary and the findings we have found could be influenced by some unmeasured factors. Nonetheless, we aimed to capture all measured factors that can be traced through administrative databases and to account for them in subsequent analyses. Fourth, the studies are subject to measurement errors. For instance, self-reported timely and after-hours access to care are subject to the HCES limitations, respondents' recall bias being one of them; other unmeasured factors might contribute to the decision of having a walk-in clinic visit or using the emergency department that cannot be captured; and ACSC medical admissions and all-cause

readmissions are not all unnecessary, inappropriate or preventable. Fifth, there is a potential influence of larger contextual changes that could have occurred and might have influenced the results. However, such changes would have affected both interprofessional and non-interprofessional teams equally and did not present an internal validity concern to our studies. Lastly, the thesis is focused on quantitative research and having qualitative insight to the examined questions would have enriched the findings.

5.3 Strengths

A notable strength for this thesis is the population-based studies that are inclusive of all the relevant Ontario population to examine the research questions. All measures from population-based databases used have been validated in the Ontario context. The second study is one of the few studies to date that links the HCES to administrative databases which provided an opportunity to enrich the data at hand to explore the research question.

5.4 Policy and practice implications

The findings from the three studies have implications for practice and policy for Ontario and other jurisdiction that are in the process or contemplating to introduce interprofessional teams-based primary care.

The government of Ontario invested in interprofessional primary care teams with the intention to improve health services access and utilization. The findings highlight the importance of coupling interprofessional team-based care with other key components of successful primary care system such as continuity, coordination and comprehensiveness of care. [239] The interprofessional aspect of teams by itself is not enough to deliver on promises of primary care to improve access and health services utilization across the continuum of care.

The voluntary aspect of transitioning to interprofessional team-based care might leave the decision to make the move to providers who sometimes have considerations that might not always align with the initial intentions and hopes of policy makers. In Ontario, evidence suggest that the voluntary approach to transition to interprofessional teams risked leaving behind more deprived patients.[240] Physician participation in interprofessional primary care teams in Ontario has been conditional on being remunerated through blended capitation. Currently, the blended capitation formula only adjusts for patient age and sex which might create incentives for practices with healthier practice populations to adopt capitation-based payment. Previous evidence from Ontario suggests that primary care physicians self-selected into payment models based on existing practice characteristics. Physicians with more complex

patient populations were less likely to switch from fee-for-service to capitation-based payment models.[241] Gearing team-based care to high needs populations would likely benefit from a physician payment model based on remuneration through salary, needs-adjusted capitation, or a heavier weighting of fee-for-service and/or bonus payment elements in a blended capitation model. Hence, steps toward introducing interprofessional primary care teams should be accompanied with the right system incentives so that the appropriate patient populations benefit the most from their services.

Given that not all outcome measures showed an advantage of interprofessional teams it will be important to question how they can be supported to produce the desired outcomes. Despite the recognition that interprofessional care is beneficial for both patients and professionals it remains challenging to operationalise.[242,243,244] Proper implementation requires overcoming professional, patient and financing barriers.[245,246] On the professional level, more time and energy should be invested in leadership, management decision-making and communication skills.[247] From a patient and family perspective, the delivery of interprofessional care requires engagement in decision making processes and programme planning.[248] From a financial perspective, the implementation of interprofessional teams is a huge investment that require a lot of resources.[249] A literature review by Xyrichis et al. in 2008 revealed that the structure of the interprofessional team, including the geographical proximity of team members, its size and composition, and the support an organisation provides, are vital for successful teamworking. Various team processes such as setting regular team meetings, with clear goals, objectives and regular appraisals were found to have an effect on the levels of teamwork obtainable amongst a team and subsequently on the team's effectiveness. It is worth noting that these factors are not mutually exclusive, and the functioning of an interprofessional teams will also depend on how these factors interrelate.[250]

Reviewing the findings from this thesis in the context of previous evidence is important. The evidence from the states through a systematic review that explored the effectiveness of patient-centred medical homes was inconclusive.[251] This is in-line with this thesis findings that interprofessional teams perform better on some but not all the domains of quality investigated when compared to non-interprofessional teams. Those findings are not in-line with evidence from Australia which concluded that interprofessional collaboration improved quality and reduced hospital admission.[252] The findings from this thesis are considered to be comparable to evidence form Norway which concluded that interprofessional care play an important role in delivering quality care on the condition of having the right coordination. Coordination of care was not a construct investigated in this thesis but will be worth exploring in future studies in Ontario. As we compare findings to other jurisdictions, it is important to highlight the role of context in influencing the results. Interprofessional teams are not quite the same from a composition perspective and are

influenced by a number of factors that predict their delivery on processes and outcomes of care. Similarly, the findings from this work are not quite comparable to evidence from Ontario given that previous studies presented earlier compared interprofessional teams to other models of care that are based on different physician payment arrangements. This thesis focused on one funding model within which primary care teams have been compared to non-interprofessional teams. To our knowledge, this is the first study in Canada that focused on one funding model within which interprofessional teams are compared to non-teams.

5.5 Conclusion

The main contribution of this thesis is the methodologically robust assessment of the interprofessional aspect of teams and its association with process and outcomes in a province that made significant investments in reforming primary care funding and delivery. Other jurisdictions aiming to expand voluntary participation in interprofessional team-based primary care should consider evidence from Ontario that can inform expectations on the relationship between primary care delivery and health services access and utilization across the continuum of care. Careful considerations should be given to contractual and policy levers that can incentivise interprofessional team-based care in delivering on intended outcomes.

5.6 Future research

The results of this thesis have several implications for future research. First, given the finding of selection factors into interprofessional teams, researchers looking to better understand the association between those teams and quality of care should be aware of pre-existing differences and the need to address selection bias. Second, future qualitative research will be important to understand physicians' voluntary decision to join interprofessional teams. Third, during and post the COVID-19 pandemic era, future research should investigate virtual health services access and assess their effectiveness. Fourth, future qualitative research could investigate factors that might contribute to patients' decision of having a walk-in clinic visit or using the emergency department to reveal personal preference or judgment during the time those services are perceived to be needed. Fifth, future research could examine contributing factors for ACSCs hospitalizations and hospital readmissions to reveal healthcare needs and broader social determinants that can affect patients' ability to manage their conditions in the community. Sixth, a deeper understanding of the success factors of interprofessional primary care teams will be useful. More specifically, an understanding of what is the role of the interprofessional aspect of care versus other factors in improving access and health services utilization would be beneficial. Availability of such evidence can be

enriched through qualitative research that aims to understand the role of the interprofessional aspect of care in improving quality and how it can be supplemented by other factors of success. Additionally, case studies that shed the light on exceptionally successful interprofessional teams in Ontario and around the world can contribute to the understanding of what is/will be the formula for success to develop integrated patient-centered care. Seventh, given the importance of continuity and coordination of care as constructs to delivery quality care, as highlighted in the literature, it will be useful to explore them in Ontario's interprofessional primary care teams from a qualitative perspective to assess to which extent they have been embraced in this model of care. Lastly, given that interprofessional teams are/have been introduced in other province and jurisdictions, it will be important for future research to assess their effectiveness in different contexts.

Appendices

Appendix 0: List of abbreviations

ACSC	Ambulatory Care Sensitive Condition
FHOs	Family Health Organizations
FHTs	Family Health Teams
PC	Primary Care
PHC	Primary Health Care
PHCTF	Primary Health Care Transition Fund
FHNs	Family Health Networks
PCNs	Primary Care Networks
HSOs	Health Services Organizations
CHCs	Community Health Centres
OHIP	Ontario Health Insurance Plan
RIO	Rurality Index Of Ontario
RUBs	Resource Utilization Bands
ACGs	Adjusted Clinical Groups
FMG	Family Medicine Groups
HCES	Health Care Experience Survey
ED	Emergency Department
MOH	Ministry Of Health
NACRS	National Ambulatory Care Reporting System
D2D	Data To Decisions
QIDS	Quality Improvement Decision Support Specialists
QIIP	Quality Improvement And Innovation Partnership
RPDB	Registered Persons Database
US	United States
COPD	Chronic Obstructive Pulmonary Disease
CCS	Chronic Coronary Syndrome
CHF	Congestive Heart Failure
AMI	Acute Myocardial Infarction
CMG	Case Mix Group
DAD	Discharge Abstract Database

Appendix 1 Additional Results tables for study 2

Physician Group and physicians characteristics by enrolment model of care – comparing interprofessional to non-interprofessional teams with HCES respondents to all interprofessional and non-interprofessional teams and all physicians groups (patient enrolment models) and physicians in Ontario on March 31st 2015

	HCES Respondents in Interprofessional Teams		HCES Respondents in Non-interprofessional Teams		All Interprofessional Teams (FHOs that are also FHTs)		All Non-interprofessional teams (FHOs that are non-FHTs)		All Ontario groups (patient enrollment models) and physicians in Ontario	
Group characteristics										
Groups No. (% of all PEMs)	177	19.9	288	32.3	177	19.9	288	32.3	891	100.0
Number of physicians per group, Mean (SD)	13.11	10.71	8.84	7.62	13.11	10.71	8.84	7.62	10.60	18.13
Years under the capitation model, Mean (SD)	5.99	2.98	4.25	2.62	5.99	2.98	4.25	2.62	5.89	3.54
Physicians characteristics										
Physicians No. (% of all physicians)	2,131	15.5	2,387	17.4	2,318	15.50	2,545	17.4	13,707	100
Number of patients per physician, Mean (SD)	1,366	615.06	1,555	665.19	1,299	642.07	1,514	679.53	939.3	877.43
Sex No. (%)										
Male	1,144	53.7	1,342	56.2	1,228	53	1,422	55.9	7451	54
Female	987	46.3	1,045	43.8	1,090	47	1,123	44.1	5865	43
Missing	0	0.0	0	0.0	0	0	0	0.0	391	3
Age group in Yrs. No. (%)										
<40	329	15.4	222	9.3	382	16	253	9.9	1789	13
40-64	1,417	66.5	1,607	67.3	1,510	65	1,695	66.6	7841	57
> 64	358	16.8	534	22.4	392	17	570	22.4	2877	21
Missing	27	1.3	24	1.0	34	1	27	1.1	1200	9
Country of medical graduation Canada No. (%)										
Yes	1,724	80.9	1,775	74.4	1,880	81	1,878	73.8	8995	66
No	380	17.8	588	24.6	404	17	640	25.1	3512	26
Missing	27	1.3	24	1.0	34	1	27	1.1	1200	9
Years in practice No. (%)										0
<5	47	2.2	41	1.7	60	3	48	1.9	758	6
5_15	620	29.1	420	17.6	700	30	467	18.3	3200	23
16-25	495	23.2	606	25.4	532	23	646	25.4	3064	22
>25	969	45.5	1,320	55.3	1,026	44	1,384	54.4	6,294	45.9
Missing	0	0.0	0	0.0	0	0	0	0.0	391	3

Patients' characteristics comparing HCES respondents in interprofessional to non-interprofessional teams at the year they have responded to the HCES to all HCES respondents						
	HCES Respondents in Interprofessional Teams		**HCES Respondents in Non-interprofessional Teams**		**All HCES respondents**	
Sex No. (%)						
Males	5,310	42.4	4,792	42.3	20,558	44.3
Female	7,678	57.6	6,856	57.7	27,349	55.7
Missing						
Age group, yr. No. (%)						
16-44	3,819	33.0	3,653	34.9	16,444	38.5
45-64	5,272	42.4	4,661	41.4	18,955	40.9
65-84	3,602	23.1	3,071	22.1	11,558	19.2
84+	295	1.5	263	1.6	950	1.3
Missing						
New OHIP registrants (within 10 years) No. (%)	355	3.1%	460	5.1	2,801	7.6
Income quintile, No. (%)						
1 (low)	2,089	13.8	1,764	13.9	8,307	15.5
2	2,468	18.6	2,228	17.9	9,140	18.6
3	2,697	21.2	2,295	19.6	9,725	20.7
4	2,822	22.8	2,550	22.0	10,114	21.7
5 (high)	2,888	23.3	2,784	26.4	10,496	23.2
Missing	24	0.3	27	0.2	125	0.3
Rurality Index of Ontario, No. (%)						
Major urban (0 to 9)	6,166	50.8	8,098	72.1	28,154	66.4
Semi-urban (10 to 39)	4,837	34.4	2,726	21.7	12,786	22.7
Rural (≥40)	1,862	14.2	763	5.8	5,782	9.4
Missing	123	0.6	61	0.4	1,185	1.5
Resource utilization band (RUB), No. (%)						
0 (non-user)	618	5.4	401	4.0	2,430	5.1
1	629	5.4	471	4.3	2,200	4.8
2	2,128	17.7	1,802	16.5	7,481	16.3
3	6,746	51.0	6,417	54.6	25,086	52.7
4	2,031	15.0	1,869	15.4	7,587	15.1
5 (very high user)	823	5.4	674	5.1	2,829	5.2
Missing	13	0.1	14	0.1	294	0.7

Patients with Chronic disease						
2 + Co-morbidity No. (%)	6,096	42.6	5,628	44.3	21,719	41.5
3+ comorbidities No. (%)	3,482	23.3	3,207	24.5	12,364	22.8
4+ comorbidities No. (%)	1,828	11.9	2,686	12.4	6,482	11.6
5+ comorbidities No. (%)	894	5.8	791	6.1	3,122	5.7

Self-reported timely (same/next day) access to care at the year patients have responded to the HCES by physicians' characteristics identified on March 31st, 2015 Stratified by Male and Female				
	HCES Respondents in Interprofessional Teams		HCES Respondents in NON-interprofessional Teams	
	Female	Male	Female	Male
	Percent	Percent	Percent	Percent
Physicians characteristics				
Sex				
Female	39.8	38.6	35.8	34.6
Male	40.2	38.1	37.4	37.4
Missing	19.0	20.0	25.0	33.3
Age group				
<40	41.9	38.5	32.6	35.0
40-64	39.7	38.0	35.9	36.1
> 64	40.7	39.8	41.6	39.2
Missing	28.4	26.3	24.4	27.3
Country of medical graduation Canada				
No	37.1	35.7	36.5	35.0
Yes	40.8	39.1	37.0	37.4
Missing	28.4	26.3	24.4	27.3
Years in practice				
<5	38.0	29.4	27.0	36.1
5_15	42.1	37.7	31.8	34.9
16-25	36.6	33.7	34.2	33.9
>25	40.6	40.8	39.5	38.1
Missing	19.0	20.0	25.0	33.3

Self-reported timely (same/next day) access to care by patients' characteristics identified at the year they have responded to the HCES Stratified by Male and Female				
	HCES Respondents in Interprofessional Teams		HCES Respondents in NON-interprofessional Teams	
	Female	Male	Female	Male
	Weighted percent	Weighted percent	Weighted percent	Weighted percent
Self-reported timely (same/next day) access to care	40.5	38.8	39.6	38.2
Age group, yr.				
16-44	42.1	38.8	38.4	37.6
45-64	36.8	36.8	39.7	35.7
65-84	46.0	42.4	41.6	43.6
85+	39.0	41.7	43.5	42.6
Missing				

New OHIP registrants (within 10 years)				
No	40.6	38.8	38.8	38.4
Yes	35.8	37.8	54.3	35.3
Income quintile				
1 (low)	39.7	33.8	37.1	33.4
2	40.1	39.0	40.1	40.7
3	40.7	41.7	37.8	36.1
4	40.0	37.1	37.2	39.0
5 (high)	41.8	40.1	44.0	39.2
Missing	9.0	86.4	12.1	74.0
Rurality Index of Ontario				
Largest Urban (0)	44.6	39.9	44.5	40.3
Large Urban (1 to 9)	43.5	39.9	37.8	36.0
Small Urban (10 to 39)	38.3	40.4	34.9	38.2
Rural (≥40)	30.3	29.6	27.2	32.4
Missing	21.2	10.7	16.1	57.7
Resource utilization band (RUB)				
0 (non-user)	30.7	22.5	20.7	43.5
1	42.1	42.0	35.6	47.2
2	36.7	41.0	36.7	36.7
3	41.1	36.8	41.2	36.0
4	42.2	43.7	36.9	43.9
5 (very high user)	38.5	42.6	42.8	40.3
Missing	58.6	100.0	0.0	36.0
Patients with Chronic disease				
2 + Co-morbidity				
No	38.5	37.6	38.7	36.5
Yes	42.8	40.1	40.6	40.0
3+ comorbidities				
No	40.8	38.8	38.5	36.6
Yes	39.8	38.7	42.7	42.4
4+ comorbidities				
No	40.4	38.5	39.2	37.7
Yes	41.5	40.6	42.4	41.3
5+ comorbidities				
No	40.4	38.8	39.4	37.8
Yes	42.5	38.5	43.1	43.2

Self-reported very easy and somewhat easy after-hours access to care at the year patients have responded to the HCES by physicians' characteristics identified on March 31st, 2015 Stratified by Male and Female				
	HCES Respondents in Interprofessional Teams		HCES Respondents in NON-interprofessional Teams	
	Female	Male	Female	Male
	Percent	Percent	Percent	Percent
Physicians characteristics				
Sex				
Female	33.3	29.8	34.6	34.2
Male	30.3	29.4	35.7	32.2
Missing	25.0	30.8	26.5	32.3
Age group				
<40	32.6	29.1	34.7	39.1
40-64	32.1	30.0	35.1	32.1
> 64	30.1	28.5	35.9	32.9
Missing				
Country of medical graduation Canada				
No	27.4	28.0	34.1	33.1
Yes	32.8	29.9	35.6	32.7
Missing	25.3	28.4	29.3	28.6
Years in practice				
<5	26.5	27.6	35.4	32.1
5_15	33.5	29.4	33.0	34.7
16-25	31.5	31.9	35.2	29.5
>25	31.1	28.6	35.7	33.5
Missing	25.0	30.8	26.5	32.3

Self-reported very easy and somewhat easy after-hours to care by patients' characteristics identified at the year they have responded to the HCES Stratified by Male and Female				
	HCES Respondents in Interprofessional Teams		HCES Respondents in NON-interprofessional Teams	
	Female	Male	Female	Male
	Weighted percent	Weighted percent	Weighted percent	Weighted percent
Overall after-hours access to care	33.4	30.9	37.0	32.8
Age group, yr.				
16-44	38.4	39.7	41.4	36.2
45-64	33.5	27.3	36.0	31.9
65-84	26.4	25.5	31.9	30.0
84+	22.4	36.9	39.1	26.4
Missing				

New OHIP registrants (within 10 years)				
No	33.4	31.0	36.5	32.9
Yes	33.4	26.8	46.2	30.8
Income quintile				
1 (low)	30.9	34.4	36.2	32.0
2	28.8	30.7	35.7	31.2
3	31.1	33.3	34.3	31.9
4	38.7	29.3	35.7	35.4
5 (high)	35.3	28.3	41.7	32.7
Missing	52.5	38.2	33.1	33.2
Rurality Index of Ontario				
0	39.7	36.2	41.7	32.4
Major urban (1 to 9)	41.6	41.5	40.0	37.7
Semi-urban (10 to 39)	29.7	25.6	27.9	29.6
Rural (≥40)	17.2	19.8	22.9	23.5
Missing	25.3	21.1	16.8	35.9
Resource utilization band (RUB)				
0 (non-user)	30.0	40.3	32.6	24.9
1	34.8	31.9	36.2	40.3
2	37.9	33.5	38.0	37.7
3	32.3	28.6	37.0	32.2
4	33.3	28.8	37.1	28.8
5 (very high user)	30.3	31.4	36.5	30.0
Missing	56.8	31.6	50.1	43.2
Patients with Chronic disease				
2 + Co-morbidity				
No	35.2	32.4	38.2	33.4
Yes	31.0	28.8	35.7	32.0
3+ comorbidities				
No	34.4	31.6	37.1	33.0
Yes	29.9	28.8	37.0	32.1
4+ comorbidities				
No	33.8	31.0	36.6	33.2
Yes	30.0	30.3	40.0	29.6
5+ comorbidities				
No	33.5	31.0	36.5	33.1
Yes	30.5	29.0	45.7	27.8

Self-reported walk-in clinic at the year patients have responded to the HCES by physicians' characteristics identified on March 31st, Stratified by Male and Female patients				
	HCES Respondents in Interprofessional Teams		HCES Respondents in Non-interprofessional Teams	
	Female	Male	Female	Male
	Percentage	Percentage	Percentage	Percentage
Physicians characteristics				
Sex				
Female	21.9	16.8	30.4	24.9
Male	18.3	16.1	27.6	24.4
Missing	24.4	10.0	25.7	21.9
Age group				
<40	20.2	18.1	27.3	28.5
40-64	20.5	15.9	29.0	23.7
> 64	18.2	16.4	29.7	25.9
Missing	16.8	16.1	20.8	20.4
Country of medical graduation Canada				
No	21.1	18.1	32.6	27.2
Yes	19.8	15.8	27.9	23.9
Missing	16.8	16.1	20.8	20.4
Years in practice				
<5	17.3	17.5	18.8	23.2
5_15	20.5	17.0	27.9	26.1
16-25	21.4	17.1	29.6	22.3
>25	19.1	15.6	29.1	25.2
Missing	24.4	10.0	25.7	21.9

Self-reported walk-in clinic by patients' characteristics identified at the year they have responded to the HCES Stratified by Male and Female				
	HCES Respondents in Interprofessional Teams		HCES Respondents in Non-interprofessional Teams	
	Female	Male	Female	Male
	Weighted Percentage	Weighted Percentage	Weighted Percentage	Weighted Percentage
Number of patients with self-reported walk-in clinic	21.2	17.7	29.7	26.1
Age group, yr.				
16-44	31.9	26.1	39.6	34.8
45-64	18.4	15.3	28.5	25.8
65-84	11.4	11.1	17.1	14.5
84+	9.6	10.7	11.6	19.5
Missing				
New OHIP registrants (within 10 years)				

No	21.1	17.6	29.5	17.6
Yes	26.5	19.9	31.1	19.9
Income quintile				
1 (low)	20.0	18.2	27.7	26.1
2	18.4	15.9	28.5	26.5
3	21.3	19.7	31.0	25.6
4	23.7	16.3	32.4	27.6
5 (high)	22.1	18.2	28.3	24.8
Missing	0.0	22.9	25.6	52.0
Rurality Index of Ontario				
0	23.4	19.4	30.5	29.8
Major urban (1 to 9)	32.5	31.4	36.8	32.1
Semi-urban (10 to 39)	18.1	13.6	22.6	16.3
Rural (≥40)	10.4	8.0	13.1	8.0
Missing	11.8	10.5	35.9	33.4
Resource utilization band (RUB)				
0 (non-user)	7.2	21.1	7.7	12.1
1	20.7	16.2	25.3	28.1
2	19.3	15.3	29.7	26.0
3	21.4	18.5	30.1	28.7
4	25.1	17.9	33.7	24.9
5 (very high user)	20.8	15.6	22.0	18.8
Missing	16.6	24.5	55.9	10.0
Patients with Chronic disease				
2 + Co-morbidity				
No	22.7	19.6	31.6	27.9
Yes	19.3	14.9	27.4	23.7
3+ comorbidities				
No	22.2	18.4	31.0	27.0
Yes	17.8	15.4	25.8	23.1
4+ comorbidities				
No	21.7	17.9	30.5	26.8
Yes	17.5	16.3	23.9	21.1
5+ comorbidities				
No	21.5	17.6	30.4	26.4
Yes	16.9	17.9	18.6	22.3

All ED visits at the year patients have responded to the HCES by physicians' characteristics identified on March 31st, 2015 by patient sex												
	HCES Respondents in Interprofessional Teams						HCES Respondents in NON-interprofessional Teams					
	Female			Male			Female			Male		
	No Use	1 ED visit	>1 ED visit	No Use	1 ED visit	>1 ED visit	No Use	1 ED visit	>1 ED visit	No Use	1 ED visit	>1 ED visit
	%	%	%	%	%	%	%	%	%	%	%	%
Sex												
Female	75.2	15.7	8.8	73.7	16.9	8.6	76.9	15.2	7.5	79.4	14.4	5.8
Male	71.3	17.0	11.4	72.1	16.6	10.5	74.6	16.1	8.9	75.3	15.6	8.3
Missing	66.7	24.4	8.9	70.0	12.5	12.5	80.0	17.1	2.9	78.1	15.6	6.3
Age group												
<40	72.9	17.3	9.3	74.4	15.8	9.1	70.7	19.3	9.4	73.6	16.2	9.3
40-64	73.4	16.0	10.4	72.9	16.3	10.1	76.1	15.2	8.2	77.6	15.1	6.5
> 64	72.2	17.4	10.1	71.5	17.8	9.9	75.2	16.4	8.0	74.2	15.3	9.8
Missing	68.5	20.1	10.9	66.4	20.3	10.5	82.6	9.7	7.6	76.3	16.1	7.5
Country of medical graduation Canada												
No	69.9	18.3	11.3	71.9	15.4	11.7	73.7	16.6	9.1	75.2	17.3	6.6
Yes	73.8	16.0	9.9	73.0	16.9	9.6	76.0	15.6	8.0	76.8	14.6	7.9
Missing	68.5	20.1	10.9	66.4	20.3	10.5	82.6	9.7	7.6	76.3	16.1	7.5
Years in practice												
<5	70.2	16.7	12.5	64.3	27.8	7.1	81.3	10.2	7.8	76.8	13.4	9.8
5_15	72.6	17.6	9.5	74.0	16.0	9.3	73.2	17.1	9.2	75.6	16.0	7.7
16-25	74.3	15.3	10.0	73.4	15.8	10.0	75.7	15.7	8.1	77.7	14.0	7.6
>25	72.8	16.4	10.5	72.0	16.9	10.3	76.1	15.5	8.1	76.1	15.6	7.5
Missing	66.7	24.4	8.9	70.0	12.5	12.5	80.0	17.1	2.9	78.1	15.6	6.3

All ED visits by patients' characteristics identified at the year they have responded to the HCES by sex												
	HCES Respondents in Interprofessional Teams						HCES Respondents in NON-interprofessional Teams					
	Female			Male			Female			Male		
	No Use	1 ED visit	>1 ED visit	No Use	1 ED visit	>1 ED visit	No Use	1 ED visit	>1 ED visit	No Use	1 ED visit	>1 ED visit
	Weighted %	Weighted %	Weighted %	Weighted %	Weighted %	Weighted %	Weighted %	Weighted %	Weighted %	Weighted %	Weighted %	Weighted %
Number of ED visits and patients totals	74.6	15.9	9.2	73.5	15.8	10.0	76.7	15.2	7.7	78.0	14.6	6.9
Age group, yr.												
16-44	71.8	17.5	10.5	76.2	16.0	7.5	76.2	14.9	8.4	80.1	13.7	5.8
45-64	77.6	14.7	7.6	74.8	14.4	10.4	79.0	14.6	6.3	78.8	14.5	6.5
65+	73.9	15.7	10.1	69.2	17.3	12.0	75.0	15.2	8.9	74.6	16.0	8.5
Missing	62.0	20.5	14.4	49.1	27.8	17.4	51.4	35.0	12.4	59.8	18.9	19.4
New OHIP registrants (within 10 years)												
No	74.5	16.0	9.3	73.4	15.9	10.1	76.7	15.4	7.7	77.9	14.7	7.0
Yes	77.1	14.1	8.9	79.8	14.3	5.5	79.2	12.9	7.4	81.7	13.9	4.4
Income quintile												
1 (low)	67.3	18.3	14.2	66.9	16.9	15.3	76.3	12.9	10.0	69.9	17.4	11.9
2	73.7	15.5	10.2	69.2	19.4	11.2	74.3	17.2	8.4	78.9	14.4	6.3
3	74.1	17.3	8.6	76.3	15.7	6.9	74.9	17.1	7.6	78.0	14.8	6.7
4	76.5	14.6	8.7	73.5	13.6	11.9	77.6	15.7	6.4	78.8	13.9	6.7
5 (high)	78.0	15.1	6.6	78.0	14.7	7.0	79.2	13.3	7.2	80.6	13.8	5.1

Missing	93.7	6.3	0.0	86.5	8.6	1.0	84.8	9.6	4.2	57.6	19.1	15.3
Rurality Index of Ontario												
0	78.6	13.9	7.2	75.6	13.2	10.7	80.0	13.2	6.4	80.0	14.0	5.6
Major urban (1 to 9)	78.3	13.3	8.1	79.1	14.8	5.9	79.4	13.9	6.4	80.9	12.5	5.9
Semi-urban (10 to 39)	72.1	17.8	9.8	72.0	17.4	9.6	70.2	19.8	9.9	75.4	16.1	8.0
Rural (≥40)	66.1	19.7	13.8	66.1	18.9	14.0	63.1	19.9	15.6	60.2	22.9	16.9
Missing	69.2	14.9	16.0	72.5	16.1	9.6	78.3	10.4	10.5	54.7	31.6	9.9
Resource utilization band (RUB)												
0 (non-user)	84.2	9.8	6.0	87.7	8.7	3.0	86.8	10.3	2.9	87.9	9.7	1.5
1	82.0	12.5	5.5	78.1	16.6	5.3	86.0	11.1	2.9	82.2	12.8	5.0
2	84.3	11.4	4.3	79.8	14.4	5.6	84.7	10.7	4.5	84.9	11.8	3.2
3	75.6	15.7	8.5	72.9	15.9	10.5	78.3	14.7	6.9	77.7	15.3	6.9
4	66.5	20.2	13.2	65.9	18.9	15.0	70.1	18.2	11.2	69.4	17.5	12.0
5 (very high user)	46.5	26.3	26.3	50.7	22.3	24.8	50.4	28.7	19.4	59.6	19.9	18.1
Missing	26.7	0.0	0.0	38.4	0.0	0.0	30.5	0.0	0.0	0.0	0.0	0.0
Patients with Chronic disease												
2 + Co-morbidity												
No	79.5	13.9	6.5	77.0	14.3	8.2	80.6	13.4	5.7	82.2	13.2	4.2
Yes	68.1	18.7	12.8	68.7	17.8	12.4	72.1	17.4	10.1	72.3	16.5	10.5
3+ comorbidities												
No	77.8	14.6	7.4	77.0	14.6	8.0	79.4	14.3	6.0	81.1	13.6	5.0
Yes	63.5	20.5	15.5	62.5	19.6	16.1	68.8	17.9	12.6	67.8	18.1	13.0
4+ comorbidities												
No	76.4	15.4	7.9	75.9	15.1	8.4	78.6	14.5	6.5	80.3	13.8	5.5
Yes	60.4	19.8	19.0	56.3	20.5	20.9	63.4	19.7	15.9	61.1	20.3	17.2
5+ comorbidities												

No	75.6	15.7	8.6	75.2	15.4	8.8	77.7	15.0	7.0	79.5	14.2	5.9
Yes	56.2	21.2	20.7	49.1	21.9	26.3	61.7	17.9	18.7	54.1	21.2	22.5

Association between enrolment in an interprofessional team-based model and timely Access to care (same/next day) identified at the year they have responded to the HCES by sex (Reference: non-interprofessional teams)				
	Among males			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	1.03	0.88	1.21	0.739
Adjusted† for:				
Physician groups' characteristics	1.01	0.85	1.19	0.9457
Physician groups and physicians' characteristics	1.04	0.86	1.21	0.6604
Physician groups, physicians and patients' characteristics	1.08	0.92	1.28	0.3578
	Among females			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	1.02	0.87	1.20	0.7867
Adjusted† for:				
Physician groups' characteristics	1.01	0.87	1.17	0.8732
Physician groups and physicians' characteristics	1.01	0.87	1.16	0.905
Physician groups, physicians and patients' characteristics	1.14	0.99	1.30	0.0612
*p-value significant <0.05 † Adjustment used physician groups and physicians' characteristics identified on March 31st, 2015 and patients' characteristics at the year they have responded to the HCES				

Association between enrolment in an interprofessional team-based model and timely Access to care (same/next day) identified at the year they have responded to the HCES by rurality (Reference: non-interprofessional teams)				
	Among Largest urban (RIO 0)			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	0.99	0.79	1.25	0.9554
Adjusted† for:				
Physician groups characteristics	1.04	0.83	1.30	0.7651
Physician groups and physicians' characteristics	1.10	0.90	1.35	0.3534
Physician groups, physicians and patients' characteristics	1.13	0.93	1.36	0.2332
	Among Large urban (RIO 1-9)			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	1.25	1.05	1.49	0.0112*
Adjusted† for:				
Physician groups characteristics	1.32	1.08	1.60	0.006*
Physician groups and physicians' characteristics	1.33	1.09	1.63	0.0052*
Physician groups, physicians and patients' characteristics	1.34	1.10	1.65	0.0043*
	Among small urban (RIO 10-39)			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	1.13	0.96	1.33	0.1423
Adjusted† for:				
Physician groups characteristics	1.11	0.93	1.31	0.2446
Physician groups and physicians' characteristics	1.09	0.91	1.29	0.3527
Physician groups, physicians and patients' characteristics	1.09	0.91	1.29	0.3526
	Among Rural (RIO ≥40 Rural)			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	0.96	0.69	1.34	0.8046
Adjusted† for:				
Physician groups characteristics	0.96	0.67	1.37	0.8201
Physician groups and physicians' characteristics	0.91	0.64	1.31	0.6188
Physician groups, physicians and patients' characteristics	0.91	0.63	1.32	0.6149

*p-value significant <0.05

† Adjustment used physician groups and physicians' characteristics identified on March 31st, 2015 and patients' characteristics at the year they have responded to the HCES

Association between enrolment in an interprofessional team-based model and after-hours care (very easy/somewhat easy) identified at the year they have responded to the HCES by sex (Reference: non-interprofessional teams)				
	Among males			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	0.96	0.82	1.11	0.5531
Adjusted† for:				
Physician groups characteristics	0.91	0.77	1.07	0.2505
Physician groups and physicians' characteristics	0.92	0.78	1.08	0.3102
Physician groups, physicians and patients' characteristics	1.09	0.91	1.29	0.3639
	Among Females			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	0.82	0.71	0.93	0.0026*
Adjusted† for:				
Physician groups characteristics	0.74	0.65	0.85	<0.0001*
Physician groups and physicians' characteristics	0.75	0.66	0.85	<0.0001*
Physician groups, physicians and patients' characteristics	0.96	0.86	1.09	0.5412
*p-value significant <0.05 † Adjustment used physician groups and physicians' characteristics identified on March 31st, 2015 and patients' characteristics at the year they have responded to the HCES				

Association between enrolment in an interprofessional team-based model and after-hours care (very easy/somewhat easy) identified at the year they have responded to the HCES by Rurality (Reference: non-interprofessional teams)				
	Among Largest urban (RIO 0)			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	1.04	0.85	1.27	0.7288
Adjusted† for:				
Physician groups characteristics	0.96	0.78	1.18	0.7101
Physician groups and physicians' characteristics	0.97	0.81	1.17	0.7782
Physician groups, physicians and patients' characteristics	0.97	0.81	1.16	0.7668
	Among Large urban (RIO 1-9)			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	1.18	0.96	1.44	0.1097
Adjusted† for:				

Physician groups characteristics	1.24	0.97	1.58	0.0931
Physician groups and physicians' characteristics	1.26	1.00	1.59	0.0543
Physician groups, physicians and patients' characteristics	1.27	1.01	1.59	0.0373
	Among small urban (RIO 10-39)			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	1.03	0.88	1.20	0.7366
Adjusted† for:				
Physician groups characteristics	1.00	0.86	1.17	0.982
Physician groups and physicians' characteristics	1.00	0.85	1.17	0.9631
Physician groups, physicians and patients' characteristics	1.01	0.86	1.18	0.933
	Among Rural (RIO ≥40 Rural)			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	0.71	0.54	0.93	0.0128*
Adjusted† for:				
Physician groups characteristics	0.70	0.52	0.94	0.0179*
Physician groups and physicians' characteristics	0.71	0.53	0.96	0.0238*
Physician groups, physicians and patients' characteristics	0.72	0.54	0.96	0.024*

*p-value significant <0.05

† Adjustment used physician groups and physicians' characteristics identified on March 31st, 2015 and patients' characteristics at the year they have responded to the HCES

Association between enrolment in an interprofessional team-based model and walk-in clinic use identified at the year they have responded to the HCES by sex (Reference: non-interprofessional teams)				
	Among males			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	0.61	0.51	0.73	<0.001*
Adjusted† for:				
Physician groups' characteristics	0.64	0.52	0.79	<0.001*
Physician groups and physicians' characteristics	0.65	0.52	0.80	<0.001*
Physician groups, physicians and patients' characteristics	0.82	0.67	1.02	0.0779
	Among Females			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	0.64	0.57	0.71	<0.001*
Adjusted† for:				
Physician groups' characteristics	0.69	0.62	0.77	<0.001*
Physician groups and physicians' characteristics	0.70	0.63	0.78	<0.001*
Physician groups, physicians and patients' characteristics	0.84	0.75	0.94	0.0032
*p-value significant <0.05 † Adjustment used physician groups and physicians' characteristics identified on March 31st, 2015 and patients' characteristics at the year they have responded to the HCES				

Association between enrolment in an interprofessional team-based model and walk-in clinic use identified at the year they have responded to the HCES by Rurality (Reference: non-interprofessional teams)				
	Among Largest urban (RIO 0)			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	0.65	0.56	0.76	<0.0001*
Adjusted† for:				
Physician groups' characteristics	0.85	0.73	1.00	0.0506
Physician groups and physicians' characteristics	0.87	0.74	1.02	0.0919
Physician groups, physicians and patients' characteristics	0.87	0.74	1.02	0.0927
	Among Large urban (RIO 1-9)			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	0.88	0.70	1.10	0.2571

Adjusted† for:				
Physician groups' characteristics	1.05	0.79	1.39	0.7296
Physician groups and physicians' characteristics	1.07	0.81	1.41	0.6337
Physician groups, physicians and patients' characteristics	0.99	0.78	1.24	0.9015
	Among small urban (RIO 10-39)			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	0.78	0.67	0.90	0.001*
Adjusted† for:				
Physician groups' characteristics	0.71	0.61	0.83	<0.0001*
Physician groups and physicians' characteristics	0.71	0.60	0.83	<0.0001*
Physician groups, physicians and patients' characteristics	0.73	0.62	0.87	0.0002*
	Among Rural (RIO ≥40 Rural)			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	0.87	0.61	1.26	0.418
Adjusted† for:				
Physician groups' characteristics	0.72	0.50	1.04	0.0831
Physician groups and physicians' characteristics	0.70	0.48	1.01	0.0584
Physician groups, physicians and patients' characteristics	0.74	0.51	1.07	0.1116

*p-value significant <0.05

† Adjustment used physician groups and physicians' characteristics identified on March 31st, 2015 and patients' characteristics at the year they have responded to the HCES

Association between enrolment in an interprofessional team-based model and All ED use identified at the year they have responded to the HCES by sex (Reference: non-interprofessional teams)				
	Among males			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	1.23	1.07	1.41	0.0039*
Adjusted† for:				
Physician groups' characteristics	1.23	1.07	1.42	0.0036*
Physician groups and physicians' characteristics	1.22	1.07	1.40	0.003*

Physician groups, physicians and patients' characteristics	1.07	0.91	1.25	0.432
	Among Females			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	1.13	1.02	1.26	0.019*
Adjusted† for:				
Physician groups' characteristics	1.18	1.06	1.32	0.003*
Physician groups and physicians' characteristics	1.18	1.06	1.32	0.0035*
Physician groups, physicians and patients' characteristics	1.04	0.93	1.16	0.5154

*p-value significant <0.05

† Adjustment used physician groups and physicians' characteristics identified on March 31st, 2015 and patients' characteristics at the year they have responded to the HCES

Association between enrolment in an interprofessional team-based model and ALL ED Use by Rurality (Reference: non-interprofessional teams)				
	Among Largest urban (RIO 0)			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	1.15	0.96	1.35	0.1321
Adjusted† for:				
Physician groups' characteristics	1.08	0.89	1.32	0.4506
Physician groups and physicians' characteristics	1.08	0.91	1.30	0.384
Physician groups, physicians and patients' characteristics	1.12	0.93	1.35	0.2327
	Among Large urban (RIO 1-9)			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	1.07	0.90	1.27	0.4243
Adjusted† for:				
Physician groups' characteristics	1.02	0.83	1.25	0.8557
Physician groups and physicians' characteristics	0.97	0.79	1.19	0.759
Physician groups, physicians and patients' characteristics	1.05	0.87	1.27	0.6087
	Among small urban (RIO 10-39)			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	1.00	0.88	1.14	0.9846
Adjusted† for:				

Physician groups characteristics	1.04	0.91	1.19	0.5928
Physician groups and physicians' characteristics	1.03	0.90	1.18	0.6474
Physician groups, physicians and patients' characteristics	1.00	0.86	1.15	0.9415
	Among Rural (RIO ≥40 Rural)			
	OR	**95% CI**		**P-Value**
Unadjusted (null model)	0.82	0.66	1.02	0.0766
Adjusted† for:				
Physician groups' characteristics	0.77	0.61	0.97	0.0233*
Physician groups and physicians' characteristics	0.78	0.62	0.98	0.0332*
Physician groups, physicians and patients' characteristics	0.78	0.61	0.98	0.0364*

*p-value significant <0.05

† Adjustment used physician groups and physicians' characteristics identified on March 31st, 2015 and patients' characteristics at the year they have responded to the HCES

Appendix 2: Health Care Experience Full Survey

HEALTH CARE EXPERIENCE SURVEY

Questionnaire

Effective October 2018

Contents

INTERVIEWER: Enter respondent's gender please

1 Male
5 Female

WARM-UP QUESTIONS

w1. The first question is: In general, how satisfied are you with health care in your community: would you say very satisfied, somewhat satisfied, not very satisfied or not satisfied at all?

1 very satisfied
2 somewhat satisfied
3 not very satisfied
4 not satisfied at all
8 don't know
9 refused

w2. In general, over the last five years do you think the quality of health care provided in your community has improved a lot, improved a little, stayed about the same, become a little worse or become a lot worse?

1 improved a lot
2 improved a little
3 stayed about the same
4 become a little worse
5 become a lot worse
8 don't know
9 refused

RESPONDENT'S HEALTH

rh_1. Now some questions about your health. In general, would you describe your own health as excellent, very good, good, fair, or poor?

1 excellent
2 very good
3 good
4 fair
5 poor
8 don't know

9 refused

rh_2. Have you ever been told by a doctor or other health care professional that you have any of the following long-term conditions:

a. Arthritis?
b. Asthma or chronic lung disease such as chronic bronchitis, emphysema or COPD?
c. Cancer?
d. Depression, anxiety or other mental health problems?
e. Diabetes?
f. Heart disease or a heart attack?
g. High blood pressure or hypertension?
h. High cholesterol?
i. Any other long-term disease or health problem, please specify?

1 yes
5 no
8 don't know
9 refused

FRENCH LANGUAGE SERVICES

lang_2. What language do you speak most often at home?

1 English 20 African language
2 French 21 Chinese (Mandarin or Cantonese) 3 English & French 22 Filipino or Tagalog
4 English & other 23 Vietnamese
5 Czech 24 Other Asian language
6 Croatian 25 Hindi
7 Danish 26 Punjabi
8 Dutch 27 Tamil
9 German 28 Urdu
10 Greek 29 Other East Indian language
11 Hungarian 30 Hispanic languages
12 Italian 31 Arabic
13 Polish 32 Other Middle Eastern languages
14 Portuguese 33 Native & Aboriginal languages
15 Russian 0 Other, specify
16 Spanish 97 Not codeable
17 Ukrainian 98 Don’t know

18 Yugoslavian 99 Refused 19 Other European language

lang_pre. When interacting with the health care system – such as speaking with nurses, physicians, specialists, etc. - which official language would you prefer to use? English or French?

1 english
2 french

PRIMARY CARE PROVIDER

fd_1a. Do you have a family doctor, a general practitioner or GP, or nurse practitioner that you see for regular check-ups, when you are sick and so on?

1 yes
5 no
8 don't know
9 refused

<if fd_1a in (5,8,9) then go to fd_1b>

< if fd_1a = 1 then go to fd_5>

fd_1b. Do you see any type of health care provider, for your health, on a regular basis?

1 yes
5 no
8 don’t know
9 refused

<if fd_1b in (5,8,9) then go to nd_1>

<if rh_2(a,b,c,d,e,f,g,h,i) in (5,8,9) then go to fd_3>

fd_2. Is this the same person you see for your [specify long_term_condition(s)]?

1 yes
5 no
8 don’t know
9 refused

fd_3. Do you think of this person as your regular health care provider or family doctor?

1 yes
5 no
8 don’t know
9 refused

<if fd_3 in (5,8,9) then go to nd_1>

fd_5. How many years have you been seeing your provider?

0 never actually saw 1 for one year or less
2-80 enter number of years 81 eighty-one or more years
98 don’t know
99 refused

<if fd_1a = 1 or fd_3=1 then famdoc = 1>

<else famdoc = 0>

<if famdoc=1 and lang_pre=2 then go to fls_1; else skip out>

fls_1. Do you speak with your provider or anyone in their office in French?

1 yes
5 no
8 don't know
9 refused

<if fls_1=1 then go to fls_2; else go to fls_3>

fls_2. Is it your provider that speaks French, someone else in their office, or both?

1 provider
2 someone else in office
3 both
8 don’t know
9 refused

<if fls_2=1> fls_2a. Does you provider usually speak with you in French about your health care? 1 yes 5 no 8 don't know 9 refused

<if fls_2=2> fls_2b. Do they usually speak with you in French about your health care?
1 yes 5 no 8 don't know 9 refused

<if fls_2=3> fls_2c. Do they both usually speak with you in French about your health care? 1 yes 5 no 8 don't know 9 refused

<skip out>

fls_3. Have you ever asked your provider or anyone else in their office to speak to you about health related matters in French?

1 yes
5 no
8 don't know
9 refused

<if fls_3=5,8,9 then skip out>

fls_4. Were they able to speak with you in French?

1 yes
5 no
8 don't know
9 refused

<if fls_4=1 then skip out>

fls_5. Did they offer to provide you with information on how to get health care services in French?

1 yes
5 no
8 don't know
9 refused

NO DOCTOR SECTION

<if famdoc = 1 then go to access_1>

nd_1. Have you ever had a family doctor?

1 yes
5 no
8 don't know
9 refused

<if nd_1 in (5,8,9) then go to nd_3>

nd_2. Why do you no longer have a family doctor?

1 respondent moved and it is no longer practical to see that doctor, have not found new doctor
2 respondent was not satisfied with family doctor, they decided not to see him/her again
3 switched to using some form of clinic/walk in clinic/clinic at hospital, other clinic, easier to use/get to clinic, better "service," etc.
4 doctor retired/deceased/changed practice type/sick/pregnant
5 doctor moved from area/cannot locate
6 did not see doctor often, did not see for long time, doctor dropped patient, etc.
7 negative experience with family/other doctor/health care system
8 none available/hard to find
9 cannot find a doctor who speaks French
0 other (specify)
98 don't know
99 refused

nd_3. Would you like to have a family doctor?

1 yes
5 no
8 don't know
9 refused

<if nd_3 in (5,8,9) then go to nd_6>

nd_4. Have you tried to find a family doctor?

1 yes
5 no
8 don't know 9 refused

<if nd_1 = 5 then go to nd_7>

nd_6. Why have you never had a family doctor?

1 no family doctors (or equivalent) available in the area
2 family doctors (or equivalent) in the area are not taking new patients
3 want family doctor to be the same sex (gender) as me, cannot/have not found one
4 have not tried to find/contact one
5 not covered by OHIP (wait listed)
6 use clinic (walk in or other clinic type)
7 do not need doctor / never sick
8 cannot find a doctor who speaks French
0 other, specify
98 don't know
99 refused

nd_8. If you needed to see a doctor, for example to get a regular check-up or medical exam, because you were not feeling well, had a cold or the flu, to get a referral to see a specialist, and so on, where would you go for help?

1 walk-in clinic/clinic/after-hours clinic
2 emergency department at hospital/hospital
3 would see/try to see family doctor of another household member/friend/etc.
4 family medicine center at/affiliated with hospital or university
5 hospital outpatient department
6 community health center/women's health centre/centre at work/school/university
7 doctor/clinic that specializes in alternative medicine (naturopath, herbalist, etc.)
8 call Telehealth 0 other, specify
97 respondent insists they do not/would not need care
98 don't know
99 refused

nd_9. Not counting yearly check-ups or monitoring of an ongoing health issue, in the last 12 months did you want to see a doctor because you were sick or were concerned that you had a health problem?

1 yes
5 no
8 don't know
9 refused

<if nd_9 in (5,8,9) then go to er_1>

nd_10. Did you actually see a doctor?

1 yes
5 no
8 don't know
9 refused

<if nd_10 in (5,8,9) then go to er_1>

nd_11. How many days did it take from when you first tried to see a doctor to when you actually SAW them?

0 saw the doctor the same day
1 saw doctor next day
2-19 Enter number of days
20 twenty or more days
98 don't know
99 refused

ACCESS TO PRIMARY CARE

access_1. Have you called or tried to call your provider office with a medical question or concern during the day on a Monday to Friday in the last 12 months?

1 yes
5 no
8 don't know
9 refused

<if access_1 in (5,8,9) then go to access_3>

access_2. How often did your provider or someone else in the office speak to you when you called or get back to you the same day?

1 always
2 often
3 sometimes

4 rarely
5 never
6 volunteers ‘depends on what they called for’
8 don't know
9 refused

access_3. In the last 12 months, have you emailed your provider with a medical question?

1 yes
5 no
6 doctor’s office does not offer email
7 I don’t have email or computer
8 don't know
9 refused

<if access_3 = 6 then go to access_4a>

<if access_3=7 then access_4=7 and go to access_5>

<else access_4b>

access_4a. Could you make an appointment with your provider on a website? access_4b. Could you make an appointment with your provider by email or on a website?

1 yes
5 no
6 doctor’s office does not offer email/website
7 I don’t have email or computer
8 don't know
9 refused

access_5. The last time when you needed medical care in the evening, on a weekend, or on a public holiday, how easy or difficult was it to get care without going to the emergency department?

1 very easy
2 somewhat easy
3 somewhat difficult
4 very difficult
6 volunteers never tried to do this/never needed care
8 don't know

9 refused

access_6. Not including hospital emergency departments, does your provider have an after-hours clinic where patients can be seen by or talk to a doctor or nurse when the provider's office is closed?

1 yes
5 no
8 don't know
9 refused

<if access_5 = 6 then go to access_10>

access_10. Will your provider make house calls; that is, come to your home to see you?

1 yes
5 no
8 don't know
9 refused

access_9. In the last 12 months, was there a time when it would have been better for your health if your provider had come to your home to see you rather than you going to your provider to see them?

1 yes
5 no
8 don't know
9 refused

ACCESS TO CARE WHEN SICK

sick_1. Not counting yearly check-ups or monitoring of an ongoing health issue, in the last 12 months did you want to see your provider because you were sick or were concerned that you had a health problem?

1 yes
5 no
8 don't know
9 refused

<if sick_1 in (5,8,9) then go to exp_1>

sick_2. Did you actually see your provider or someone else in their office?

1 yes saw own doctor
2 yes saw someone else in office
3 saw both provider and someone else (and others)
5 no
8 don't know
9 refused

<if sick_2 = 5 then go to sick_5>

<if sick_2 in (8,9) then go to exp_1>

<if lang_pre=2 and sick_2 in (2,3) then go to fls_6; else skip out>

fls_6. Did they speak French to you?

1 yes
5 no
8 don't know
9 refused

<if fls_6=5 then go to fls_7; else skip out>

fls_7. Did they offer to provide you with information on how to get health care services in French?
1 yes
5 no
8 don't know
9 refused

sick_3. How many days did it take from when you first tried to see your provider to when you actually saw them or someone else in their office?

0 saw the doctor the same day
1 saw doctor next day
2-19 Enter number of days
20 twenty or more days
98 don't know
99 refused

sick_6. Would you say the length of time it took between making the appointment and the actual visit was about right, somewhat too long, or much too long?

1 about right
2 somewhat too long 3 much too long
5 other (e.g., if they felt it was too short) 8 don’t know
9 refused

sick_4. Overall, would you say the medical care that you received from your provider was excellent, very good, good, fair, or poor?

1 excellent
2 very good
3 good
4 fair 5 poor
8 don't know
9 refused

<if sick_4 in (1,2,3,4,5,8,9) then go to exp_1>

sick_5. Please tell me why you did not see the [fill fd_type]?

1. doctor not available when needed (as it was a weekend or evening, doctor was away, on vacation, ill, booked, etc.)/had to wait too long
2. got advice from doctor's office to see a specialist or doctor at another location (such as a hospital, clinic, etc.)
3. went to emergency / went to the hospital
4. problem went away / not that serious
5. went to a clinic, any type (walk in, community clinic, at work, etc.)
6. called Telehealth
7. other reason (specify, include did not have a doctor at that time here)

0 no mention
1 stated
8 don't know
9 refused

PATIENT EXPERIENCE

exp_1. When you see your provider or someone else in their office, how often do they know important information about your medical history?

1 always
2 often
3 sometimes
4 rarely
5 never
6 r volunteers it depends on who they see and/or what they are there for
7 never saw family doctor or anyone in their office
8 don't know
9 refused

<if exp_1 = 7 then go to spec_1>

exp_2. When you see your provider or someone else in their office, how often do they give you an opportunity to ask questions about recommended treatment?

1 always
2 often
3 sometimes
4 rarely 5 never
6 volunteers it depends on who they see and/or what they are there for 7 volunteers not using/on any treatments/not applicable
8 don't know
9 refused

exp_3. When you see your provider or someone else in their office, how often do they spend enough time with you?

1 always
2 often
3 sometimes
4 rarely
5 never
6 volunteers it depends on who they see and/or what they are there for
8 don't know
9 refused

exp_4. When you see your provider or someone else in their office, how often do they involve you as much as you want to be in decisions about your care and treatment?

1 always
2 often
3 sometimes
4 rarely 5 never
6 volunteers it depends on who they see and/or what they are there for 7 volunteers no decisions required on care or treatment/not applicable
8 don't know
9 refused

exp_5. When you see your provider or someone else in their office, how often do they explain things in a way that is easy to understand?

1 always
2 often
3 sometimes
4 rarely
5 never
6 r volunteers it depends on who they see and/or what they are there for
8 don't know
9 refused

INTEGRATION

SPECIALISTS

spec_1. In the past 12 months, have you been advised by your provider to see a specialist?

1 yes
5 no
8 don't know
9 refused

<if spec_1 in (5,8,9) then go to int_1>

spec_2. After you were advised to see a specialist, how many days, weeks or months did you have to wait for an appointment?

Days:
Weeks:
Months:
Years:
9997 never got an appointment/still waiting/etc. 9998 don't know
9999 refused

<if spec_2 = 9997 then go to int_1>

spec_4. When you saw the specialist, did he/she have basic medical information from your provider about the reason for your visit?

1 yes
5 no
7 never got an appointment/still waiting, etc.
8 don't know
9 refused

spec_6. After you saw the specialist, did your provider seem informed and up-to-date about the care you got from the specialist?

1 yes
5 no
7 did not see provider since seeing specialist
8 don't know
9 refused

spec_7. In the last 12 months, was there ever a time when you received conflicting information about your health care and needs from your primary care provider and the specialist?

1 yes
5 no
7 did not see provider since seeing specialist
8 don't know
9 refused

<if lang_pre=2 then go to fls_8; else skip out>

fls_8. Did you speak to the specialist in French?

1 yes
5 no
8 don't know
9 refused

<if fls_8=5 then go to fls_9; else skip out>

fls_9. Did you ask if you could speak to the specialist in French?

1 yes
5 no
8 don't know
9 refused

<if fls_9 =1 then go to fls_10; else skip out>

fls_10. Was the specialist or someone in their office able to speak with you in French?

1 yes
5 no
8 don't know
9 refused

<if fls_10 =5,8,9 then go to fls_11; else skip out>

fls_11. Did they offer to provide you with information on how to get health care services in French?

1 yes
5 no
8 don't know
9 refused

TESTS

int_1. In the last 12 months, when receiving care for a medical problem, was there ever a time when test results were not available at the time of a scheduled appointment with your provider?

1 yes
5 no

7 did not receive care for medical problem/no tests in last 12 months/not applicable
8 don't know
9 refused

HOSPITALIZATION

int_2. In the last 12 months, have you been hospitalized overnight?

1 yes
5 no
8 don't know
9 refused

<if int_2 in (5,8,9) then go to pres_1>

int_3. After you were discharged from hospital, did your provider seem informed and up-to-date about the care you received in the hospital?

1 yes
5 no
6 have not seen provider since discharged from hospital
7 did not receive care for medical problem/no tests in last 12 months/not applicable
8 don't know
9 refused

PRESCRIPTION MEDICATION

pres_1. Are you taking any prescription medicines on a regular or on-going basis?

1 yes
5 no
8 don't know
9 refused

<if pres_1 in (5,8,9) then go to bf_1>

pres_2. How many different prescription medicines are you taking on a regular or on- going basis?

1 one
2 two

3 three
4 four or more
8 don’t know
9 refused

<if pres_2 in (1,2,3,4) then go to bf_1>

pres_3. In the last 12 months, has your provider reviewed and discussed with you the prescription medicine(s) you are using?

1 yes (includes reviewed, or discussed, or both)
5 no
8 don’t know
9 refused

USE OF EMERGENCY AND WALK-IN

EMERGENCY

er_1. Have you been to an emergency department because you were sick or for a health related problem in the last 12 months?

1 yes
5 no
8 don't know
9 refused

<if er_1 in (5,8,9) then go to wi_1>

<if lang_pre=2 then go to fls_12; else skip out>

fls_12. Were you able to speak with any of the health care providers in the emergency department in French?

1 yes, with everyone I dealt with
2 yes, with some of the people I dealt with
5 no
8 don't know
9 refused

<if fls_12=1 then skip out>

fls_13. Did you ask if you could have what was happening in the emergency department explained to you in French?

1 yes
5 no
8 don't know
9 refused

<if fls_13=5,8,9 then skip out>

fls_14. Was anyone in the emergency department able to speak with you in French?

1 yes
5 no
8 don't know
9 refused

<if fls_14=1 then skip out>

fls_15. Did they offer to provide you with information on how to access emergency care in French?

1 yes
5 no
8 don't know
9 refused

er_2. Overall, would you say the medical care that you received in the emergency department was excellent, very good, good, fair, or poor?

1 excellent
2 very good
3 good
4 fair 5 poor
8 don't know
9 refused

<if famdoc = 0 then go to wi_1>

er_4. The last time you went to the emergency department, was it for a condition that you think could have been treated by your provider if he or she had been available?

1 yes
5 no
8 don't know
9 refused

<if er_4 in (5,8,9) then go to wi_1>

er_5. Which of the following was the MAIN reason you went to the emergency rather than to you provider ?

1 it was an emergency
2 your provider was not available
3 you could not get an appointment with your provider
4 it was faster to go to the emergency
5 the emergency was closer
6 provider advised you to go to emergency
7 provider works out of the emergency
0 other, specify
8 don't know
9 refused

er_6. Did your provider seem informed and up-to-date about the last time you went to the emergency department?

1 yes
5 no
7 has not seen provider since ED visit
8 don’t know
9 refused

er_7. After you received treatment from the emergency department, how confident were you that your provider or another health care professional was checking that you received the follow-up care you needed?

1 very confident
2 somewhat confident
3 not very confident

4 not at all confident
7 has not seen provider since ED visit
8 don’t know
9 refused

er_8. When you left the emergency department, did the physician, nurse, or another health care professional clearly explain the things you needed to do so you could take care and manage the health problem for which you went to the emergency department?

1 yes
5 no
8 don’t know
9 refused

er_9. When you left the emergency department, how confident were you that you had the information you needed to care for and manage the health problem for which you went to the emergency?

1 very confident
2 somewhat confident
3 not very confident
4 not at all confident
7 has not seen provider since ED visit
8 don’t know
9 refused

WALK-IN
Intro: We are going to ask some questions about your experience using a walk-in clinic. For these questions, we do not mean a drop-in or walk-in clinic that is offered by your provider ’s practice. We are only asking about separate walk-in clinics that your provider is not affiliated with.

wi_1. Have you been to a walk in clinic because you were sick or for a health related problem in the 12 months?

1 yes
5 no
8 don't know
9 refused

<if wi_1 in (5,8,9) then go to hcare _1>

<if lang_pre=2 then go to fls_16>

fls_16. Were you able to speak with a health care provider at the walk-in clinic in French?

1 yes, with everyone I dealt with
2 yes, with some of the people I dealt with
5 no
8 don't know
9 refused

<if fls_16=1,2 then skip out>

fls_17. Did you ask if you could get health care services at the walk-in clinic in French?

1 yes
5 no
8 don't know
9 refused

<if fls_17=5,8,9 then skip out>

fls_18. Was anyone in the walk-in clinic able to speak with you in French?

1 yes
5 no
8 don't know
9 refused

<if fls_18=5,8,9 then skip out>

fls_19. Did they offer to provide you with information on how to get health care services in French?

1 yes
5 no
8 don't know
9 refused

wi_2. Overall, would you say the medical care that you received at the walk-in clinic was excellent, very good, good, fair, or poor?

1 excellent
2 very good
3 good
4 fair 5 poor
8 don't know
9 refused

<if famdoc = 0 then go to hcare _1>

wi_4. The last time you went to a walk-in, was it for a condition that you think could have been treated by your provider if he or she had been available?

1 yes
5 no
8 don't know
9 refused

<if wi_4 in (5,8,9) then go to hcare_1>

wi_5. Which of the following was the MAIN reason you went to the walk-in rather than to you provider ?

1 your provider was not available
2 you could not get an appointment with your provider
3 it was faster to go to the walk-in
4 the walk-in was closer
5 provider advised you to go to a walk-in
6 it was a follow-up to a previous visit at the walk-in
0 other, specify
8 don't know
9 refused

HOME CARE
Intro: Now some questions about health care services such as nursing, personal support, occupational therapy, physiotherapy, and so on that COULD BE PROVIDED to you IN YOUR HOME, rather than at a doctor's office, clinic, or hospital.

hcare_1. Have you received any home care services in the last year?

1 yes

5 no
8 don't know
9 refused

<if hcare_5 = 1 then go to hcare_2>
<if hcare_5 in (8,9) then go to hc_1>

<if lang_pre=2 and hcare=1 then go to fls_20; else skip out>

fls_20. Were you able to speak about your health care needs in French with the home care service provider(s)?

1 yes, with everyone I dealt with
2 yes, with some of the people I dealt with
5 no
8 don't know
9 refused

<if fls_20=1,2 then skip out>

fls_21. Did you ask if you could get home care services in French?

1 yes
5 no
8 don't know
9 refused

<if fls_21=5,8,9 then skip out>

fls_22. Was anyone in the home care team able to speak with you in French?

1 yes
5 no
8 don't know
9 refused

<if fls_22=5,8,9 then skip out>

fls_23. Did they offer to provide you with information on how to access home care services in French?

1 yes
5 no
8 don't know
9 refused

hcare_2. In the last year, did you think you needed home care services, such as nursing, personal support, occupational therapy, physiotherapy, and so on to be provided in your home?

1 yes
5 no
8 don't know
9 refused

<if hcare_2 in (5,8,9) then go to hc_1>

hcare_3. In the last year, have you discussed home care needs with your provider?

1 yes
5 no
8 don't know
9 refused

hcare_4. The last time you received home care services, did you or another family member pay for it or was it paid for by a government or publicly-funded program?

1 by respondent or family member
3 by government or publicly funded program
5 paid by both
7 someone else paid
8 don't know
9 refused

<if hcare_4 = 7 then go to hc_5>
<else go to hc_6>

hcare_5. And who was it that paid for the home care you received?

As entered

hcare_6. Overall, would you say the home care that you received was excellent, very good, good, fair, or poor?

1 excellent
2 very good
3 good
4 fair
5 poor
8 don't know
9 refused

hcare_7. In the last year, has your provider talked with you about the home care services you have received? For example has your provider asked if you are getting all of the home care services you need, how satisfied you are with the care, and so on?

1 yes
5 no
8 don't know
9 refused

GENERAL HEALTH QUESTIONS

ghc_1. In general, how confident are you that your provider or other health care professional checks to make sure you receive the health care you need?

1 very confident
2 somewhat confident
3 not very confident
4 not at all confident
8 don’t know
9 refused

ghc_2. In general, how confident are you that you know the things that you need to do to take care of and manage your health?

1 very confident
2 somewhat confident
3 not very confident
4 not at all confident

8 don’t know
9 refused

HOUSEHOLD COMPOSTION

hc_1. Counting yourself, how many people live in your household?

1 respondent indicates they live alone 2-9 enter number of people
10 ten or more people live in household
98 don't know
99 refused

<if hc_1 = 1 then go to birth_yr>

hc_2. How many children under the age of 16 live in your household?

0 no children\no children under 16
1-9 enter number of children under 16
10 ten or more children under 16
98 don't know
99 refused

<if hc_2 in (0,98,99) then go to birth_yr>

hc_3. Are you a parent or guardian of any of the children under 16 years of age who live in your household?

1 yes
5 no
8 don't know
9 refused

<if hc_3 in (5,8,9) then go to birth_yr>

hc_4. Could you tell me the age(s) of the child/children in your household under 16?

0 less than one year old
1-15 enter age of children
98 don't know
99 refused

CHILDREN'S SECTION

ca_1. To help us determine which child to refer to on the following questions, can you tell me the age of your child, who will have the next birthday?

0-15 enter ages
98 don't know
99 refused

<if ca_1 in (98,99) then go to yr_birth>

CHILDREN'S ACCESS TO CARE WHEN SICK

ca_3. Do you have a pediatrician, family doctor, nurse practitioner or other regular health care provider for your child?

1 yes
5 no
8 don't know
9 refused

<if ca_3 in (5,8,9) then go to ca_9>

ca_4. Not counting yearly check-ups or monitoring of an ongoing health issue, in the last 12 months did you want to take your child to see their provider because they were sick or you were concerned that they had a health problem?

1 yes
5 no
8 don't know
9 refused

<if ca_4 in (5,8,9) then go to ca_9>

ca_5. Did they actually see their provider or someone else in their office?

1 yes, saw own provider
2 yes, saw other provider in office

3 saw own provider and other provider
5 no
8 don't know
9 refused

<if ca_5 = 5 then go to ca_8>

<if ca_5 in (8,9) then go to ca_9>

ca_6. How many days did it take from when they first tried to see their provider to when they actually saw them or someone else in their office?

0 saw the doctor the same day
1 saw doctor next day
2-19 Enter number of days
20 twenty or more days
98 don't know
99 refused

CHILDREN'S USE OF EMERGENCY

ca_9. Have you taken your child to an emergency department because they were sick or for a health related problem in the last 12 months?

1 yes
5 no
8 don't know
9 refused

CHILDREN'S USE OF A WALK-IN

ca_13. Have you taken your child to a walk in clinic because they were sick or for a health related problem in the 12 months?

1 yes
5 no
8 don't know
9 refused

SOCIODEMOGRAPHICS

birth_yr. In what year were you born?

1900-1997 enter year
9998 don’t know
9999 refused

<if birth_yr= 9999 then go to agegroup>

birth_mth. And in what month was that?

1 January	5 May	9 September
2 February	6 June	10 October
3 March	7 July	11 November
4 April	8 August	12 December
98 don’t know	99 refused	

<if birth_mth in (1 to 12) then go to edu>

agegroup (for those who do not answer birth_yr and birth_mth). The information collected in the study is more valuable when we know the age of the people who participated. Now we don't need your exact age, but would you please tell me if you are:

1 16-24 years of age
2 25-34 years of age
3 35-44 years of age
4 45-54 years of age
5 55-64 years of age
6 65-74 years of age
7 75 years of age or older

edu. What is the highest level of education you have completed to date?

1 less than high school
2 some high school
3 high school graduate or equivalent
4 some community college, technical, trade, or vocational college
5 completed community college, technical, trade, or vocational college
6 some university but no degree
7 completed bachelor's degree (Arts, Science, Eng, etc.)

8 post graduate training: MA, MSc, MLS, MSW, MBA, etc.
9 post graduate training: PhD, "doctorate"
10 professional degree (Law, Medicine, Dentistry)
98 don't know
99 refused

birthplace. In what country were you born?

1 Canada 38 Pakistan
2 United States 39 Philippines
3 China, Hong Kong, Taiwan 42 Russia/USSR/Soviet Union
4 France 44 Serbia
5 Germany 46 Somalia
6 India 47 Czechoslovakia/Slovakia
7 Italy 48 Spain
8 Netherlands (Holland) 49 Sri Lanka
9 Poland 50 Sweden
10 Portugal 51 Switzerland
11 Denmark 52 Trinidad
13 England, Scotland, Ireland, 53 Ukraine UK, Wales, Great Britain 54 Vietnam
14 El Salvador 55 Yugoslavia
15 Ethiopia 56 Bangladesh
17 Finland 57 Iran/Iraq
19 Greece 58 Other Europe
20 Guyana 59 Other Asia
21 Haiti 60 Other Central America
23 Hungary 61 Other South America
27 Israel 62 Other Africa
28 Jamaica 63 Other Caribbean
29 Japan 64 Other Middle East 31 Korea (North & South) 65 Other North African 32 Lebanon
67 South Pacific
33 Macedonia 0 Not codeable
34 NZ & Australia 98 don’t know
36 Nigeria 99 refused
37 Norway
<if birthplace in (1,98,99) then go to lang_2> imm. In what year did you come to Canada? 1900-2014
enter year
9998 don't know
9999 refused

fin_sit. Which of the following words best describes your current financial situation: very comfortable, comfortable, tight, very tight, or poor?

1 very comfortable
2 comfortable
3 tight
4 very tight
5 poor
8 don’t know
9 refused

inc1. Could you please tell me how much income you and other members of your household received in the year ending December 31st 2013, before taxes. Please include income from all sources such as savings, pensions, rent, as well as wages. To the nearest thousand dollars, what was your total household income before taxes and other deductions were made?

0 less than one thousand dollars
1-997 enter amount (2 for $2,000, 20 for $20,000, 120 for $120,000, etc.)
998 don't know
999 refused

<if inc_1 in (998,999) then go to inc2>

<else go to in_postal>

inc2 (for those who refuse inc1). We don't need the exact amount; could you tell me which of these broad categories it falls into?

1 less than $20,000
2 between $20,000 and $30,000 ($29,999.99) 3 between $30,000 and $40,000
4 between $40,000 and $50,000 5 between $50,000 and $60,000 6 between $60,000 and $70,000 7 between $70,000 and $80,000 8 between $80,000 and $90,000 9 between $90,000 and $100,000
10 between $100,000 and $120,000 11 between $120,000 and $150,000
12 more than $150,000
98 don't know
99 refused

POSTAL CODE

postcode. Can you tell me your postal code?

As entered

PERMISSION TO LINK/FOLLOW UP

permis_1. Understanding the relationship between people's health, and how often see a doctor, have been hospitalized, and so on, is important to delivering effective health care in Ontario. The ministry would like to use your responses, and share them with authorized health organizations, so that both the ministry and the organizations can research, analyze and evaluate Ontario's health care system. Are you willing to permit the ministry and the authorized health organizations to do this?

1 yes
5 no
8 don't know 9 refused

followup_1. Would you be interested in talking to the ministry, and their researchers, again?

1 yes
5 no
8 don't know 9 refused

<if followup_1 in (5,8,9) 1 then go to eval_1>

fname. Could you please tell me your first name so we know who to ask for if we do call back?

As entered

EVALUATION

eval_1. Did you find any questions hard to understand, confusing, or unclear?

1 yes
5 no
8 don't know 9 refused

<if eval_ 1 in (5,8,9) then go to end>

eval_2. Which questions did you find hard to understand, confusing, or unclear?
As entered

Appendix 3: Additional Tables for Study 3

ACSC hospital admissions between April 1st, 2015 and February 28th, 2017 among multi-morbid adults by physician characteristics on identified on March 31st, 2015 stratified by Male and Female				
	Interprofessional Teams		**Non-interprofessional teams**	
	Male	**Female**	**Male**	**Female**
	Rate per 100	Rate per 100	Rate per 100	Rate per 100
Physician Sex				
Male	2.9	2.6	2.4	2.3
Female	2.6	2.0	2.3	1.5
Missing			2.1	2.1
Patient per physician, Mean (SD)				
Age group in Yrs.				
<40	4.3	4.4	2.4	1.8
40-64	2.4	1.7	2.3	1.9
> 64	3.0	2.7	2.5	2.3
Missing	3.4	2.4	2.1	2.4
Country of medical graduation Canada				
Yes	2.8	2.3	2.3	1.9
No	2.9	2.6	2.5	2.1
Missing	3.4	2.4	2.1	2.4
Years in practice				
<5	100.0	2.6	2.9	2.4
5_15	3.0	2.2	2.4	1.8
16-25	2.7	2.2	2.4	1.9
>25	2.8	2.4	2.3	2.0
Missing			2.1	2.1

ACSC hospital admissions between April 1st, 2015 and March31st, 2017 among multi-morbid adults by patient characteristics from March 31st, 2003 stratified by Male and Female				
	Interprofessional Teams		Non-interprofessional teams	
	Male	Female	Male	Female
	Rate per 100	Rate per 100	Rate per 10,000	Rate per 100
Age group, yr.				
18-44	1.0	0.8	0.8	0.7
45-64	2.6	2.0	2.2	1.7
65-84	5.4	4.8	5.0	4.2
84+	5.9	5.4	9.3	5.1
Missing				
New OHIP registrants (within 10 years)				
yes	2.5	1.9	1.8	1.4
No	2.8	2.3	2.4	2.0
Income quintile				
1 (low)	3.5	3.1	3.0	2.7
2	3.1	2.7	2.7	2.3
3	2.8	2.2	2.4	1.9
4	2.6	2.0	2.2	1.7
5 (high)	2.2	1.7	1.9	1.4
Missing	2.7	3.4	1.9	2.3
Rurality Index of Ontario				
Major urban (0 to 9)	2.5	2.1	2.2	1.8
Semi-urban (10 to 39)	3.0	2.5	2.8	2.3
Rural (≥40)	3.6	2.9	3.4	2.8
Missing	2.9	3.4	3.7	3.3

Resource utilization band (RUB)				
0 (non-user)	**1.7**	**1.8**	**2.0**	**2.8**
1	**1.5**	**2.2**	**1.0**	**1.1**
2	**1.6**	**1.8**	**1.3**	**1.5**
3	**2.4**	**1.9**	**2.0**	**1.6**
4	**3.7**	**2.8**	**3.2**	**2.3**
5 (very high user)	**5.6**	**4.9**	**5.0**	**4.3**
Missing				
2 + Co-morbidity				
Yes	**2.8**	**2.3**	**2.4**	**2.0**
3+ comorbidities				
Yes	**4.4**	**3.7**	**3.8**	**3.8**
4+ comorbidities				
Yes	**6.6**	**6.6**	**6.6**	**6.6**
5+ comorbidities				
Yes	**8.6**	**7.9**	**8.0**	**6.7**

All cause hospital re-admissions among multi-morbid adults between April 1st, 2015 and March 31st, 2017 by physician characteristics based March 31st, 2017 stratified by Male and Female				
	Interprofessional Teams		**Non-interprofessional teams**	
	Male	**Female**	**Male**	**Female**
	Rate per 100	**Rate per 100**	**Rate per 10,000**	**Rate per 100**
Physician Sex				
Male	15.5	14.7	15.0	13.8
Female	14.9	15.0	15.9	14.5
Age group in Yrs.				
<40	16.2	15.7	14.6	13.9
40-64	15.4	14.3	15.1	14.2
> 64	14.7	16.1	15.8	13.9
Country of medical graduation Canada				
Yes	15.6	14.5	15.6	14.5
No	14.8	16.0	14.8	16.0
Years in practice				
<5	11.3	16.9	15.3	11.8
5_15	15.2	15.4	15.1	13.0
16-25	15.0	14.9	14.4	14.3
>25	15.6	14.4	15.5	14.2

All cause hospital re-admissions between April 1st, 2015 and March31st, 2017 among multi-morbid adults by patient characteristics from March 31st, 2003 stratified by Male and Female				
	Interprofessional Teams		Non-interprofessional teams	
	Male	Female	Male	Female
	Rate per 100	Rate per 100	Rate per 10,000	Rate per 100
Patients characteristics				
Age group, yr.				
18-44	12.3	13.4	13.9	10.9
45-64	15.1	14.6	14.4	13.4
65-84	16.3	15.3	16.3	15.2
84+	10.0	2.6	19.0	16.7
New OHIP registrants (within 10 years)				
yes	9.6	14.5	15.1	17.8
No	15.5	14.8	15.2	13.9
Income quintile				
1 (low)	14.4	15.0	17.3	14.9
2	15.2	15.9	15.1	13.3
3	13.6	14.0	14.5	13.5
4	17.2	15.2	14.6	13.8
5 (high)	16.8	13.2	14.8	14.9
Rurality Index of Ontario				
Major urban (0 to 9)	16.7	14.5	15.6	14.4
Semi-urban (10 to 39)	14.0	14.8	14.6	13.4
Rural (≥40)	14.2	15.7	13.9	12.3
Resource utilization band (RUB)				
0 (non-user)	13.0	14.3	15.6	20.8
1	10.5	19.0	40.0	8.3
2	16.3	11.7	15.0	13.2
3	14.0	14.5	14.6	14.0
4	16.9	14.6	14.6	13.8
5 (very high user)	17.2	16.7	18.1	14.8
Patients with Chronic disease				

2 + Co-morbidity				
Yes	**15.3**	**14.8**	**15.2**	**14.0**
No				
3+ comorbidities				
Yes	**16.3**	**15.9**	**15.9**	**15.0**
No	**13.9**	**12.5**	**13.9**	**12.1**
4+ comorbidities				
Yes	**16.1**	**16.8**	**16.8**	**15.2**
No	**14.9**	**13.6**	**14.3**	**13.3**
5+ comorbidities				
Yes	**15.7**	**19.0**	**17.1**	**15.6**
No	**15.3**	**13.9**	**14.8**	**13.7**

Appendix 4: List of diagnostic information for defining the 17 selected chronic conditions under investigation in Study 3

These conditions represent a subset of all possible chronic conditions that may be experienced by individuals over a lifetime but represent the most substantial conditions from a population perspective.

Condition [reference for validated algorithm]	**ICD 9 / OHIP**	**ICD 10**	**ODB***
Acute Myocardial Infarction (AMI) [1]	410	I21, I22	
Osteo- and other Arthritis:			
(A) Osteoarthritis	715	M15-M19	
(B) Other Arthritis (includes Synovitis, Fibrositis, Connective tissue disorders, Ankylosing spondylitis, Gout Traumatic arthritis, pyogenic arthritis, Joint derangement, Dupuytren's contracture, Other MSK disorders)	727, 729, 710, 720, 274, 716, 711, 718, 728, 739	M00-M03, M07, M10, M11-M14, M20-M25, M30-M36, M65-M79	
Arthritis - Rheumatoid arthritis [2]	714	M05-M06	
Asthma [3]	493	J45	
(all) Cancers	140-239	C00-C26, C30-C44, C45-C97	
Cardiac Arrhythmia	427 (OHIP) / 427.3 (DAD)	I48.0, I48.1	
Congestive Heart Failure [4]	428	I500, I501, I509	
Chronic Obstructive Pulmonary Disease [5]	491, 492, 496	J41, J43, J44	
Coronary syndrome (excluding AMI)	411-414	I20, I22-I25	

Dementia [6]	290, 331 (OHIP) / 046.1, 290.0, 290.1, 290.2, 290.3, 290.4, 294, 331.0, 331.1, 331.5, F331.82 (DAD)	F00, F01, F02, F03, G30	Cholinesterase Inhibitors
Diabetes [7]	250	E08 - E13	
Hypertension [8]	401, 402, 403, 404, 405	I10, I11, I12, I13, I15	
Inflomatary Bowel Disease (IBD) [9]	555, 556	K50, k51	
(Other) Mental Illnesses	291, 292, 295, 297, 298, 299, 301, 302, 303, 304, 305, 306, 307, 313, 314, 315, 319	F04, F050, F058, F059, F060, F061, F062, F063, F064, F07, F08, F10, F11, F12, F13, F14, F15, F16, F17, F18, F19, F20, F21, F22, F23, F24, F25, F26, F27, F28, F29, F340, F35, F36, F37, F430, F439, F453, F454, F458, F46, F47, F49, F50, F51, F52, F531, F538, F539, F54, F55, F56, F57, F58, F59, F60, F61, F62, F63, F64, F65, F66, F67, F681, F688, F69, F70, F71, F72, F73, F74, F75, F76, F77, F78, F79, F80, F81, F82, F83, F84, F85, F86, F87, F88, F89, F90, F91, F92, F931, F932, F933, F938, F939, F94, F95, F96, F97, F98	
Mood, anxiety, depression and other nonpsychotic disorders	296, 300, 309, 311	F30, F31, F32, F33, F34 (excl. F34.0), F38, F39, F40, F41, F42, F43.1, F43.2, F43.8, F44, F45.0, F45.1, F45.2, F48, F53.0, F68.0, F93.0, F99	
Osteoporosis	733	M81, M82	

Renal failure	403, 404, 584, 585, 586, v451	N17, N18, N19, T82.4, Z49.2, Z99.2
Stroke (excluding transient ischemic attack)	430, 431, 432, 434, 436	I60-I64

NOTES:

Abbreviations: ICD = International Classification of Disease; ODB = Ontario Drug Benefit program database; OHIP = Ontario Health Insurance Plan, physician billings database;

All case definitions look back to 2001 to ascertain disease status, with the exception of AMI (1 year prior to index), Cancer (2 years), Mood Disorder (2 years) and Other Mental Illnesses (2 years)

AMI, Asthma, COPD, CHF, Dementia, Diabetes Hypertension and Rheumatoid Arthritis are based on validated case algorithms (see Sources 1-8 below, respectively). All other conditions required at least one diagnosis recorded in acute care (CIHI) or two diagnoses recorded in physician billings within a two-year period.

*ODB prescription drug records are not available for the majority of persons under the age of 65

Appendix 5: List of Eligible CMGs for hospital readmission in study 3

List of Eligible Conditions (CMGs)		
CMG+		**CMG+ description**
Stroke (Age ≥ 45)		
CMG 2008	25	Hemorrhagic Event of Central Nervous System
	26	Ischemic Event of Central Nervous System
	28	Unspecified Stroke
CMG 2009	25	Hemorrhagic Event of Central Nervous System
	26	Ischemic Event of Central Nervous System
	28	Unspecified Stroke
COPD (Age ≥ 45)		
CMG 2008	139	Chronic Obstructive Pulmonary Disease
CMG 2009	139	Chronic Obstructive Pulmonary Disease
Pneumonia (All ages)		
CMG 2008	136	Bacterial Pneumonia
	138	Viral/Unspecified Pneumonia
	143	Disease of Pleura
CMG 2009	136	Bacterial Pneumonia
	138	Viral/Unspecified Pneumonia
	143	Disease of Pleura
Congestive Heart Failure (Age ≥ 45)		
CMG 2008	196	Heart Failure without Cardiac Catheter
CMG 2009	196	Heart Failure without Cardiac Catheter
Diabetes (All ages)		
CMG 2008	437	Diabetes
CMG 2009	437	Diabetes
Cardiac CMGs (Age ≥ 40)		
CMG 2008	202	Arrhythmia without Cardiac Catheter
	204	Unstable Angina/Atherosclerotic Heart Disease without Cardiac Cath
	208	Angina (except Unstable)/Chest Pain without Cardiac Catheter
CMG 2009	202	Arrhythmia without Cardiac Catheter
	204	Unstable Angina/Atherosclerotic Heart Disease without Cardiac Cath
	208	Angina (except Unstable)/Chest Pain without Cardiac Catheter
Gastrointestinal CMGs (All ages)		
CMG 2008	231	Minor Upper Gastrointestinal Intervention
	248	Severe Enteritis
	251	Complicated Ulcer

	253	Inflammatory Bowel Disease
	254	Gastrointestinal Hemorrhage
	255	C
	256	Esophagitis/Gastritis/Miscellaneous Digestive Disease
	257	Symptom/Sign of Digestive System

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