FOCUSED PRACTICE AND ADDED COMPETENCE ON PRIMARY CARE QUALITY

THE ROLE OF PHYSICIAN FOCUSED PRACTICE AND ADDED COMPETENCE ON PRIMARY CARE QUALITY FOR OLDER ADULTS

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Lay Abstract

Older adults frequently seek care from family doctors for a variety of health needs. Some family doctors focus their medical practice to increasingly care for older patients or undergo extra training to learn more about their needs. There is a research gap in understanding if added focus or training impacts the care that older adults receive. This thesis studied family doctors with focused medical practices and extra training to see how they compare with other family doctors. Experienced physicians and researchers were consulted to determine what primary care activities related to caring for older patients are most important and appropriate to measure. Findings showed some practice differences between family doctors who focus on older patients or have extra training, but the quality of care that older adults receive is similar. This research suggests that added focus and training might not lead to better quality of primary care for older patients.

Abstract

Background: Family physicians are central care providers for older adults. Some family physicians have enhanced skills to care for this patient population, sometimes reflected in a focused medical practice and/or extra training. There are knowledge gaps concerning how to identify physicians with focused practice or added training within health administrative data, as well as understanding their contributions to quality primary care.

Research Question: This thesis investigated: (1) What are appropriate and important performance measures of family physician services that are relevant to older adults? (2) How can family physicians with focused practice or added training be classified within population-based health administrative data, and what are their medical practice characteristics? (3) How do family physicians with/without focused practice or added competence compare in delivering high quality care to older patients?

Methods: This thesis comprised a modified Delphi consensus study and two population-based observational studies. Expert panelists rated indicators and refined proposed technical definitions for endorsed indicators. Using health administrative data, family physicians with focused medical practices and/or added competence were classified, and their practice- and provider-level characteristics were described. A propensity score-matched cohort study enabled comparisons of family physicians on the consensus-based performance measures.

Results: This thesis established consensus on 12 measurable processes across four priority topics relevant to added competency training. An approach to classify family physicians with focused practice or added training was developed, and practice differences were identified. Lastly, this work operationalized the technical definitions of performance measures and identified distinctions on four processes.

Conclusion: This thesis provides novel data on the family physician workforce with focused medical practices and added competence to care for older adults. The studies demonstrated the feasibility of establishing measurable indicators using a modified Delphi procedure, and developed an approach to classify focused practice physicians and added competency holders within health administrative data.

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First and foremost, I want to express my sincere gratitude to my supervisor, Dr. Andrew Costa, for his unwavering encouragement and mentorship. Thank you for introducing me to research and exemplifying the traits of an exceptional leader. Your expertise and passion have inspired and enhanced my work, and I truly appreciate all the lessons you have shared with me. I am grateful for all the reference letters you prepared, the connections you facilitated, and the valuable career advice you offered. I could not have asked for a more supportive supervisor, and I attribute much of my success to your guidance. It has been an honour working with you.

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I had the pleasure of working with two incredible research teams during my doctoral studies: the Big Data & Geriatrics Models of Care Research Group

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It is with the support of those mentioned here that I accomplished this work.

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List of Abbreviations

ACE	Angiotensin-converting-enzyme
AF	Atrial fibrillation
ARB	Angiotensin receptor blocker
BZRA	Benzodiazepine receptor agonist
CAC	Certificate of Added Competence
CAPE	Client Agency Program Enrolment
CaRMS	Canadian Resident Matching Service
CCFP (COE)	Family physicians with a Certificate of Added Competence in Care of the Elderly
CFPC	College of Family Physicians of Canada
CHF	Congestive heart failure
CI	Confidence interval
CIHR	Canadian Institutes of Health Research
CMA	Census metropolitan area
COE	Care of the Elderly
COPD	Chronic obstructive pulmonary disease
CREDES	Conducting and reporting of Delphi studies
DAD	Discharge Abstract Database
ED	Emergency department
EMR	Electronic medical record
FFS	Fee-for-service

FM-COE Priority Topics	Priority Topics and Key Features for the Assessment of Competence in Care of the Elderly
FP	Family physician
FP-COE	Family physicians with a focused practice in Care of the Elderly
HHR	Human health resources
HiREB	Hamilton Integrated Research Ethics Board
HQO	Health Quality Ontario
ID	Identification
IPDB	ICES Physician Database
IQR	Interquartile range
LHIN	Local Health Integration Network
LTC	Long-term care
MD	Medical doctor
MI	Myocardial infarction
MRP	Most responsible physician
N	Sample size
NACRS	National Ambulatory Care Reporting System
NGT	Nominal group technique
ODB	Ontario Drug Benefit
OHIP	Ontario Health Insurance Plan
OLIS	Ontario Laboratories Information System
ON-MARG	Ontario Marginalization Index

OR	Odds ratio
PCP	Primary care provider
PCPOP	Primary Care Population
PEM	Patient enrolment model
PHIPA	Personal Health Information Protection Act
PIP	Potentially inappropriate medication
RAE	Remote Access Environment
RAM	RAND/UCLA Appropriateness Method
RECORD	Reporting of studies conducted using observational routinely collected health data
REDCap	Research Electronic Data Capture
Ref	Reference group
SAS	Statistical Analysis Software
SD	Standard deviation
SDS	Same Day Surgery
SGLT2	Sodium-glucose cotransporter-2
SGS	Specialized geriatric services
STROBE	Strengthening the reporting of observational studies in epidemiology
TUTOR-PHC	Transdisciplinary Understanding and Training on Research - Primary Healthcare

Declaration of Academic Achievement

I, Rebecca Correia, was responsible for the conceptualization, analysis, interpretation, writing, and revisions of all chapters comprising this thesis. The chapters include an introduction (Chapter 1), a consensus study (Chapters 2 and 3), a retrospective cohort study (Chapter 4), a propensity score-matched study (Chapter 5), and a discussion (Chapter 6). I consulted with my PhD supervisor (Dr. Andrew Costa) and thesis committee members (Dr. Aaron Jones, Dr. Meredith Vanstone, and Dr. Henry Siu) when methodological and contextual guidance was warranted.

For the consensus study, I recruited the assistance of graduate students (Darly Dash and Komal Aryal) and a physician (Dr. Aquila Gopaul) to screen candidate indicators and review the questionnaires before they were disseminated to panel members. Chapters 4 and 5 utilized administrative data obtained from ICES. Original data were cut and extracted by ICES analysts (Glenda Babe and David Kirkwood) in accordance with ICES standard procedures for student investigators. Before submitting the included studies to academic journals, I collaborated with field leaders and methodological experts to review and contribute to the final drafts, including Steve Slade, Dr. Chris Frank, and Dr. Ruth Lavergne.

CHAPTER ONE

Introduction

Primary Care for an Aging Demographic

Primary care constitutes a spectrum of health care services that are foundational to the functioning of health systems. Primary care includes the diagnosis and treatment of acute and chronic conditions, health promotion, disease prevention, counselling, and rehabilitation; this level of care can address the majority of patients' medical needs.[1–3] Often regarded as patients' first point of contact with the health care system, primary care serves coordinating functions to ensure continuity, integration, accessibility, and comprehensiveness. Research consistently demonstrates that investments in primary care are associated with enhanced access, improved outcomes, and reduced costs.[3]

There is much diversity in how primary care is organized, governed, and delivered in Canada.[4] Multidisciplinary providers collaborate in the shared delivery of primary care, with the vast majority of patients receiving care from family physicians (general practitioners).[4] Family physicians are responsible for addressing patients' diverse medical needs, developing sustained relationships, and providing holistic, patient-centred care. Although family physicians deliver a range of medical services to patients of all age groups,[5] older adults (aged ≥65) constitute a large proportion of family physicians' overall medical practice.[6] Family physicians exhibit differences in their knowledge and skills to care for older adults, and some demonstrate a commitment to increasingly care for this

demographic by completing enhanced skills training or focusing their medical practice. The impact of family physician demographics and medical practice composition on elderly patient care is largely unknown.

Older adults encompass a vulnerable patient demographic that often presents with multiple, complex health issues and experiences greater health service use compared to patients of other ages.[7–10] The Patient's Medical Home model, developed by the College of Family Physicians of Canada, conveys the importance of primary care systems and family physician services in addressing older patients' complex medical needs.[11] Projected increases in Canada's aging population are expected to impact economic, social, and health care systems significantly.[6,12] Current data asserts that older adults frequently seek primary care – accounting for almost one-third of all family medicine services.[4] Compared to other specialty groups, family physicians provide the highest volume of medical services to older patients,[13] and deliver care in a variety of settings: office-based and virtual practices,[14] nursing (long-term care [LTC]) homes,[15] retirement homes,[16] patients' homes,[17] and inpatient (hospital) units.[18] Older patients' vulnerabilities and projected increases in health service use are compounded by growing income inequality,[19–21] more newcomers to Canada and ethnic diversity,[21–24] migration to rural areas,[25,26] and other features of social position.

Health Human Resource Challenges

In their call for a national seniors care strategy, the Canadian Medical Association stated that Canada's health care system is inadequate to meet the

needs of aging populations, given that structures, governance, and funding precede recent population growth and demographic shifts.[27] Every health system in Canada is currently grappling with primary care workforce shortfalls amidst the increasing demands of an aging population.[28,29] Despite more family physicians per capita than ever before,[14] many Canadians are without a regular provider or struggle to access timely care.[15,16] Access to the broad scope of family physician services in community settings facilitates the defining features of primary care – continuity, coordination, and comprehensiveness – and underpins effective chronic disease management.[30] Disruptions to continuous primary care for older adults may result in higher health care expenditures, increased risks of hospitalization, and poor patient satisfaction.[31,32] Unmet primary care needs can exacerbate disease progression into more complicated, detrimental, and expensive health outcomes, particularly for medically complex older persons.[33,34]

Beyond generalist care, there are longstanding shortages in the physician workforce with specialized skills to care for the increasing number of older adults worldwide.[35] Despite the widely acknowledged need for more providers, there is a large body of literature concerning limited interest among medical trainees in providing elderly patient care, negative impressions of working with older adults, and a preference to pursue other types of medicine.[36–41] The Canadian Resident Matching Service (CaRMS) consistently reports unfilled residency training positions for family medicine and geriatrics relative to other specialties.[42,43] In addition, access to physician resources and specialized geriatric services (SGS)

is compounded by features of older patients' social position (e.g., sex, gender, socioeconomic status, geography, income, language, newcomer status).[44,45] The Canadian Institutes of Health Research (CIHR) recognize human health resources (HHR) as a priority to achieve sustainable workforce planning, meet health system demands, and deliver adequate care to aging Canadians.[46,47]

Merits of Quality Primary Care

Access to high quality primary care is central to the effectiveness and efficiency of health systems,[2,48] and has the potential to address the complex medical needs of older adults.[6] Ongoing primary care reform is posited to benefit older adults,[49–51] given implications for HHR planning, medical education, physician remuneration, team-based care, and accessibility.[52,53]

The Donabedian model is the dominant paradigm in health services research that enables assessments of health care quality.[54] The model considers three interrelated components – structures, processes, and outcomes – in conceptualizing and evaluating the quality of health systems and services.[55] Structures are static or technical factors affecting the context in which health care is delivered (e.g., HHR, payment models, health care institutions), processes refer to acts of health care delivery (e.g., diagnosis, treatment, preventative care), and outcomes include the impacts of structures and processes (e.g., prognosis, patient satisfaction, health service utilization). Figure 1 illustrates a modified Donabedian model demonstrating structures, processes, and outcomes relevant to the primary care of older adults. Given an interest in understanding family

physicians' contributions to primary care quality, this thesis focused on *process* measures encompassing practice-based clinical activities delivered by physicians to older patients.

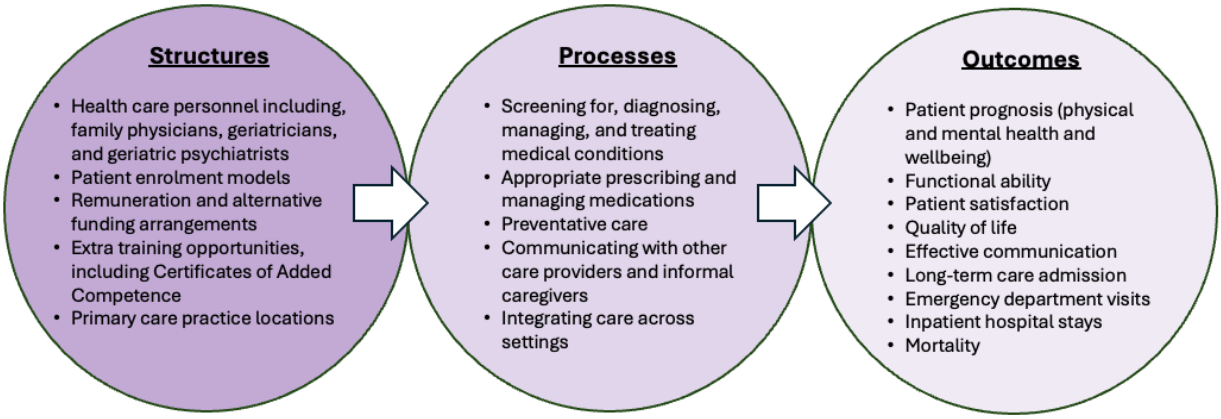

Figure 1. Structures, processes, and outcomes relevant to care quality for older adults

Family Physician Added Competence and Focused Practice

The College of Family Physicians of Canada (CFPC) conceptualizes competence as the ability to enter and adapt to comprehensive family medicine practice anywhere in Canada.[56] The College outlines professional competencies to guide family medicine training, assessment, and certification.[57] Competence is determined by continuously sampling, observing, and reflecting on learner performance throughout clinical encounters and across multiple dimensions.[57] Beyond the foundational family medicine curriculum, some family physicians pursue additional training and develop enhanced skills and knowledge to support and extend the delivery of comprehensive, community-adaptive care.[58] Added

competence may expand or broaden a physician's scope of practice, which is defined as the bounds of medical services that a physician performs/provides in practice based on their professional certification.[59,60]

All family medicine graduates of accredited Canadian residency programs have achieved a baseline level of competence to care for older patients.[61] However, in the absence of national training standards (e.g., minimum practice hours with older patients), particular training trajectories may equip physicians with more or less content knowledge, technical skills, and clinical exposures relevant to caring for older patients. Variations in training curricula across medical schools and learner choice in elective elements may lead to a range of geriatric competencies in the family physician workforce.

Added competence: Enhanced skills training programs extend the comprehensive skills of family physicians in particular medical domains, while maintaining competence across a broad scope of practice.[58] The CFPC directs the Certificate of Added Competence (CAC) program, whereby family physicians pursue additional postgraduate training and become accredited to practice in particular areas, one of which is Care of the Elderly (COE).[62,63] Enhanced skills programs remain centered in family medicine by promoting the integration of added competence and comprehensive practice.[58] COE CAC holders emulate 85 core competencies across 18 Priority Areas aligned with the CanMEDS framework,[62,64,65] which are complementary but distinct from geriatric specialists (i.e., geriatricians and geriatric psychiatrists).[66] Beyond COE training and

certification, other educational opportunities exist for family physicians to acquire or enhance their skills to meet older patients' medical needs. Therefore, the COE CAC is not necessarily an exhaustive marker of family physicians with additional skills relevant to caring for older patients.

There is much diversity in how physicians with COE CACs structure some or all of their medical practice to care for older patients,[67,68] as the CFPC does not mandate practice expectations for CAC holders.[69] To date, some studies have characterized COE CAC holders,[43,67,68,70–75] but the lack of a validated cohort in health administrative data has inhibited detailed descriptive or inferential analyses. Much is unknown about these providers, including their individual and medical practice characteristics, service provision, and quality of care delivered.

Focused practice: In the province of Ontario, family physicians – with or without CACs – can apply for and obtain a General Practitioner Focused Practice designation (an alternative funding arrangement) from the Ministry of Health.[76] The billing designation is an alternate patient enrolment model (PEM) that recognizes specialized services provided by some family physicians and their impact on the Access Bonus.[77,78] The Access Bonus is an Ontario payment incentive for family physicians participating in harmonized payment models to prioritize providing primary care services to enrolled patients.[78] In an effort to incentivize primary care access and minimize primary care visits outside of capitation-based practices, an individual physician's Access Bonus is reduced when rostered patients seek care outside their enrollment group.[50] However,

family physicians with a focused practice designation are exempt from impacting the Access Bonus; physicians are not penalized if their rostered patients receive care from family physicians who are in focused practice. Further, focused practice physicians are eligible to bill for additional fee codes (medical services) pertinent to their area of focused practice for attached patients and others within their group practice.[79] To be eligible for a COE focused practice designation, family physicians must demonstrate a need within their community, have relevant training or qualifications, and dedicate at least 20% of their medical practice to caring for older patients.[78]

The absence of a classification to identify family physicians with added competence or focused practices to care for older adults has hindered research about their medical practice characteristics and contributions. Given measurement challenges, prior HHR efforts have not comprehensively examined the roles of COE CAC or focused practice physicians in caring for older patients.[12,13,80] The values of geriatric care models and additional competencies relevant to elderly-patient care have been documented across care settings,[81–90] but the impacts of CACs and focused practice organization on care quality are largely unknown.

Enhanced skill training and focused practice organization have been postulated to benefit older patients, such as by expanding the range of clinical services offered in community-based settings.[67,91] However, given the widely recognized benefits of comprehensive family practice,[3,92–97] there are concerns

that focused or narrowed family medicine practice diverts physician resources and contributes to workforce shortfalls.[5,98] The contributions of family physicians with CACs or focused practices to core primary care services have not been examined to understand the range of medical services delivered. Therefore, this thesis addresses current research gaps by characterizing family physicians with COE CACs and focused practices, and describing their contributions to quality primary care for older patients.

Data Sources

This thesis involved the collection and analysis of primary and secondary data. Using multiple methods, the results obtained from each study informed the planning and conduct of subsequent research stages. Primary data were collected in the form of two questionnaires completed by technical expert panelists in a modified Delphi study (Chapters 2 and 3). Study data were managed using Research Electronic Data Capture (REDCap) hosted at McMaster University.[99,100] Research involving primary data collection received ethics approval from the Hamilton Integrated Research Ethics Board (HiREB) (reference #15545).

The secondary data source examined in Chapters 4 and 5 comprised multiple, population-based health administrative datasets linked using unique encoded identifiers. ICES is a non-profit, independent corporation that supports the study of health service and population-wide outcomes in Ontario for publicly funded encounters. The collection and use of secondary data at ICES is

authorized under Section 45 of Ontario's Personal Health Information Protection Act (PHIPA). As a prescribed entity, ICES is allowed to collect and analyze health care and demographic data, without consent, for health system evaluation and improvement; this work is exempt from review by a research ethics board.[101,102] However, to enable a data linkage between ICES and the CFPC, this project was reviewed and approved by HiREB (reference #11391). Secondary data were accessed and analyzed using the Remote Access Environment (RAE) at ICES McMaster.

Thesis Objectives

This thesis aimed to characterize family physicians with a focused medical practice and/or added competence to care for older adults and examine the quality of care delivered to older patients. The research objectives were three-fold:

1. To establish appropriate and important performance measures for family physician services relevant to the primary care needs of older adults;
2. To develop an approach to classify family physicians with focused practices and added training relevant to caring for older adults within population-based health administrative data; and
3. To understand the contributions of family physicians in delivering high quality care to older adults.

This thesis advanced methodological literature by developing a measurable indicator set that can be used to assess primary care quality among family physicians in community-based settings. While the indicators were operationalized in a particular data source, the technical definitions can be adapted for measurement and evaluation elsewhere. Further, this work introduced a novel approach to classify family physicians skilled in caring for older adults, which can be adapted and leveraged in other administrative data sources to understand the contributions of this workforce to primary care systems elsewhere. The findings are informative to health system planners and medical educators during ongoing demographic transition and primary care reform.

This sandwich thesis includes a modified Delphi consensus study, a retrospective cohort study, and a propensity score-matched analysis (Figure 2). The reporting of the consensus study followed the Recommendations for the Conducting and REporting of DElphi Studies (CREDES) checklist,[103] while the observational studies followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) and REporting of studies Conducted using Observational Routinely collected health Data (RECORD) statements.[104,105]

Thesis Overview

Chapters 2 and 3 describe a modified Delphi consensus study where I established consensus on a measurable set of practice-based metrics that characterize quality of care for older primary care patients. Chapter 2 contains the study protocol titled, “Development of Practice-based Quality Indicators for

the Primary Care of Older Adults: A RAND/UCLA Appropriateness Method Study Protocol,"[106] whereas Chapter 3 presents the findings, "Primary Care Quality for Older Adults: Practice-Based Quality Measures Derived From a RAND/UCLA Appropriateness Method Study."[107] The study protocol and findings were published in *BMJ Open* and *PLOS ONE*, respectively. I engaged expert panelists asynchronously to rate indicators in two questionnaires and came together to refine the proposed technical definitions for endorsed indicators. These findings were foundational to Chapter 5, where I refined and operationalized the endorsed indicator set.

Chapter 4 contains a retrospective cohort study titled, "Characterizing Family Physicians with Additional Training or Focused Practice in Caring for Older Adults: A Population-Based Retrospective Cohort Study." In this study, I developed an approach to classify family physicians with a COE CAC or a focused practice billing designation within the population-based administrative data source. I then described the medical practice characteristics and service provision of family physicians with additional skills to care for older adults. This classification was foundational to Chapter 5 where I compared the contributions of COE CAC and focused practice physicians in delivering high quality primary care to older patients. As of the thesis submission date, this study has been accepted for publication in *Canadian Family Physician*.[108]

Chapter 5 presents findings from a propensity score-matched analysis titled, "Do Family Physicians with Focused Practice or Care of the Elderly

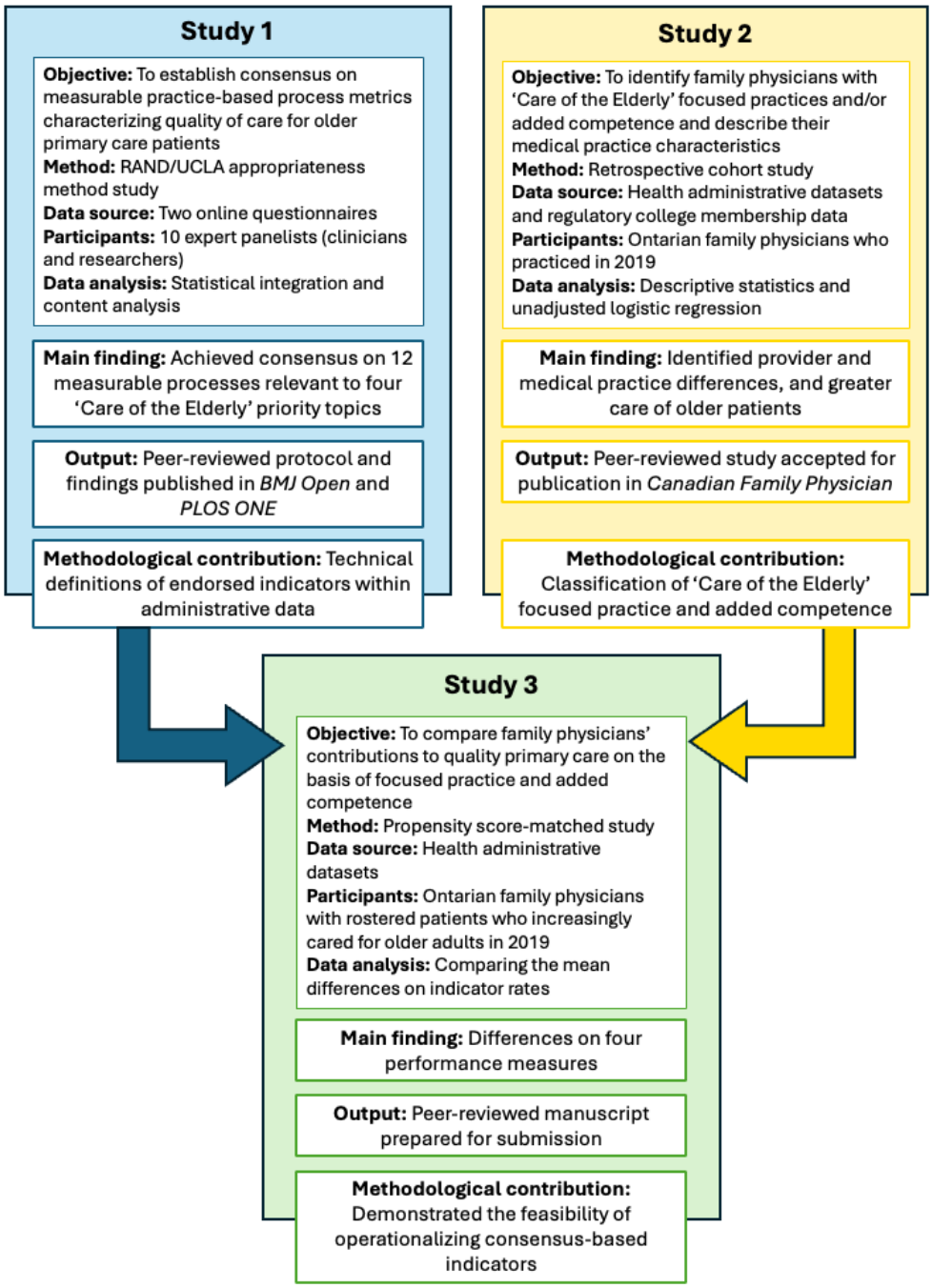

Figure 2. Overview of thesis studies

Training Practice Differently than Others? A Population-Based, Propensity Score-Matched Cohort Study." This work directly builds on findings from Chapters 3 and 4 by comparing the medical practice of family physicians with/without COE CACs or focused practices on the established clinical practice performance measures. In addition to testing the technical definitions endorsed in Chapter 3, this study contributes new knowledge about the contributions of family physicians to high quality care for older patients. At the time of thesis submission, this study is being prepared for submission.

Chapter 6 summarizes the findings and implications of the studies comprising this sandwich thesis. I compare and contrast the insights to previous literature, and discuss their novelty and contributions. A detailed review of the methodological strengths and limitations is also provided.

Conclusion

High quality primary care is posited to meet the complex medical needs of older adults. Still, much is unknown about the family physician workforce that delivers primary care services to older patients, including those with enhanced skills evidenced by focused practice or added competence. In the absence of an endorsed indicator set to examine family physician practice and an approach to identify those with focused practices or extra training, previous work has not comprehensively examined the contributions of family physicians to older patients' primary care needs. This thesis provides novel data on the COE CAC and focused practice family physician workforce in Ontario, Canada. The

chapters in this thesis build upon each other by consulting experts to establish a measurable indicator set, developing an approach to identify family physicians skilled in caring for older adults, and examining their contributions to quality primary care.

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CHAPTER TWO

Development of Practice-based Quality Indicators for the Primary Care of Older Adults: A RAND/UCLA Appropriateness Method Study Protocol

Summary

The second chapter of this thesis describes the methodology of a RAND/UCLA Appropriateness Method (RAM) study to establish consensus on practice-based metrics that characterize quality of care for older primary care patients. This protocol details the multiple procedures constituting the RAM study, including identifying and recruiting technical expert panelists; reviewing literature to generate a list of candidate indicators; developing, testing, and administering two online questionnaires; facilitating a synchronous panel meeting; developing technical definitions for each endorsed indicator; and analyzing panelists' numeric ratings and open-ended responses.

The RAM study described in this protocol provided three methodological contributions. First, in contrast to much of the quality improvement literature, I focused on developing a measurable indicator set to support subsequent research using secondary, health administrative data. This study modified the traditional RAM criteria by adding the criterion 'importance' to ensure endorsed indicators reflect processes that are clinically meaningful. Lastly, indicators were organized using the 'Priority Topics and Key Features for the Assessment of Competence in Care of the Elderly' (FM-COE Priority Topics) to propose indicators that express each competency.

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Development of practice-based quality indicators for the primary care of older adults: a RAND/UCLA Appropriateness Method study protocol

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ABSTRACT

Introduction Older adults have high rates of primary care utilisation, and quality primary care has the potential to address their complex medical needs. Family physicians have different levels of knowledge and skills in caring for older patients, which may influence the quality of care delivery and resulting health outcomes. In this study, we aim to establish consensus on practice-based metrics that characterise quality of care for older primary care patients and can be examined using secondary, administrative data.

Methods and analysis We describe a two-round RAND/UCLA Appropriateness Method (RAM) study to assess the consensus of a technical expert panel. We will recruit pan-Canadian experts who demonstrate excellence in clinical practice or scholarship related to the primary care of older adults. A literature review will generate a candidate list of practice-based quality indicators. The first round aims to evaluate the appropriateness and importance of candidate indicators through an online questionnaire. We will then develop technical definitions for each endorsed indicator using ICES data holdings. Panellists will offer feedback on the technical definitions in a virtual synchronous meeting and provide ratings on the same criteria in a second questionnaire.

Ethics and dissemination Our study has been approved by the Hamilton Integrated Research Ethics Board (Project ID #15545). Findings will be disseminated via manuscripts, presentations and the lead author's thesis.

Trial registration number ISRCTN17074347

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ We are recruiting pan-Canadian, multidisciplinary experts with extensive knowledge about primary care provision for older adults to gather diverse perspectives about this heterogeneous patient population and primary care delivery in different contexts.
⇒ Our initial set of candidate quality indicators will be informed by the literature to understand the state of indicator development, methodological quality and current gaps in indicator availability. In addition, we will provide an opportunity for panellists to elect new indicators.
⇒ This study focuses on practice-based quality measures that are captured in health administrative data, such as fee codes associated with physician services. Thereby, aspects of primary care provision that are not captured in administrative data will be excluded from our indicator set—although they may be clinically meaningful and important to providers and patients.
⇒ We will collect and analyse both quantitative data and open-ended responses from the questionnaires, which will offer explanations and clarification on the items.
⇒ This study will establish technical definitions for quality indicators that can be examined in future population-based analyses. We present an example of using health administrative data to understand quality of care within ICES data holdings in Ontario, Canada. Due to differences in how processes are specified and measured in other administrative data sources, these technical definitions will require adaptation before they can be applied to other settings.

INTRODUCTION

Primary healthcare is situated as the 'first point of contact' with the health system, helping patients navigate and coordinate their care journey.[1] Well-developed primary care has the potential to address the complex medical needs of older adults (aged 65+),[2 3] including frailty, multimorbidity, polypharmacy, functional decline and the need for integration across healthcare settings.[4–8] Older adults have high rates of primary care utilisation, which have intensified over the course of the COVID-19 pandemic.[9] In Canada, multidisciplinary providers collaborate in the shared delivery of primary healthcare, with the vast majority of patients receiving care from family physicians.[10] Family physicians provide the highest volume of medical services to older adults compared with other medical specialties, and almost one-third of all family medicine services are delivered to older patients.[11]

While graduating from an accredited Canadian family medicine residency programme would confer baseline competencies in caring for older adults, it would be expected that there is a wide range of competencies and confidence in providing the types of care needed by older patients.[12] This variation may influence care quality and could be associated with more positive or negative health outcomes.

All physicians who graduate from an accredited family medicine programme in Canada have achieved a baseline level of competence in caring for older adults; the College of Family Physicians of Canada (CFPC) recognises caring for 'elderly' patients as a priority.[13] Accordingly, this education and accreditation body has developed essential competencies aligned with the 'elderly' priority topic that family physicians must master to become certified to practice as a family physician in Canada.[13] 'Competencies' are regarded as abilities or capabilities and form the basis for medical education planning and training in many jurisdictions.[14] Individual postgraduate family medicine training programmes use CFPC priorities to establish educational curricula, define core professional activities and develop evaluation methods to assess competence.[15 16] Individual postgraduate programmes will also determine the nature of clinical experience to best achieve competence in priority topics by considering local needs and resources. Beyond this foundational training, some resident physicians may pursue enhanced skills training to become a community-based resource for older adults by completing a third year of residency training through the Certificate of Added Competency (CAC) programme.[17 18] This extra training is not necessary to provide high-quality care for older patients.

While there are benchmarks of achieving competence during medical training, the current educational model is unlikely to prepare family physicians to consistently provide high-quality care in the future for *all* older patients in *all* areas. Because medical knowledge, evidence and best practice guidelines evolve and patients grow increasingly complex, the goal of medical training is to provide the foundation on which additional competency building blocks are placed. The current state of primary care and recent calls for reform create an opportunity to examine the quality of care provision to this patient group.

Quality indicators in healthcare offer guidance and direction to understand the performance of structures, processes and outcomes, and allow for inferences about care quality.[19] Despite well-recognised barriers, quality improvement work concerning the primary care of older persons has not been widely pursued in Canada. One approach to measuring healthcare quality is utilising secondary (health administrative) data;[20 21] although examining indicators in practice are limited by the information sources available. Some appropriateness studies have established quality standards or priorities to improve care for older patients in different care settings,[22–27] but none have reported a measurable indicator set. Few quality indicator sets are based on readily collected data or have been developed by referencing health administrative data holdings, thereby affecting their efficacy to assess performance.[21]

The primary objective of this study is to establish consensus on practice-based process metrics that characterise quality of care for older primary care patients and can be examined using secondary, administrative data. Once developed, these metrics will provide a preliminary framework to characterise practice-level and population-level encounters of family physicians delivering care to older patients, and offer insights into the outcomes of their care provision. This work is organised around the research question: within the framework of secondary, administrative data as a lens to understand primary care practice, can a technical expert panel establish consensus on which practice-based process metrics suggest better versus worse quality of care for older patients? The secondary objective will be to operationalise these indicators using population-based data in Ontario.

METHODS AND ANALYSIS

Study design

This study utilises a two-phase RAND/UCLA Appropriateness Method (RAM) study design to assess the consensus of a technical expert panel. Consensus group methods (eg, Delphi and its derivatives and Nominal Group Technique (NGT)) systematically measure and establish agreement across disciplines.[28] They are based on the premise that an accurate and reliable assessment can be achieved by consulting a panel of experts and accepting group consensus.[28 29] The Delphi technique has been widely applied in health research for quality indicator development.[30] In particular, RAM is a modified Delphi design and an iterative group facilitation technique that seeks the opinions of experts through a series of structured questionnaires and direct (synchronous) interactions.[31] We will apply the Conducting and REporting DElphi Studies (CREDES) checklist to report this study protocol (online supplemental file 1).[32]

Setting

We will derive indicators of primary care delivery pertaining to family physician care—irrespective of any additional training, certification or focused practice experience they may possess in the care of older adults. Technical definitions will be established to operationalise each indicator using ICES data holdings in Ontario, Canada. ICES is a population-based, health administrative data repository containing record-level, linkable data sets about publicly funded health service encounters.[33]

Quality indicators

The Donabedian model—the dominant quality improvement paradigm in health services research—conceptualises and enables evaluations of the quality and performance of medical care through three inter-related components: structures, processes and outcomes.[20 34 35] Structures are

static or technical factors affecting the context in which medical care is delivered (eg, human resources, payment models and healthcare institutions), processes refer to acts of healthcare delivery (eg, diagnoses, treatments, preventative care and patient education) and outcomes include the effects of medical care on patient health (eg, prognosis, patient satisfaction and health service utilisation). In this study, we focus on indicators that can be classified as processes, given their relevance to the practice-based clinical activities of physicians. Structures will not be examined due to their upstream and evolving nature, which is challenging to discern from individual-level data. Outcomes are influenced by multiple structures and processes, including care delivered by multidisciplinary providers in different settings, which is not specific to the care of family physicians.

Population-based health administrative data repositories enable health services researchers to examine components of medical care, which can support inferences about care quality. Therefore, establishing technical definitions to operationalise each endorsed quality indicator will enable future work to describe processes inherent to the care of older primary care patients. Our access to linkable health administrative data at ICES, a central data repository in Ontario, Canada, provides an example of using physician billing data to examine primary care processes.

Data collection

There are multiple components of this two-round RAM study.

Literature review

First, we will conduct a literature search to inform the questionnaire items,[36] which distinguishes this method from NGT.[29] This review of academic (peer-reviewed) and grey literature will clarify the state of indicator development for older adults' primary care, their methodological quality and identify current gaps in indicator availability.[31] The full search strategy is outlined in online supplemental file 2. From the included literature, we will extract the names and descriptions of quality indicators, metrics, or processes and generate a candidate list that our technical expert panel will formally evaluate.

We will organise the indicators by the 'Priority Topics and Key Features for the Assessment of Competence in Care of the Elderly' to propose indicators that express each competency.[37] While not exhaustive, these 18 priority topics represent critical areas to assess enhanced competence in the care of older adults. We selected this framework as it reflects the bounds of best practices, and includes the specialised/added competence of CAC holders, but does not exclude the generalist family physician.

Preparing for round 1

The research team will iteratively draft the quality statements for our questionnaire to ensure accurate wording—thereby reducing bias and response variance.[38 39] A physician (AG) will aid in reviewing the quality statements to ensure they align with current practice guidelines and accurately describe clinical scenarios and activities. Quality statements are traditionally written as a set of 'if' and 'then' statements, where the 'if' statement describes persons to whom the quality indicator applies and the 'then' statement identifies the care process. For example, *if* an older primary care patient is prescribed a new chronic medication, *then* the family physician should document the response to therapy and continued need.[40]

The quality statements will undergo internal review by two health administrative data experts (APC and AJ) to streamline the number of questionnaire items. The administrative data experts will rate each quality statement on a three-point Likert scale regarding their feasibility to be measured within ICES data holdings. Any statement rated 'definitely feasible' or 'probably feasible' by at least one reviewer will be included in the questionnaire. Finally, a physician (AG) will conduct a final review of the indicators to advise whether any statements can be combined based on clinical presentation or diagnosis.

Round 1—questionnaire

In the first round, an asynchronous questionnaire will be developed and distributed to our technical expert panel to evaluate the appropriateness and importance of each quality statement. The goal is to refine and evaluate the set of candidate indicators identified in the literature review.[28] RAM advises participants to rate items as 'appropriate' if the expected benefits exceed the expected risks.[31] Here, the expected benefit is assumed to occur when a family physician competently performs or facilitates the stated process within a primary care setting. The expected risk is any harm for the patient associated with the process (eg, inappropriate prescribing and avoidable emergency department visit) that might have unintended consequences or exacerbate the clinical problem. Participants will be advised not to consider cost implications when making their rating.[31] 'Importance' refers to whether the indicator occurs with moderate or high frequency in the primary care setting, and whether it impacts outcomes that are significant to health status or quality of life. We modified the traditional RAM criteria by adding 'importance' to ensure our indicator list reflects processes that are clinically meaningful and patient oriented.

Panel documents (ie, study protocol, evaluative criteria definitions and instructions) will be emailed to participants, along with a link to access the online questionnaire via Research Electronic Data Capture (REDCap). We will collect ordinal ratings using a nine-point Likert scale, which aligns with RAM recommendations and allows for granular measurement.[31 41] Ratings will range from 1 (extremely inappropriate/not important) to 9 (extremely appropriate/important). We will encourage open-ended responses in the questionnaire to solicit insights and other feedback from panellists.[38 42] Panellists will complete the questionnaire within a 2 week period in Spring 2023.

Pilot testing will occur with a subset of the research team to ensure comprehension and reliability of the questionnaire items.[38] Indicators meeting the specified threshold will be considered for the second round after further refinement and wording clarification.

Given diverse approaches to define consensus in RAM studies,[31] we elected to measure the proportion of agreement for each indicator within a predefined range. We will retain indicators that achieved a rating between 7 and 9 on both criteria (appropriateness and importance) by at least 50% of panellists. Following the first round, ratings and free-text responses will be summarised, and individual and group feedback will be shared with the technical expert panel.[28]

Preparing for round 2

Between the first and second rounds, we will reference health administrative data holdings at ICES to develop technical definitions for each candidate indicator. We will identify the relevant data set(s) and variable(s) for each endorsed quality statement, and present them in the second round for clarification and discussion.

Round 2—synchronous virtual meeting and questionnaire

The purpose of the synchronous virtual meeting is to establish consensus on the endorsed indicators and their corresponding technical definitions. This group meeting is a defining feature of RAM compared with a traditional Delphi.[31] The moderators (RHC and APC) will review findings obtained from the first questionnaire and facilitate an in-depth discussion of the data sets, variables and measurement characteristics (eg, timings) proposed for each indicator's technical definition. During the group meeting, members of the technical expert panel will be able to elect new indicators for rating. If a panellist suggests a new indicator and more than 60% of the panel endorses it, we will proceed with rating the item in the second questionnaire. Indicators that cannot be operationalised will be eliminated.

After the meeting, a second questionnaire will be circulated to participants to evaluate the endorsed indicators within 2 weeks. Panellists will once again rate the 'appropriateness' and 'importance' of the quality statements and their corresponding technical definitions. As in the first questionnaire, we will collect ordinal ratings using a nine-point Likert scale. Endorsed indicators will move into our final set if more than 60% of panel members rate the indicator between 7 and 9. Conformity is expected in our second round as panellists' opinions may converge based on group feedback and discussion—warranting an increased cut-point. Following the meeting, the final results will be summarised and shared with panellists.

Data analysis

We will combine the judgements of panel members using statistical integration for ratings and content analysis of open-ended responses. For each item (indicator) in the questionnaire, we will report the median, IQR and percentage of agreement to discern consensus and quantify its degree.[43] Medians are considered well suited for ordinal data and to reflect convergence of opinion.[42] We will conduct a Wilcoxon matched-pairs signed-rank test to measure changes in consensus between rounds.[44] If response bias is suspected, we will perform a sensitivity analysis to compare results among subgroups of respondents. Conventional content analysis will be used to derive themes and concepts from free-text responses provided by panellists.[45] When providing individual feedback, we will share each panellist's response relative to the group and a summary of the open-ended responses.

Data management

Data collected by the investigators will be analysed after each round. McMaster University will act as the sole data custodian, with the lead investigator (RHC) ensuring appropriate privacy and security standards are upheld.

Sample and eligibility criteria

To ensure validity, our technical expert panel will comprise individuals with extensive knowledge about primary care provision for older patients, evidenced by practice experience, research excellence, organisational or policy leadership.[38] Multidisciplinary panellists, including clinicians, educators and researchers of different genders, ages, races, geographic locations and institutions, will be sought to reflect diverse perspectives in the care of this heterogeneous patient population.[31] Specific qualifications to demonstrate expertise include at least two relevant academic publications related to the primary care of older adults and/or at least 5 years of clinical experience or activity with older primary care patients. Based on our intent to operationalise the elected indicators using provincial health data at ICES, we are primarily interested in panellists based in Ontario but will seek some national leaders. Each panellist is considered equal in their expertise to others in the group; the weight of each response is equal.[36]

Recruitment

We will identify prospective panel members by reviewing publicly available information (eg, faculty profiles) and published work (eg, reports and peer-reviewed articles), and consulting our personal networks to generate a list of experts in the field. We will employ purposive/criterion sampling to identify those that meet our eligibility criteria and quota sampling to ensure diversity in the professional backgrounds and demographics of panellists. Prospective panel members will be approached by research team members or their delegates via a personal email that describes the study, with a request about their interest in participation.[31] The lead investigator (RHC) will follow-up with individuals who express interest to explain the study methodology, scope of their engagement, time commitment and how their responses will be applied in the study.[46]

We will recruit between 12 and 15 individuals for our technical expert panel, which aligns with the recommended sample size to not overload, demotivate or disengage participants.[47] Given limited guidance on the target sample size for RAM studies, we aimed to strike a balance between generating more data with a large, representative sample and the potential for continuous dissensus. Panel members will be expected to participate in the two consecutive rounds to ensure engagement in the decision-making process. To deter response bias, we will implement strategies to increase the response rate (eg, providing honorariums and sending reminder emails) and compare the characteristics of respondents and non-respondents to identify potential impacts on the data. Following the study period, personal emails will be sent to panellists thanking them for their contributions and providing honoraria aligned with the standard primary care physician reimbursement rate in Ontario multiplied by the estimated time to complete each questionnaire and the duration of the virtual synchronous meeting.[48]

Patient and public involvement

The current study relies on the expertise of panellists with in-depth knowledge of primary care for older adults. However, through a separate study supported by the Transdisciplinary Understanding and Training on Research-Primary Healthcare (TUTOR-PHC) Patient and Community Engagement Research Fellowship, we intend to engage older adults to understand factors impacting the quality of primary care provision. This complementary study aims to compare aspects of primary care practice that are important to patients with indicators derived from the RAM study. We chose to engage the public through a separate consultative approach to eliminate technical discussions about operationalising indicators using health administrative data. This approach maximises patient perspectives and feedback in an open-ended format, rather than limiting their viewpoints to the constraints of feasible secondary data. This independent activity will allow the public to rate indicators identified in our formal consensus process and provide perspectives on what was created.

Rigour/limitations

Given the nature of consulting human subjects to generate consensus, several sources of bias may impact our findings' validity and reliability.[49] We will mitigate selection bias and foster dependability by predefining our inclusion criteria to seek a representative sample of experts and not solely relying on personal networks for recruitment.[49 50] While there is a potential for low response rates among panel members in RAM studies, we will combat this limitation by restricting our design to two rounds and providing honorariums.[36] We will ensure the credibility of our findings through ongoing engagements of our technical expert panel to solicit feedback and iteratively develop our indicator set.[49] We will not restrict the set of candidate indicators for panellists to rate to those identified in our literature review, as this may bias the responses or limit the available options for indicator development; we will provide an opportunity to elect new indicators in the second round.[51] We will lessen bandwagon effect (groupthink) in our synchronous virtual meeting by still allowing panellists to rate indicator items anonymously after group discussion. By registering our study and publishing this protocol, we have produced an audit trail of key methodological decisions to support trustworthiness.[49] Finally, our focus on practice-based indicators related to physician activities excludes the valuable contributions of multidisciplinary providers engaged in the integrated care of older adults across settings.

ETHICS AND DISSEMINATION

Risks to participants

We did not identify any known or anticipated risks for panellists as a result of participating in this study. Voluntary, written consent will be sought from panellists before participation and at each study phase. Individuals will be able to withdraw from the study at any time for any reason, and will be able to have their data withdrawn.

Confidentiality

Ratings, insights and other feedback shared by panellists will be anonymised on collection. All data will be associated with a unique identification (ID) number assigned to each respondent. No participant-level data will be shared with anyone other than the individual who submitted these data; they will receive individual feedback to understand how their response compares to others. All other findings from this study will be presented in aggregate.

Ethics approval

This study was approved by the Hamilton Integrated Research Ethics Board (Project ID #15545).

Results dissemination

Our findings will be shared publicly in academic publications, conference presentations and a doctoral thesis. Communications will be sent to relevant stakeholders (eg, CFPC and ICES) with the study's results for distribution in reports, social media posts, and newsletters.

DISCUSSION

This study will produce a measurable set of quality indicators to support further research examining primary care provision for older adults using secondary, health administrative data. While health services research often uses billing data to characterise healthcare encounters, there is substantial diversity in how processes are defined in different healthcare contexts and reported in administrative data sources. In the absence of universal technical definitions, we selected a particular context (ie, ICES) to develop technical definitions. While the specific data set and variable names we will use to construct technical definitions may not directly apply to other research settings,

future work can leverage the endorsed indicator set from our first round and translate our definitions to other contexts.

Additionally, our focus on practice-based quality measures may exclude some aspects of primary care that are not captured in administrative data. For example, characteristics of primary care encounters such as time spent with individual patients or engagement with informal caregivers may be clinically meaningful and important to patients, but are not available in billing data. Similarly, some components of the 'Priority Topics and Key Features for the Assessment of Competence in Care of the Elderly' may be over-represented or under-represented in our final indicator set based on their availability within health administrative data. For example, we anticipate it will be highly feasible to operationalise indicators related to 'medical conditions' because diagnostic codes and billing data for physician services are readily available in administrative data. However, indicators related to 'goals of care' may not have objective measures to specify within data holdings. Therefore, the practice-based processes included in our final indicator set may only constitute some of the primary care activities delivered to older patients.

While our final indicator set will apply to all family physicians who deliver care to older patients, we are interested in examining differences among those with a Focused Practice Designation in 'Care of the Elderly', CAC holders and generalist family physicians. Understanding the medical practice characteristics of family physicians with different levels of competency or practice compositions may identify systematic challenges in caring for older adults and gaps in essential competencies that require greater education and support. In addition, our final indicator set may inform the development of quality improvement strategies addressing processes integral to the primary care of older adults, which may then influence outcomes. Ultimately, this work aims to inform practice and education models that promote high-quality care for older adults.

Progress to-date

The literature review and preparation for the first questionnaire occurred in January and February 2023. Identification and recruitment of panellists began in March 2023. We anticipate distributing the first questionnaire in April 2023.

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Contributors RHC and APC contributed towards the research idea and MV, HY-HS, AJ and AG provided input into the study design. RHC designed the protocol, drafted and revised the manuscript. All authors provided critical feedback and approved the version to be published.

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Appendices

Supplementary File 1. Recommendations for the Conducting and REporting of DElphi Studies (CREDES) Checklist[1]

Reporting items	Reported on page
Purpose and rationale. The purpose of the study should be clearly defined and demonstrate the appropriateness of the use of the Delphi technique as a method to achieve the research aim. A rationale for the choice of the Delphi technique as the most suitable method needs to be provided.	Pages 6-7
Expert panel. Criteria for the selection of experts and transparent information on recruitment of the expert panel, sociodemographic details including information on expertise regarding the topic in question, (non)response and response rates over the ongoing iterations should be reported.	Pages 10-11
Description of the methods. The methods employed need to be comprehensible; this includes information on preparatory steps (How was available evidence on the topic in question synthesised?), piloting of material and survey instruments, design of the survey instrument(s), the number and design of survey rounds, methods of data analysis, processing and synthesis of experts' responses to inform the subsequent survey round and methodological decisions taken by the research team throughout the process.	Pages 7-13
Procedure. Flow chart to illustrate the stages of the Delphi process, including a preparatory phase, the actual 'Delphi rounds', interim steps of data processing and analysis, and concluding steps.	Described on Pages 7-13. A flow chart will be included in the future paper presenting our findings.
Definition and attainment of consensus. It needs to be comprehensible to the reader how consensus was achieved throughout the process, including strategies to deal with non-consensus.	Page 13
Results. Reporting of results for each round separately is highly advisable in order to make the evolving of consensus over the rounds transparent. This includes figures showing the average group response, changes between rounds, as well as any modifications of the survey instrument such as deletion, addition or modification of survey items based on previous rounds.	Page 9
Discussion of limitations. Reporting should include a critical reflection of potential limitations and their impact of the resulting guidance.	Pages 13-14
Adequacy of conclusions. The conclusions should adequately reflect the outcomes of the Delphi study with a view to the scope and applicability of the resulting practice guidance.	The conclusions from our consensus process will be presented in the future paper of our findings.
Publication and dissemination. The resulting guidance on good practice in palliative care should be clearly identifiable from the publication, including recommendations for transfer into practice and implementation. If the publication does not allow for a detailed presentation of either the resulting practice guidance or the methodological features of the applied Delphi technique, or both, reference to a more detailed presentation elsewhere should be made (e.g. availability of the full guideline from the authors or online; publication of a separate paper reporting on methodological details and particularities of the process (e.g. persistent disagreement and controversy on certain issues)). A dissemination plan should include endorsement of the guidance by professional associations and health care authorities to facilitate implementation.	Page 15

[1] Jünger, S., Payne, S. A., Brine, J., Radbruch, L., & Brearley, S. G. (2017). Guidance on Conducting and REporting DElphi Studies (CREDES) in palliative care: Recommendations based on a methodological systematic review. *Palliative medicine*, *31*(8), 684-706.

Supplementary File 2. Search Strategy for Literature Review

The literature review occurred in three stages. First, we screened pre-existing materials that were obtained while preparing this study protocol. Second, we conducted a literature search of three online databases. Third, we scanned the reference lists of included literature (identified in the previous steps) for any additional literature.

Approach #1 – Literature obtained from background topic reading

We obtained materials from an unstructured online search that was conducted to identify background literature when preparing the study protocol. We screened these materials for relevance against the following criteria (Supplementary Table 1).

Supplementary Table 1. Eligibility criteria for literature review

Inclusion criteria	Exclusion criteria

• Published between 2008 and 2023 to reflect older adults' current and potential future needs.
• Published as an academic (peer-reviewed) article or grey literature (e.g., report, policy document).
• Relevant to the community-dwelling older adult population (people aged 65+).
  ○ Discussed or included this population, even if they are not exclusively of interest.
• Relevant to community-based primary health care systems or services.
  ○ Discussed or included this setting, even if it is not exclusively of interest.
• Relevant to family physician practice or care delivery.
• Lists, presents, proposes, discusses, or tests a quality measure, metric, or indicator.
• Published in English.
• Full text is available.
	• Focuses exclusively on the primary care of other age groups (e.g., children) or caregivers of older persons.
	• Focus exclusively on subsets of older adults or care settings (e.g., persons living with dementia, people with heart failure, memory clinics, home care).
	• Focus exclusively on older adults' experiences in nursing homes (long-term care), inpatient care, or other settings (e.g., prison).
	• Text is a case report, case series, conference abstract, or study protocol.

Approach #2 – Literature obtained from online search

We conducted an online literature search of three academic databases (PubMed, MEDLINE via Ovid, and Google Scholar) in February 2023. We applied the following search terms in each database:

(primary care OR primary health care OR primary healthcare OR family medicine)
AND
(family physician OR family doctor* OR general practitioner* OR GP)*
AND
(quality)
AND
(indicator OR measure* OR metric* OR standard* OR statement*)*

AND
(elder OR senior* OR older adult* OR older people OR older person OR older patient*)*

We conducted the PubMed and MEDLINE searches on February 27, 2023, and the Google Scholar search on February 28, 2023. We did not apply any filters in our search.

We limited our results to the first ten references obtained by each database using the default sort order. We only modified the sort order in PubMed to sequence our results by "best match." We restricted our review to the first ten search results due to feasibility. Therefore, we proceeded to screen 30 search results against the eligibility criteria (Supplementary Table 1).

Approach #3 – Reviewing the reference lists of included literature

Lastly, we scanned the reference lists of included literature (identified in Approaches #1 and #2) that satisfied our eligibility criteria.

***

The number of search results and information about the included literature will be presented in a future paper reporting the findings from this study.

CHAPTER THREE

Primary Care Quality for Older Adults: Practice-Based Quality Measures Derived From a RAND/UCLA Appropriateness Method Study

Summary

This chapter presents findings of the RAM study described in Chapter 2. The study achieved consensus on a measurable set of quality indicators to support further research examining primary care provision for older adults using secondary, health administrative data. The novelty of this study was in demonstrating a consensus process whereby panelists rated indicators asynchronously and deliberated the technical definitions corresponding to each endorsed indicator in a panel group meeting. Findings from this study directly informed analyses conducted in Chapter 5, where I compared family physician performance on the quality indicators established here.

In this study, 10 Canadian experts (clinicians and researchers) with extensive knowledge about primary care provision for older adults were consulted to rate candidate indicators in two rounds. Investigators proposed technical definitions to express each endorsed indicator at the panel group meeting, and refined the final specifications using feedback collected in two questionnaires. I used statistical integration to combine technical expert panelists' judgements and content analysis of open-ended survey responses. This study resulted in 12 practice-based quality measures across four FM-COE Priority Topics that were refined and operationalized in Chapter 5. This work presented a case of soliciting

expert feedback to enable assessments of quality indicators that can be examined using population-based, administrative data.

Citation

Correia RH, Dash D, Jones A, Vanstone M, Aryal K, Siu HY-H, Gopaul A, & Costa AP. Primary care quality for older adults: Practice-based quality measures derived from a RAND/UCLA appropriateness method study. *PLOS ONE.* 2024;19(1):e0297505. doi:10.1371/journal.pone.0297505

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RESEARCH ARTICLE

Primary care quality for older adults: Practice-based quality measures derived from a RAND/UCLA appropriateness method study

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Abstract

We established consensus on practice-based metrics that characterize quality of care for older primary care patients and can be examined using secondary health administrative data. We conducted a two-round RAND/UCLA Appropriateness Method (RAM) study and recruited 10 Canadian clinicians and researchers with expertise relevant to the primary care of elderly patients. Informed by a literature review, the first RAM round evaluated the appropriateness and importance of candidate quality measures in an online questionnaire. Technical definitions were developed for each endorsed indicator to specify how the indicator could be operationalized using health administrative data. In a virtual synchronous meeting, the expert panel offered feedback on the technical specifications for the endorsed indicators. Panelists then completed a second (final) questionnaire to rate each indicator and corresponding technical definition on the same criteria (appropriateness and importance). We used statistical integration to combine technical expert panelists' judgements and content analysis of open-ended survey responses. Our literature search and internal screening resulted in 61 practice-based quality indicators for rating. We developed technical definitions for indicators endorsed in the first questionnaire (n = 55). Following the virtual synchronous meeting and second questionnaire, we achieved consensus on 12 practice-based quality measures across four Priority Topics in Care of the Elderly. The endorsed indicators provide a framework to characterize practice- and population-level encounters of family physicians delivering care to older patients and will offer insights into the outcomes of their care provision. This study presented a case of soliciting expert feedback to develop measurable practice-based quality indicators that can be examined using administrative data to understand quality of care within population-based data holdings. Future work will refine and operationalize the technical definitions established through this process to examine primary care provision for older adults in a particular context (Ontario, Canada).

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Introduction

Community-based primary healthcare is often patients' first point-of-contact with health services [1]. Older adults (aged 65+) are the highest users of primary care services [2], and their number of interactions and dependence on health systems increases with age [3]. Aging demographics [4], compounded by older adults' growing social vulnerabilities [5–10] and preference to remain in the community [11, 12], portends even greater demands on primary care systems in the coming years [3, 13]. Primary care is currently grappling with substantial healthcare provider workforce shortfalls [14–16], posing significant challenges for patient access [17, 18]. Improvements in primary care structures and processes are essential to create the necessary capacity for family physicians to adequately address the complex and emerging needs of older adults [1, 19, 20].

In Canada, family physicians are central to primary care teams and are the most frequent physician providers of medical services to older adults [2]. Although all family physicians must achieve a baseline level of competence to care for elderly patients to be certified for independent practice, there is a range of competence across family physicians [21]. Variability in knowledge and clinical skills of providers may influence quality of care and health outcomes for older patients. Therefore, developing indicators to assess, measure, and compare the medical practice structures and services provided by family physicians–in the context of caring for older patients–may inform quality improvement activities and priorities for continuing professional education [22, 23].

Inferences about quality of care are limited by the availability of data since reliable and valid data holdings are needed to apply indicators [23]. Information systems, such as population-based health administrative data sources, enable the accurate and consistent measurement of indicators by providing access to data at the macro (e.g., healthcare organizations) and micro (e.g., individual patients, providers) levels. Research focused on the development of elderly-focused quality indicators for primary care to-date have not been concerned with operationalizing them [21]. In this context, "operationalize" refers to developing technical specifications to apply, measure, and examine indicators using available data holdings. Despite the limitations of using secondary data to make inferences about quality [21], indicators developed without reference to information sources or those that are not feasible to operationalize within a particular context are limited in their utility and capacity to promote change.

Therefore, we sought to establish consensus on measurable practice-based process metrics that characterize quality of care for older primary care patients. We focus on quality indicators that are directly relevant to the clinical activities of physicians (practice-based) and classified as acts of healthcare service delivery (processes). Along with clinical structures and medical outcomes, healthcare service delivery processes are one of three interrelated components comprising the Donabedian model–the dominant quality improvement paradigm that enables evaluations of medical care quality and the performance of health systems [21, 24]. Our study is situated within the province of Ontario, Canada to develop technical definitions for each indicator using available administrative data holdings. We organized our work around the research question: *Within the framework of secondary, administrative data as a lens to understand primary care practice, can a technical expert panel establish consensus on which practice-based process metrics suggest better versus worse quality of care for older patients*? We hypothesized that derived indicators would be clinically meaningful and feasible to measure, but not comprehensive of all clinical activities relevant to older adult-focused primary care. Our endorsed indicator set will support future work examining the medical practice of family physicians and quality of care for older patients.

Methods

Study design

We conducted a two-phase RAND/UCLA Appropriateness Method (RAM) study that has been described previously [21]. The Delphi technique and its derivatives, including RAM, have been widely applied in health services research for quality indicator development. We report our study using the CREDES guideline [25] (S1 Table). We describe the four major stages of our study.

Stage 1: Literature review to identify candidate indicators

We conducted a literature review to inform the RAM questionnaire items. We reviewed existing literature obtained through informal literature searches while preparing the study protocol. The titles and abstracts were scanned for relevance and screened against a set of inclusion and exclusion criteria [21]. We formally searched three online databases (i.e., PubMed, MEDLINE via Ovid, Google Scholar) to identify academic and grey literature. Lastly, we scanned the reference lists of included literature to obtain any additional materials. The full search strategy is detailed in our study protocol [21].

From the included texts, we extracted any quality indicators, metrics, measures, or processes to generate a candidate list. We assessed the relevance of candidate indicators for inclusion in our questionnaire by applying screening criteria (Table 1). Indicators must have satisfied all four criteria for inclusion.

Candidate quality indicators were then organized by the 18 "Priority Topics and Key Features for the Assessment of Competence in Care of the Elderly" (FM-COE Priority Topics) [29], which outline the bounds of best practices in caring for older adults [21]. For each Priority Topic, we grouped similar indicators to streamline our initial list and remove any duplicates. To finalize our RAM questionnaire items, we translated each indicator into a set of "if" and "then" statements and conducted an internal screening process to assess measurement feasibility and streamline the number of questionnaire items.

Stage 2: Recruitment of technical expert panel

We described the procedures to identify and recruit prospective panelists previously [21]. Panelists included individuals with extensive knowledge about primary care for older persons, evidenced by at least five years of clinical practice experience or activity with older patients and/or at least two relevant academic publications. Prospective panelists reviewed our letter of information and completed our demographic survey in April 2023. We used findings from the demographic survey to tailor our sampling approach and ensure diverse representation.

Table 1. Criteria for screening the relevance of candidate indicators.

1. Does the indicator relate to community-based primary care? [a]
2. Does the indicator relate to the role (scope of practice) of a family physician? [b]
3. Is the indicator relevant to the care of older adults?
   - **Must be related** to the care of older adults **but not necessarily limited** to the care of older adults only.
4. Is the indicator practice-based? Is the indicator directly relevant to clinical activities/practice?

[a] Working definition of "community-based primary care": [26]

[b] Family physicians scope of practice definition: [27, 28]

https://doi.org/10.1371/journal.pone.0297505.t001

Stage 3: Achieving consensus in two RAM rounds

Round #1 questionnaire. Panelists completed the first questionnaire over a two-week period in May 2023 to rate candidate indicators on two criteria: appropriateness and importance. We defined and rationalized our modified RAM criteria in our study protocol [21]. Each indicator received ratings for each criterion on a 9-point Likert scale, ranging from 1 (extremely inappropriate; extremely not important) to 9 (extremely appropriate; extremely important). Participants had the opportunity to provide comments about the quality statements and their ratings within free-text comment boxes. All study data were collected and managed using the secure, web-based data capture platform, Research Electronic Data Capture (REDCap), hosted at McMaster University [30, 31].

As per RAM guidelines, indicators advanced to the second round if they achieved a median score between 7 and 9 for both criteria without disagreement, where disagreement was defined as three or more panelists rating in both extremes (i.e., 1–3 or 7–9) for either criterion [32]. Among indicators deemed eligible for inclusion in the second round, we rank-ordered the indicators to develop corresponding technical definitions efficiently and feasibly. We summed the median scores for each indicator on both criteria and computed interquartile ranges (IQRs). We sequenced indicators by those with the highest summed median score. For indicators with equal summed median scores, we prioritized those with the lowest summed IQR.

Developing technical definitions. We developed technical definitions for each endorsed indicator by suggesting approaches to operationalize the numerator ("then" portion of quality statement) and denominator ("if" portion). We anticipated prioritizing a subset of highly rated indicators to specify and present at our panel meetings. Within the previously determined meeting duration of two hours, we planned to allocate at least five minutes per indicator to gather feedback on each proposed technical definition. Based on the number of endorsed items from the first questionnaire, we planned to specify a threshold that would allow for a reasonable number of items to be discussed during our allotted meeting time (e.g., top 25% of the most highly rated endorsed indicators).

Health administrative data holdings at ICES in Ontario, Canada were referenced to identify relevant datasets and variables that expressed each indicator [33]. ICES is a central data repository for publicly funded administrative health services records in Ontario supporting population-based health research [34]. We identified, referenced, and modified pre-existing and validated indicators, specifications, classifications, procedures, outcomes, and derived cohorts, where possible [35–42]. We developed a standard template for each quality statement detailing its conceptual definition, interpretation, inclusion and exclusion criteria, data source (including relevant datasets and variable names), computation, and references. The proposed technical definitions were reviewed by two health administrative data experts (AC and AJ) in advance of the panel meeting.

Synchronous panel meeting. The purpose of the synchronous panel meeting was to review the endorsed indicators and gather feedback on their proposed technical definitions [21]. Panelists attended one of two virtual meetings (via Zoom) in June 2023. We were unable to identify a meeting time that satisfied the availability of all panelists, warranting two separate group meetings. Indicators were presented for discussion according to rank order; limited time and resources necessitated prioritizing a subset of indicators to present in each meeting.

Round #2 questionnaire. Following the group meetings, panelists rated the quality statements and corresponding technical definitions in a second questionnaire in June 2023. Panelists were only asked to rate indicators that were discussed during their panel meeting. We provided summary notes from the group meetings for panelists to consider while completing their ratings. As in the first questionnaire, panelists rated each indicator on both criteria and

could optionally provide free-text comments. Indicators comprising our final endorsed set included those rated between 7 and 9 on both criteria by more than 60% of panel members. Questionnaire responses were collected over a two-week period in June 2023.

Stage 4: Analysis

Our data sources comprised the demographic survey and two RAM questionnaires. We summarized the demographic characteristics of panelists using descriptive statistics. Panelists reported their race/ethnicity, age, and gender within free-text comment boxes; we categorized participants' race and gender based on the responses provided verbatim and did not impose socially constructed groupings. After each questionnaire period concluded, we combined the de-identified judgements of panelists using statistical integration of Likert-scale ratings and conventional content analysis of open-ended responses [43]. We computed the median and IQR for each indicator on both criteria. We conducted the Wilcoxon matched-pairs signed-rank test to measure changes in consensus between rounds [44]. Qualitative data were used to revise quality statements and technical definitions. We shared individual feedback to panelists after each round, including summaries of their ratings relative to others. Statistical analyses were performed using Statistical Analysis Software (SAS) version 14 (Cary, North Carolina).

Ethics and registration

Our study was approved by the Hamilton Integrated Research Ethics Board (#15545) and prospectively registered with ISRCTN (#17074347). All panelists provided written consent before data collection.

Results

Literature review

The search, screening, and extraction results of our literature review yielded 36 included texts and 500 candidate indicators (S1 Fig). We list and summarize the texts from which these indicators were obtained in S2 Table. Upon screening the extracted indicators, 282 were eligible for inclusion (n = 58 indicators obtained from the previously collected literature, n = 52 from the new literature search results, and n = 127 of those obtained from the reference lists of included literature).

We organized the 282 quality indicators by the 18 FM-COE Priority Topics and streamlined indicators within each Topic (S1 Fig), resulting in 178 items for internal screening. Most indicators aligned with "Medical Conditions" (n = 83) or "Appropriate Prescribing" (n = 73), while some did not align with any areas (n = 12). We grouped similar items and removed duplicates within each Priority Topic; this process eliminated 183 indicators. For example, nine items from different information sources pertained to the process of medication review and reconciliation and were collapsed into a single quality statement. The considerable degree of duplication in our candidate list suggested saturation, defined as information redundancy, across information sources [45].

We translated the eligible indicators into 178 quality statements using the "if"/"then" format. 112 statements were deemed "definitely not feasible" to measure within ICES data holdings via independent review in duplicate by health administrative data experts (APC and AJ); these statements were subsequently removed. Five quality statements were removed after a review for clinical accuracy by a physician (AG) and alignment with clinical practice guidelines (S1 Fig). Therefore, the literature review process resulted in 61 quality statements for inclusion in our first questionnaire, aligning with 10 FM-COE Priority Topics.

Technical expert panel

We recruited 10 participants for our technical expert panel. All panelists reported involvement with health research for a median of 14 years (IQR: 8.75). Eight panelists held graduate degrees (i.e., master's degree or PhD) and nine were medical doctors (MDs); six physicians held "Care of the Elderly" Certificates of Added Competence. Clinicians had been in independent practice for a median of 22 years (IQR: 14). Panelists had a median age of 49 years (IQR: 11.25) and 70% were female (n = 7). Nine panelists were affiliated with institutions or organizations within Ontario; one resided and worked in another province. Seventy percent of panelists self-identified as white and 30% as East Asian, South Asian, or Southeast Asian. Eight panelists primarily worked or practiced in urban areas, one primarily in rural areas, and one in both urban and rural areas.

Round #1 questionnaire

Across 61 questionnaire items, median scores ranged from 5.5 to 9.0 for appropriateness and 6.0 to 9.0 for importance (S3 Table). 55 indicators met our pre-specified threshold and advanced to the second round; six indicators were eliminated. Indicators that did not advance were rated poorly for not pertaining to the role/scope of family physicians or describing inappropriate clinical activities or timeframes.

Panelists' open-ended responses justified or clarified their ratings, suggested revisions to the wording of quality statements, or shared other reflections. For example, a participant rationalized their rating as follows: "*I rated importance lower because sometimes the info found in a CGA [Comprehensive Geriatric Assessment] would be included as part of the knowledge from continuity of care, not as a discrete assessment*" (Panelist #3, Indicator #2). Panelists confirmed activities that were "standard of care" (Panelist #10, Indicator #52) and criticized statements that were inaccurate or irrelevant. For example, a panelist questioned the role of family physicians in cardiac rehabilitation activities (Indicator #21),

> *"While it is important that cardiac rehab be offered, should this be done by cardiology? Maybe the PCP [Primary Care Provider] role is to verify that it has been offered."*
>
> –Panelist #5

Participants often noted *"it depends"* (Panelist #4, Indicator #40) when rating statements, and clarified that the importance of performing any given clinical activity depended on the patient's severity, health status, goals of care, available resources, and other factors. Where relevant, panelists stated discrepancies between current practice guidelines and the given the clinical scenario or activity, such as: "*B12 is not in Canadian consensus guidelines*" (Panelist #2, Indicator #23). Some panelists shared references to jurisdictional and organizational guidelines, frameworks, policies, or research studies that facilitated or impeded the specified activities. For example, *"Offer all appropriate vaccines is consistent with the Canadian Frailty Network's AVOID framework"* (Panelist #5, Indicator #10). When diagnostic criteria or drugs were listed in the quality statement, participants frequently shared comments about adding or removing some of the specified items, such as: *"Consider adding sglt2 inhibitors"* (Panelist #2, Indicator #16).

Technical definitions

From the 55 endorsed quality statements, it was necessary to develop technical definitions, an example of which is provided in S4 Table. We documented our efforts to operationalize each

quality statement and posed discussion questions within the technical definition workbook used to guide our discussion in the synchronous panel meeting. For example, if the frequency of a health service encounter or timeframe for follow-up was not specified within the quality statement, we noted these outstanding aspects as points of discussion.

We referenced four ICES datasets and three derived cohorts to draft technical definitions. The Primary Care Population (PCPOP) is an ICES dataset of eligible primary care patients in Ontario and contains information on demographics, primary care enrollment, healthcare utilization, specialist visits, and continuity of care. The Ontario Health Insurance Plan (OHIP) contains information on all billing claims submitted by physicians for consultations and procedures, including shadow billings for physicians practicing in non-fee-for-service models. The Ontario Laboratories Information System (OLIS) is an information repository containing lab test orders and results from hospitals, community labs and public health labs. The Ontario Drug Benefit (ODB) contains community-based, outpatient drug orders for products listed on the ODB formulary, notably for residents aged 65 years and older. We also referenced three ICES-derived cohorts that were previously developed using validated algorithms using diagnostic codes, hospitalization records, physician claims, and/or drug reimbursements for persons with dementia (DEMENTIA), chronic obstructive pulmonary disease (COPD), or congestive heart failure (CHF) [46–48].

We rank-ordered endorsed indicators from the first questionnaire to pragmatically determine a subset that would be reasonable to present in our allotted panel meeting times; it would not have been possible to discuss all 55 endorsed indicators during the predetermined two-hour timeframe. We considered what threshold of the most highly rated indicators would be feasible to present (e.g., top 10% = 6 indicators, top 25% = 14 indicators, etc.). We allotted 10 minutes to review the project objectives and facilitate introductions, 15 minutes to review ratings from the first questionnaire, and five minutes per indicator to gather feedback on the proposed technical definition–resulting in sufficient time to review 19 indicators (the top 35% most highly rated indicators) over 95 minutes (S5 Table; S2 Fig). In round 1, 14 indicators were rated most highly with summed median scores ranging from 18 to 16.5. 14 indicators achieved the next highest summed median score of 16; from these, 5 were prioritized based on having the lowest summed IQR.

Synchronous panel meeting

We gathered feedback on the technical definitions during our synchronous panel meetings. Six panelists attended the first group meeting; four attended the second. The facilitator (RC) presented the technical definitions individually, and panelists provided feedback on the clinical scenario or activity. Panelists often commented on the frequency in which some physician fee codes were utilized, the diagnostic codes to specify clinical conditions, and medication groupings or classifications.

Through these discussions, we unanimously omitted four quality statements; two items were duplicates and two were not possible to accurately specify using administrative data. Panelists also suggested revising the language of eleven quality statements; these revised statements were incorporated into the second questionnaire and rated. Following the meetings, we finalized our technical definition workbook to reflect group feedback.

Round #2 questionnaire

Panelists rated 15 quality statements and their corresponding technical definitions in the second questionnaire. Median scores ranged from 6.0 to 9.0 for appropriateness and 6.5 to 8.5 for importance (S6 Table). 12 indicators met our threshold for inclusion in the final indicator set

(Table 2); three indicators were eliminated. Drafted technical definitions for the endorsed indicators are available upon request.

Fig 1 illustrates the flow of candidate indicators across the study phases into our final set, broken down by FM-COE Priority Topics. The 12 endorsed quality statements expressed four Priority Topics: "Appropriate Prescribing" (n = 5), "Medical Conditions" (n = 4), "Cognitive Impairment" (n = 2), and "Driving Issues" (n = 1). The Wilcoxon matched-pairs signed-rank test achieved a P value of 0.0391, suggesting a significant difference in consensus scores between the two RAM rounds (S3 Fig).

Panelists' open-ended responses offered suggestions to the proposed technical definitions accompanying the indicators. Some comments affirmed the importance of indicators: "*A staple indicator in primary care*" (Panelist #10, Indicator #1). Others noted the limitations of technical definitions, such as physician fee codes used as a proxy measure of vaccination status. Participants noted regional differences inhibiting measurement in some jurisdictions (Indicators #7,8). Both supportive feedback and criticism was received for indicators that were reworded during the synchronous panel meeting, including "*the revision is too broad and lacks context*" (Panelist #8, Indicator #13). Challenges of measuring some indicators were expressed: "*This indicator is appropriate, but as the discussion suggest[ed], will be very hard to measure/assess so my rating goes down*" (Panelist #3, Indicator #2). Panelists also referenced guidelines,

Table 2. Final endorsed quality indicator set by FM-COE Priority Topic.

Medical Conditions	
1	IF an older primary care patient is eligible for the influenza vaccine, THEN the patient should be administered the vaccine annually.
2	IF an older primary care patient is not known to have already received a pneumococcal vaccine or if the patient received it more than 5 years ago (if before age 65 years), THEN a pneumococcal vaccine should be administered.
3	IF an older primary care patient has chronic obstructive pulmonary disease, THEN the primary care provider should recommend influenza and pneumococcal immunizations.
4	IF an older primary care patient presents with memory concerns, THEN the primary care provider should perform tests aligned with the 5th Canadian Consensus on Dementia.[a]
Appropriate Prescribing	
5	IF an older primary care patient requires a new medication, THEN the primary care provider should not use benzodiazepines or other sedative-hypnotics as the first choice.
6	IF an older primary care patient requires a new medication, THEN the primary care provider should not prescribe a medication with strong anticholinergic effects if alternatives are available.
7	IF an older primary care patient requires medication, THEN the primary care provider should avoid prescribing potentially inappropriate medications (e.g., drugs from the Beers list).
8	IF an older primary care patient is prescribed medications from multiple providers, THEN the primary care provider should conduct a collaborative medication review (e.g., focus on evidence-based new drug prescriptions and prevention of polypharmacy).
9	IF an older primary care patient has congestive heart failure, THEN the primary care provider should order ACE inhibitors, ARBs, beta-blockers, or SGLT2 inhibitors.
Cognitive Impairment	
10	IF an older primary care patient is diagnosed with dementia, THEN the primary care provider should provide dementia care management.
11	IF an older primary care patient is diagnosed with dementia, THEN the primary care provider should consider alternatives to antipsychotics as the first choice to treat.
Driving Issues	
12	IF an older primary care patient receives a new diagnosis of dementia and is deemed unsafe to drive, THEN the primary care provider should report the patient to the Ministry of Transportation.[a]

[a] Indicator also pertains to the Cognitive Impairment FM-COE Priority Topic

https://doi.org/10.1371/journal.pone.0297505.t002

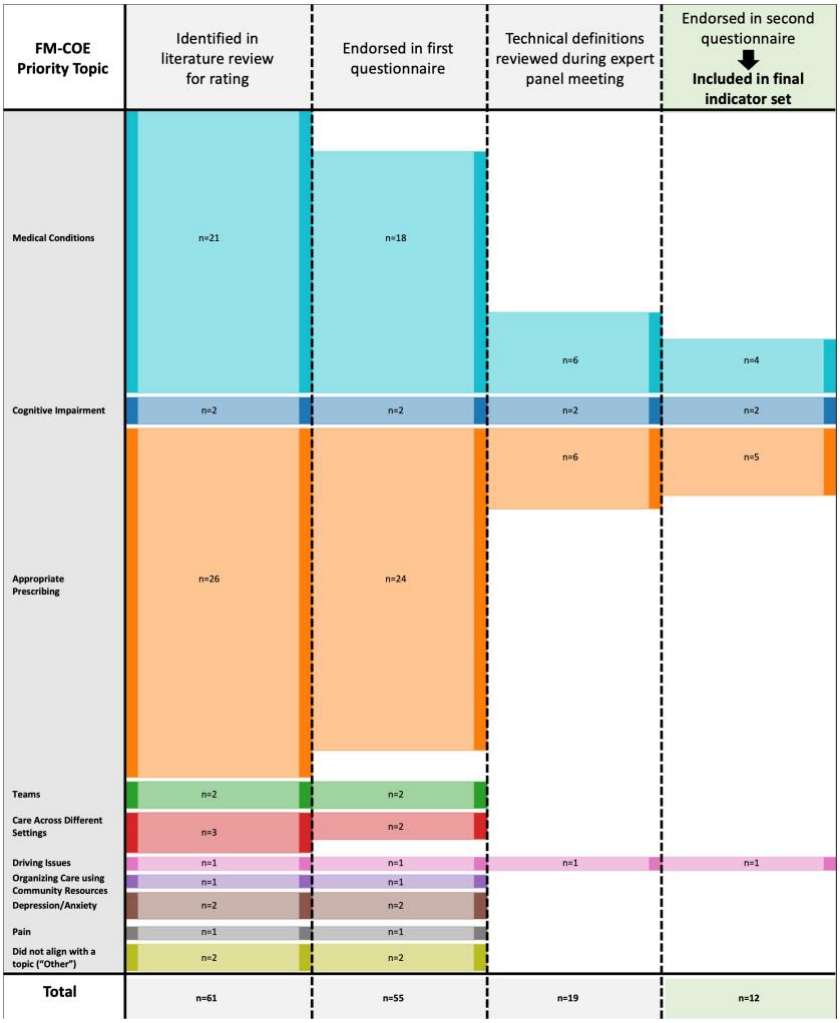

Fig 1. Flow diagram of endorsed indicators, by FM-COE Priority Topic. Legend: 61 indicators across 10 FM-COE Priority Topics were identified in the literature review for rating; 55 were endorsed in the first questionnaire. Of the 19 indicators reviewed in the panel meeting, 12 indicators across four Priority Topics were endorsed in the second questionnaire.

https://doi.org/10.1371/journal.pone.0297505.g001

reports, research articles, and other documents to refine specifications, and suggested revisions to how some quality statements were stated. For example,

> *"To be future oriented, should the item read THEN "the PCP should perform tests aligned with the MOST CURRENT Canadian Consensus on Dementia". Presumably, the science/evidence will evolve and this language will prevent the indicator from becoming stale dated."*
>
> –Panelist #5, Indicator #9

Discussion

We established consensus on a set of 12 practice-based process metrics and technical definitions to characterize quality of care for older primary care patients through the use of secondary health administrative data. The endorsed statements express four of 18 FM-COE Priority Topics and achieved increasingly greater ratings on "appropriateness" (round 1: 5.5 to 9.0; round 2: 6.0 to 9.0) and "importance" (round 1: 6.0 to 9.0; round 2: 6.5 to 8.5) in subsequent rounds. While the literature review revealed that many relevant indicators exist, our feasibility screening affirmed that most cannot be measured at scale to assess performance; we were unable to operationalize all candidate or endorsed indicators due to limitations within the available information sources. High ratings for the appropriateness and importance of indicators were achieved in both questionnaires, affirming the relevance of the included literature in which candidate indicators were extracted. Findings from this consensus study will support future work to test the endorsed indicators within population-based data holdings on their ability to distinguish medical practice of family physicians and quality of care for older patients.

While prior RAM studies have established quality standards or priorities to improve care for older patients in different care settings, we intended to develop a *measurable* indicator set. Limited efforts to date have yielded real world indicator translation supporting quality improvement [49, 50]. This process revealed that many indicators–those identified from the literature and endorsed through our consensus process–were concentrated on the biomedical aspects of caring for elderly patients–namely, the "Medical Conditions" (n = 4) and "Appropriate Prescribing" (n = 5) FM-COE Priority Topics. While developing measurable definitions for established indicators is not a required activity [23, 51], we intended to develop feasible indicator set to reference readily collected data to assess performance; measurement is essential to inform and support quality improvement. Whereas some Priority Topics lend themselves well to measurement using administrative data (e.g., by specifying diagnostic codes, drug identification numbers), others were not possible to specify (e.g., "Communication," "Decision making and capacity," "Family and informal care supports"). More work can be done to develop approaches to measure other facets of elderly-focused care.

Further, our panelists with demonstrated clinical and research expertise likely prioritized indicators differently than older adults or informal caregivers would have. Patients are increasingly involved in quality improvement initiatives and their first-hand experiences and inputs into problem-solving have demonstrated value in redesigning care aligned with patient priorities [52–54]. For example, indicators relevant to "organizing care using community resources," a FM-COE Priority Topic, were identified in our literature review but not endorsed. Therefore, by not including patients or caregivers on our expert panel, the endorsed indicators may only constitute some of the primary care activities that are important or meaningful to patients. Through a separate but complementary study, we will engage older adults to compare and establish patient-important indicators. This approach will extend how we conceptualize and

assess quality primary care for older adults, and maximize patient perspectives and feedback in an open-ended format, rather than limiting their viewpoints to the constraints of feasible secondary data.

Measurable quality indicators are limited by information sources available, and technical definitions–which are necessary to operationalize indicators–pertain to particular settings, thereby, affecting their generalizability [21]. There is substantial diversity in how clinical scenarios and activities are defined in different healthcare contexts and reported in administrative data sources, which prohibits the development of universal technical definitions. In an effort to establish measurable indicators to support future work, technical definitions developed through this process are contextualized to community-based primary care settings in Ontario, Canada, and relevant information sources. While the specific data set and variable names of our endorsed indicators may not be directly apply to other information sources, they can be adapted to the local context if studied in other settings [55].

Given current and projected demands on the geriatric healthcare workforce [56, 57], efforts are needed to improve the quality of medical care delivered to complex older patients [58]. This study focused on testing *whether* technical definitions can be established that define quality primary care for this vulnerable population. Quality measures do not function well on the individual (in this case, provider) level since other factors (e.g., setting, resources) may impact processes or resulting health outcomes. Therefore, we do not suggest that these indicators should be implemented in practice (such as to generate individual-level reports); rather, our findings may lead to education and awareness about approaches to measuring practice-based primary care encounters and for quality improvement. Ultimately, the use of indicators must be driven by the professional community.

Limitations

The technical expert panel was composed mostly of primary care clinicians and researchers who worked or practiced in urban areas and lacked representation of some ethnic minorities and experts located outside Ontario. Although we recruited fewer panelists than anticipated [21], all participants completed both questionnaires and actively contributed in the synchronous panel meetings. Due to the volume of indicators identified in our literature review, we restricted items for rating in the first questionnaire to those that were potentially feasible to measure using administrative data. Our focus on developing a *measurable* indicator set excluded many items that were not currently collected/available in data holdings; future work could examine excluded indicators as new measures become available or within other information sources. For example, we could not specify physicians' referrals to social services or resources (e.g., adult day programs) or patients' symptoms (e.g., insomnia, agitation, delirium), and we used physician fee codes as a proxy for some clinical activities (e.g., immunizations).

We only presented a subset of endorsed indicators from the first questionnaire and their technical definitions in the group panel meetings. Although excluding indicators for pragmatic reasons (i.e., the predetermined two-hour panel meeting length) may have biased our findings, our study demonstrated the utility of using a consensus process to derive a measurable indicator set for those rated most highly. We prioritized indicators for discussion in the panel meeting by rank-ordering endorsed indicators from round 1 with the highest summed median scores and, for those tied, the lowest summed IQR. We did not initially set out to establish a comprehensive indicator set; rather, we aimed to determine whether it was possible to establish consensus on measurable indicators by referencing administrative data holdings [21]. Lastly, we did not test our technical specifications for the endorsed indicators; these definitions

will be operationalized and refined in future work. If a useful profile can be created, we can re-engage panelists to solicit feedback on the outstanding indicators (S5 Table).

Conclusion

We produced a measurable set of quality indicators that will support work to examine primary care provision for older adults using health administrative data. While not comprehensive of all 18 FM-COE Priority Topics, the endorsed indicators provide a framework to characterize practice- and population-level encounters of family physicians delivering care to older patients and will offer insights into the outcomes of their care provision. The technical definitions established through this study offer a case to trial their measurement within the context of population-based data sources in Ontario, Canada. There is work to be done to understand the feasibility of operationalizing the drafted specifications. Ultimately, these efforts may identify areas where high quality care for elderly patients is consistently provided and systematic challenges in delivering elderly-focused care. Measuring primary care quality for older adults using these metrics is a starting point to determine opportunities for resources, education, incentives, interventions, and policies to support quality improvement.

Supporting information

S1 Fig. Literature search, organization, and screening results. Legend: Steps 1 to 4 outline the literature search results of 282 candidate indicators. Steps 5 to 7 illustrate how the candidate indicators were organized by the FM-COE Priority Topics and streamlined into 178 quality statements. Steps 8 and 9 display the results of internal feasibility screening and clinical review, resulting in 61 quality statements for inclusion in the first questionnaire.
(TIFF)

S2 Fig. Distribution of summed median scores and IQRs for indicators that advanced from round 1. Legend: 19 indicators whose summed median scores were rated most highly were prioritized for discussion in the group panel meeting. 14 indicators had equal summed median scores and were rank-ordered by the lowest summed IQR for prioritization.
(TIFF)

S3 Fig. Distribution of Wilcoxon scores (matched-pairs signed-rank test). Legend: The p-value obtained by the Wilcoxon matched-pairs signed-rank test suggests a significant difference in consensus scores between the two RAM rounds.
(TIFF)

S1 Table. Recommendations for the conducting and REporting of DElphi studies (CREDES) checklist.
(DOCX)

S2 Table. Summary of included literature.
(DOCX)

S3 Table. Summary of round 1 ratings.
(DOCX)

S4 Table. Example of a technical definition for an endorsed quality statement.
(DOCX)

S5 Table. Prioritization of endorsed items from round 1 to round 2.
(DOCX)

S6 Table. Summary of round 2 ratings.
(DOCX)

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Writing – original draft: Rebecca H. Correia.

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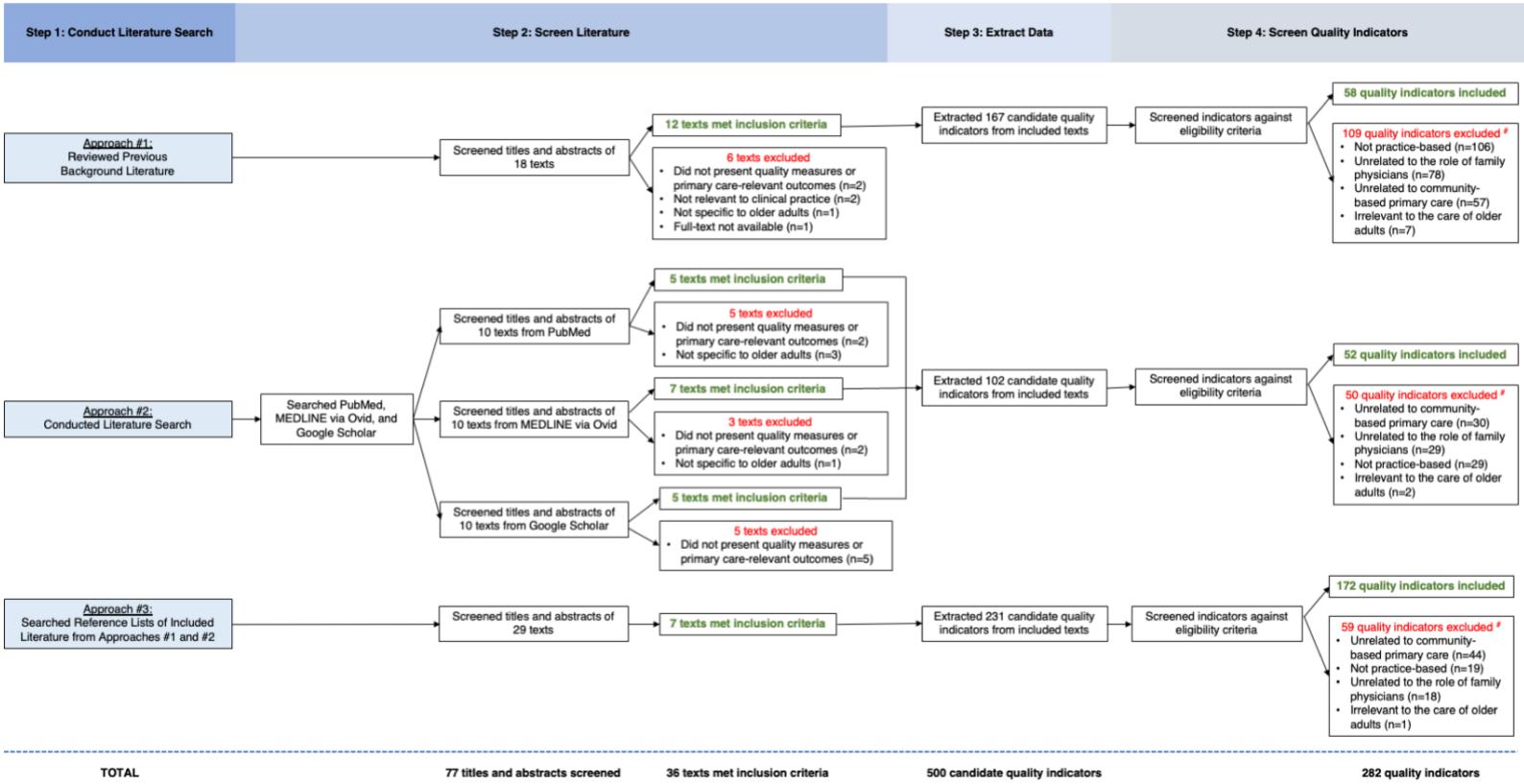
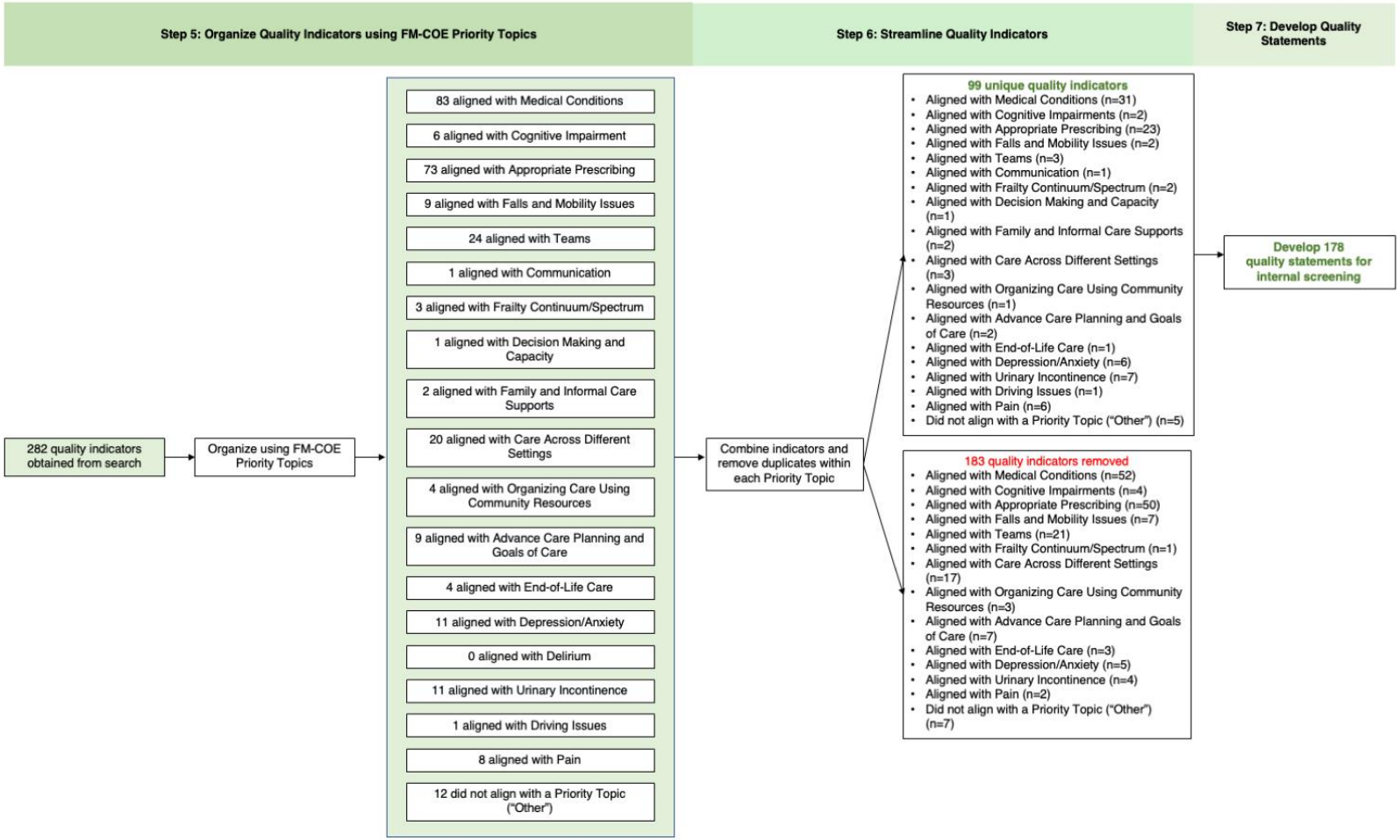
Appendices

S1 Fig. Literature search, organization, and screening results (Part 1 of 3)

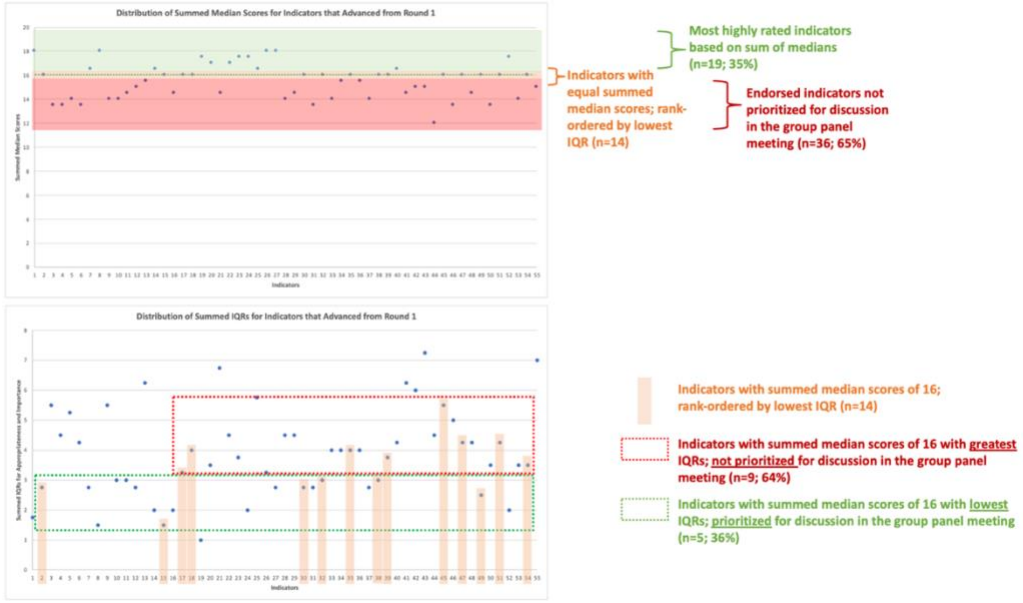


S1 Fig. Literature search, organization, and screening results (Part 2 of 3)

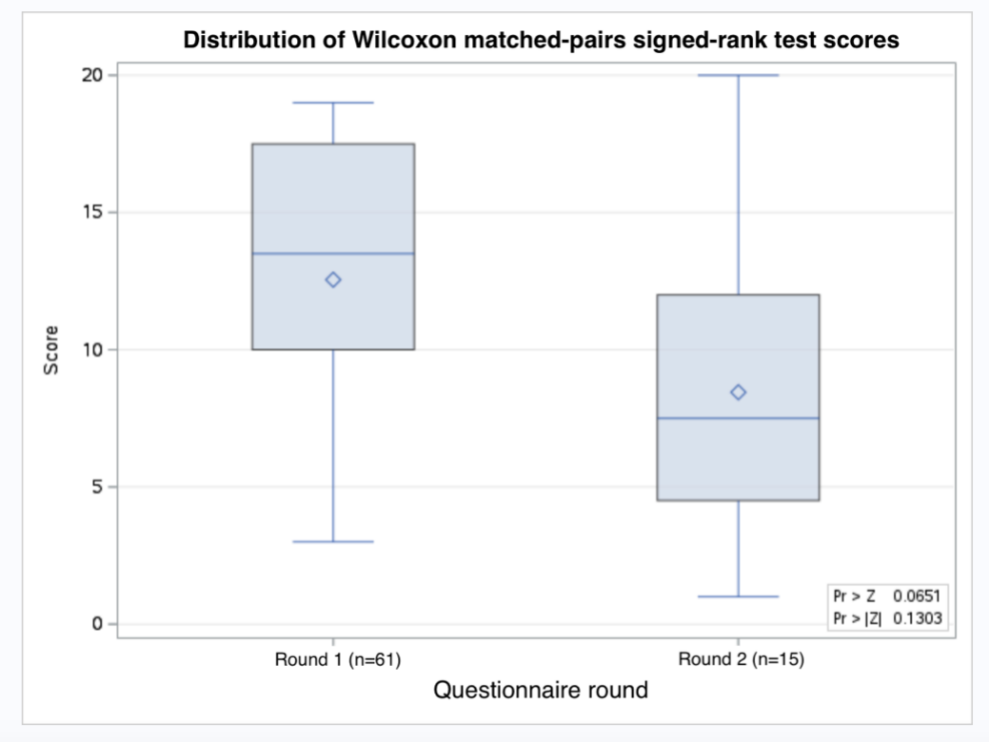


S1 Fig. Literature search, organization, and screening results (Part 3 of 3)

S2 Fig. Distribution of summed median scores and IQRs for indicators that advanced from round 1



S3 Fig. Distribution of Wilcoxon scores (matched-pairs signed-rank test)



S1 Table. Recommendations for the Conducting and REporting of DElphi Studies (CREDES) checklist

Reporting items	Reported on page
Purpose and rationale. The purpose of the study should be clearly defined and demonstrate the appropriateness of the use of the Delphi technique as a method to achieve the research aim. A rationale for the choice of the Delphi technique as the most suitable method needs to be provided.	2-3
Expert panel. Criteria for the selection of experts and transparent information on recruitment of the expert panel, sociodemographic details including information on expertise regarding the topic in question, (non)response and response rates over the ongoing iterations should be reported.	5, 9
Description of the methods. The methods employed need to be comprehensible; this includes information on preparatory steps (How was available evidence on the topic in question synthesised?), piloting of material and survey instruments, design of the survey instrument(s), the number and design of survey rounds, methods of data analysis, processing and synthesis of experts' responses to inform the subsequent survey round and methodological decisions taken by the research team throughout the process.	3-7
Procedure. Flow chart to illustrate the stages of the Delphi process, including a preparatory phase, the actual 'Delphi rounds', interim steps of data processing and analysis, and concluding steps.	Available in protocol
Definition and attainment of consensus. It needs to be comprehensible to the reader how consensus was achieved throughout the process, including strategies to deal with non-consensus.	5-7
Results. Reporting of results for each round separately is highly advisable in order to make the evolving of consensus over the rounds transparent. This includes figures showing the average group response, changes between rounds, as well as any modifications of the survey instrument such as deletion, addition or modification of survey items based on previous rounds.	9-14
Discussion of limitations. Reporting should include a critical reflection of potential limitations and their impact of the resulting guidance.	15-16
Adequacy of conclusions. The conclusions should adequately reflect the outcomes of the Delphi study with a view to the scope and applicability of the resulting practice guidance.	16-17
Publication and dissemination. The resulting guidance on good practice in palliative care should be clearly identifiable from the publication, including recommendations for transfer into practice and implementation. If the publication does not allow for a detailed presentation of either the resulting practice guidance or the methodological features of the applied Delphi technique, or both, reference to a more detailed presentation elsewhere should be made (e.g. availability of the full guideline from the authors or online; publication of a separate paper reporting on methodological details and particularities of the process (e.g. persistent disagreement and controversy on certain issues)). A dissemination plan should include endorsement of the guidance by professional associations and health care authorities to facilitate implementation.	3, 14-17

S2 Table. Summary of included literature

	Reference	Setting	Aim / Purpose	Literature Type
1	Horgan, S., Kay, K., & Morrison, A. (2020, August). Designing Integrated Care for Older Adults Living with Complex and Chronic Health Needs: A Scoping Review. Provincial Geriatrics Leadership Office.	Canada	Identify the core design elements that guide integrated care for older persons, and examine how best-practice models operationalize these design elements in practice.	Report (Scoping review)
2	Akpan, A., Roberts, C., Bandeen-Roche, K., Batty, B., Bausewein, C., Bell, D., ... & Banerjee, J. (2018). Standard set of health outcome measures for older persons. BMC Geriatrics, 18(1), 1-10.	Multi-national	Develop multiple global outcome measures in older persons to support the ability of healthcare systems to improve their care pathways and quality of care.	Peer-reviewed article (Modified Delphi study)
3	INSPIRE-PHC. (2023). Primary Care Data Reports for Ontario Health Teams.	Canada	Use standardized health administrative measures in primary care to provide a deeper understanding of the attributed population of each Ontario Health Team.	Data report
4	World Health Organization. (2019). Integrated care for older people (ICOPE) implementation framework: Guidance for systems and services. Geneva. Licence: CC BY-NC-SA 3.0 IGO.	Geneva	Describe the Integrated Care for Older People (ICOPE) Implementation Framework to assess and measure the capacity of services and systems to deliver integrated care at the community-level.	Report
5	World Health Organization and the United Nations Children's Fund (UNICEF). (2022). Web Annex. Technical specifications. In: Primary health care measurement framework and indicators: monitoring health systems through a primary health care lens. Geneva. Licence: CC BY-NC-SA 3.0 IGO.	Geneva	Provide technical specifications for each indicator included in the menu of indicators proposed for primary health care measurement framework and indicators.	Report
6	Canadian Institute for Health Information. (2022). Common Challenges, Shared Priorities: Measuring Access to Home and Community Care and to Mental Health and Substance Use Services in Canada — Volume 4. Ottawa, ON.	Canada	Describe the development and reporting of the Shared Health Priorities indicators that were endorsed by the federal, provincial, and territorial governments in 2017.	Report

7	Canadian Institute for Health Information. (2023). Indicator Library.	Canada	Provides definitions and methodologies for more than 100 CIHI indicators, ranging from acute care, continuing care and rehabilitation to finance, spending and health human resources.	Indicator library
8	Health Quality Ontario. (2023). Indicator Library.	Canada	Provides a fully searchable library of indicator profiles reported by HQO and other entities.	Indicator library
9	Ministry of Health and Long-Term Care. (2014). Assessment & Restore Guideline.	Canada	Define the elements of the Assess & Restore (A&R) approach to care and set out the Ministry's expectations with respect to the planning, establishment, delivery, monitoring, and evaluation of A&R initiatives.	Report
10	Health Canada. (2013). Healthy Canadians 2012: A Federal Report on Comparable Health Indicators. Ottawa.	Canada	Reports on the health status of Canadian and the performance of the health care system based on 53 indicators.	Report
11	Regional Geriatric Program of Toronto. (2017). The Senior Friendly Care Framework.	Canada	Introduce the Senior Friendly Care Framework and provide highlights of the development process.	Report
12	Kromm S, Mondor L, Wodchis WP. (2015). Assessing Value in Ontario Health Links. Part 3: Measures of System Performance in Ontario's Health Links. Health System Performance Research Network. Volume 4. Toronto.	Canada	Describe the characteristics of the population in Health Links regions; measure health system performance in HL regions using data held at the Institute for Clinical Evaluative Sciences (ICES), creating a portrait of HLs that can be used in the future; and compare system performance among HLs and to existing physician networks (PN), defined by referral patterns among primary care physicians.	Report
13	Thyrian JR, Hertel J, Wucherer D, Eichler T, Michalowsky B, Dreier-Wolfgramm A, Zwingmann I, Kilimann I, Teipel S, Hoffmann W. (2017). Effectiveness and Safety of Dementia Care Management in	Canada	Test the effectiveness and safety of Dementia Care Management in the treatment and care of people with dementia living at home and caregiver burden.	Peer-reviewed article (Randomized clinical trial)

	Primary Care: A Randomized Clinical Trial. JAMA Psychiatry, 1;74(10):996-1004.			
14	Pottie, K., Thompson, W., Davies, S., Grenier, J., Sadowski, C. A., Welch, V., ... & Farrell, B. (2018). Deprescribing benzodiazepine receptor agonists: Evidence-based clinical practice guideline. *Canadian Family Physician*, *64*(5), 339-351.	Canada	Develop an evidence-based guideline to help clinicians make decisions about when and how to safely taper and stop benzodiazepine receptor agonists (BZRAs); to focus on the highest level of evidence available and seek input from primary care professionals in the guideline development, review, and endorsement processes.	Peer-reviewed article (Clinical guideline development)
15	Kim, K. I., Jung, H. K., Kim, C. O., Kim, S. K., Cho, H. H., Kim, D. Y., Ha, Y. C., Hwang, S. H., Won, C. W., Lim, J. Y., Kim, H. J., Kim, J. G., & Korean Association of Internal Medicine, The Korean Geriatrics Society. (2017). Evidence-based guidelines for fall prevention in Korea. The Korean Journal of Internal Medicine, 32(1), 199–210.	Korea	Develop guidelines and provide detailed recommendations and concrete measures to assess the risk of falls and prevent falls among older people.	Peer-reviewed article (Clinical guideline development)
16	Romskaug, R., Skovlund, E., Straand, J., Molden, E., Kersten, H., Pitkala, K. H., ... & Wyller, T. B. (2020). Effect of clinical geriatric assessments and collaborative medication reviews by geriatrician and family physician for improving health-related quality of life in home-dwelling older patients receiving polypharmacy: a cluster randomized clinical trial. JAMA Internal Medicine, 180(2), 181-189.	Norway	Investigate the effect of clinical geriatric assessments and collaborative medication reviews by geriatrician and family physician on health-related quality of life and other patient-relevant outcomes in home-dwelling older patients receiving polypharmacy.	Peer-reviewed article (Randomized clinical trial)
17	Mays, A. M., Saliba, D., Feldman, S., Smalbrugge, M., Hertogh, C. M., Booker, T. L., ... & Katz, P. R. (2018). Quality indicators of primary care provider engagement in nursing home care. Journal of the American Medical Directors Association, 19(10), 824-832.	Multi-national	Identify quality indicators germane to the international practice of primary care providers in post-acute and long-term care in order to demonstrate the added value of medical providers in nursing homes.	Peer-reviewed article (Modified Delphi study)

18	Chadborn, N. H., Devi, R., Williams, C., Sartain, K., Goodman, C., Gordon, A. L. (2021). GPs' involvement to improve care quality in care homes in the UK: a realist review.	United Kingdom	Review reports of research and quality improvement (or similar change management) in care homes to explore how general practitioners have been involved; and develop programme theories explaining the role of general practitioners in improvement initiatives and outcomes.	Peer-reviewed article (Realist review)
19	Snooks H, Bailey-Jones K, Burge-Jones D, et al. (2018). Predictive risk stratification model: a randomised stepped-wedge trial in primary care (PRISMATIC). Southampton (UK): NIHR Journals Library.	United Kingdom	Evaluate the introduction of predictive risk stratification in primary care.	Peer-reviewed article (Randomized clinical trial)
20	Bosch-Lenders, D., Jansen, J., Stoffers, Winkens, B., Aretz, K., Twellaar, M., Schols, J. M. G. A., van der Kuy, P. M., Knottnerus, J. A., van den Akker, M. (2021). The effect of a comprehensive, interdisciplinary medication review on quality of life and medication use in community dwelling older people with polypharmacy. Journal of Clinical Medicine, 10(4).	Netherlands	Conduct a comprehensive medication review at the patients' home and evaluate the effect of this medication review on quality of life and medication use.	Peer-reviewed article (Randomized clinical trial)
21	Ekwegh, U., Dean, J. (2020). Improving care planning and communication for frail older persons across the primary-secondary care interface. Future Healthcare Journal, 7(3), e23-e26.	United Kingdom	Develop effective handover communication between the frailty team and primary care for patients assessed and transferred home from an emergency department.	Peer-reviewed article (Plan, do, study, act)
22	Dyer, S. M., Suen, J., Williams, H., Inacio, M. C., Harvey, G., Roder, D., Wesselingh, S., Kellie, A., Crotty, M., Caughey, G. E. (2022). Impact of relational continuity of primary care in aged care: a systematic review. BMC Geriatrics, 22(1), 579.	Australia	Examine the impact of relational continuity between primary care professionals and older people receiving aged care services, in residential or home care settings, on health care resource use and person-centred outcomes.	Peer-reviewed article (Systematic review)
23	Hetlevik, O., Holmas, T. H., Monstad, K. (2021). Continuity of care, measurement and association with hospital admission and	Norway	Assess whether continuity of care (COC) with a general practitioner (GP) is associated with mortality and hospital admissions for older patients.	Peer-reviewed article (Cohort study)

	mortality: a registry-based longitudinal cohort study. BMJ Open, 11(12), e051958.			
24	Mahlknecht, A., Wiedermann, C. J., Sandri, M., Engl, A., Valentini, M., Vogele, A., Schmid, S., Deflorian, F., Montalbano, C., Koper, D., Bellmann, R., Sonnichsen, A., Piccoliori, G. (2021). Expert-based medication reviews to reduce polypharmacy in older patients in primary care: a northern-Italian cluster-randomised controlled trial. BMC Geriatrics, 21(1), 659.	Italy	Achieve clinical benefits for older patients (aged 75+) by means of evidence-based reduction of polypharmacy (defined as ≥8 prescribed drugs) and inappropriate prescribing in general practice.	Peer-reviewed article (Randomized clinical trial)
25	Kurtzman, E. T., & Barnow, B. S. (2017). A comparison of nurse practitioners, physician assistants, and primary care physicians' patterns of practice and quality of care in health centers. Medical Care, 55(6), 615-622.	United States	To compare the quality of care and practice patterns of nurse practitioners, physician assistants, and primary care physicians in community health centres.	Peer-reviewed article (Cohort study)
26	Hogg, W., Lemelin, J., Dahrouge, S., Liddy, C., Armstrong, C. D., Legault, F., ... & Zhang, W. (2009). Randomized controlled trial of anticipatory and preventive multidisciplinary team care: for complex patients in a community-based primary care setting. Canadian family physician, 55(12), e76-e85.	Canada	Examine whether quality of care improves when nurse practitioners and pharmacists work with family physicians in community practice and focus their work on patients who are 50 years of age and older and considered to be at risk of experiencing adverse health outcomes.	Peer-reviewed article (Randomized clinical trial)
27	Chen, L. M., Farwell, W. R., & Jha, A. K. (2009). Primary care visit duration and quality: does good care take longer?. Archives of internal medicine, 169(20), 1866-1872.	United States	Describe changes in the duration of adult primary care visits and in the quality of care provided during these visits and to determine whether quality of care is associated with visit duration.	Peer-reviewed article (Cohort study)
28	Terrell, K. M., Hustey, F. M., Hwang, U., Gerson, L. W., Wenger, N. S., Miller, D. K., & Society for Academic Emergency Medicine (SAEM) Geriatric Task Force. (2009). Quality indicators for geriatric emergency care. Academic Emergency Medicine, 16(5), 441-449.	United States	Develop emergency department-specific quality indicators for older patients to help practitioners identify quality gaps and focus quality improvement efforts.	Peer-reviewed article (Consensus study)

29	Leff, B., Carlson, C. M., Saliba, D., & Ritchie, C. (2015). The invisible homebound: setting quality-of-care standards for home-based primary and palliative care. Health Affairs, 34(1), 21-29.	United States	Describe the current status of home-based medical care in the United States and the network's quality-of-care framework.	Peer-reviewed article (Literature synthesis)
30	Heckman, G. A., Hillier, L., Manderson, B., McKinnon-Wilson, J., Santi, S. M., & Stolee, P. (2013). Developing an integrated system of care for frail seniors. Healthcare Management Forum, 26(4), 200-208. SAGE Publications.	Canada	Undertake a consultation process with healthcare providers to assess current system strengths, challenges and gaps in providing care to frail seniors.	Peer-reviewed article (Qualitative study)
31	Frank, C., & Wilson, C. R. (2015). Models of primary care for frail patients. Canadian Family Physician, 61(7), 601-606.	Canada	Discuss models of care for frail seniors provided in primary care settings and those developed by Canadian family physicians.	Peer-reviewed article (Literature review)
32	Higashi, T., Shekelle, P. G., Adams, J. L., Kamberg, C. J., Roth, C. P., Solomon, D. H., ... & Wenger, N. S. (2005). Quality of care is associated with survival in vulnerable older patients. Annals of Internal Medicine, 143(4), 274-281.	United States	Examine the link between the quality of care that patients received and their survival.	Peer-reviewed article (Cohort study)
33	Canadian Geriatrics Society. (2022). Eight tests and treatments to question. Choosing Wisely Canada.	Canada	Ensure recommendations and background information from the American Geriatrics Society were valid and relevant for Canadian patients and our health care system.	Web page
34	AMDA. (2022). Fifteen Things Physicians and Patients Should Question. Choosing Wisely.	United States	Achieve consensus on clinical recommendations relevant to the quality of care for long-term care patients.	Web page
35	AGS Choosing Wisely Workgroup. (2014). American Geriatrics Society identifies another five things that healthcare providers and patients should question. Journal of the American Geriatrics Society, 62(5), 950-960.	United States	Engage healthcare organizations and professionals, individuals, and family caregivers in discussions about the safety and appropriateness of medical tests, medications, and procedures to identify five tests, medications, or procedures that appear to harm rather than help.	Peer-reviewed article (Clinical guideline development)

36	Muth, C., Blom, J. W., Smith, S. M., Johnell, K., Gonzalez-Gonzalez, A. I., Nguyen, T. S., ... & Valderas, J. M. (2019). Evidence supporting the best clinical management of patients with multimorbidity and polypharmacy: a systematic guideline review and expert consensus. Journal of Internal Medicine, 285(3), 272-288.	Multi-national	Identify and analyse available evidence-based clinical practice guidelines for multimorbidity or polypharmacy in order to investigate the clinical decision support they provide and the key concepts they address.	Peer-reviewed article (Clinical guideline development)

S3 Table. Summary of round 1 ratings

	Quality Statement	Appropriateness		Importance	
		Median	IQR	Median	IQR
1	IF an older primary care patient presents with a health concern, THEN the PCP conducts a focused clinical assessment.	9	1	9	0.75
2	IF a comprehensive geriatric assessment is performed on an older primary care patient, THEN the PCP should follow-up to ensure the implementation of recommendations.	8	1	8	1.75
3	IF an older primary care patient seeks care, THEN the patient should receive routine screening for visual impairment and timely provision of comprehensive eye care.	5.5	2	6	2.75
4	IF an older primary care patient receives a cataract diagnosis, THEN the PCP should assess their visual function with respect to carrying out needed or desired activities every 12 months.	6.5	2.75	7	2.75
5	IF an older primary care patient has diabetes, THEN the PCP should recommend an ACE inhibitor or ARB, measure HbA1C at least twice annually, and examine feet and eyes every 2 years.	6.5	2.75	7	1.75
6	IF an older primary care patient with diabetes does not have established renal disease and is not receiving an ACE inhibitor or ACE receptor blocker, THEN the PCP should test for proteinuria annually.	7	2.75	7	2.5
7	IF an older primary care patient with diabetes has a LDL >2.0, ApoB>0.8, or nonHDL-c >2.6 , THEN the PCP should offer an intervention to lower cholesterol.	6.5	2.5	7	1.75
8	IF an older primary care patient with no history of allergy to the pneumococcal vaccine is not known to have already received a pneumococcal vaccine or if the patient received it more than 5 years ago (if before age 65 years), THEN a pneumococcal vaccine should be offered.	8.5	1	8	1.75
9	IF an older primary care patient has no history of anaphylactic hypersensitivity to eggs or to other components of the influenza vaccine, THEN the patient should be offered an annual influenza vaccination.	9	0.75	9	0.75

10	IF an older primary care patient presents for care, THEN the patient should be offered the shingles vaccine.	7	3	7	2.5
11	IF an older female primary care patient receives a new diagnosis of osteoporosis, THEN the PCP should offer bisphosphonate/denosumab followed by estrogen receptor agonist (only in those with menopausal symptoms) within 3 months.	7	2.25	7	0.75
12	IF an older primary care patient has rheumatoid arthritis, THEN the PCP should conduct a face-to-face annual review every 12 months.	7.5	2	7	1
13	IF an older primary care patient is diagnosed with coronary artery disease, THEN the PCP should recommend aspirin, beta-blockers, and/or statins.	7	1.75	8	1
14	IF an older primary care patient has established coronary artery disease and their cholesterol level is not known, THEN the PCP should order a fasting cholesterol evaluation, including total LDL and HDL cholesterol.	8	2.75	7.5	3.5
15	IF an older primary care patient has chronic obstructive pulmonary disease, THEN the PCP should recommend influenza immunization, pneumococcal vaccination, and the use of bronchodilators.	8	1	8.5	1
16	IF an older primary care patient has congestive heart failure, THEN the PCP should order ACE inhibitors or ARB and beta-blockers.	8	0.75	8	0.75
17	IF an older primary care patient receives a new diagnosis of heart failure, THEN the PCP should offer an evaluation of LV ejection fraction within 1 month.	7	1	7.5	1
18	IF an older primary care patient receives a new diagnosis of heart failure, THEN the PCP should order the following studies within 1 month of the diagnosis (unless they have already been performed within the previous 3 months): chest radiography, electrocardiography, CBC, serum sodium and potassium levels, serum creatinine level, and TSH level in patients with AF or heart failure with no obvious cause.	8	1.5	8	1.75
19	IF an older primary care patient has an elevated glycated hemoglobin level, THEN the PCP should offer a therapeutic intervention aimed at improving glycemic control within 3 months if the glycated hemoglobin level is 9.0% to 10.9%, and within 1 month if the glycated hemoglobin level is 11% or more.	8	2	8	2

20	IF an older primary care patient with a history of cardiac disease is started on an antidepressant, THEN the PCP should order baseline electrocardiography before initiation of treatment (within 3 months).	5.5	1	6	2
21	IF an older primary care patient has had a recent MI or recent coronary bypass graft surgery, THEN the PCP should offer cardiac rehabilitation.	7	3.5	6	2.5
22	IF an older primary care patient is diagnosed with dementia, THEN the PCP should provide dementia care management.	9	0	8.5	1
23	IF an older primary care patient receives a new diagnosis of dementia, THEN the PCP should perform a serum vitamin B12 and TSH test.	9	0.75	8	2.75
24	IF an older primary care patient is discharged from hospital, THEN the PCP should conduct a medication reconciliation within 14 days.	7.5	3.5	7	3.25
25	IF an older primary care patient presents for care, THEN the PCP should perform and document a medication review and reconciliation at least once a year (i.e., evaluate the risk benefit of each drug, its possible interactions and adverse effects, adherence to treatment and unmet needs and be aware of possible prescribing cascades).	9	1	8	3.5
26	IF an older primary care patient is prescribed medications from multiple providers, THEN the PCP should conduct a collaborative medication review (e.g., focus on evidence-based new drug prescriptions and prevention of polypharmacy).	9	1.75	8.5	2
27	IF an older primary care patient requires medication, THEN the PCP should avoid prescribing potentially inappropriate medications (e.g., drugs from the Beers list) unless clearly documented why that medication should be prescribed.	9	1	8.5	1
28	IF an older primary care patient is prescribed a drug from the Beers list, THEN the PCP should monitor chronic use of drugs from the Beers List.	8.5	2.5	8	3.25
29	IF an older primary care patient requires a new medication, THEN the PCP should not prescribe a medication with strong anticholinergic effects if alternatives are available.	9	0.75	9	2.5
30	IF an older primary care patient has symptoms of insomnia, agitation or delirium, THEN the PCP should not use benzodiazepines or other sedative-hypnotics as the first choice.	9	1.75	9	1

31	IF an older primary care patient is prescribed BZRAs, THEN the PCP should deprescribe (taper), regardless of duration of use.	7	2.75	7	1.75
32	IF an older primary care patient is prescribed a new medication, THEN the PCP should conduct a drug regime review (medication reconciliation review) and consider opportunities for deprescribing.	7.5	2.75	7	1.75
33	IF an older primary care patient experiences behavioural and psychological symptoms of dementia, THEN the PCP should consider alternatives to antipsychotics as the first choice to treat.	8.5	1	7.5	1.75
34	IF an older primary care patient has advanced dementia, THEN the PCP should not routinely prescribe or continue acetylcholinesterase inhibitors or N-Methyl-D-Aspartate antagonists.	7	1	6.5	1.75
35	IF an older primary care patient with advanced dementia has been prescribed acetylcholinesterase inhibitors or N-Methyl-D-Aspartate antagonists, THEN the PCP should conduct periodic reassessments for perceived benefits (cognitive, functional, behavioural) and adverse effects, and consider deprescribing if the risks outweigh the benefits.	8	1	8	2
36	IF an older primary care patient is newly started on a diuretic, THEN the PCP should check serum potassium and creatinine levels within 1 month of the initiation of therapy.	7	2	7	2
37	IF an older primary care patient is prescribed a thiazide or loop diuretic, THEN the PCP should check electrolyte levels at least annually.	8	2	7.5	2
38	IF an older primary care patient has hyperlipidemia, THEN the PCP should order a statin.	5.5	1.75	7	0.75
39	IF an older primary care patient is newly started on an ACE inhibitor, THEN the PCP should check serum potassium and creatinine levels within 1 month of the initiation of therapy.	8	2	8	2
40	IF an older primary care patient with dementia has cerebrovascular disease, THEN the PCP should offer appropriate stroke prophylaxis.	6	2.75	7.5	2.75

41	IF an older primary care patient requires pharmacotherapy for treatment of hypertension, THEN the PCP should order a once- or twice-daily medication (unless there is documentation about the need for agents that require more frequent dosing).	7.5	2	8	2
42	IF an older primary care patient has hypertension and asthma, THEN the PCP should not use beta-blocker therapy for hypertension.	7	1.75	7	1
43	IF an older primary care patient remains hypertensive after nonpharmacologic intervention, THEN the PCP should initiate pharmacologic antihypertensive treatment.	8	1.5	8	1.5
44	IF a primary care patient is older than 75 years of age and/or has a history of peptic ulcer disease, gastrointestinal bleeding, or current warfarin use and the patient is being treated with a COX-2 nonselective NSAID, THEN the PCP should offer concomitant treatment with either a proton-pump inhibitor or H2 blocker (like famotidine).	8	2	8	1.75
45	IF an older primary care patient requires analgesia, THEN the PCP should not use meperidine.	8.5	1	8	3.25
46	IF an older primary care patient is prescribed warfarin, THEN the PCP should order an INR test at least every 6 weeks.	8	3.5	6.5	2.75
47	IF an older primary care patient is prescribed warfarin, THEN an INR should be determined within 4 days after initiation of therapy and at least every 6 weeks by the PCP.	8	2.5	7	3.5
48	IF an older primary care patient has established CHD and is not receiving warfarin, THEN the PCP should offer antiplatelet therapy.	7.5	3.75	7.5	3.5
49	IF an older primary care patient has high HbA1c levels, THEN the PCP should avoid using medications known to cause hyperglycemia to achieve HbA1c <7.5%.	6	3.75	6	3.5
50	IF an older primary care patient requires specialist consultation, THEN the PCP should collaborate with specialist services by providing referrals/access, follow-up, and monitoring.	8	1.75	8	2.75
51	IF an older primary care patient receives care from multiple providers, THEN the PCP should communicate with other providers to ensure continuity of care and coordination.	6.5	2.75	7	2.75

52	IF an older primary care patient is discharged from hospital, THEN the PCP should follow up with the patient within 14 days.	8	2.5	8	2.5
53	IF an older primary care patient is in the last 30 days of life, THEN the PCP should conduct a home visit.	5.5	2	6	2.25
54	IF an older primary care patient seeks primary care services, THEN the patient receives continuous care from the same PCP in subsequent visits (beyond a specific episode of illness).	7.5	1.75	7	2.5
55	IF an older primary care patient could benefit from community-based supports/resources, THEN the PCP identifies and facilitates the appropriate use of these resources.	8	1	8	1.5
56	IF an older primary care patient receives a diagnosis of depression, THEN the PCP should offer antidepressant treatment or psychotherapy within 2 weeks (unless there is documentation within that period that the patient has improved or unless the patient has substance abuse or dependence).	6.5	1.75	7	1.75
57	IF an older primary care patient is started on an antidepressant medication, THEN the PCP should not use the following medications as first- or second-line therapy: tertiary amine tricyclics (amitriptyline, imipramine, doxepin, clomipramine, or trimipramine), monoamine oxidase inhibitors (unless atypical depression is present), benzodiazepines, or stimulants (except methylphenidate).	8	1	8	3.25
58	IF an older primary care patient receives a new diagnosis of moderate or severe dementia, THEN the PCP should advise the patient not to drive a motor vehicle, request that the Department of Motor Vehicles (or equivalent) retests the patient's ability to drive, or refer the patient to a drivers' safety or education course that includes assessment of driving ability consistent with provincial laws.	9	1	8.5	1
59	IF an older primary care patient is treated for a chronic painful condition, THEN the PCP should assess for a response within 6 months.	7	1	7	2.5
60	IF an older primary care patient requires after-hours primary care, THEN the patient should be able to access this care from their PCP or another provider.	8	1.75	8	1.75
61	IF an older primary care patient requires immediate health care services, THEN the patient should be able to access this care from their PCP or another provider.	7.5	3.5	7.5	3.5

S4 Table. Example of a technical definition for an endorsed quality statement

Quality Indicator #11
ORIGINAL: IF an older primary care patient with no history of allergy to the pneumococcal vaccine is not known to have already received a pneumococcal vaccine or if the patient received it more than 5 years ago (if before age 65 years), THEN a pneumococcal vaccine should be offered.
REVISED: IF an older primary care patient is not known to have already received a pneumococcal vaccine or if the patient received it more than 5 years ago (if before age 65 years), THEN a pneumococcal vaccine should be administered.

Definition: Proportion of attached patients who have received the pneumococcal vaccine.

DENOMINATOR: IF an older primary care patient is not known to have already received a pneumococcal vaccine or if the patient received it more than 5 years ago (if before age 65 years),

Definition	Data Sources
Number of older patients who are eligible for the pneumococcal vaccine. **Inclusions:** • Patient is an Ontario resident eligible for OHIP, aged 65 years or older. • Patient is attached to the PCP. **Exclusions:** • None	1) Patient appears in ***PCPOP*** **AND** 2) Patient's age group in PCPOP: ***AGEGP = Any of 7, 8, or 9*** *where 7 = 65-74 years, 8 = 75-84 years, and 9 = 85+ years* **Notes:** • We cannot determine whether a patient is eligible for the vaccine (i.e., whether the patient has "no history of allergy") in the absence of patient-level medical data at ICES (e.g., allergies captured in an EMR). Therefore, this condition has been removed from the denominator.

NUMERATOR: THEN a pneumococcal vaccine should be administered.

Definition	Data Sources
Number of older patients who received the pneumococcal vaccination. **Inclusions:** • Attached patients who received at least one dose of the immunization after the age 65. **Exclusions:** • This indicator only reflects immunizations associated with a physician fee code (i.e., billing record). For example, if an immunization was provided by a nurse practitioner, pharmacist, or a provider from outside Ontario, the immunization record would only appear in OHIP if the	1) ***OHIP*** pneumococcal vaccination fee code: ***G846*** *(Pneumococcal Conjugate)* **Notes:** • None

patient informed their PCP and the PCP noted this in their medical record.	

Calculation: (Numerator ÷ Denominator) x 100%

References:

1. Public Health Agency of Canada. Pneumococcal vaccine: Canadian Immunization Guide [Internet]. fitch. 2007 [cited 2023 Jun 6]. Available from: https://www.canada.ca/en/public-health/services/publications/healthy-living/canadian-immunization-guide-part-4-active-vaccines/page-16-pneumococcal-vaccine.html
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S5 Table. Prioritization of endorsed items from round 1 to round 2

	Quality Statement	Endorsed in questionnaire 1 but not presented in panel group meeting (n=36)	Presented in panel group meeting (n=19)	Rated in questionnaire 2 (n=15)
1	IF an older primary care patient presents with a health concern, THEN the PCP conducts a focused clinical assessment.		X	X
2	IF a comprehensive geriatric assessment is performed on an older primary care patient, THEN the PCP should follow-up to ensure the implementation of recommendations.		X	X
3	IF an older primary care patient receives a cataract diagnosis, THEN the PCP should assess their visual function with respect to carrying out needed or desired activities every 12 months.	X		
4	IF an older primary care patient has diabetes, THEN the PCP should recommend an ACE inhibitor or ARB, measure HbA1C at least twice annually, and examine feet and eyes every 2 years.	X		
5	IF an older primary care patient with diabetes does not have established renal disease and is not receiving an ACE inhibitor or ACE receptor blocker, THEN the PCP should test for proteinuria annually.	X		
6	IF an older primary care patient with diabetes has a LDL >2.0, ApoB>0.8, or nonHDL-c >2.6 , THEN the PCP should offer an intervention to lower cholesterol.	X		
7	IF an older primary care patient with no history of allergy to the pneumococcal vaccine is not known to have already received a pneumococcal vaccine or if the patient received it more than 5 years ago (if before age 65 years), THEN a pneumococcal vaccine should be offered.		X	X
8	IF an older primary care patient has no history of anaphylactic hypersensitivity to eggs or to other components of the influenza vaccine, THEN the patient should be offered an annual influenza vaccination.		X	X

9	IF an older primary care patient presents for care, THEN the patient should be offered the shingles vaccine.	X		
10	IF an older female primary care patient receives a new diagnosis of osteoporosis, THEN the PCP should offer bisphosphonate/denosumab followed by estrogen receptor agonist (only in those with menopausal symptoms) within 3 months.	X		
12	IF an older primary care patient has rheumatoid arthritis, THEN the PCP should conduct a face-to-face annual review every 12 months.	X		
13	IF an older primary care patient is diagnosed with coronary artery disease, THEN the PCP should recommend aspirin, beta-blockers, and/or statins.	X		
13	IF an older primary care patient has established coronary artery disease and their cholesterol level is not known, THEN the PCP should order a fasting cholesterol evaluation, including total LDL and HDL cholesterol.	X		
14	IF an older primary care patient has chronic obstructive pulmonary disease, THEN the PCP should recommend influenza immunization, pneumococcal vaccination, and the use of bronchodilators.		X	X
15	IF an older primary care patient has congestive heart failure, THEN the PCP should order ACE inhibitors or ARB and beta-blockers.		X	X
16	IF an older primary care patient receives a new diagnosis of heart failure, THEN the PCP should offer an evaluation of LV ejection fraction within 1 month.	X		
17	IF an older primary care patient receives a new diagnosis of heart failure, THEN the PCP should order the following studies within 1 month of the diagnosis (unless they have already been performed within the previous 3 months): chest radiography, electrocardiography, CBC, serum sodium and potassium levels, serum creatinine level, and TSH level in patients with AF or heart failure with no obvious cause.	X		
18	IF an older primary care patient has an elevated glycated hemoglobin level, THEN the PCP should offer a therapeutic intervention aimed at improving glycemic control within 3 months if the glycated hemoglobin level is 9.0% to 10.9%, and within 1 month if the glycated hemoglobin level is 11% or more.	X		
19	IF an older primary care patient is diagnosed with dementia, THEN the PCP should provide dementia care management.		X	X

20	IF an older primary care patient receives a new diagnosis of dementia, THEN the PCP should perform a serum vitamin B12 and TSH test.		X	X
21	IF an older primary care patient is discharged from hospital, THEN the PCP should conduct a medication reconciliation within 14 days.	X		
22	IF an older primary care patient presents for care, THEN the PCP should perform and document a medication review and reconciliation at least once a year (i.e., evaluate the risk benefit of each drug, its possible interactions and adverse effects, adherence to treatment and unmet needs and be aware of possible prescribing cascades).		X	
23	IF an older primary care patient is prescribed medications from multiple providers, THEN the PCP should conduct a collaborative medication review (e.g., focus on evidence-based new drug prescriptions and prevention of polypharmacy).		X	X
24	IF an older primary care patient requires medication, THEN the PCP should avoid prescribing potentially inappropriate medications (e.g., drugs from the Beers list) unless clearly documented why that medication should be prescribed.		X	X
25	IF an older primary care patient is prescribed a drug from the Beers list, THEN the PCP should monitor chronic use of drugs from the Beers List.		X	
26	IF an older primary care patient requires a new medication, THEN the PCP should not prescribe a medication with strong anticholinergic effects if alternatives are available.		X	X
27	IF an older primary care patient has symptoms of insomnia, agitation or delirium, THEN the PCP should not use benzodiazepines or other sedative-hypnotics as the first choice.		X	X
28	IF an older primary care patient is prescribed BZRAs, THEN the PCP should deprescribe (taper), regardless of duration of use.	X		
29	IF an older primary care patient is prescribed a new medication, THEN the PCP should conduct a drug regime review (medication reconciliation review) and consider opportunities for deprescribing.	X		
30	IF an older primary care patient experiences behavioural and psychological symptoms of dementia, THEN the PCP should consider alternatives to antipsychotics as the first choice to treat.		X	X

31	IF an older primary care patient has advanced dementia, THEN the PCP should not routinely prescribe or continue acetylcholinesterase inhibitors or N-Methyl-D-Aspartate antagonists.	X		
32	IF an older primary care patient with advanced dementia has been prescribed acetylcholinesterase inhibitors or N-Methyl-D-Aspartate antagonists, THEN the PCP should conduct periodic reassessments for perceived benefits (cognitive, functional, behavioural) and adverse effects, and consider deprescribing if the risks outweigh the benefits.	X		
33	IF an older primary care patient is newly started on a diuretic, THEN the PCP should check serum potassium and creatinine levels within 1 month of the initiation of therapy.	X		
34	IF an older primary care patient is prescribed a thiazide or loop diuretic, THEN the PCP should check electrolyte levels at least annually.	X		
35	IF an older primary care patient is newly started on an ACE inhibitor, THEN the PCP should check serum potassium and creatinine levels within 1 month of the initiation of therapy.	X		
36	IF an older primary care patient requires pharmacotherapy for treatment of hypertension, THEN the PCP should order a once- or twice-daily medication (unless there is documentation about the need for agents that require more frequent dosing).	X		
37	IF an older primary care patient has hypertension and asthma, THEN the PCP should not use beta-blocker therapy for hypertension.	X		
38	IF an older primary care patient remains hypertensive after nonpharmacologic intervention, THEN the PCP should initiate pharmacologic antihypertensive treatment.		X	X
39	IF a primary care patient is older than 75 years of age and/or has a history of peptic ulcer disease, gastrointestinal bleeding, or current warfarin use and the patient is being treated with a COX-2 nonselective NSAID, THEN the PCP should offer concomitant treatment with either a proton-pump inhibitor or H2 blocker (like famotidine).	X		
40	IF an older primary care patient requires analgesia, THEN the PCP should not use meperidine.		X	
41	IF an older primary care patient is prescribed warfarin, THEN the PCP should order an INR test at least every 6 weeks.	X		

42	IF an older primary care patient is prescribed warfarin, THEN an INR should be determined within 4 days after initiation of therapy and at least every 6 weeks by the PCP.	X		
43	IF an older primary care patient has established CHD and is not receiving warfarin, THEN the PCP should offer antiplatelet therapy.	X		
44	IF an older primary care patient has high HbA1c levels, THEN the PCP should avoid using medications known to cause hyperglycemia to achieve HbA1c <7.5%.	X		
45	IF an older primary care patient requires specialist consultation, THEN the PCP should collaborate with specialist services by providing referrals/access, follow-up, and monitoring.	X		
46	IF an older primary care patient receives care from multiple providers, THEN the PCP should communicate with other providers to ensure continuity of care and coordination.	X		
47	IF an older primary care patient is discharged from hospital, THEN the PCP should follow up with the patient within 14 days.	X		
48	IF an older primary care patient seeks primary care services, THEN the patient receives continuous care from the same PCP in subsequent visits (beyond a specific episode of illness).	X		
49	IF an older primary care patient could benefit from community-based supports/resources, THEN the PCP identifies and facilitates the appropriate use of these resources.		X	
50	IF an older primary care patient receives a diagnosis of depression, THEN the PCP should offer antidepressant treatment or psychotherapy within 2 weeks (unless there is documentation within that period that the patient has improved or unless the patient has substance abuse or dependence).	X		
51	IF an older primary care patient is started on an antidepressant medication, THEN the PCP should not use the following medications as first- or second-line therapy: tertiary amine tricyclics (amitriptyline, imipramine, doxepin, clomipramine, or trimipramine), monoamine oxidase inhibitors (unless atypical depression is present), benzodiazepines, or stimulants (except methylphenidate).	X		
52	IF an older primary care patient receives a new diagnosis of moderate or severe dementia, THEN the PCP should advise the patient not to drive a motor vehicle, request that the Department of Motor Vehicles (or equivalent) retests the patient's ability to drive, or refer the patient		X	X

	to a drivers' safety or education course that includes assessment of driving ability consistent with provincial laws.			
53	IF an older primary care patient is treated for a chronic painful condition, THEN the PCP should assess for a response within 6 months.	X		
54	IF an older primary care patient requires after-hours primary care, THEN the patient should be able to access this care from their PCP or another provider.	X		
55	IF an older primary care patient requires immediate health care services, THEN the patient should be able to access this care from their PCP or another provider.	X		

S6 Table. Summary of round 2 ratings

	Quality Statement	Appropriateness		Importance	
		Median	IQR	Median	IQR
1	**ORIGINAL:** IF an older primary care patient has no history of anaphylactic hypersensitivity to eggs or to other components of the influenza vaccine, THEN the patient should be offered an annual influenza vaccination. **REVISED:** IF an older primary care patient is eligible for the influenza vaccine, THEN the patient should be administered the vaccine annually.	8.5	1	8	1
2	**ORIGINAL:** IF an older primary care patient presents with a health concern, THEN the PCP conducts a focused clinical assessment. **REVISED:** IF an older primary care patient presents for care, THEN the PCP conducts a focused clinical assessment.	7	3.5	6.5	3.5
3	**ORIGINAL:** IF an older primary care patient has symptoms of insomnia, agitation or delirium, THEN the PCP should not use benzodiazepines or other sedative-hypnotics as the first choice. **REVISED:** IF an older primary care patient requires a new medication, THEN the PCP should not use benzodiazepines or other sedative-hypnotics as the first choice.	8	1.5	8	1.5
4	IF an older primary care patient requires a new medication, THEN the PCP should not prescribe a medication with strong anticholinergic effects if alternatives are available.	8	1.75	8	1.75
5	IF an older primary care patient is diagnosed with dementia, THEN the PCP should provide dementia care management.	7.5	1.75	7	1
6	**ORIGINAL:** IF an older primary care patient requires medication, THEN the PCP should avoid prescribing potentially inappropriate medications (e.g., drugs from the Beers list) unless clearly documented why that medication should be prescribed. **REVISED:** IF an older primary care patient requires medication, THEN the PCP should avoid prescribing potentially inappropriate medications (e.g., drugs from the Beers list).	8	1	7	2.75
7	**ORIGINAL:** IF an older primary care patient receives a new diagnosis of moderate or severe dementia, THEN the PCP should advise the patient not to drive a motor vehicle, request that the Department of Motor Vehicles (or equivalent) retests the patient's ability to drive, or refer the patient to a drivers' safety or education course that includes assessment of driving ability consistent with provincial laws.	8.5	2.75	8	2.5

	REVISED: IF an older primary care patient receives a new diagnosis of dementia and is deemed unsafe to drive, THEN the PCP should report the patient to the Ministry of Transportation.				
8	IF an older primary care patient is prescribed medications from multiple providers, THEN the PCP should conduct a collaborative medication review (e.g., focus on evidence-based new drug prescriptions and prevention of polypharmacy).	7.5	1.75	7.5	2.5
9	**ORIGINAL:** IF an older primary care patient receives a new diagnosis of dementia, THEN the PCP should perform a serum vitamin B12 and TSH test. **REVISED:** IF an older primary care patient presents with memory concerns, THEN the PCP should perform tests aligned with the 5th Canadian Consensus on Dementia.	8	1.75	7.5	1
10	**ORIGINAL:** IF an older primary care patient has chronic obstructive pulmonary disease, THEN the PCP should recommend influenza immunization, pneumococcal vaccination, and the use of bronchodilators. **REVISED:** IF an older primary care patient has chronic obstructive pulmonary disease, THEN the PCP should recommend influenza and pneumococcal immunizations.	9	1	8.5	1
11	**ORIGINAL:** IF an older primary care patient with no history of allergy to the pneumococcal vaccine is not known to have already received a pneumococcal vaccine or if the patient received it more than 5 years ago (if before age 65 years), THEN a pneumococcal vaccine should be offered. **REVISED:** IF an older primary care patient is not known to have already received a pneumococcal vaccine or if the patient received it more than 5 years ago (if before age 65 years), THEN a pneumococcal vaccine should be administered.	8	1	8	0.75
12	**ORIGINAL:** IF an older primary care patient has congestive heart failure, THEN the PCP should order ACE inhibitors or ARB and beta-blockers. **REVISED:** IF an older primary care patient has congestive heart failure, THEN the PCP should order ACE inhibitors, ARBs, beta-blockers, or SGLT2 inhibitors.	7.5	1	8	1.75
13	**ORIGINAL:** IF an older primary care patient experiences behavioural and psychological symptoms of dementia, THEN the PCP should consider alternatives to antipsychotics as the first choice to treat. **REVISED:** IF an older primary care patient is diagnosed with dementia, THEN the PCP should consider alternatives to antipsychotics as the first choice to treat.	8	0.75	7.5	2
14	IF a comprehensive geriatric assessment is performed on an older primary care patient, THEN the PCP should follow-up to ensure the implementation of recommendations.	7	1.5	6.5	2

15	**ORIGINAL:** IF an older primary care patient remains hypertensive after nonpharmacologic intervention, THEN the PCP should initiate pharmacologic antihypertensive treatment. **REVISED:** IF an older primary care patient presents as hypertensive, THEN the PCP should initiate pharmacologic antihypertensive treatment.	6	1.75	6.5	2

CHAPTER FOUR

Characterizing Family Physicians with Additional Training or Focused Practice in Caring for Older Adults: A Population-Based Retrospective Cohort Study

Summary

This chapter established a novel approach to identify family physicians with a COE CAC and/or an elderly-focused practice within population-based, health administrative data, enabling a description of their medical practice characteristics and service provision. I championed a project-specific data linkage with the CFPC and ICES to identify COE CAC holders within administrative data for the first time. The classification established in this study to identify family physicians with elderly-focused training and practices underpins the analysis of Chapter 5 to examine the contributions of family physicians to older patients' quality of care.

While this study found that few family physicians have additional training or focused practice to care for older adults, these providers had more encounters with patients aged ≥65, provided significantly more consults than other family physicians, and delivered core (comprehensive) primary care services. This study contributes new information about the individual and medical practice characteristics of COE CAC holders and focused practice physicians.

Citation

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Abstract

Objective: To identify family physicians with additional training and focused practice activities relevant to the needs of older patients within health administrative data, and describe their medical practice and service provision in community-based primary care settings. **Design:** Retrospective cohort study. **Setting:** Ontario, Canada. **Participants:** Family physicians with a “Care of the Elderly” Certificate of Added Competence from the College of Family Physicians of Canada or a focused practice billing designation in “Care of the Elderly.” **Main Outcome Measures:** Evidence of additional training/certification or practice activities relevant to the care of older adults. **Results:** 242 of 14,123 family physicians had evidence of additional scope to better support older adults. These physicians mainly practiced in team-based models, exhibited comprehensive practice types, and increasingly billed for core primary care services. In an unadjusted analysis, factors significantly associated with greater likelihood of exhibiting additional training or focused practice relevant to the care of older patients included: physician demographics (i.e., female sex, community size, graduating from a Canadian medical school, community-level residential instability), primary care practice model (i.e., focused practice type), primary care activities (i.e., increasingly providing consultations, long-term care practice, referring patients to psychiatry and geriatrics, billing for complex house call assessments, home care applications, and long-term care health report forms), and patient characteristics (i.e., increased age of non/rostered patients).

Conclusion: The family physician workforce skilled in caring for older patients comprises a small but specialized group of providers who contribute a portion of the total primary care activities for older adults. As such, health human resources planning should consider the contributions of all family physicians who care for older adults, and enhancing geriatric competence across the family medicine workforce should be emphasized.

Background

Primary care systems across the world are grappling with shortages in the family physician (FP) workforce,[1–4] prompted by exits from practice during the COVID-19 pandemic,[5] narrowing scopes of practice,[6] and waning interest in comprehensive family medicine.[7,8] While family medicine involves caring for patients across the age spectrum, FPs are central to the care of older persons.[9,10] Compared to other age groups, older adults (aged ≥65) are the most frequent users of primary care services, accounting for almost one-third of family medicine services.[9] Older patients' medical complexity, chronicity, and higher rates of health service utilization across settings are best managed when FPs play a central role in care coordination and continuity.[11] However, as the population of older adults continues to increase, gaps between what older patients need and what FPs have the capacity to provide are growing.[12]

Comprehensive primary care is associated with better health equity and efficiency, care continuity, patient satisfaction, as well as fewer emergency department visits, hospital admissions, specialist referrals, and health system costs.[13–19] Despite the centrality of comprehensiveness to family medicine training and professional identity,[20] FPs are increasingly choosing to provide comprehensive care to distinct population groups or focus their practice in specific clinical areas.[21–26] Pursuit of additional training or focusing scope of practice is driven by many factors, including geography, remuneration, personal interests or values, support from colleagues, positive training experiences, and

desire to decrease breadth to handle complexity in a focused area.[21,27–30] There is a gap in understanding factors associated with FPs acquiring additional skills or a billing designation specific to the needs of older patients, including the range of clinical services delivered.

FPs with additional training or focused practice related to the care of older adults are not identified in health administrative data. In the absence of a validated classification, little is known about their individual and practice characteristics, including their impacts on quality of care and patient outcomes. We aimed to identify FPs with additional training/certification and/or practice with a focus on care of older adults within population-based health administrative data holdings in Ontario, Canada. We then sought to describe their medical practice characteristics and service provision.

Methods

Design: We conducted a retrospective cohort study to examine FPs with additional training and practice activities suggesting a focus on older adults in the calendar year, 2019. Our reporting follows the STROBE Statement (Appendix 1).[31]

Setting: We linked multiple data sets at ICES, an independent, non-profit research institute that collects and analyzes health care and demographic data about publicly funded encounters in Ontario, Canada (Appendix 2).[32] Datasets were linked using unique encoded identifiers and analyzed at ICES. We conducted a project-specific linkage with the College of Family Physicians of

Canada (CFPC) Membership Database for physicians with a Certificate of Added Competence (CAC) in "Care of the Elderly." Data were accessed using the Remote Access Environment. We ascertained most responsible provider (MRP) practice in long-term care (LTC) using a previous classification.[33]

Participants: We established a cohort of physicians who submitted at least one OHIP fee claim in 2019. We excluded physicians whose main specialty in the ICES Physician Database (IPDB) was not family medicine/general practice, and non-residents of Ontario.

We identified FPs with additional training or a focus on older adults using two methods related to their education/training and practice organization. First, we identified FPs with a CAC in "Care of the Elderly" (CCFP (COE)) by importing a validated list from the CFPC.[34,35] Second, we classified physicians as FP-COE if they submitted at least one billing for the five Ontario Health Insurance Plan (OHIP) fee codes eligible to FPs enrolled in a focused practice funding arrangement in "Care of the Elderly."[36,37] Our methodology is detailed in Appendix 3.

Participants who did not fall within our classification of having additional skills to care for older adults were grouped together, although they exhibit heterogeneity; some provide comprehensive care, are CAC holders in other domains, or focused practice physicians in other areas.

Analysis: We reported measures of central tendency in descriptive tables (e.g., medians and interquartile range (IQR) for continuous variables; frequencies

and proportions for categorical variables). We performed chi-square and Wilcoxon rank-sum tests to assess differences between CCFP (COE)/FP-COE and others using two-sided tests with the conventional 95% threshold for significance. We used data visualization techniques to illustrate the number of CCFP (COE)/FP-COE per 100,000 persons aged ≥65 by health region (Local Health Integration Network, LHIN).[38] We used unadjusted logistic regression to examine factors associated with exhibiting additional training or focused practice in caring for older adults. Lastly, we conducted a sensitivity analysis with an increased threshold for relevant fee codes to classify FP-COE. Cases with missing data were excluded from each analysis. All analyses were performed using SAS software, version 9.4.

Ethics: This project was approved by the Hamilton Integrated Research Ethics Board (11391). The use of ICES data is authorized under Section 45 of Ontario's Personal Health Information Protection Act, which allows ICES to collect and analyze health care and demographic data, without consent, for health system evaluation and improvement.

Results

Cohort creation: 14,123 FPs satisfied our inclusion criteria (Figure 1). We identified 242 FPs with additional training or focused practice in caring for older adults: 143 as CCFP (COE) and 142 as FP-COE (Figure 2). Of these, 43 physicians billed the FP-COE fee codes and held a COE CAC.

For the purposes of description, we considered the remaining 13,881 physicians as not having evidence of additional training or focused care of older adults.

Descriptive findings: CCFP (COE)/FP-COE were more frequently female (n=145; 59.92%; p<.001) and significantly younger (median: 45 years; IQR: 16 years; p<.001) (Table 1). Their median length in practice was 17 years (IQR: 18; p<.001) and most were Canadian Medical Graduates (n=158; 65.29%; p=0.01). Most CCFP (COE)/FP-COE exhibited a comprehensive practice type (n=147; 60.74%; p<.001); the most common patient enrolment model was blended salary (n=82; 33.88%; p<.001). Gross OHIP payments for CCFP (COE)/FP-COE (median: $160,733; IQR: $142,935; p=0.79) did not significantly vary from other FPs (median: $159,789; IQR: $158,491).

FPs with additional training or focused practice had fewer total patient visits (median: 2,636; IQR: 2,513; p=0.06). However, they provided significantly more consults than other FPs (median: 48; IQR: 128.5; p<.001) and had more encounters with patients aged ≥65 (median: 323; IQR: 285; p=0.007). 91 practiced as a MRP in LTC (37.60%).

There were significant differences in clinical activities for adults aged ≥65, including the frequency of house call assessments and the completion of home care applications and LTC health report forms. CCFP (COE)/FP-COE made significantly more referrals to geriatricians (median: 3; IQR: 10; p<.001) and psychiatrists for patients aged ≥65 (median: 6; IQR: 11; p<.001). Patients aged

≥65 comprised a significantly greater proportion of their overall medical practice (median=39%; IQR: 54%; p<.001) (Figure 3).

CCFP (COE)/FP-COE primarily practiced in the Champlain, Toronto Central, Central, Hamilton Niagara Haldimand Brant, and North East health regions (Figure 4).

The majority of CCFP (COE) held one CAC (n=130; 90.91%) (Table 2). 17 CCFP (COE) (11.9%) are affiliated with the CFPC's Section of Researchers; 43 (30.1%) are in the Section of Teachers.

Inferential findings: The following factors were significantly associated with greater likelihood of being CCFP (COE)/FP-COE: physician demographics (i.e., female sex; community size; being a Canadian medical graduate; community-level residential instability), maintaining a focused practice type, primary care activities (i.e., increasingly providing consultations; being a MRP in LTC; billing for ≥1 complex house calls, home care applications, and LTC health report forms; referring patients aged ≥65 to psychiatry and geriatrics), and caring for patients of increased age (Table 3). Three factors were significantly associated with decreased odds of additional scope: increased years practicing medicine, community-level ethnic diversity, and billing for ≥1 periodic health visits.

Sensitivity analysis: 83 FPs billed the FP-COE fee codes more than once, reducing our CCFP (COE)/FP-COE cohort to 186 FPs (Appendix 4). Compared to the main analysis, we observed similarities on most descriptive factors.

Discussion

We established the first working classification of FPs with additional training or focused practice in the care of older adults using health administrative data in Ontario, Canada. To date, examining individual and medical practice characteristics of CCFP (COE)/FP-COE has been limited to survey methods and environmental scans[39–42] or case studies.[28]

We found that these FPs primarily practice in team-based models, in comprehensive practice types, and over half of their billings are attributed to core primary care services. Therefore, despite additional training or focused practice organization, CCFP (COE)/FP-COE remain engaged in contributing to comprehensive care. While some FPs deliver skilled care to a focused population of older patients, their practice aligns with the CFPC's "Triple C Competency-Based Curriculum" by maintaining continuous, comprehensive, and coordinated care centred in family medicine.[43] This finding aligns with previous work where CCFP (COE) attributed their CAC to improving patient access to specialized geriatric care, supporting continuity as their patients age, and enabling community-adaptive care.[28]

Our findings support and extend prior work describing CCFP (COE) and focused practice FPs. Our cohort classification and examination of remuneration align with prior findings of the substantial differences in how CCFP (COE) are compensated, and a lack of financial incentive to pursue focused practice designations.[28,44] In previous work examining differences between focused

practice physicians (of any clinical domain) and others, the community size of the physician's practice location and remuneration models differed significantly.[21] Our findings conflict with studies suggesting focused practice FPs and medical directors in LTC are not early-career physicians, as we found FPs with additional scope for older patients tended to be younger and had fewer years in practice.[24,33] However, this difference may reflect our reliance on the CAC in COE to determine focused practice. The CCFP (COE) is most commonly achieved through a full-time postgraduate training year that, while open to all physicians, is typically completed by younger individuals.[39]

Previous health human resource initiatives found large discrepancies between the limited supply of physicians delivering specialized geriatric services (SGS) and population-level needs.[28,40–42] Given the small number of FPs identified, these findings might be explained by fewer applicants to CCFP (COE) and geriatric medicine postgraduate training,[45] and an increasing number of vacant positions in recent years.[46,47] Practice locations that we identified as having a greater supply of CCFP (COE)/FP-COE affirmed prior work; these health regions were regarded as successful in negotiating funding arrangements to attract and retain CCFP (COE).[42] Further, the frequent engagement of CCFP (COE)/FP-COE in consultative work affirms their expertise as skilled resources and reflects their practice in other settings where older adult-focused clinical services are delivered (e.g., in-patient rehabilitation, memory clinics).[48]

Given the small number of FPs with additional expertise and/or focused practice relevant to the needs of older adults, most older persons will receive care from FPs without advanced clinical training in geriatrics.[41] As such, all Canadian FPs will be more prepared for practice by fully acquiring the knowledge, skills, and attitudes required to provide effective care to older patients. Postgraduate training programs could benefit from engaging CCFP (COE) as leaders to enhance geriatric competencies among *all* FPs who increasingly deliver care to older populations.

Limitations: Our classification of FPs with additional scope was sensitive but not specific. Although the Schedule of Benefits stipulates that only FPs with billing designations are eligible for focused practice fee codes, some may have billed these in error. In the absence of a validated list of FP-COE, we could not assess the validity of our classification and may have overestimated the workforce, although the sensitivity analysis affirmed our main findings. Our reliance on administrative data (i.e., physician fee codes for reimbursement) may not accurately reflect clinical practice.[49] Lastly, a FP's practice composition may be influenced by natural aging or proximity to areas more densely populated by older adults. As such, a FP could provide more care for older adults without identifying as having additional expertise or focused practice.

Conclusion

We established the first working classification to identify FPs with additional scope to care for older adults within health administrative data in

Ontario, Canada. Our findings demonstrate significant practice differences between CCFP (COE)/FP-COE and FPs without evidence of additional training or focused practice. Given the limited number of FPs identified, the contributions of all FPs who care for older adults should be considered in health human resources planning and enhancing geriatric competence in family medicine training should be emphasized. Our classification enables future work to examine the impacts of FP practice on older patients' outcomes and quality of care.

Tables and Figures

Table 1. Characteristics of family physicians with additional training/certification or focused practice in the care of older adults

	CCFP (COE)/FP-COE (n=242)	**FPs without evidence of additional training or focused practice** (n=13,881)	
	N (%) [a]		**P value**
Physician Demographics			
Sex, Female	145 (59.92)	6,754 (48.66)	<.001 *
Age (years) [a]	45 (16)	49 (23)	<.001 *
Years in practice [a]	17 (18)	22 (24)	<.001 *
Rural [b]	20 (8.26)	1,236 (8.90)	0.73
Community size [c]			
≥1,500,000 residents	90 (37.19)	6,136 (44.20)	0.19
500,000 to 1,499,999 residents	49 (20.25)	2,499 (18.00)	
100,000 to 499,999 residents	60 (24.79)	2,802 (20.19)	
10,000 to 99,999 residents	23 (9.50)	1,208 (8.70)	
<10,000 residents	20 (8.26)	1,236 (8.90)	
ED in physician's census subdivision	200 (82.64)	10,723 (77.25)	0.05 *
Location of medical school			
Canada	158 (65.29)	7,625 (54.93)	0.01 *
Unknown	46 (19.01)	3,356 (24.18)	
Community-level marginalization in primary practice location [a,d]			
Residential instability	0.04 (0.22)	0.02 (0.21)	<.001 *
Material deprivation	-0.12 (0.19)	-0.12 (0.43)	0.45
Economic dependency	-0.16 (0.46)	-0.16 (0.55)	0.19
Ethnic diversity	-0.07 (0.93)	-0.07 (1.22)	<.001 *
Primary Care Practice Model			
Full-time affiliation with a patient enrolment model	155 (64.05)	9,059 (65.26)	0.69
Practice type			
Comprehensive	147 (60.74)	9,581 (69.02)	<.001 *
Focused	58 (23.97)	2,172 (15.65)	
Other or <44 days in practice	37 (15.29)	2,128 (15.33)	

Type of patient enrolment model			
Enhanced fee-for-service models			
Comprehensive Care Model or Family Health Group	20 (8.26)	2,861 (20.61)	
Blended capitation models			<.001 *
Family Health Network or Family Health Organization	43 (17.77)	2,888 (20.81)	
Blended salary model			
Family Health Team	82 (33.88)	2,823 (20.34)	
Other or no enrolment group	87 (35.95)	3,957 (28.51)	
Unknown	10 (4.13)	1,352 (9.74)	
>50% of payments attributed to fee-for-service	96 (39.67)	6,978 (50.27)	<.001 *
Total OHIP billings ($) [a,e]	160,733 (142,935)	159,789 (158,491)	0.79
Primary Care Activities			
Billings attributed to core primary care services			0.03 *
Over half of all billings	166 (68.60)	10,218 (73.61)	
Unknown	23 (9.50)	1,348 (9.71)	
Count of patient visits [a]	2,636 (2,513)	3,005 (3,019)	0.06
Count of consultations [a]	48 (128.50)	2 (31)	<.001 *
Submitted billings for adults aged ≥65			
≥1 Care of the Elderly focused practice assessment (A967)	56 (23.14)	0 (0.00)	<.001 *
≥1 geriatric outpatient case conference (K703)	108 (44.63)	0 (0.00)	<.001 *
≥1 geriatric telephone support (K077)	23 (9.50)	0 (0.00)	<.001 *
≥1 geriatric home visit premium for first person seen (B988)	20 (8.26)	0 (0.00)	<.001 *
≥1 geriatric home visit travel premium (B986)	19 (7.85)	0 (0.00)	<.001 *
≥1 complex house call assessment (A900)	121 (50.00)	3,232 (23.28)	<.001 *
≥1 periodic health visit (K132)	135 (55.79)	8,364 (60.26)	0.16
≥1 home care application (K070)	141 (58.26)	5,166 (37.22)	<.001 *
≥1 completion of long-term care health report form (K038)	196 (80.99)	7,757 (55.88)	<.001 *
Most responsible physician in long-term care	91 (37.60)	1,409 (10.15)	<.001 *
Count of specialist referrals made[a]			
Total referrals			
To geriatric medicine			
To psychiatry	3 (10)	1 (4)	<.001 *
Referrals for patients aged ≥65	25 (41)	28 (45)	0.23
To psychiatry	6 (11)	2 (7)	<.001 *

Primary Care Patients			
Patients with a health services encounter [a]			
Total (any age)	860 (993)	1,273 (1,249)	<.001 *
Total aged ≥65	323 (285)	299 (314)	0.007 *
Rostered only (any age)	389 (776)	704 (979)	<.001 *
Not rostered only (any age)	377.50 (529)	474 (939)	0.002 *
Average age of patients, years [a]			
Rostered	54 (28)	44 (14)	<.001 *
Not rostered	55 (31)	44 (13)	<.001 *
Patients cared for aged ≥65 (%) [a]	39 (54)	23 (19)	<.001 *

FP=Family Physician; CCFP (COE)=Family physicians with a Certificate of Added Competence in Care of the Elderly; FP-COE=Family physicians with a focused practice billing designation in Care of the Elderly; ED=Emergency Department; OHIP=Ontario Health Insurance Plan

[a] Median and interquartile range are reported for continuous variables

[b] < 10,000 population in census metropolitan area

[c] Based on Census Metropolitan Area size

[d] Based on Ontario Marginalization Index factor score. Higher factor scores imply higher degrees of marginalization

[e] This represents gross billing amounts and payments according to the Ontario Schedule of Benefits. These amounts may not reflect net payments made/approved by the Ministry of Health

Table 2. Characteristics of "Care of the Elderly" Certificate of Added Competency holders

	Family Physicians with a "Care of the Elderly" Certificate of Added Competence (n=143)
	N (%)
Physician Demographics	
CACs earned	
Care of the Elderly	143 (100.0)
Palliative Care	7 (4.90)
Other [a]	8 (5.59)
Count of CACs	
1	130 (90.91)
2 or more	13 (9.09)
Calendar year COE CAC earned	
2015 or earlier	55 (38.46)
2016	56 (39.16)
2017 or later	32 (22.38)
Section of Researchers	17 (11.89)
Section of Teachers	43 (30.07)

CAC=Certificate of Added Competence; COE=Care of the Elderly

[a] "Other" includes addiction medicine, enhanced surgical skills, family practice anesthesia, obstetrical surgical skills, emergency medicine, or sport and exercise medicine

Table 3. Factors associated with family physicians with additional training/certification or focused practice in caring for older adults

	Unadjusted analysis	
	OR (95% CI)	**P value**
Physician Demographics		
Sex, Female	1.58 (1.22-2.04)	<.001 *
Years in practice	0.98 (0.97-0.99)	<.001 *
Community size [a]		
≥1,500,000 residents (ref)	-	-
500,000 to 1,499,999 residents	1.34 (0.94-1.90)	0.11
100,000 to 499,999 residents	1.46 (1.05-2.03)	0.02 *
10,000 to 99,999 residents	1.30 (0.82-2.06)	0.27
<10,000 residents	1.10 (0.68-1.80)	0.69
Location of medical school, Canada	1.58 (1.11-2.26)	0.01 *
Community-level marginalization [b]		
Residential instability	1.51 (1.19-1.91)	<.001 *
Material deprivation	0.74 (0.38-1.45)	0.38
Economic dependency	1.41 (0.93-2.14)	0.11
Ethnic diversity	0.69 (0.57-0.85)	<.001 *
Primary Care Practice Model		
Full-time affiliation with a patient enrolment model	0.95 (0.73-1.24)	0.69
Practice type		
Comprehensive (ref)	-	-
Focused	1.74 (1.28-2.37)	<.001 *
Other or <44 days in practice	1.13 (0.79-1.63)	0.50
Primary Care Activities		
Visits per 1,000 patients	0.96 (0.92-1.01)	0.09
Consultations per 1,000 patients	1.82 (1.39-2.38)	<.001 *
Submitted billings for adults aged 65+		
≥1 complex house call assessment (A900)	3.30 (2.55-4.25)	<.001 *
≥1 periodic health visit (K132)	0.83 (0.64-1.08)	0.16
≥1 home care application (K070)	2.36 (1.82-3.05)	<.001 *
≥1 completion of long-term care health report form (K038)	3.36 (2.44-4.64)	<.001 *
Most responsible physician in long-term care	5.33 (4.09-6.96)	<.001 *
Count of specialist referrals made for patients aged 65+		
To geriatric medicine	1.01 (1.00-1.01)	<.001 *
To psychiatry	1.00 (1.00-1.00)	0.02 *
Primary Care Patients		
Patients with a health services encounter		
Total aged 65+	1.00 (1.00-1.00)	0.08
Average age of patients, years		
Rostered	1.07 (1.06-1.08)	<.001 *
Not rostered	1.07 (1.06-1.08)	<.001 *

OR=Odds ratio; CI=Confidence Interval; Ref=Reference group
[a] Based on Census Metropolitan Area size
[b] Based on Ontario Marginalization Index factor score for the physician's primary practice location

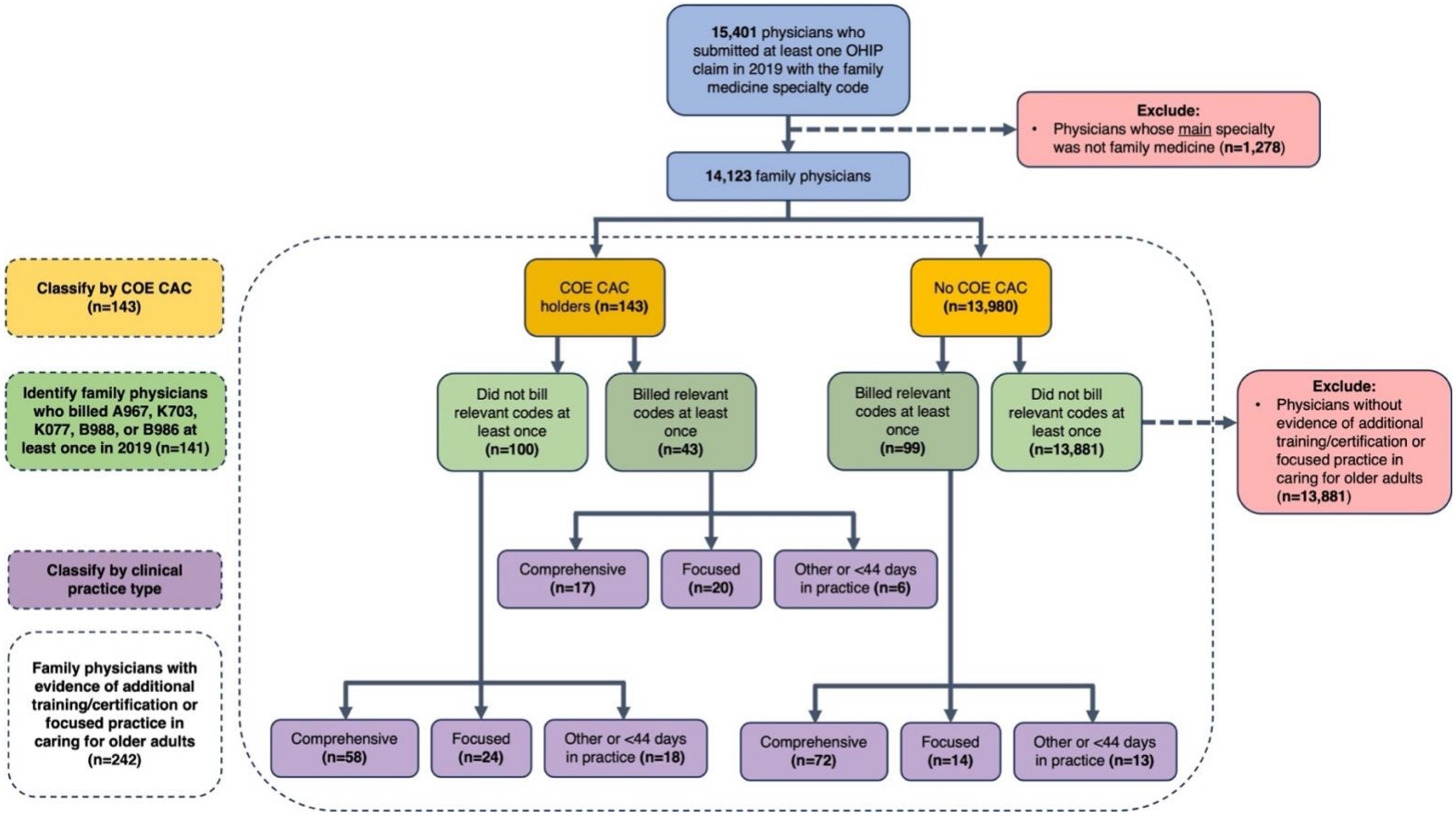


Figure 1. Cohort creation

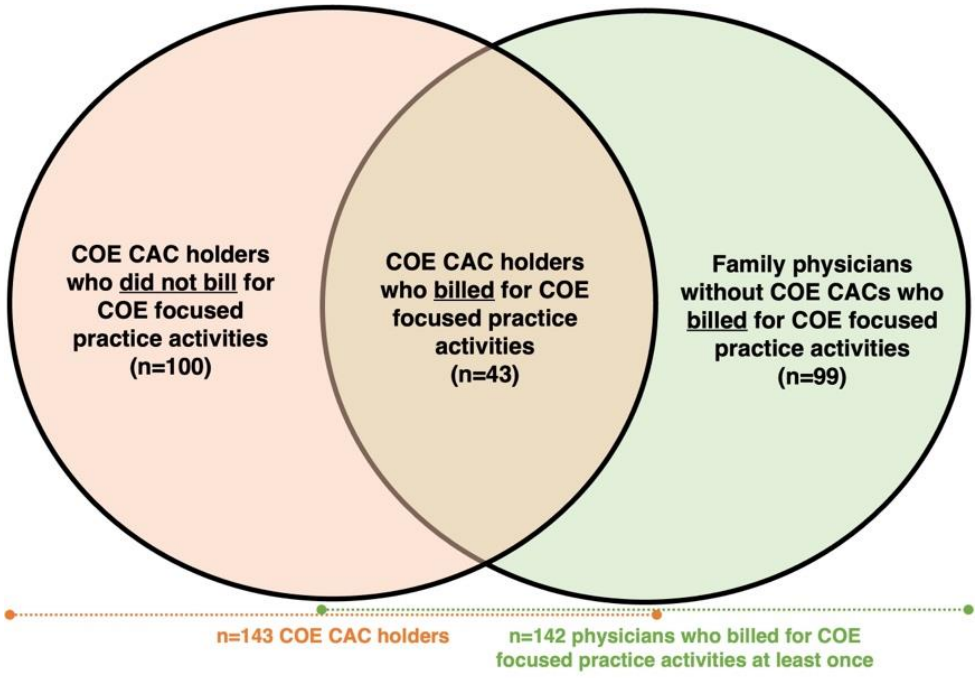


Figure 2. Family physician classification

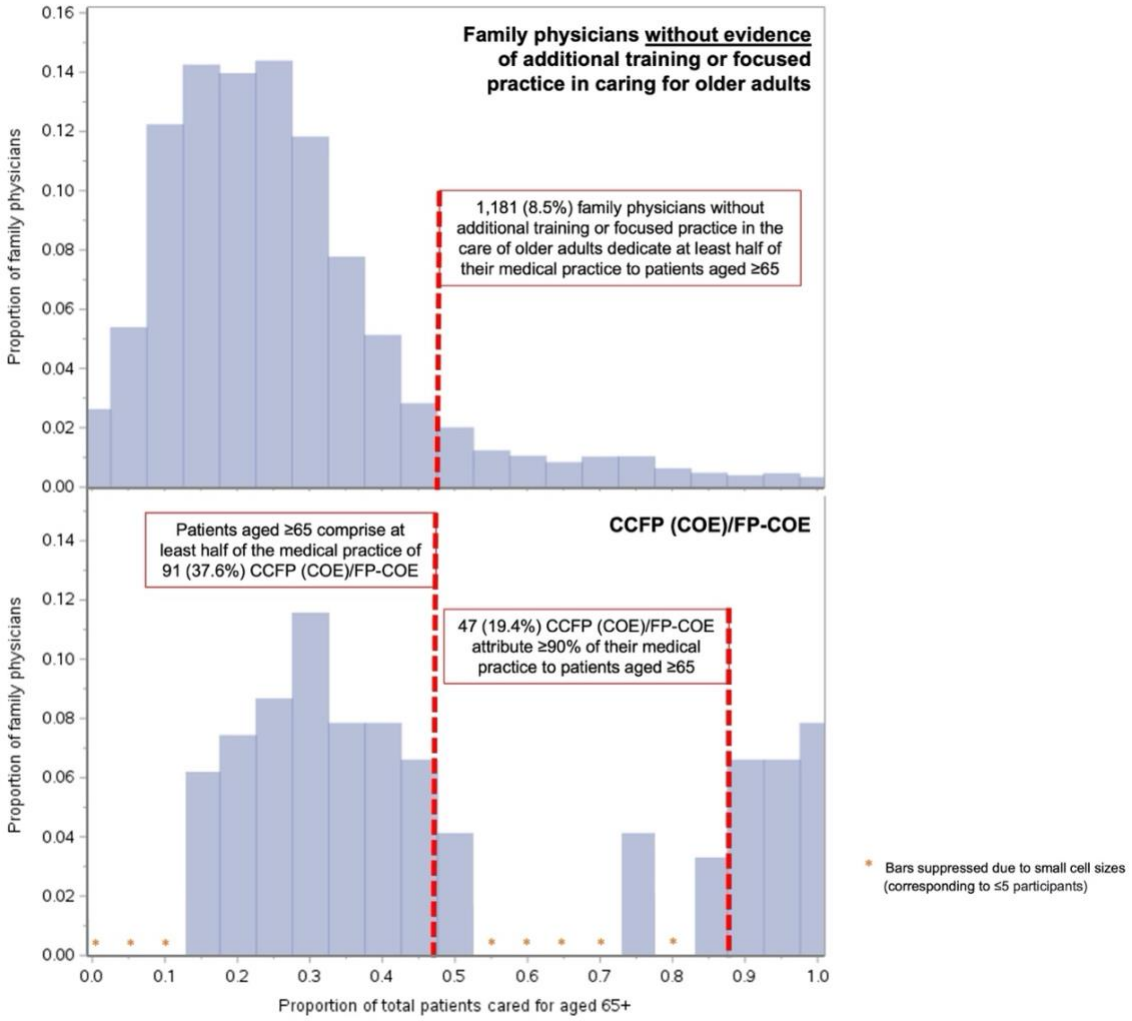


Figure 3. Proportion of total medical practice attributed to older patients

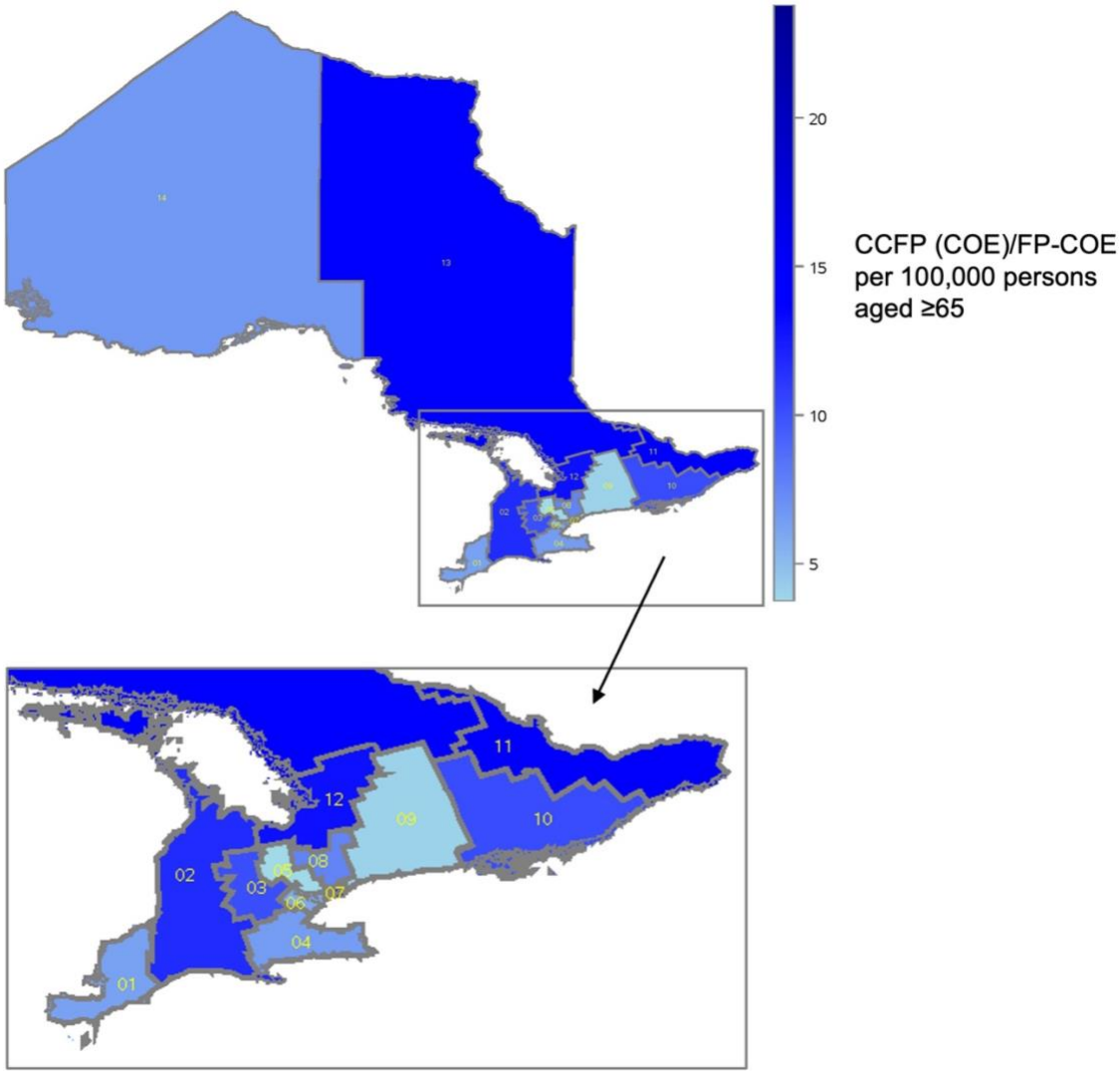


Figure 4. Practice locations of family physicians with additional training or focused practice per 100,000 older adults by health region

Appendices

Appendix 1. STROBE Statement – Checklist of items that should be included in reports of cohort studies

	Item No	Recommendation	Page No
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3
Objectives	3	State specific objectives, including any prespecified hypotheses	4
Methods			
Study design	4	Present key elements of study design early in the paper	4
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	4
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	
		(*b*) For matched studies, give matching criteria and number of exposed and unexposed	4-5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Apdx 2
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Apdx 2
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	4-5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Apdx 2
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	
		(*b*) Describe any methods used to examine subgroups and interactions	5
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, explain how loss to follow-up was addressed	
		(*e*) Describe any sensitivity analyses	

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	5
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	6
		(b) Indicate number of participants with missing data for each variable of interest	
		(c) Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	Report numbers of outcome events or summary measures over time	6-7
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	6-7
		(*b*) Report category boundaries when continuous variables were categorized	
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	7
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	8-9
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	7-9
Generalisability	21	Discuss the generalisability (external validity) of the study results	8-9
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Title page

*Give information separately for exposed and unexposed groups.

Appendix 2. Description of health administrative datasets

Dataset	Description	Relevant variables
Ontario Health Insurance Plan (OHIP)	The OHIP claims database contains information on publicly funded health services, primarily provided by physicians, to Ontario residents eligible for provincial health insurance. The main data elements are service/billing codes submitted by physicians.	• **Cohort creation:** physicians who submitted at least one OHIP fee claim in 2019 with "00" specialty code • **Cohort classification:** FP-COE fee codes (i.e., A967, K703, K077, B988, B986) • **Primary outcome:** family physicians with evidence of a FP-COE • **Baseline characteristics:** Various fee codes (e.g., K132, K070, K038, A900), number of referrals to geriatric medicine and psychiatry, nursing home practice[1], gross payments for OHIP billings
ICES Physician Database (IPDB)	IPDB uses billing and workforce information to assign specialties based on the proportion of specialty billing codes used.	• **Baseline characteristics:** physician sex, birth year, graduation year, location of medical school, size of CMA, practice type, focused practice,[2] main LHIN of practice, rurality, affiliation with PEM, consultation count, visit count, percent of FFS billings, core primary care billings
Primary Care Population (PCPOP)	PCPOP is an ICES-derived cohort of Ontario residents who are eligible for provincial health insurance and had at least one health services encounter within nine years of the index event.	• **Baseline characteristics:** physician model of care for most patients, median age of patients, number of rostered and not rostered patients with a health services encounter (practice size)
Ontario Marginalization Index (ON-MARG)	ON-MARG is a geographically based index that quantifies the degree of marginalization using area-level census data.	• **Baseline characteristics:** residential instability factor score, ethnic diversity factor score, material deprivation factor score, economic dependency factor score
College of Family Physicians of Canada (CFPC) Membership Database	The CFPC Membership Database is based on an annual survey to clinical and research members. We imported and linked a subset of membership data pertaining to COE CAC holders.	• **Cohort classification:** validated list of COE CAC holders • **Primary outcome:** family physicians with a COE CAC • **Baseline characteristics:** section of researchers membership, section of teachers membership, type(s) of CAC(s) earned and date(s)

COE=Care of the Elderly; CAC=Certificate of Added Competence; FP-COE=Focused Practice Designation in “Care of the Elderly”; CMA=Census Metro Area; LHIN=Local Health Integration Network; PEM=patient enrolment model; FFS=fee-for-service

Methodological Resources:

1. Correia RH, Dash D, Poss JW, Moser A, Katz PR, Costa AP. Physician practice in Ontario nursing homes: Defining physician commitment. J Am Med Dir Assoc. 2022 May [cited 2022 Nov 17];S152586102200322X. Available from: https://linkinghub.elsevier.com/retrieve/pii/S152586102200322X

2. Schultz SE, Glazier RH. Identification of physicians providing comprehensive primary care in Ontario: A retrospective analysis using linked administrative data. CMAJ Open. 2017 Dec 19 [cited 2021 May 14];5(4):E856–63. Available from: http://cmajopen.ca/lookup/doi/10.9778/cmajo.20170083

Appendix 3. Methodology to identify study population

Additional skills or focused practice organization in the care of older adults among family physicians (FPs) is enabled through additional training, including the Certificates of Added Competence (CAC) program accredited by the College of Family Physicians of Canada (CFPC),[1,2] and by funder arrangements such as the focused practice designation or salaried fee agreements offered by the Ontario Health Insurance Plan (OHIP).[3]

"Care of the Elderly" Certificate of Added Competency Holders

Canadian FPs can complete formal training directed by the CFPC to earn a CAC in "Care of the Elderly."[4,5] FPs certified in "Care of the Elderly" (CCFP (COE)) exhibit a defined level of competence in caring for older adults, which is complementary but distinct from geriatricians and geriatric psychiatrists.[6] The CFPC has outlined 18 priority topics to guide assessment efforts of physicians pursuing COE CAC training over time to infer their overall competence.[7] There is much diversity in how CCFP (COE) structure some or all of their medical practice to care for older patients,[2,8] as the CFPC does not mandate practice expectations for CAC holders.[4]

We identified CCFP (COE) using the validated list imported from the CFPC Membership Database. The data set contained information about FPs who responded to the CFPC's annual membership survey, including the type(s) of CACs and the date(s) they were earned.

Focused Practice Billing Designation in "Care of the Elderly"

In Ontario, FPs can obtain a focused practice designation in "Care of the Elderly" (FP-COE) as an alternative patient enrolment model, which recognizes specialized services provided by some FPs and their possible impact on the Access Bonus.[9,10] The Access Bonus is an Ontario payment incentive for FPs participating in harmonized payment models to focus and prioritize providing primary care services to enrolled patients.[10] To be eligible for focused practice billing designations, FPs must demonstrate a need within their community, have relevant training or qualifications, and dedicate a portion of their medical practice to the area of focus.[10] Despite an expectation for FP-COE to allocate at least 20% of their practice time to care for older patients, the focused practice designation does not intend to reflect the skills or abilities of physicians in the focused area.[10]

Physicians with a focused practice designation are eligible and incentivized to perform services relevant to their area of focused practice for attached patients and those within their group practice. Five OHIP fee codes pertain to FP-COE activities: "Care of the Elderly" focused practice assessments (A967), geriatric outpatient case conference (K703), geriatric telephone support (K077), geriatric home visit premium for first person seen (B988), and geriatric home visit travel premium (B986).[11] We classified physicians as FP-COE if they submitted at least one A967, K703, K077, B988, or B986 billing in 2019. Some FP-COE may be CAC holders, but not all CAC holders pursue a Focused Practice Designation.[10,12]

Taken together, we classified FPs skilled in the care of older adults as those with additional competence (CCFP (COE)) **and/or** focused practice organization (FP-COE) in "Care of the Elderly."

Methodological Resources:

1. Grierson L, Allice I, Baker A, Farag A, Guscott J, Howard M, et al. Impacts of the Certificates of Added Competence credentialling program: a qualitative case study of enhanced-skill family medicine practice across Canada. Can Med Assoc Open Access J. 2021 Oct 1 [cited 2021 Nov 16];9(4):E966–72. Available from: https://www.cmajopen.ca/content/9/4/E966

2. Correia RH, Grierson L, Allice I, Siu HYH, Baker A, Panday J, et al. The impact of care of the elderly certificates of added competence on family physician practice: results from a pan-Canadian multiple case study. BMC Geriatr. 2022 Nov 7 [cited 2022 Nov 10];22(1):840. Available from: https://bmcgeriatr.biomedcentral.com/articles/10.1186/s12877-022-03523-4

3. McKay M, Lavergne MR, Lea AP, Le M, Grudniewicz A, Blackie D, et al. Government policies targeting primary care physician practice from 1998-2018 in three Canadian provinces: A jurisdictional scan. Health Policy Amst Neth. 2022 Jun;126(6):565–75.

4. College of Family Physicians of Canada. Certificates of added competence in family medicine [Internet]. [cited 2021 Nov 3]. Available from: https://www.cfpc.ca/cac

5. Frank C, Seguin R. Care of the elderly training. Can Fam Physician. 2009 May [cited 2020 Jun 4];55(5):510-511.e4. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2682313/

6. Correia RH, Jabbar A, Siu HYH, Hogeveen S, Dash D, Mowbray FI, et al. Comparing the scopes of practice of geriatric-focused physicians in Canada: a qualitative study of core competencies. CMAJ Open. 2022 Apr [cited 2022 Jul 10];10(2):E563–9. Available from: http://cmajopen.ca/lookup/doi/10.9778/cmajo.20210193

7. Arcand M, Charles L, Feldman S, Frank C, Lam R, Mehta P, et al. Priority topics and key features for the assessment of competence in care of the elderly. The College of Family Physicians of Canada; 2017 [cited 2021 Nov 3]. Available from: https://www.cfpc.ca/CFPC/media/Resources/Education/COE_KF_Final_ENG.pdf

8. Elma A, Vanstone M, Allice I, Barber C, Howard M, Mountjoy M, et al. The Certificate of Added Competence credentialling program in family medicine: a descriptive survey of the family physician perspective of enhanced skill practices in Canada. Can Med Educ J. 2023 Oct 16 [cited 2023 Oct 19]; Available from: https://journalhosting.ucalgary.ca/index.php/cmej/article/view/77114

9. Government of Ontario, Ministry of Health and Long-Term Care. Primary care payment models in Ontario - health care professionals - MOHLTC [Internet]. Government of Ontario, Ministry of Health and Long-Term Care; [cited 2022 Nov 15]. Available from: https://www.health.gov.on.ca/en/pro/programs/pcpm/

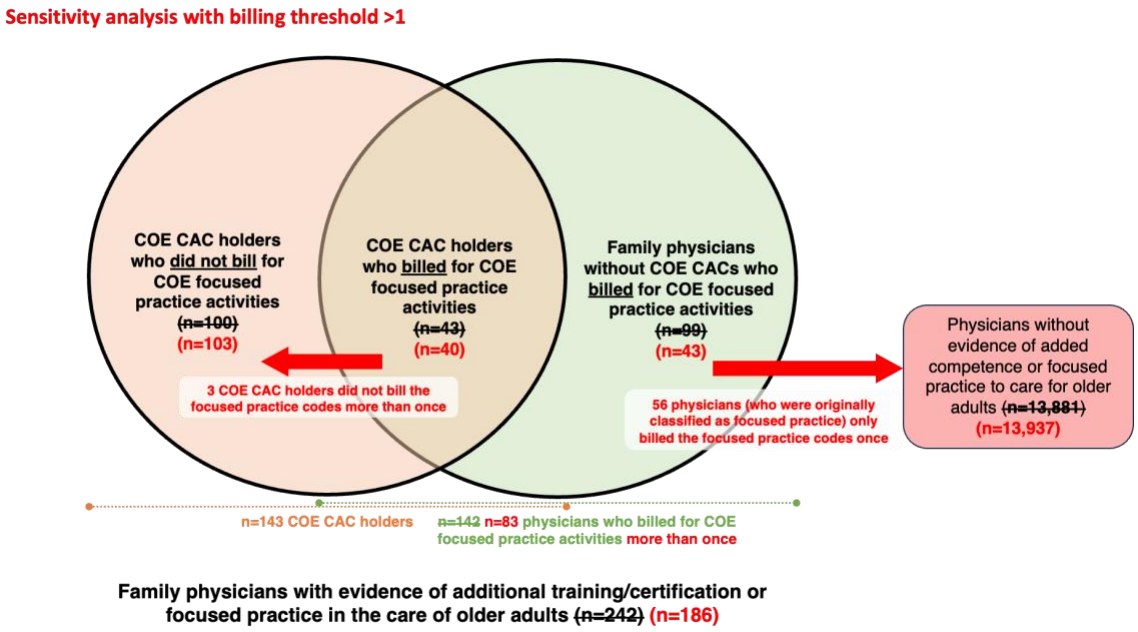
10. Ontario Medical Association. GP focused practice designation: policy and program overview [Internet]. 2018. Available from: https://docplayer.net/93133960-Gp-focused-practice-designation-policy-and-program-overview.html

11. Ministry of Health and Long-Term Care. Schedule of benefits under the Health Insurance Act [Internet]. Government of Ontario; 2021 Feb [cited 2021 Jun 15] p. 970. Available from: https://www.health.gov.on.ca/en/pro/programs/ohip/sob/

12. Marbeen M, Freeman TR, Terry AL. Focused practice in family medicine: quantitative study. Can Fam Physician. 2022 Dec 1 [cited 2023 May 3];68(12):905–14. Available from: https://www.cfp.ca/content/68/12/905

Appendix 4. Sensitivity analysis with increased threshold for focused practice billings

Revised cohort



Updated Table 1 with revised cohort

Table 1. Characteristics of family physicians with additional training/certification or focused practice in the care of older adults

	CCFP (COE)/FP-COE (n=186)	**FPs without evidence of additional training or focused practice** (n=13,937)	
		N (%) [a]	**P value**
Physician Demographics			
Sex, Female	115 (61.8)	6,784 (48.7)	<.001 *
Age (years) [a]	45 (17)	49 (22)	0.001 *
Years in practice [a]	17 (18)	22 (24)	<.001 *
Rural [b]	14 (7.5)	1,242 (8.9)	0.51
Community size [c]			0.29
≥1,500,000 residents	70 (37.6)	6,156 (44.2)	
500,000 to 1,499,999 residents	41 (22.0)	2,507 (18.0)	
100,000 to 499,999 residents	44 (23.7)	2,818 (20.2)	
10,000 to 99,999 residents	17 (9.1)	1,214 (8.7)	
<10,000 residents	14 (7.5)	1,242 (8.9)	

ED in physician's census subdivision	150 (80.6)	10,773 (77.3)	0.28
Location of medical school			
Canada	126 (67.7)	7,657 (54.9)	0.002 *
Unknown	35 (18.8)	3,367 (24.2)	
Community-level marginalization in primary practice location [a,d]			
Residential instability	0.04 (0.22)	0.02 (0.21)	<.001 *
Material deprivation	-0.12 (0.29)	-0.12 (0.43)	0.23
Economic dependency	-0.16 (0.55)	-0.16 (0.55)	0.40
Ethnic diversity	-0.07 (0.93)	-0.07 (1.22)	0.005 *
Primary Care Practice Model			
Full-time affiliation with a patient enrolment model	105 (56.5)	9,109 (65.4)	0.01 *
Practice type			
Comprehensive	102 (54.8)	9,626 (69.1)	<.001 *
Focused	53 (28.5)	2,177 (15.6)	
Other or <44 days in practice	31 (16.7)	2,134 (15.3)	
Type of patient enrolment model			
Enhanced fee-for-service models			
Comprehensive Care Model or Family Health Group	11 (5.9)	2,870 (20.6)	
Blended capitation models			<.001 *
Family Health Network or Family Health Organization	32 (17.2)	2,899 (20.8)	
Blended salary model			
Family Health Team	53 (28.5)	2,852 (20.5)	
Other or no enrolment group	80 (43.0)	3,964 (28.4)	
Unknown	10 (5.4)	1,352 (9.7)	
>50% of payments attributed to fee-for-service	82 (44.1)	6,992 (50.2)	0.01 *
Total OHIP billings ($) [a]	158,358 (145,410)	159,794 (158,266)	0.98
Primary Care Activities			
Billings attributed to core primary care services			0.01 *
Over half of all billings	119 (64.0)	10,265 (73.7)	
Unknown	23 (12.4)	1,348 (9.7)	
Count of patient visits [a]	2,574 (2,380)	3,006 (3,013)	0.008 *
Count of consultations [a]	75 (155)	2 (31)	<.001 *
Submitted billings for adults aged ≥65			
≥1 Care of the Elderly focused practice assessment (A967)	47 (25.3)	0 (0.0)	<.001 *
≥1 geriatric outpatient case conference (K703)	55 (29.6)	0 (0.0)	<.001 *
≥1 geriatric telephone support (K077)	20 (10.8)	0 (0.0)	<.001 *
≥1 geriatric home visit premium for first person seen (B988)	17 (9.1)	0 (0.0)	<.001 *
≥1 geriatric home visit travel premium (B986)	18 (9.7)	0 (0.0)	<.001 *

≥1 complex house call assessment (A900)	90 (48.4)	3,263 (23.4)	<.001 *
≥1 periodic health visit (K132)	93 (50.0)	8,406 (60.3)	0.004 *
≥1 home care application (K070)	109 (58.6)	5,198 (37.3)	<.001 *
≥1 completion of long-term care health report form (K038)	145 (78.0)	7,808 (56.0)	<.001 *
Most responsible physician in long-term care	82 (44.1)	1,418 (10.2)	<.001 *
Count of specialist referrals made[a]			
Total referrals			
To geriatric medicine	2 (10)	1 (5)	<.001 *
To psychiatry	20 (36)	28 (45)	0.004 *
Referrals for patients aged ≥65			
To psychiatry	6 (11)	2 (7)	<.001 *
Primary Care Patients			
Patients with a health services encounter [a]			
Total (any age)	720 (949)	1,273 (1,249)	<.001 *
Total aged ≥65	326 (271)	299 (315)	0.04 *
Rostered only (any age)	195 (697)	705 (977)	<.001 *
Not rostered only (any age)	361 (477)	474 (936)	<.001 *
Average age of patients, years [a]			
Rostered	57 (29)	44 (14)	<.001 *
Not rostered	61 (31)	44 (13)	<.001 *
Patients cared for aged ≥65 (%) [a]	46 (58)	23 (19)	<.001 *

FP=Family Physician; CCFP (COE)=Family physicians with a Certificate of Added Competence in Care of the Elderly; FP-COE=Family physicians with a focused practice billing designation in Care of the Elderly; ED=Emergency Department; OHIP=Ontario Health Insurance Plan

[a] Median and interquartile range are reported for continuous variables

[b] < 10,000 population in census metropolitan area

[c] Based on Census Metropolitan Area size

[d] Based on Ontario Marginalization Index factor score

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CHAPTER FIVE

Do Family Physicians with Focused Practice or Care of the Elderly Training Practice Differently than Others? A Population-Based, Propensity Score-Matched Cohort Study

Summary

This chapter builds on findings from Chapters 3 and 4 to compare family physicians with/without elderly-focused practices or added competence on established clinical practice performance measures. Using the approach to identify family physicians with a COE CAC and/or a focused practice billing designation in COE (developed in Chapter 4), I created a matched cohort of family physicians without this training or practice organization. I operationalized the technical definitions established in the RAM study (Chapter 3) to compare performance on 11 practice-based quality indicators. This study was the first to examine the health services impacts of focused practice and additional training in Canada on the clinical practice of family physicians.

The findings indicate that family physicians with a COE CAC or focused practice perform similarly on established performance measures compared to other physicians. These similarities may reflect the provider- and practice-level differences found in Chapter 4. Given the small number and magnitude of observed differences on performance measures, this study suggests that elderly-focused practice and training may not impact clinical practice.

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Abstract

Background: Older adults are frequent users of primary care, and family physicians vary in aptitude, confidence, and interest to care for complex older patients. We compared performance on established clinical practice measures among FPs with/without evidence of elderly-focused practice or training. **Methods:** We used linked administrative data to conduct a population-based, propensity score-matched cohort study. Participants included family physicians in Ontario with rostered patients who practiced in 2019. Using logistic regression, we computed propensity scores and matched physicians with a focused alternative funding plan and/or a Certificate of Added Competence in Care of the Elderly at a 1:4 ratio to a control group. We adjusted for physician factors, medical practice characteristics, and primary care activities. We examined 11 practice-based quality indicators endorsed by Canadian clinicians and researchers. **Results:** We identified 232 family physicians with an elderly-focused practice or training and 928 comparable controls. While clinical practice did not vary for most indicators (n=7), physicians differed on four performance measures. More physicians with elderly-focused practice or training conducted testing aligned with the most recent Canadian Consensus on Dementia (mean difference, 2.46%; CI=1.16-3.76) and provided dementia care management (mean difference, 4.32%; CI=0.24-8.40). However, physicians with focused practice or certification were more likely to prescribe potentially inappropriate medications (mean difference, 6.83%; CI=3.79-9.87) and antipsychotics (mean

difference, 2.98%; CI=0.53-5.42) to older attached patients. **Interpretation:** Family physicians with a focused practice or certification in Care of the Elderly exhibited similar performance on established indicators compared to other physicians, suggesting that clinical practice may not differ by elderly-focused practice organization and training.

Introduction

Family physicians (FPs) deliver comprehensive, continuous, and coordinated care to older patients.[1] In Canada, older adults constitute a large proportion of FPs' overall medical practice and, compared to specialists, FPs provide the majority of older adult care.[2–4] Older adults' use of primary care services is expected to increase given demographic shifts.[5] Despite their important role to the patient's medical home,[6] FPs vary in their aptitude, confidence, and interest to care for older patients.[7] In addition, FPs report interpersonal (e.g., communication) challenges, administrative burdens, inadequate time and remuneration, and deficient knowledge of community resources/services as barriers to caring for this patient population.[2]

High quality care of older patients is challenged by their medical complexity, evidenced by multimorbidity, chronicity, polypharmacy, and care-seeking across settings and from multiple providers.[8] While all FPs achieve foundational knowledge and clinical skills to care for older adults,[9] some pursue additional training to hone geriatric competencies[10,11] and/or intend to dedicate a portion of their medical practice exclusively to older patients.[12] At this time, the impacts of elderly-focused practice and training are largely unknown, although some descriptive work has characterized these providers.[13–19] Recent advances have allowed FPs with focused practice or additional training within administrative data to be identified – enabling inferences about the quality of their care.[19]

The Donabedian model – the dominant health services paradigm to assess, evaluate, and improve quality – conceptualizes the interrelationships of structures and processes affecting health care outcomes.[20] Process measures include interactions between patients and health care providers for clinical practice activities or service provision. Through this model, we can conceptualize and quantify the contributions of FPs with focused practice or additional training, and make inferences about health care quality for older patients.[21] However, quality measurement is often limited by information sources, and most indicators are not developed in reference to available data holdings.[7]

We previously established consensus on clinical practice quality indicators that are integral to the primary care of older adults and can be assessed using health administrative data.[7,22] Endorsed by a panel of Canadian clinicians and researchers, we developed technical specifications for the established performance measures by referencing a population-based, health administrative data source. Now, using these technical definitions, we aimed to compare the clinical practice of FPs with and without focused practice or additional training to care for older adults. We hypothesized that elderly-focused practice and enhanced geriatric competence would contribute to improved practice performance.

Methods

Design/setting: We conducted a population-based, propensity score-matched cohort study to compare FP clinical practice in Ontario, Canada. Our

reporting concords with the REporting of studies Conducted using Observational Routinely collected health Data (RECORD) statement (Appendix 1).[23]

Data source: We accessed multiple datasets at ICES, an independent, non-profit research institute that collects and analyzes health care and demographic data about publicly funded encounters (Appendix 2).[24] Datasets were linked using unique encoded identifiers. We conducted a project-specific data linkage with the CFPC Membership Database to identify FPs with a COE CAC. Data were analyzed using the Remote Access Environment at ICES McMaster.

Participants: We established a cohort of FPs who submitted at least one Ontario Health Insurance Plan (OHIP) fee claim in the calendar year, 2019. We excluded physicians who were not residents of Ontario and those whose main specialty in the ICES Physician Database (IPDB) did not indicate family medicine/general practice. Physicians without any rostered patients were subsequently excluded, as the performance measures pertain to the ongoing care of attached patients.[25]

We identified FPs with evidence of focused practice or additional training to care for older adults based on a classification developed previously by our team.[19] A focused practice designation was attributed to FPs who bill OHIP fee codes eligible to those enrolled in an alternative funding plan by the Ministry of Health. To apply for a focused practice billing designation, FPs demonstrate need within their community, have relevant training or qualifications, and dedicate at

least 20% of their practice time to caring for older patients.[26] Additional training was demonstrated by holding a Certificate of Added Competence (CAC) in Care of the Elderly (COE) from the College of Family Physicians of Canada (CFPC).[27] COE CAC holders exhibit a defined level of competence in caring for older adults across 18 Priority Topics.[10,28] There may be some overlap between CAC holders and FPs with a focused practice, but the groups are not identical.[17,19]

Outcomes: We trialed and refined the measurement of 11 practice-based quality indicators endorsed in a RAND/UCLA Appropriateness Method (RAM) study.[22] These established performance measures characterize primary care quality for older primary care patients across four COE Priority Topics.[28] In the RAM study, health services researchers (RHC, AJ, APC) drafted technical definitions corresponding to each endorsed indicator. Panelists reviewed the specifications in a synchronous group meeting and rated items in two questionnaires. The technical definitions examined in this work reflect panelists' feedback and review by a physician (HS) for clinical accuracy.

Although 12 indicators were endorsed in the RAM study, we assessed 11 outcomes here due to considerable overlap in the measurement and interpretation of two indicators. Names of relevant datasets and variables, steps in computation, and the interpretations are described in Appendix 3. For each indicator, the presence or absence of the practice activity was determined and summarized as a proportion at the physician-level. This resulted in each indicator representing the average proportion of FPs – in either group – who

delivered/performed the clinical practice performance measure to older attached patients.

Analysis: We used propensity score matching to identify a comparable control group of FPs without evidence of elderly-focused practice or additional training. These FPs *may* represent those with "naturally aged" practices[29] and/or physicians who acquired additional geriatric competencies through educational opportunities other than CAC training.[30–33] Propensity scores estimate the probability of assignment to an exposure, and are used to balance baseline characteristics between two otherwise non-comparable groups.[34] Matching on the propensity score enables us to reduce the effects of confounding on estimates of the association between our exposure (i.e., having a focused practice or CAC) and outcome (i.e., indicator performance).

We calculated propensity scores using logistic regression to model the probability of exposure while adjusting for physician factors (i.e., years in practice, community size of primary practice location), practice model (i.e., practice type and patient enrolment model), and primary care activities (i.e., long-term care [LTC] practice and the number of patients cared for aged ≥65). These matching variables were selected based on their relevance to family practice organization, the care of older adults, and significant differences at baseline. FPs with evidence of elderly-focused practice or additional training were matched at a 1:4 ratio to a control group without replacement using a caliper of 0.2 times the standard deviation of the logit of the propensity score.[35–37]

We reported provider and practice characteristics using measures of general frequency, central tendency, dispersion, and standardized differences.[38] We reported mean differences to compare the indicator rates between groups. We then compared clinical practice performance measures between FP groups by conducting t-tests with the conventional alpha=0.05 threshold for significance. Cases with missing data were excluded. All analyses were performed using Statistical Analysis Software, version 9.4.

Ethics: This study was approved by the Hamilton Integrated Research Ethics Board (11391). The use of ICES data is authorized under Section 45 of Ontario's Personal Health Information Protection Act, which allows for the collection and analysis of health care and demographic data, without consent, for health system evaluation and improvement.

Results

12,701 FPs met our selection criteria and 232 (1.83%) had evidence of an elderly-focused practice or CAC (Figure 1). Before matching, these groups were imbalanced on numerous covariates. Propensity score-matching resulted in 232 FPs with an elderly-focused practice or CAC and 928 controls (n=1,160). After matching, the standardized differences for all descriptive factors were ≤0.1, suggesting comparability between groups (Table 1). FPs with elderly-focused practices or training tended to have comprehensive practices (n=146; 62.93%) with 382.57 (SD=249.57) unique encounters, on average, with patients aged ≥65.

Ninety-one FPs (39.22%) with focused practices or CACs were a most responsible physician (MRP) in LTC.

FPs with/without elderly-focused practices or CACs significantly differed on four performance measures (Table 2). On average, FPs with elderly-focused practices or CACs performed more testing for older patients aligned with the most current Canadian Consensus on Dementia (mean difference: 2.46%, CI=1.16-3.76) compared to controls (Indicator 3). In contrast to other FPs, a greater proportion of FPs with elderly-focused practices or CACs performed activities pertaining to dementia care management (mean difference: 4.32%, CI=0.24-8.40) (Indicator 4). FPs with elderly-focused practices or CACs prescribed one or more potentially inappropriate medications (PIPs) to a greater proportion of attached older patients (mean difference: 6.83%, CI=3.79-9.87) compared to controls (Indicator 7). Further, for attached older patients living with dementia, FPs with elderly-focused practices or CACs prescribed more antipsychotics (mean difference: 2.98%, CI=0.53-5.42) versus controls (Indicator 10). We observed no significant differences on the remaining quality indicators (n=7).

Missingness was observed for all indicators, ranging from 3.0% to 20.2% (Appendix 4). In all instances, missing values resulted from a physician roster without any patients for which the indicator could be calculated.

Interpretation

This study was the first to examine the health services impacts of focused practice and added competence in Canada on the clinical practice of FPs. We

operationalized 11 established performance measures using health administrative data and observed minimal practice differences between FPs with/without elderly-focused practices or CACs. While we expected that FPs with focused practices or additional training would demonstrate substantial differences in caring for older patients, we only observed discrepancies on four indicators. Performance measures related to caring for patients with greater medical complexity (i.e., cognitive impairment, multimorbidity inferred by polypharmacy) often differed between FP groups. In contrast, crude indicators (applying broadly to attached older patients) were often similar for those with/without focused practices or additional training. This study, in conjunction with our prior work,[22] demonstrates the feasibility of operationalizing quality indicators for clinical practice measurement. We extend previous research that examined the impacts of COE CACs using survey methods and interviews,[13,14] and contribute new information about focused practice.[17,39]

Older adults attached to FPs with elderly-focused practices or CACs were more likely to receive testing and care management for cognitive impairment. While all FPs demonstrate competence in dementia care for certification,[9] COE CAC holders are expected to exhibit 16 additional competencies.[28] Enhanced dementia training and more exposure/experience caring for older patients with memory concerns in a focused setting may explain the observed differences on three relevant indicators. Surprisingly, FPs with a focused practice or additional training were more likely to prescribe PIPs and antipsychotics to attached older

patients. Given five explicit competencies related to appropriate prescribing for COE CAC assessment,[28] suggesting greater knowledge/awareness of PIP risks, this finding was unexpected. However, these practice differences may be explained by FPs with elderly-focused practices or CACs exhibiting greater comfort with the pragmatic use of PIPs and antipsychotics, which may be warranted or beneficial in some circumstances.[40] We could not control for patient-level factors (e.g., sex, multimorbidity, social deprivation) that have been shown to increase PIP use. However, FPs with additional expertise in caring for older adults should have the competence to manage and understand the nuances of appropriately prescribing an "inappropriate" medication to older patients.[41,42] These FPs would be more comfortable in having a patient population that represents the spectrum of frailty, and not just the well older adult.

Similarities observed for most performance measures (i.e., 7 of 11 indicators) may reflect the small provider- and practice-level differences between FPs with/without elderly-focused practices or CACs.[19] The lack of distinguishing characteristics calls into question the efficacy of alternative funding plans and educational opportunities. Considered "valued resources" by the CFPC,[43] COE CAC holders are well positioned to mitigate health human resource (HHR) shortfalls of geriatric specialists and offer expertise to colleagues and patients.[2] However, our previous findings suggest that FPs with elderly-focused practices or training are not intensively caring for older adults,[19] which may explain the minimal practice differences observed. Our findings indicate that some core

professional activities expected of COE CAC holders are not always achieved: FPs with elderly-focused practice or training did not consistently provide an advanced level of care for patients with complex needs or increase the capacity of other FPs to care for older adults.[27] The lack of differences in indicator performance suggests that FPs who pursue elderly-focused practice or training function like other FPs whose medical practice comprises a comparable number of older adults and LTC activity. This suggests the development of practice-based or independently developed expertise to care for elderly patients – regardless of CAC certification or focused practice designation – yielding a similar level of care quality.

We previously found that FP practice does not vary greatly on the basis of having an elderly-focused practice or CAC.[13,19] Marginal differences in practice performance, observed here, can be juxtaposed against the rapidly aging population, and the complexity of older patients posited to benefit from enhanced remuneration and training. COE CAC holders acknowledge limited incentives to establish and pursue focused practices,[13,14] which may encourage CAC holders to maintain comprehensive practices.[13,19] Further, prior HHR estimates indicate that less than one-third of COE CACs directly support specialized services for older adults.[44] While some FPs directly contribute to SGS, memory clinics, rehabilitation units, retirement homes, and LTC,[13,16] others maintain family practice models caring for patients of all ages.[19] Those who continue to care for patients across all life stages may see the diminishing influence of their

specialized training for geriatric care, resulting in similar performance observed here. Together, our findings suggest that FPs in comprehensive practice with high proportions of elderly patients and LTC commitment provide comparable care regardless of additional training.

Limitations: Our assessment and interpretation of clinical practice was limited by available information within our data source and the validity of our technical specifications, although the nature of the analytic design meant that these weaknesses were non-differential between groups. Given measurement challenges (detailed in Appendix 3), the absolute indicator rates are knowingly imperfect, and their interpretations must consider the technical limitations. For indicators with low rates in both groups, it is unknown whether these processes are, in fact, not frequently occurring or if they reflect poor measurement. We could not adjust for unmeasured confounders that may have affected practice differences (e.g., patients' behavioural problems) or disparities in access. Our interpretations are limited by the lack of patient-level information about clinical indications preceding the activities assessed. The complexity and heterogeneity of older patients may have warranted deviance from widely accepted clinical guidance (e.g., instances where PIP is justified). However, measurement challenges were consistent across both groups, so the comparative conclusions hold. Lastly, our assessment of care quality was limited to processes endorsed in the preceding consensus study.[22]

Conclusion: We observed similar levels of achievement among FPs with high proportions of older patients and those engaged in LTC practice, regardless of having a focused practice or additional training, on performance measures pertinent to caring for older adults. Given related work demonstrating minimal practice differences between FPs with/without elderly-focused practice or CACs, we conclude that these policy interventions do not differentiate clinical practice.

Tables and Figures

Table 1. Participant characteristics after matching (N=1,160)

	FPs with a focused practice or CAC in COE (n=232)	FPs without a focused practice or CAC in COE (n=928)	Standardized difference
	N (%) [a]		
Physician Demographics			
Years in practice [a]	18.82 (11.29)	19.01 (13.10)	0.02
Community size [b]			
≥1,500,000 residents	89 (38.36)	358 (38.58)	0.004
500,000 to 1,499,999 residents	45 (19.40)	189 (20.37)	0.02
100,000 to 499,999 residents	58 (25.00)	198 (21.34)	0.09
10,000 to 99,999 residents	22 (9.48)	107 (11.53)	0.07
<10,000 residents	18 (7.76)	76 (8.19)	0.02
Primary Care Practice Model			
Full-time affiliation with a PEM	155 (66.81)	628 (67.67)	0.02
Medical practice type			
Comprehensive	146 (62.93)	569 (61.31)	0.03
Focused	53 (22.84)	207 (22.31)	0.01
Other or <44 days in practice	33 (14.22)	152 (16.38)	0.06
Primary Care Activities			
MRP in long-term care	91 (39.22)	370 (39.87)	0.01
Primary Care Patients			
Patients with a health services encounter [a]			
Total aged ≥65	382.57 (249.57)	386.88 (297.08)	0.02

FP=family physician; CAC=Certificate of Added Competence; COE=Care of the Elderly; PEM=patient enrolment model; MRP=most responsible physician

[a] Mean and standard deviation are reported for continuous variables

[b] Based on Census Metropolitan Area size

Table 2. Clinical activities of family physicians on practice-based quality measures by Care of the Elderly Priority Topic

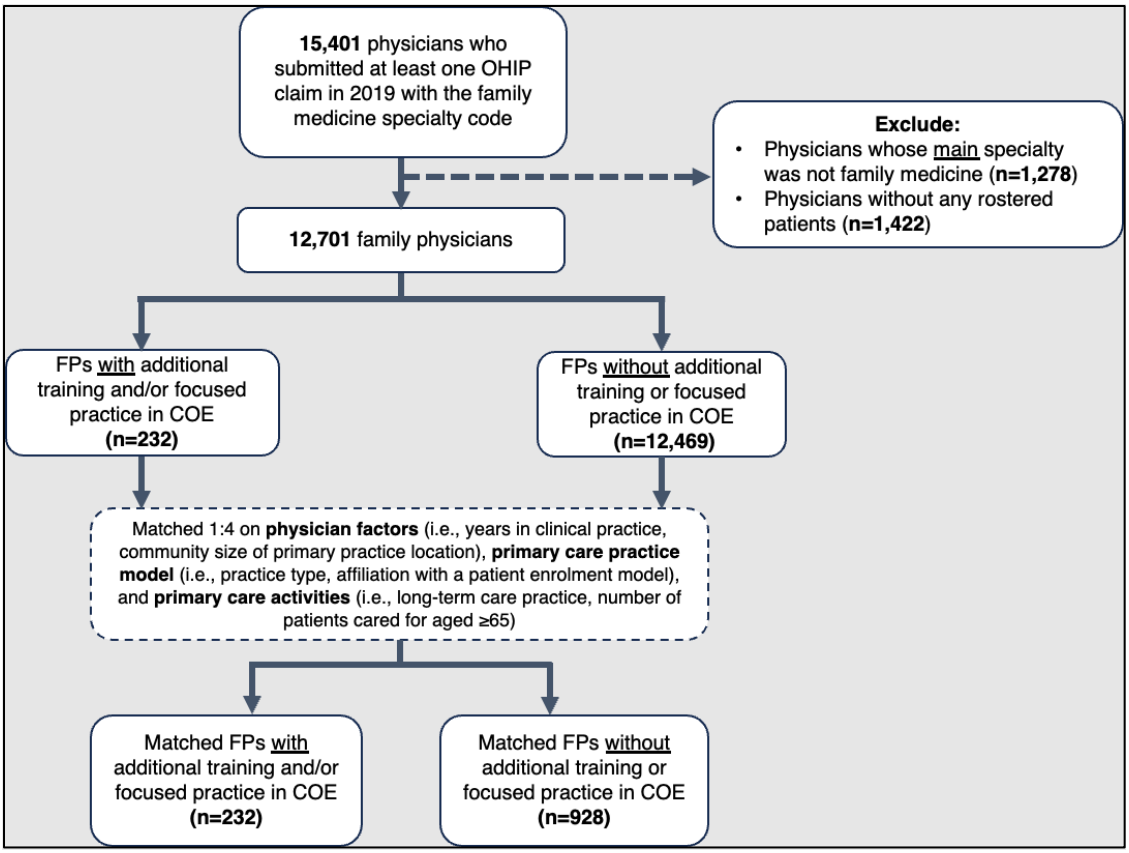
	Mean (SD)		Mean difference (95% CI)	P value
	FPs with a focused practice or CAC in COE (n=232)	FPs without a focused practice or CAC in COE (n=928)		
Medical Conditions				
Indicator 1: Proportion of attached patients aged ≥65 who received the influenza vaccine, % *Missing, n (%)*	27.78 (26.13) 7 (3.0)	29.35 (25.01) 83 (8.9)	-1.57 (-5.29, 2.15)	0.4070
Indicator 2: Proportion of attached patients aged ≥65 living with COPD who received influenza and pneumococcal immunizations, % *Missing, n (%)*	29.07 (26.05) 23 (9.9)	30.33 (25.68) 152 (16.4)	-1.25 (-5.19, 2.69)	0.5321
Indicator 3^: Proportion of attached patients aged ≥65 living with dementia who received tests aligned with the most current Canadian Consensus on Dementia, % *Missing, n (%)*	5.44 (10.77) 19 (8.2)	2.98 (7.76) 187 (20.2)	2.46 (1.16, 3.76)	0.0002 *
Indicator 4^: Proportion of attached patients aged ≥65 living with dementia who received dementia care management, % *Missing (%)*	76.46 (24.52) 19 (8.2)	72.14 (27.33) 187 (20.2)	4.32 (0.24, 8.40)	0.0379 *
Appropriate Prescribing				
Indicator 5: Proportion of attached patients aged ≥65 who are prescribed one or more benzodiazepines, % *Missing, n (%)*	8.91 (10.03) 7 (3.0)	8.74 (10.33) 83 (8.9)	0.17 (-1.34, 1.68)	0.8215
Indicator 6: Proportion of attached patients aged ≥65 who are prescribed one or more medications with strong anticholinergic effects, % *Missing, n (%)*	0.08 (0.29) 7 (3.0)	0.11 (0.56) 83 (8.9)	-0.03 (-0.10, 0.05)	0.4822
Indicator 7: Proportion of attached patients aged ≥65 who are prescribed one or more potentially inappropriate	36.35 (22.23) 7 (3.0)	29.52 (20.21) 83 (8.9)	6.83 (3.79, 9.87)	<.0001 *

medications (e.g., from Beers list, START/STOPP criteria), % *Missing, n (%)*				
Indicator 8: Proportion of attached patients aged ≥65 with more than one prescribing physician who received a collaborative medication review, % *Missing, n (%)*	0.05 (0.19) 11 (4.7)	0.09 (0.57) 95 (10.2)	-0.04 (-0.12, 0.04)	0.3199
Indicator 9: Proportion of attached patients aged ≥65 living with CHF who were prescribed ACE inhibitors, ARBs, beta-blockers, or SGLT2 inhibitors, % *Missing, n (%)*	53.72 (26.59) 25 (10.8)	56.79 (26.51) 186 (20.0)	-3.07 (-7.16, 1.02)	0.1410
Indicator 10^: Proportion of attached patients aged ≥65 living with dementia who are prescribed antipsychotics, % *Missing, n (%)*	17.02 (17.83) 19 (8.2)	14.05 (15.49) 187 (20.2)	2.98 (0.53, 5.42)	0.0171 *
Driving Issues				
Indicator 11^: Proportion of attached patients aged ≥65 living with dementia whose medical condition was reported to the Ministry of Transportation, % *Missing, n (%)*	1.48 (4.23) 19 (8.2)	0.96 (3.52) 187 (20.2)	0.51 (-0.05, 1.08)	0.0743

FP=family physician; CAC=Certificate of Added Competence; COE=Care of the Elderly; COPD=chronic obstructive pulmonary disease; CHF=congestive heart failure; ACE=Angiotensin-converting-enzyme; ARBs= Angiotensin receptor blockers; SGLT2=Sodium-glucose cotransporter-2

*Significant at the level of 0.05

^ Indicator also relates to the Cognitive Impairment COE Priority Topic



OHIP=Ontario Health Insurance Plan; FP=family physician; COE=Care of the Elderly

Figure 1. Flow diagram of participant selection and matching

Appendices

Appendix 1. Completed RECORD checklist

	Item No.	STROBE items	Location in manuscript where items are reported	RECORD items	Location in manuscript where items are reported
Title and abstract					
	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found	Page 1	RECORD 1.1: The type of data used should be specified in the title or abstract. When possible, the name of the databases used should be included. RECORD 1.2: If applicable, the geographic region and timeframe within which the study took place should be reported in the title or abstract. RECORD 1.3: If linkage between databases was conducted for the study, this should be clearly stated in the title or abstract.	Page 1 Page 1 Page 1
Introduction					
Background rationale	2	Explain the scientific background and rationale for the investigation being reported	Pages 2-3		
Objectives	3	State specific objectives, including any prespecified hypotheses	Page 3		
Methods					
Study Design	4	Present key elements of study design early in the	Page 3		

		paper			
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Page 3		
Participants	6	(a) *Cohort study* - Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up (b) *Cohort study* - For matched studies, give matching criteria and number of exposed and unexposed	Pages 3-4 Page 5, Figure 1	RECORD 6.1: The methods of study population selection (such as codes or algorithms used to identify subjects) should be listed in detail. If this is not possible, an explanation should be provided. RECORD 6.2: Any validation studies of the codes or algorithms used to select the population should be referenced. If validation was conducted for this study and not published elsewhere, detailed methods and results should be provided. RECORD 6.3: If the study involved linkage of databases, consider use of a flow diagram or other graphical display to demonstrate the data linkage process, including the number of individuals with linked data at each stage.	Pages 2-3, Appendix 2 Pages 3-4 Page 3, Figure 1
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable.	Appendix 2 & 3	RECORD 7.1: A complete list of codes and algorithms used to classify exposures, outcomes, confounders, and effect modifiers should be provided. If these cannot be reported, an explanation should be provided.	Appendix 2 & 3
Data sources/ measurement	8	For each variable of interest, give sources of data and details of methods of assessment (measurement).	Page 3, Appendix 2 & 3		

		Describe comparability of assessment methods if there is more than one group			
Bias	9	Describe any efforts to address potential sources of bias	Page 5		
Study size	10	Explain how the study size was arrived at	Pages 3-5		
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen, and why	Pages 3-5		
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) *Cohort study* - If applicable, explain how loss to follow-up was addressed (e) Describe any sensitivity analyses	Page 5		
Data access and cleaning methods		..		RECORD 12.1: Authors should describe the extent to which the investigators had access to the database population used to create the study population. RECORD 12.2: Authors should provide information on the data cleaning methods used in the study.	Pages 3-4 Pages 3-5

Linkage		..		RECORD 12.3: State whether the study included person-level, institutional-level, or other data linkage across two or more databases. The methods of linkage and methods of linkage quality evaluation should be provided.	Page 3
Results					
Participants	13	(a) Report the numbers of individuals at each stage of the study (*e.g.*, numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed) (b) Give reasons for non-participation at each stage. (c) Consider use of a flow diagram	Figure 1	RECORD 13.1: Describe in detail the selection of the persons included in the study (*i.e.,* study population selection) including filtering based on data quality, data availability and linkage. The selection of included persons can be described in the text and/or by means of the study flow diagram.	Figure 1
Descriptive data	14	(a) Give characteristics of study participants (*e.g.*, demographic, clinical, social) and information on exposures and potential confounders (b) Indicate the number of participants with missing data for each variable of interest (c) *Cohort study* - summarise follow-up time (*e.g.*, average and total amount)	Page 6, Table 1 Page 6 N/A		
Outcome data	15	*Cohort study* - Report numbers of outcome events or summary measures over time	Page 6, Table 2		

Main results	16	(a) Give unadjusted estimates and, if applicable, confounder- adjusted estimates and their precision (e.g., 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Page 6, Table 2		
Other analyses	17	Report other analyses done e.g., analyses of subgroups and interactions, and sensitivity analyses	N/A		
Discussion					
Key results	18	Summarise key results with reference to study objectives	Page 7		
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Page 9	RECORD 19.1: Discuss the implications of using data that were not created or collected to answer the specific research question(s). Include discussion of misclassification bias, unmeasured confounding, missing data, and changing eligibility over time, as they pertain to the study being reported.	Page 9
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar	Pages 7-9		

		studies, and other relevant evidence			
Generalisability	21	Discuss the generalisability (external validity) of the study results	Page 9		
Other Information					
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Title page		
Accessibility of protocol, raw data, and programming code		..		RECORD 22.1: Authors should provide information on how to access any supplemental information such as the study protocol, raw data, or programming code.	Title page

Appendix 2. Description of relevant datasets

Datasets	Description	Relevant variables
Ontario Health Insurance Plan (OHIP)	The OHIP claims database contains information on publicly funded health services, primarily provided by physicians, to Ontario residents eligible for provincial health insurance. The main data elements are service/billing codes submitted by physicians.	• **Cohort creation:** physicians who submitted at least one OHIP fee claim in 2019 with "00" specialty code • **Cohort classification:** focused practice in COE fee codes (i.e., A967, K703, K077, B988, B986) • **Baseline characteristics:** long-term care practice[1] • **Outcomes:** physician fee codes
College of Family Physicians of Canada (CFPC) Membership Database	The CFPC Membership Database is based on an annual survey to clinical and research members. We imported and linked a subset of membership data pertaining to COE CAC holders.	• **Cohort classification:** validated list of COE CAC holders
ICES Physician Database (IPDB)	IPDB uses billing and workforce information to assign specialties based on the proportion of specialty billing codes used.	• **Baseline characteristics:** years in clinical practice, community size of primary practice location, practice type, affiliation with a patient enrolment model
Primary Care Population (PCPOP)	PCPOP is an ICES-derived cohort of Ontario residents who are eligible for provincial health insurance and had at least one health services encounter within nine years of the index event.	• **Baseline characteristics:** number of patients aged ≥65
Client Agency Program Enrolment (CAPE)	CAPE lists patients registered with a primary care organization and contains information on patients' association to a specific physician and primary care organization.	• **Outcomes:** number of attached patients
Ontario Drug Benefit (ODB)	ODB contains information (recipients, payments, claims, practitioners) for the Ontario Drug Benefit	• **Outcomes:** drug identification numbers

[1] Approach to measuring long-term care practice was described in: Correia, R. H., Dash, D., Poss, J. W., Moser, A., Katz, P. R., & Costa, A. P. (2022). Physician Practice in Ontario Nursing Homes: Defining Physician Commitment. *Journal of the American Medical Directors Association*, *23*(12), 1942–1947.e2. https://doi.org/10.1016/j.jamda.2022.04.011

	Program. Drug identification number is provided by IQVIA Solutions Canada Inc.	
ICES-derived cohorts	Validated cohorts of individuals with specific diseases and conditions, including the Congestive Heart Failure (CHF) database, Chronic Obstructive Pulmonary Disease (COPD) database, and Ontario Dementia Dataset (DEMENTIA).	• **Outcomes:** patients diagnosed with dementia, congestive heart failure, and chronic obstructive pulmonary disease
Discharge Abstract Database (DAD)	The DAD contains patient-level clinical, demographic, diagnostic, procedural, and treatment data for hospital admissions and day surgeries.	• **Outcomes:** potentially inappropriate medication use
Same Day Surgery (SDS)	SDS contains patient-level demographic, diagnostic, procedural and treatment information on all day surgeries.	• **Outcomes:** potentially inappropriate medication use
National Ambulatory Care Reporting System (NACRS)	NACRS contains patient-level demographic, diagnostic, procedural and treatment information for all hospital-based and community-based ambulatory care, including outpatient and community-based clinics and emergency departments.	• **Outcomes:** potentially inappropriate medication use

COE=Care of the Elderly; CAC=Certificate of Added Competence

Appendix 3. Technical definitions of quality indicators

Indicator #	Technical definition			
1	Indicator name	Older adults who receive the influenza immunization.		
	Description	The proportion of attached older adults to a family physician with a billing record for influenza immunization.		
	Calculation	Proportion, % (Numerator divided by denominator x 100%)		
	Numerator	The number of older adults (aged ≥65) with a billing record for influenza immunization in 2019.		
		Dataset(s) Variable(s)	OHIP fee codes: • G590 (Immunization of influenza agent), • G592 (Administration of intranasal influenza vaccine), • Q130 (Preventative care tracking code), **or** • G538 (Other immunization)	ODB DINs: • 02015986, 02223929, 02269562, 02346850, 02362384, 02365936, 02420643, 02420686, 02420783, 02426544, 02428881, 02432730, 02445646, 02473283, 02473313, 02494248, 02500523, 09857501, 09857645, 09857646, **or** 09858149
	Denominator	The number of older adults (aged ≥65) attached (formally rostered or virtually) to a particular family physician in 2019.		
		Dataset(s)	CAPE (main source for rostering information) OHIP (virtual rostering information)	
	Considerations and limitations	1. This indicator only reflects influenza immunizations associated with a physician fee code (i.e., billing record) or DIN for pharmacist-administered vaccinations. Therefore, it excludes vaccines administered in workplaces, hospitals, or public health		

<table>
<tr><td></td><td></td><td colspan="3">by other health professionals (e.g., registered nurses) where the family physician does not subsequently bill.
2. While G538 in OHIP captures immunizations where the type is not stated, it is not specific to influenza immunizations. However, these differences in specificity are likely balanced between groups.
3. In some team-based models (e.g., FHTs), physicians may not bill for immunizations administered by others in the practice (e.g., nurse practitioners).</td></tr>
<tr><td></td><td>References</td><td colspan="3">Canadian Institute for Health Information. (2016). Pan-Canadian Primary Health Care Indicator Update Report. Ottawa, Canada. Available: https://secure.cihi.ca/free_products/Pan-Canadian_PHC_Indicator_Update_Report_en_web.pdf</td></tr>
<tr><td>2</td><td>Indicator name</td><td colspan="3">Older adults living with COPD who receive influenza and pneumococcal immunizations.</td></tr>
<tr><td></td><td>Description</td><td colspan="3">The proportion of older adults living with COPD who receive influenza and pneumococcal immunizations in 2019.</td></tr>
<tr><td></td><td>Calculation</td><td colspan="3">Proportion, % (Numerator divided by denominator x 100%)</td></tr>
<tr><td></td><td>Numerator</td><td colspan="3">The number of older adults (aged ≥65) whose family physician billed for administering influenza and pneumococcal immunizations in 2019.</td></tr>
<tr><td></td><td></td><td>Dataset(s)
Variable(s)</td><td>OHIP fee codes:
• G846 (Pneumococcal Conjugate),
• G590 (Immunization of influenza agent),
• G592 (Administration of intranasal influenza vaccine), or
• Q130 (Preventative care tracking code)</td><td>ODB DINs:
• 02015986, 02223929, 02269562, 02346850, 02362384, 02365936, 02420643, 02420686, 02420783, 02426544, 02428881, 02432730, 02445646, 02473283, 02473313, 02494248, 02500523, 09857501, 09857645, 09857646, or 09858149</td></tr>
</table>

			Note: OHIP/ODB SERVDATE for activities occurred after dementia diagnosis date.
	Denominator	The number of older adults (aged ≥65) living with COPD attached (formally rostered or virtually) to a particular family physician in 2019.	
		Dataset(s)	CAPE (main source for rostering information) OHIP (virtual rostering information) COPD (ICES-derived cohort)
	Considerations and limitations	1. This indicator only reflects influenza immunizations associated with a physician fee code (i.e., billing record) or DIN for pharmacist-administered vaccinations. Therefore, it excludes vaccines administered in workplaces, hospitals, or public health by other health professionals (e.g., registered nurses) where the family physician does not subsequently bill. 2. While G538 in OHIP captures immunizations where the type is not stated, it is not specific to influenza immunizations. However, these differences in specificity are likely balanced between groups. 3. In some team-based models (e.g., FHTs), physicians may not bill for immunizations administered by others in the practice (e.g., nurse practitioners).	
	References	Canadian Institute for Health Information. (2016). Pan-Canadian Primary Health Care Indicator Update Report. Ottawa, Canada. Available: https://secure.cihi.ca/free_products/Pan-Canadian_PHC_Indicator_Update_Report_en_web.pdf	
3	Indicator name	Older adults living with dementia who receive tests aligned with the most current Canadian Consensus on Dementia.	
	Description	The proportion of older adults living with dementia who receive tests aligned with the most current Canadian Consensus on Dementia in 2019.	
	Calculation	Proportion, % (Numerator divided by denominator x 100%)	
	Numerator	The number of older adults (aged ≥65) whose family physician billed for tests aligned with the most current Canadian Consensus on Dementia.	
		Dataset(s)	OHIP fee codes:

		Variable(s)	• K032 (Extended specific neurocognitive assessment), • X421 (Head MRI multi-slice sequence), **or** • X425 (Head MRI repeat)
	Denominator	The number of older adults (aged ≥65) living with dementia attached (formally rostered or virtually) to a particular family physician in 2019.	
		Dataset(s)	CAPE (main source for rostering information) OHIP (virtual rostering information) DEMENTIA (ICES-derived cohort)
	Considerations and limitations	1. Many of the recommendations from the most current Canadian Consensus on Dementia cannot be measured using administrative data (e.g., patients' symptoms warranting cognitive testing). 2. The family physician may not have ordered the test; the indicator may not accurately reflect their clinical practice (e.g., ordered by neurologist).	
	References	Rojas-Rozo, L., Lee, L., Khanassov, V., Sivananthan, S., Ismail, Z., Gauthier, S., & Vedel, I. (2023). Latest Canadian Consensus Conference on the Diagnosis and Treatment of Dementia: What's in It for Primary Care?. Canadian Journal on Aging, 19: 1-12. 10.1017/S0714980823000521	
4	Indicator name	Older adults living with dementia who receive dementia care management.	
	Description	The proportion of older adults living with dementia who are attached to a family physician who provided dementia care management in 2019.	
	Calculation	Proportion, % (Numerator divided by denominator x 100%)	
	Numerator	The number of older adults (aged ≥65) whose family physician billed for activities related to dementia care in 2019.	
		Dataset(s) Variable(s)	OHIP fee codes: • K035 (Mandatory reporting of medical condition to the Ontario), • A900 (Complex house call assessment), • K032 (Extended specific neurocognitive assessment), • K033 (Individual counselling),

			• K013 (Individual counselling), • K703 (Geriatric outpatient case conference), • K132 (General assessment for an adult 65 years of age and older), • A967 (Care of the elderly Focused Practice Assessment), • A003 (General assessments), • A004 (General re-assessments), • A007 (Intermediate assessments), • K077 (Geriatric telephone support), • K005 (Primary mental health care visit for dementia), **or** • K070 (home care application) Note: OHIP SERVDATE for activities occurred after dementia diagnosis date.
	Denominator	The number of older adults (aged ≥65) living with dementia attached (formally rostered or virtually) to a particular family physician in 2019.	
		Dataset(s)	CAPE (main source for rostering information) OHIP (virtual rostering information) DEMENTIA (ICES-derived cohort)
	Considerations and limitations	1. There are some concerns about construct validity as the ICES-derived cohort for dementia patients is derived from some physician fee codes for activities that would constitute “dementia care management.” 2. While some of the fee codes are not specific to “dementia care management” activities, they all pertain to activities in the care of persons living with dementia.	
	References	Godard-Sebillotte, C., Le Berre, M., Schuster, T., Trottier, M., & Vedel, I. (2019). Impact of health service interventions on acute hospital use in community-dwelling persons with dementia: A systematic literature review and meta-analysis. PLoS One, 14(6), e0218426.	
5	Indicator name	Older adults who are prescribed benzodiazepines.	
	Description	The proportion of attached older adults to a family physician who have been prescribed one or more benzodiazepines in 2019.	
	Calculation	Proportion, % (Numerator divided by denominator x 100%)	

	Numerator	The number of older adults (aged ≥65) with a prescription for one or more benzodiazepines in 2019.	
		Dataset(s) Variable(s)	ODB DINs: • 00548359, 00548367, 00677477, 00677485, 00813958, 00865397, 00865400, 01913239, 01913247, 01913484, 01913492, 02137534, 02137542, 02230074, 02230075, 02349191, 02349205, 02400111, 02400138, 02417634, 02417642, 00518123, 00518131, 00682314, 02167808, 02167816, 02167824, 02171856, 02171864, 02171872, 02177153, 02177161, 02177188, 02192705, 02192713, 02192721, 02230584, 02230585, 00522724, 00522988, 00522996, 00012645, 00295051, 00012629, 00012637, 00013463, 00013471, 00013498, 00020915, 00020923, 00020931, 00398403, 00398411, 00398438, 00115630, 01989634, 02221799, 02238334, 02238797, 02244474, 02244638, 00846392, 00382825, 00382841, 02048701, 02048736, 02103656, 02103737, 02145227, 02145243, 02173344, 02173352, 02177889, 02177897, 02207818, 02230366, 02230369, 02230950, 02230951, 02233960, 02233985, 02236948, 02239024, 02239025, 02270641, 02270676, 02303337, 02345676, 09852395, 00264911, 00264938, 00264946, 00628190, 00628204, 00628212, 00860689, 00860697, 00860700, 02386143, 00012874, 00399728, 00602825, 02065614, 09857240, 00891797, 02238162, 09853340, 09853430, 00013277, 00013285, 00013293, 00013757, 00013765, 00013773, 00272434, 00272442, 00272450, 00272639, 00272647, 00280429, 00362158, 00396230, 00405329, 00405337, 00466891, 00466905, 00012696, 00012718, 00496545, 00496553, 00521698, 00521701, 00483818, 00483826, 00514519, 00514527, 00557773, 02041405, 02243278, 09857216, 02410753, 02410761, 00348325, 00348333, 00399124, 00637742, 00637750,

			00655740, 00655759, 00655767, 00711101, 00728187, 00728195, 00728209, 00865672, 00865680, 00865699, 02041413, 02041421, 02041448, 02351080, 02351099, 00557757, 00557765, 00722138, 02041456, 02041464, 02041472, 02240285, 02240286, 02243254, 09857225, 00766011, 00784516, 02242905, 09857436, 09857437, 09857438, 00511528, 00511536, 02229654, 02229655, 02234003, 02234007, 02245230, 02245231, 00231363, 00295698, 00295701, 00402680, 00402737, 00402745, 00483893, 00483907, 00483915, 00496529, 00496537, 00500852, 02043653, 02043661, 02043688, 00604453, 00604461, 02223570, 02223589, 02225964, 02225972, 02229455, 02229456, 02230095, 02230102, 02231615, 02231616, 02243023, 02243024, 02244814, 02244815, 02273039, 02273047, 00443158, 00512559, 00614351, 00614378, 00808563, 00808571, 00872431, 00886084, 00886092, 01913506, 01995227, 02230024, **or** 02230025
	Denominator	The number of older adults (aged ≥65) attached (formally rostered or virtually) to a particular family physician in 2019.	
		Dataset(s)	CAPE (main source for rostering information) OHIP (virtual rostering information)
	Considerations and limitations	1. Without knowledge of patients' clinical or behavioural symptoms, we do not know whether instances of prescribing benzodiazepines were warranted and appropriate (e.g., for insomnia, agitation, seizure disorder, alcohol withdrawal). 2. The family physician may not have prescribed the benzodiazepine; the indicator may not accurately reflect their clinical practice.	
	References	This DIN list was based on an extensive search in the ODB at ICES (using the %dinexplore macro) for all active and relevant drugs, and reviewed for accuracy by a physician.	

6	Indicator name	Older adults who are prescribed medications with strong anticholinergic effects.	
	Description	The proportion of attached older adults to a family physician who have been prescribed one or more medications with strong anticholinergic effects in 2019.	
	Calculation	Proportion, % (Numerator divided by denominator x 100%)	
	Numerator	The number of older adults (aged ≥65) with a prescription for one or more medications with strong anticholinergic effects in 2019.	
		Dataset(s) Variable(s)	ODB DINs: • 00706531, 00649392, 01927744, 00545058, **or** 00545074
	Denominator	The number of older adults (aged ≥65) attached (formally rostered or virtually) to a particular family physician in 2019.	
		Dataset(s)	CAPE (main source for rostering information) OHIP (virtual rostering information)
	Considerations and limitations	1. Without knowledge of patients' clinical or behavioural symptoms, we do not know whether instances of prescribing anticholinergics were warranted and appropriate (e.g., for cognitively intact person with an overactive bladder). 2. Unable to capture instances where these medications are obtained over the counter (e.g., Gravol, Benadryl); although this does not reflect the family physician's clinical practice. 3. The family physician may not have prescribed the anticholinergic; the indicator may not accurately reflect their clinical practice.	
	References	This DIN list was based on an extensive search in the ODB at ICES (using the %dinexplore macro) for all active and relevant drugs, and reviewed for accuracy by a physician.	
7	Indicator name	Older adults who are prescribed potentially inappropriate medications.	
	Description	The proportion of attached older adults to a family physician who have been prescribed one or more potentially inappropriate medications in 2019.	

	Calculation	Proportion, % (Numerator divided by denominator x 100%)	
	Numerator	The number of older adults (aged ≥65) with a prescription for one or more potentially inappropriate medications in 2019.	
		Dataset(s) Variable(s)	ODB, DAD, SDS, NACRS, OHIP We utilized the DINs specified by Bjerre et al. (below) to identify potentially inappropriate medications.
	Denominator	The number of older adults (aged ≥65) attached (formally rostered or virtually) to a particular family physician in 2019.	
		Dataset(s)	CAPE (main source for rostering information) OHIP (virtual rostering information)
	Considerations and limitations	1. Without knowledge of patients' clinical or behavioural symptoms, we do not know whether instances of prescribing potentially inappropriate medications were warranted and appropriate (e.g., for urinary incontinence). 2. Since there are many lists of potentially inappropriate medications (e.g., Beers, STOPP/START, medication appropriateness index), we selected to utilize the medications specified by Bjerre et al. 3. The family physician may not have prescribed the potentially inappropriate medication; the indicator may not accurately reflect their clinical practice.	
	References	1. Bjerre, L.M., Ramsay, T., Cahir, C., Ryan, C., Halil, R., Farrell, B., Thavorn, K., Catley, C., Hawken, S., Gillespie, U., & Manuel, D.G. (2015). PIP-STOPP Study: Assessing Potentially Inappropriate Prescribing in (PIP) and predicting patient outcomes using a subset of the STOPP criteria in Ontario's older population: a population-based cohort study using large health administrative databases. BMJ Open, 5(e010146). doi:http://bmjopen.bmj.com/content/5/11/e010146 2. Black, C., Thavorn K., Coyle D., Smith G., Bjerre, L.M. (2018). The health system costs of potentially inappropriate prescribing in Ontario, Canada: a protocol for a population-based cohort study. BMJ Open, 8(e021727). doi: https://bmjopen.bmj.com/content/8/6/e021727 3. Black, C.D., Thavorn, K., Coyle, D., & Bjerre, L.M. (2020). The health system costs of potentially	

		inappropriate prescribing: a population-based, retrospective cohort study using linked health administrative databases in Ontario, Canada. Pharmacoeconomics Open, 4(1):27-36. doi: 10.1007/s41669-019-0143-2	
8	Indicator name	Older adults who receive a collaborative medication review.	
	Description	The proportion of attached older adults to a family physician who have been prescribed one or more medications from multiple providers and receive a collaborative medication review in 2019.	
	Calculation	Proportion, % (Numerator divided by denominator x 100%)	
	Numerator	The number of older adults (aged ≥65) with a prescription for one or more medications from more than one prescribing physician in 2019.	
		Dataset(s) Variable(s)	ODB (MedsCheck Name, DIN): • Annual (93899979), • Follow-up Hospital Discharge (93899981), • Follow-up for Pharmacist Referral (93899982), • Follow-up for MD/RN referral (93899983), • Medication review (93899985), • Follow-up for hospital admission (93899984), • Diabetes Annual Assessment (93899988), • Diabetes Follow-up Assessment (93899989), **or** • Annual at Home (93899987).
	Denominator	The number of older adults (aged ≥65) attached (formally rostered or virtually) to a particular family physician with one or more prescribing physicians in 2019.	
		Dataset(s)	CAPE (main source for rostering information) OHIP (virtual rostering information) Patients with more than one prescribing physician ID (PRESC_I) in all ODB records in 2019.
	Considerations and limitations	1. There are no specific fee codes for physicians to conduct medication reviews. Therefore, we are limited	

		at only measuring MedChecks activities captured in ODB for pharmacists. Pharmacists working within FHTs who are salaried will not bill ODB for MedChecks activities. Further, medication reconciliation may be performed by other health care professionals (e.g., home care nurses patient discharge from hospital). The numerator will likely be underreported. 2. We do not know the extent of the medication reconciliation activities (e.g., whether all four activities outlined by the Institute for Safe Medication Practices were conducted).	
	References	Ontario Ministry of Health. (2024). Professional pharmacy services. Available from: https://www.ontario.ca/page/professional-pharmacy-services	
9	Indicator name	Older adults living with CHF who are prescribed ACE inhibitors, ARBs, beta-blockers, or SGLT2 inhibitors.	
	Description	The proportion of older adults living with CHF who were prescribed ACE inhibitors, ARBs, beta-blockers, or SGLT2 inhibitors in 2019.	
	Calculation	Proportion, % (Numerator divided by denominator x 100%)	
	Numerator	The number of older adults (aged ≥65) whose family physician billed for administering influenza and pneumococcal immunizations in 2019.	
		Dataset(s) Variable(s)	ODB DINs: • ACE inhibitors: 02273918, 02290332, 02290340, 00893595, 00893609, 00893617, 00893625, 01942964, 01942972, 01942980, 01942999, 02266350, 02266369, 02266377, 02283778, 02283786, 02283794, 02291134, 02291142, 02291150, 01911473, 01911481, 02444771, 02444798, 02459450, 02459469, 02474786, 02474794, 02474808, 02474816, 00670901, 00670928, 00708879, 02019884, 02019892, 02019906, 02020025, 02233005, 02233006, 02233007, 02291878, 02291886, 02291894, 02291908, 02299933, 02299941, 02299968, 02299976, 02300036, 02300044, 02300052, 02300060, 02300087, 02300095, 02300109,

			02300117, 02300125, 02300133, 02300141, 02300680, 02352230, 02352249, 02352257, 02352265, 02331004, 02247802, 02247803, 02266008, 02266016, 02294524, 02294532, 02301768, 02045737, 02103729, 02301776, 02302136, 02302144, 02302365, 02302373, 02408767, 02408783, 00839396, 00839418, 02049333, 02049376, 02049384, 02217481, 02217503, 02217511, 02271443, 02271451, 02271478, 02285061, 02285088, 02285096, 02285118, 02285126, 02285134, 02289199, 02289202, 02289229, 02292211, 02292238, 02294230, 02294249, 02294257, 02361531, 02361558, 02361566, 02394472, 02394480, 02394499, 09853685, 09853960, 09854010, 09857272, 09857286, 09857287, 02123274, 02123282, 02246624, 02289261, 02289288, 02289296, 02459817, 02459825, 02459833, 02464985, 02464993, 02465000, 02470225, 02470233, 02470241, 02470675, 02470683, 02470691, 02474824, 02474832, 02474840, 02476762, 02476770, 02476789, 02477009, 02477017, 02477025, 02248499, 02248500, 02248501, 02248502, 01947664, 01947672, 01947680, 01947699, 02290995, 02291002, 02291010, 02340550, 02340569, 02340577, 02340585, 02221829, 02221837, 02221845, 02221853, 02247917, 02247918, 02247919, 02247945, 02247946, 02247947, 02251515, 02251531, 02251574, 02251582, 02287706, 02287927, 02287935, 02287943, 02295369, 02295482, 02295490, 02295504, 02295512, 02310503, 02310511, 02310538, 02310546, 02331101, 02331128, 02331136, 02331144, 02374846, 02374854, 02374862, 02387387, 02387395, 02387409, 02387417, 02469057, 02469065, 02469073, 02469081, 02420457, 02420465, 02420473, 02420481, 02421305, 02421313, 02421321, 02438887, 02231459, 02231460, 02239267, 02325748,

			02325756, 02325764, 02357763, 02357771, 02357798, 02415437, 02415445, 02415453, 02471876, 02471884, **or** 02471892, • ARBs: 02239090, 02239091, 02239092, 02311658, 02326957, 02326965, 02326973, 02365340, 02365359, 02365367, 02366312, 02366320, 02366339, 02376520, 02376539, 02376547, 02376555, 02379120, 02379139, 02379147, 02379155, 02379260, 02379279, 02379287, 02379295, 02380684, 02380692, 02380706, 02380714, 02386496, 02386518, 02386526, 02386534, 02391171, 02391198, 02391201, 02391228, 02399105, 02445786, 02445794, 02445808, 02445816, 02476916, 02476924, 02417340, 02240432, 02243942, 02253631, 02244344, 02318709, 02393263, 02393271, 02393557, 02393565, 02419114, 02419122, 02420023, 02420031, 02456389, 02456397, 02237923, 02237924, 02237925, 02316390, 02316404, 02316412, 02317060, 02317079, 02317087, 02328070, 02328089, 02328100, 02328461, 02328488, 02328496, 02347296, 02347318, 02386968, 02386976, 02386984, 02406810, 02406829, 02406837, 02418193, 02418207, 02418215, 02422980, 02422999, 02423006, 02406098, 02406101, 02406128, 02445980, 02182815, 02182874, 02182882, 02309750, 02309769, 02309777, 02313332, 02313340, 02313359, 02353504, 02353512, 02354829, 02354837, 02354845, 02357968, 02357976, 02368277, 02368285, 02368293, 02379058, 02380838, 02398834, 02398842, 02398850, 02403323, 02403331, 02403358, 02404478, 02404486, 02405733, 02405741, 02405768, 02422484, 02424967, 02424975, 02424983, 02426595, 02442191, 02442205, 02443414, 02443422, 02443864, 02443872, 02453452, 02453460, 02461307, 02461315, 02461641, 02461668, 02318660, 02318679, 02240769, 02240770,

			02320177, 02320185, 02375958, 02375966, 02376717, 02376725, 02393247, 02393255, 02432897, 02432900, 02453568, 02453576, 02407485, 02407493, 02420082, 02420090, 02434164, 02244781, 02244782, 02289504, 02313006, 02337495, 02337509, 02337517, 02356651, 02356678, 02356686, 02356759, 02356767, 02356775, 02363100, 02363119, 02371529, 02371537, 02371545, 02383535, 02414228, 02414236, **or** 02414244, • Beta blockers: 01926543, 01926551, 02147602, 02147610, 02147629, 02204517, 02204525, 02204533, 02237721, 02237722, 02237723, 02466465, 02466473, 00773689, 00773697, 01912054, 01912062, 02039532, 02039540, 02146894, 02147432, 02171791, 02171805, 02237600, 02237601, 02255545, 02255553, 02267985, 02267993, 02367564, 02367572, 02368021, 02368048, 02368641, 02371987, 02371995, 02465612, 02465620, 02247439, 02247440, 02256134, 02256177, 02267470, 02267489, 02245914, 02245915, 02245916, 02245917, 02247933, 02247934, 02247935, 02247936, 02248752, 02248753, 02248755, 02252309, 02252317, 02252325, 02252333, 02268027, 02268035, 02268043, 02268051, 02364913, 02364921, 02364948, 02364956, 02368897, 02368900, 02368919, 02368927, 02418495, 02418509, 02418517, 02418525, 02106272, 02106280, 02243538, 02243539, 02489406, 02489414, 00618632, 00618640, 00749354, 00751170, 00842648, 00842656, 02230803, 02230804, 02354187, 02354195, 02356821, 02356848, 00648035, 00648043, 02303396, 02303418, 02350394, 02350408, 02285169, 02285177, 00534560, 00658855, 00782467, 00782475, 00782505, 00417270, 00443174, 00755877, 00755885, 00755893, 00869007, 00869015, 00869023, 02042258, 02042266, 02042274, 02457857, 00496480,

			00496499, 00496502, 00740675, 02084236, 02167794, 02210428, 02231182, 0223832, 02238327, 02270633, 02368617, 02368625, 00755842, 00755850, 00755869, 00451207, 00755826, 00755834, 02083345, 02083353, 02166712, 02166720, 02171880, 02171899, 02242275, 02242276, **or** 02290812, • SGLT2 inhibitors: 02425483, 02425491, 02435462, 02435470, 02449935, 02449943, 02443937, 02443945, 02456575, 02456583, 02456591, 02456605, 02456613, **or** 02456621 Note: OHIP/ODB SERVDATE for activities occurred after dementia diagnosis date.
	Denominator	The number of older adults (aged ≥65) living with CHF attached (formally rostered or virtually) to a particular family physician in 2019.	
		Dataset(s)	CAPE (main source for rostering information) OHIP (virtual rostering information) CHF (ICES-derived cohort)
	Considerations and limitations	1. There is no concern about construct validity as the CHF derived cohort is not informed by ODB claims. 2. The family physician may not have prescribed the relevant medications (e.g., prescribed by cardiologist or internal medicine consult); the indicator may not accurately reflect their clinical practice. 3. There are instances where it is not appropriate to prescribe these medications for clinical reasons. However, in the absence of patient-level clinical data, we cannot exclude CHF patients who were deemed ineligible to receive these medications. Further, these prescriptions may only be warranted based on clinical symptoms (e.g., reduced ejection fraction), which cannot be discerned from administrative data.	
	References	This DIN list was based on an extensive search in the ODB at ICES (using the %dinexplore macro) for all active and relevant drugs, and reviewed for accuracy by a physician.	
10	Indicator name	Older adults living with dementia who are prescribed antipsychotics.	

	Description	The proportion of older adults living with dementia who are prescribed antipsychotics in 2019.	
	Calculation	Proportion, % (Numerator divided by denominator x 100%)	
	Numerator	The number of older adults (aged ≥65) with ODB orders for antipsychotics in 2019.	
		Dataset(s) Variable(s)	ODB DINs: • 09900065, 02420864, 02420872, 02322374, 02322382, 02322390, 02322404, 02322412, 02322455, 02460025, 02460033, 02460041, 02460068, 02460076, 02460084, 02464144, 02464152, 02464160, 02464179, 02464187, 02464195, 02466635, 02466643, 02466651, 02466678, 02466686, 02466694, 02471086, 02471094, 02471108, 02471116, 02471124, 02471132, 02473658, 02473666, 02473674, 02473682, 02473690, 02473704, 02374811, 02374803, 00232807, 00232823, 00232831, 02156040, 02156032, 02156008, 02156016, 00755575, 00405345, 00405361, 00410632, 00363650, 00363669, 00363677, 00363685, 00713449, 00768820, 09853758, 00808652, 02230838, 02230839, 02230840, 02230837, 01927698, 02238403, 02238404, 02238405, 02238406, 02229250, 02229269, 02229277, 02229285, 02238850, 02276712, 02276720, 02276739, 02276747, 02276755, 02281791, 02281805, 02281813, 02281821, 02281848, 02303116, 02303159, 02303167, 02303175, 02303183, 02310341, 02310368, 02310376, 02310384, 02310392, 02325659, 02325667, 02325675, 02325683, 02325691, 02337878, 02337886, 02337894, 02337908, 02337916, 02372819, 02372827, 02372835, 02372843, 02372851, 02403072, 02403099, 02403102, 02410141, 02410184, 02243086, 02243087, 02243088, 02303191, 02303205, 02303213, 02321343, 02321351, 02321378, 02327562, 02327570, 02327589, 02327775, 02327783, 02327791,

			02360616, 02360624, 02360632, 02389088, 02389096, 02389118, 02406624, 02406632, 02406640, 02414090, 02414104, 02417243, 02417251, 02417278, 02417286, 02417294, 02421232, 02421240, 02421259, 02421267, 02421275, 02414112, 02436965, 02436973, 02436981, 02448734, 02448742, 02448726, 02300273, 02300281, 02300303, 02354217, 02354225, 02354233, 02354241, 02455943, 02455986, 02455994, 02456001, 01926772, 01926780, 01926756, 00335096, 00335118, 00335126, 00335134, 00313815, 02245432, 02245433, 00789720, 02457229, 02457237, 02457245, 02457253, 02457261, 02438046, 02447193, 02395479, 02407671, 02407698, 02407701, 02407728, 02407736, 02236951, 02236952, 02236953, 02244107, 02284235, 02284243, 02284278, 02284286, 02296551, 02296578, 02296594, 02296608, 02313901, 02313928, 02313936, 02313944, 02313995, 02314002, 02314010, 02314029, 02316080, 02316099, 02316110, 02316129, 02317893, 02317907, 02317923, 02317931, 02330415, 02330423, 02330458, 02330466, 02353164, 02353199, 02387794, 02387808, 02387824, 02387832, 02390205, 02390213, 02390248, 02390256, 02397099, 02397102, 02397110, 02397129, 02399822, 02399830, 02399849, 02399857, 02438003, 02438011, 02438054, 02300184, 02300192, 02300206, 02300214, 02321513, 02395444, 02395452, 02395460, 02395487, 02434024, 02439158, 02439166, 02439182, 02439190, 02255707, 02255723, 02255758, 02236950, 02279266, 02280396, 02025280, 02025299, 02025302, 02025310, 02240551, 02240552, 02252007, 02252015, 02252023, 02252031, 02252058, 02252066, 02264188, 02264196, 02264218, 02264226, 02264234, 02279800, 02279819, 02279827, 02279835, 02282119, 02282127,

			02282135, 02282143, 02282151, 02282178, 02282585, 02282593, 02282607, 02282615, 02282623, 02282631, 02282690, 02303655, 02303663, 02328305, 02328313, 02328321, 02328348, 02328364, 02328372, 02356880, 02356899, 02356902, 02356910, 02356929, 02356937, 02359529, 02359537, 02359545, 02359553, 02359561, 02359588, 02359790, 02359804, 02359812, 02359820, 02359839, 02359847, 02371766, 02371774, 02371782, 02371790, 02371804, 02371812, 02247705, 02291789, 02291797, 02370697, 02413493, 02413507, 02413515, 02413523, 02413485, 02454319, 00312746, 00312754, 00326836, 00345539, 02298597, 02298600, 02298619, 02298627, 02449544, 02449552, 02449560, 02449579, 02230406, 02230402, **or** 02230403 Note: ODB SERVDATE for activities occurred after dementia diagnosis date.
	Denominator	The number of older adults (aged ≥65) living with dementia attached (formally rostered or virtually) to a particular family physician in 2019.	
		Dataset(s)	CAPE (main source for rostering information) OHIP (virtual rostering information) DEMENTIA (ICES-derived cohort)
	Considerations and limitations	1. This indicator does not consider clinical or behavioural symptoms of patients that may warrant antipsychotic prescriptions (e.g., if patient is aggressive towards family caregivers).	
	References	Mast, G., Fernandes, K., Tadrous, M., Martins, D., Herrmann, N., & Gomes, T. (2016). Persistence of antipsychotic treatment in elderly dementia patients: a retrospective, population-based cohort study. Drugs-Real World Outcomes, 3, 175-182. Alzheimer Society. (2024). The risk of using antipsychotic medications to treat dementia. Available: https://alzheimer.ca/en/about-dementia/how-can-i-treat-dementia/risk-using-antipsychotic-medications-treat-dementia	

11	Indicator name	Older adults living with dementia who were reported to the Ministry of Transportation.	
	Description	The proportion of older adults living with dementia who were reported to Ministry of Transportation in 2019.	
	Calculation	Proportion, % (Numerator divided by denominator x 100%)	
	Numerator	The number of older adults (aged ≥65) whose family physician billed for reporting a medical condition to the Ontario Ministry of Transportation.	
		Dataset(s) Variable(s)	OHIP fee codes: • K035 (Mandatory reporting of medical condition to the Ontario Ministry of Transportation) Note: OHIP SERVDATE for activities occurred after dementia diagnosis date.
	Denominator	The number of older adults (aged ≥65) living with dementia attached (formally rostered or virtually) to a particular family physician in 2019.	
		Dataset(s)	CAPE (main source for rostering information) OHIP (virtual rostering information) DEMENTIA (ICES-derived cohort)
	Considerations and limitations	1. Without knowledge of patients' clinical or behavioural symptoms, we do not know whether instances of reporting to the Ministry of Transportation were warranted and appropriate (e.g., if the patient was assessed as unsafe to drive). 2. The family physician may not have completed the reporting (e.g., may have been reported by neurologist); the indicator may not accurately reflect their clinical practice.	
	References	Baycrest Centre for Geriatric Care and Sunnybrook Health Sciences Centre. (2022). Driving & Dementia Roadmap. Available: https://www.drivinganddementia.ca/	

OHIP=Ontario Health Insurance Plan; ODB=Ontario Drug Benefit; DIN=Drug Identification Number; CAPE=Client Agency Program Enrolment; FHT=Family Health Team; DEMENTIA=ICES-derived cohort of persons living with dementia; COPD=ICES-derived cohort of persons living with chronic obstructive pulmonary disease; ACE=angiotensin-converting enzyme; ARBs=angiotensin 2 receptor blockers; SGLT2=sodium-glucose co-transporter-2; CHF=ICES-derived cohort of persons living with congestive heart failure.

Appendix 4. Examination of missingness in quality measures

	FPs with a focused practice or CAC in COE (n=232)			**FPs without a focused practice or CAC in COE** (n=928)		
	Missingness n (%)	**Rationale**		**Missingness** n (%)	**Rationale**	
	Indicator	**Numerator**	**Denominator**	**Indicator**	**Numerator**	**Denominator**
Medical Conditions						
Indicator 1: Proportion of attached patients aged ≥65 who received the influenza vaccine	7 (3.0)	'0' for all 7 participants → did not bill the relevant fees	'0' for all 7 participants → FP did not have any attached patients aged ≥65	83 (8.9)	'0' for all 83 participants → did not bill the relevant fees	'0' for all 83 participants → FP did not have any attached patients aged ≥65
Indicator 2: Proportion of attached patients aged ≥65 living with COPD who received influenza and pneumococcal immunizations	23 (9.9)	'0' for all 23 participants → did not bill the relevant fees	'0' for all 23 participants → FP did not have any attached patients with chronic obstructive pulmonary disease	152 (16.4)	'0' for all 152 participants → did not bill the relevant fees	'0' for all 152 participants → FP did not have any attached patients with chronic obstructive pulmonary disease
Indicator 3^: Proportion of attached patients aged ≥65 living with dementia who received tests aligned with the most current Canadian Consensus on Dementia	19 (8.2)	'0' for all 19 participants → did not bill the relevant fees	'0' for all 19 participants → FP did not have any attached patients with dementia	187 (20.2)	'0' for all 187 participants → did not bill the relevant fees	'0' for all 187 participants → FP did not have any attached patients with dementia

Indicator 4^: Proportion of attached patients aged ≥65 living with dementia who received dementia care management	19 (8.2)	'0' for all 19 participants → did not bill the relevant fees	'0' for all 19 participants → FP did not have any attached patients with dementia	187 (20.2)	'0' for all 187 participants → did not bill the relevant fees	'0' for all 187 participants → FP did not have any attached patients with dementia
Appropriate Prescribing						
Indicator 5: Proportion of attached patients aged ≥65 who are prescribed one or more benzodiazepines	7 (3.0)	'0' for all 7 participants → did not bill the relevant fees	'0' for all 7 participants → FP did not have any attached patients aged ≥65	83 (8.9)	'0' for all 83 participants → did not bill the relevant fees	'0' for all 83 participants → FP did not have any attached patients aged ≥65
Indicator 6: Proportion of attached patients aged ≥65 who are prescribed one or more medications with strong anticholinergic effects	7 (3.0)	'0' for all 7 participants → did not bill the relevant fees	'0' for all 7 participants → FP did not have any attached patients aged ≥65	83 (8.9)	'0' for all 83 participants → did not bill the relevant fees	'0' for all 83 participants → FP did not have any attached patients aged ≥65
Indicator 7: Proportion of attached patients aged ≥65 who are prescribed one or more potentially inappropriate medications (e.g., from Beers list, START/ STOPP criteria)	7 (3.0)	'0' for all 7 participants → did not bill the relevant fees	'0' for all 7 participants → FP did not have any attached patients aged ≥65	83 (8.9)	'0' for all 83 participants → did not bill the relevant fees	'0' for all 83 participants → FP did not have any attached patients aged ≥65
Indicator 8: Proportion of attached patients aged ≥65 with more than one prescribing physician	11 (4.7)	'0' for all 11 participants → did not bill the relevant fees	'0' for all 11 participants → FP did not have any attached	95 (10.2)	'0' for all 95 participants → did not bill the relevant fees	'0' for all 95 participants → FP did not have any attached

who received a collaborative medication review			patients with more than 1 prescribing physician			patients with more than 1 prescribing physician
Indicator 9: Proportion of attached patients aged ≥65 living with CHF who were prescribed ACE inhibitors, ARBs, beta-blockers, or SGLT2 inhibitors	25 (10.8)	'0' for all 25 participants → did not bill the relevant fees	'0' for all 25 participants → FP did not have any attached patients with congestive heart failure	186 (20.0)	'0' for all 186 participants → did not bill the relevant fees	'0' for all 186 participants → FP did not have any attached patients with congestive heart failure
Indicator 10^: Proportion of attached patients aged ≥65 living with dementia who are prescribed antipsychotics	19 (8.2)	'0' for all 19 participants → did not bill the relevant fees	'0' for all 19 participants → FP did not have any attached patients with dementia	187 (20.2)	'0' for all 187 participants → did not bill the relevant fees	'0' for all 187 participants → FP did not have any attached patients with dementia
Driving Issues						
Indicator 11^: Proportion of attached patients aged ≥65 living with dementia whose medical condition was reported to the Ministry of Transportation	19 (8.2)	'0' for all 19 participants → did not bill the relevant fees	'0' for all 19 participants → FP did not have any attached patients with dementia	187 (20.2)	'0' for all 187 participants → did not bill the relevant fees	'0' for all 187 participants → FP did not have any attached patients with dementia

FP=family physician; COE=Care of the Elderly; COPD=chronic obstructive pulmonary disease; CHF=congestive heart failure; ACE=Angiotensin-converting-enzyme; ARBs= Angiotensin receptor blockers; SGLT2=Sodium-glucose cotransporter-2
*Significant at the level of 0.05
^ Indicator also relates to the Cognitive Impairment FM-COE Priority Topic

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CHAPTER SIX

Discussion

Summary of Main Findings

This thesis contributed new information about the family physician workforce with focused practice models and additional training to care for older adults. The Donabedian model guided this work by conceptualizing how practice-based clinical activities (processes) inherent to family physician practice impact quality for older primary care patients.[1] This thesis involved the collection and analysis of primary and secondary data, with findings from each study directly informing subsequent chapters. Using sequential methods, the data collection and analysis of later chapters were informed by and dependent on the methodological contributions and findings of preceding studies (Figure 1), allowing for a comprehensive investigation. The studies advanced methodological approaches by demonstrating the use of a modified Delphi procedure to develop measurable quality indicators and establishing an approach to identify family physicians with focused practices and added competency training – in both cases, in reference to population-based, administrative data holdings. The findings are informative to researchers, policymakers, and medical educators amidst ongoing demographic shifts and primary care reform.

The RAM study presented in Chapters 2 and 3 resulted in 12 endorsed practice-based indicators that characterize care quality for older primary care patients.[2,3] The innovations of this study were three-fold in (1) applying the

Donabedian model to conceptualize relevant physician processes, (2) testing the FM-COE Priority Topics as a framework for indicator development, and (3) demonstrating a case for establishing consensus on a measurable indicator set. Primary care quality improvement for older adults has not been widely pursued in Canada and, while some appropriateness studies have established quality standards or priorities in other health care settings,[4–9] none have reported a measurable indicator set. In applying the FM-COE Priority Topics, I found that some Priority Topics lent themselves well to measurement and were over-represented (e.g., “Medical conditions,” “Appropriate prescribing”), whereas others were not possible to specify using health administrative data and so did not appear in the final indicator set (e.g., “Decision making and capacity,” “Family and informal care supports”). In contrast to much of the quality improvement literature, I developed indicators in direct reference to a health administrative data source to ensure the endorsed items were feasible to measure; otherwise, indicators would be limited in their ability to inform quality improvement and promote change.[10] These findings directly supported successive studies where I operationalized the technical definitions of endorsed processes to examine family physicians’ engagement in primary care activities.

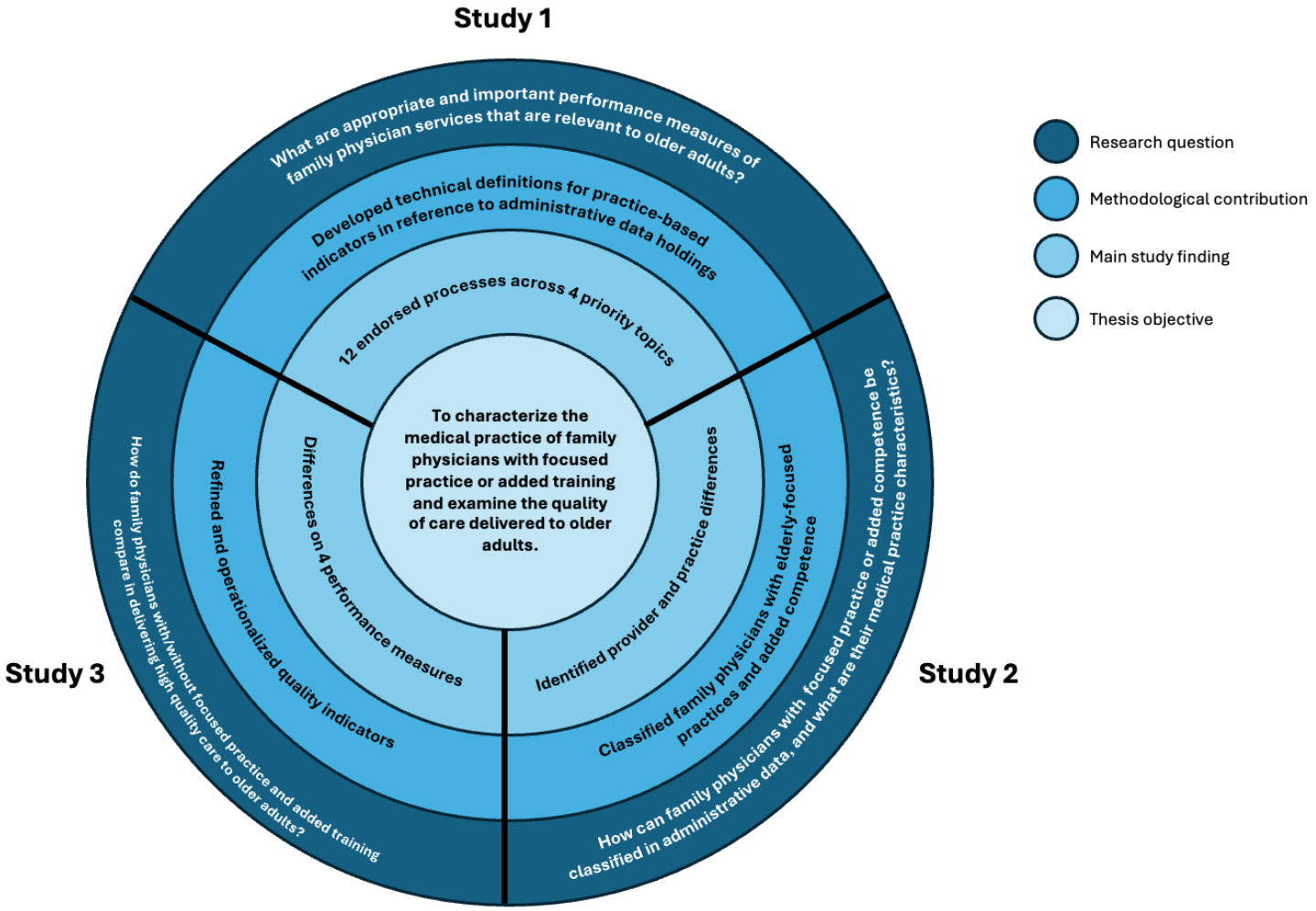

Figure 1. Summary of findings and methodological contributions across studies

In Chapter 4, I developed an approach to identify family physicians with COE focused medical practices and/or added training for the first time within a population-based, health administrative data source. I led a project-specific data linkage with the CFPC and ICES to identify COE CAC holders within health administrative datasets to characterize provider demographics, their medical practice, and service provision. This study contributed the most in-depth information about the family physician workforce with elderly-focused practices and training, extending prior work that utilized survey and qualitative methods.[11–16] Further, the approach I developed to classify physicians was integral to Chapter 5 to compare the practice differences of family physicians with/without focused practices and added training.

The research activities in Chapter 5 were informed by the methodological contributions and findings of Chapters 3 and 4. In this study, I observed minimal differences between family physicians who increasingly care for older patients – regardless of having an elderly-focused practice or additional training – on established performance measures. This study was the first to examine the health services impacts of focused medical practices and CAC training in Canada on physician processes pertinent to caring for older adults. I refined and tested the original indicator specifications (reported in Chapter 3) and demonstrated the feasibility of operationalizing consensus-based indicators for clinical practice measurement. Given findings of similar performance on processes integral to caring for older adults, this thesis concluded that focused practice and COE

certification do not distinguish clinical practice. Family physicians may develop competence to deliver high quality care to older patients through practice experience and other training/learning opportunities; establishing a focused practice or obtaining a CAC is not necessary to ensure care quality for older adults.

Comparison of Findings with Relevant Literature

Focused practice and CAC training exemplify two policy approaches in the province of Ontario to enhance family physicians' knowledge and skills in a particular medical domain that exist in different forms across Canada and globally.[17–22] As the population of older adults increases and demands on family physicians ensue, investments in alternative payment models and educational opportunities may not be effective or necessary to promote care quality.[23] This thesis demonstrated a lack of evidence to support that alternative funding arrangements (i.e., focused practice) and advanced postgraduate training (i.e., CACs) improve primary care quality for older adults. These studies tested the philosophy of the CAC program by establishing and examining indicators inherent to family medicine practice across the FM-COE Priority Topics, although some processes could not be specified in administrative data. The framing of this work within the lens of secondary, administrative data, and the subsequent measurement challenges, may suggest that the established indicators are insufficient at identifying the value imparted to physicians with focused practice designations or added competence. Therefore, these findings should be

considered alongside existing literature that has demonstrated the benefits of focused practice or CACs at the individual (provider and patient) level. While some aspects of other CAC domains (e.g., palliative care) have been examined previously,[12,24] future work could study the health services impacts of CACs other than COE using similar methods to those exemplified in this work. The novelty of this thesis in examining the health services impacts of elderly-focused practice and CACs provides a methodological template to classify, describe, and investigate other domains.

This thesis extends what is known about family physicians with elderly-focused practices and additional training. Prior work has used surveys and environmental scans to quantify the number of COE CAC holders in Ontario and across Canada to assess physician supply gaps, and determine their contributions to SGS and primary care.[13–15,25] Alongside reports that only one-third of COE holders practice in SGS,[14,15] I found that most family physicians with elderly-focused practices or additional training largely deliver core primary care services to older patients. Although all primary care activities do not align with SGS, increased practice with older patients (evidenced by more encounters and a larger proportion of attached patients aged ≥65) aligns with the original intentions of CACs by encouraging advanced practice with domain-specific patient groups.[26] These findings align with those presented in a multiple case study, where family physicians with COE CACs reported that they continued to deliver comprehensive care and had greater capacity to care for older adults after

earning the certificate.[11] This thesis advanced previous research about focused practice in family medicine by describing physicians across the province[27] and using domain-specific fee codes that have not been assessed by others.[28]

This thesis provides evidence on family physicians' contributions to quality primary care for older patients according to the Donabedian model.[1] Using these research findings, an adapted Donabedian Structure-Process-Outcome model was created to illustrate the impact of providers with focused practices and added competence on medical services delivered to older adults (Figure 2). The adapted model uses the traditional linear triad of structural aspects of health care influencing processes of care, which ultimately impact health outcomes. Chapter 4 established a classification to distinguish family physician HHR (structures) that contribute to the care of older patients, given two policy approaches (focused practice models and enhanced training). Examining practice-based activities (processes) in health administrative data that are only eligible to physicians with elderly-focused practices or added competence enabled cohort creation. The performance measures established in Chapter 5 enabled inferences about care quality by comparing processes among family physicians with/without focused practices and additional training. Overall, this thesis generated evidence surrounding the role of structures (focused practice and added competence) on processes (performance measures) integral to the primary care of older adults. Future work can examine the cumulative influence of these structures and processes on outcomes relevant to the care of older persons.

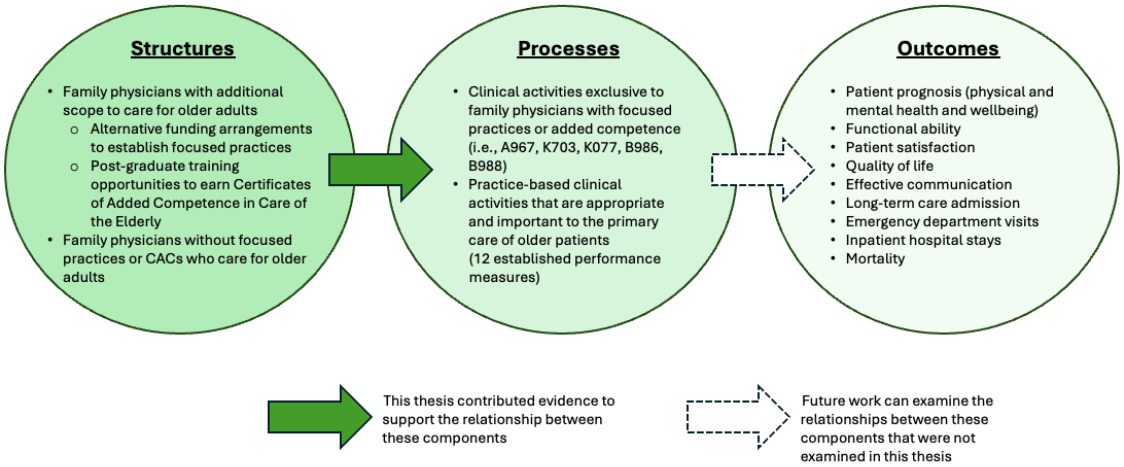

Figure 2. Role of focused practice and added competence on primary care quality for older adults (Adapted Donabedian model)

Quality assessment is important to health care providers, administrators, policymakers, funders, and patients in efforts to promote evidence-based medicine, optimize cost-effectiveness, and improve outcomes.[29,30] Measurement is necessary but not sufficient for quality improvement.[31] The indicators established in this thesis provide quantitative evidence on physician processes integral to quality primary care for older adults that may be informative for future quality improvement efforts. However, given the multifaceted structures and processes relevant to patient care, these measures comprise a subset of the total activities pertaining to primary care quality for older adults.[29] The limitations of measurement techniques, described in Chapters 3 and 5, suggest that some relevant clinical activities may not have been considered in this quality assessment. Further, applying these measures to incentives tied to performance

may inadvertently inspire unintended consequences if physicians become disincentivized to perform processes that are not readily measured.[32] For example, given the confines of the data source, information about clinical indications precipitating processes were unknown, which may have misclassified a warranted process (e.g., prescribing) as suggesting poor performance. Given these challenges, the endorsed measures are not useful to monitor individual physicians' performance, but offer evidence at the population-level to inform quality improvement.

This work demonstrated how family physicians with elderly-focused practices and enhanced training contribute to team-based care and deliver a broad range of core primary care and consultative services. In contrast to prior research reporting that family physicians with focused practices are dedicated solely to their particular areas of practice,[27] I found that most physicians with elderly-focused practices maintain comprehensive practices and do not limit their scope. While this specialized workforce has more patient encounters with older persons, they deliver a range of medical services to this patient demographic; therefore, their contributions to comprehensive care should not be discounted on the basis of increased practice with a domain-specific patient sub-group.

Prior work has hypothesized links between focused practice or CAC training and the provision of high quality primary care.[24,33] However, the findings of this thesis do not suggest that receiving care from a family physician with a focused medical practice or additional training results in differences on the

established performance measures pertinent to caring for older adults. Examining other aspects of family medicine services that could not be measured using this particular administrative data source – such as integrating care across teams and settings, engaging patients and families in decision-making, mitigating communication barriers, and accounting for the patient's goals of care – may reveal differences in family physician performance on the basis of focused practice and CACs. Future work can use alternative methods and data sources to examine the impacts of focused practice and added competence on other aspects of care. Overall, these studies provide new information about how physicians with focused practice and added competence care for older adults, structure their medical practice, and contribute to quality primary care.

Implications of Thesis Findings

This thesis presents important implications for clinicians, medical educators, and policymakers. I established an approach to classify family physicians with added skills to care for older adults and determined that only 1.7% of Ontarian family physicians (n=242) have elderly-focused practices or COE CACs. The limited size of this workforce, in contrast to the rapidly aging population, suggests that most older adults will not receive care from family physicians with focused practices or advanced clinical training in geriatrics. However, the marginal differences in performance indicate that elderly-focused practices and additional training may not distinguish practice; it is unlikely that the objective quality of primary care that older patients receive depends on whether

their family physician has a focused practice or CAC. This may reflect that family physicians without focused practices and CACs develop competence to adequately care for older patients through generalist family medicine education, practice experience, and other training opportunities; this exposure may be sufficient to equip family physicians with geriatric competencies to promote high quality care.

For the process indicators I assessed, demonstrating some interest or commitment to increasingly caring for older patients (e.g., having many older adult rostered patients, engaging in LTC practice) resulted in comparable levels of care quality. While low rates on performance indicators in both groups may reflect measurement challenges, this may also suggest that all physicians have meaningful room for improvement. Enhanced geriatric medical education should be prioritized for all family physicians since providers currently, and will increasingly, care for the aging demographic – not just those with focused practices or CAC training.

This thesis contributed evidence that family physicians with focused practices and added competence to care for older adults largely maintain in comprehensive practice and deliver core primary care services. Previous research found that family physicians with focused practices and CACs have narrowed practice scopes and contribute to HHR shortfalls.[34–36] While some family physicians with elderly-focused practices and additional training function similar to specialists (e.g., 35.9% not affiliated with a PEM, 19.4% who attributed

≥90% of their OHIP billings to patients aged 65+), the majority care for patients of all ages and deliver a range of medical services. While these findings demonstrate the contributions of this workforce to primary care systems, focused practice physicians and CAC holders may not be increasing the capacity for geriatric care as previously reported.[13–15,25] Given widely recognized shortfalls in geriatric physician resources,[15,16] this thesis suggests the supply of providers is even smaller than anticipated because COE CAC holders considered in HHR estimates do not uniformly dedicate their medical practice to elderly patient care.

Prior research has reported variability in how family physicians with COE CACs structure their medical practice,[11] and this thesis confirms that not all CAC holders establish focused practices. Although CAC holders are well positioned to increasingly care for patients within their domain of expertise, the CFPC does not expect that providers restrict or narrow their scope of practice.[26] Enhanced skills training is portrayed as an opportunity for family physicians to extend their comprehensive skills, while maintaining competence across the broad family medicine scope.[37] While the lack of incentive to establish a focused practice model fosters comprehensiveness and maintains primary care HHR, it may also constrain the potential benefits of CAC training and certification. Resumption of practice as a generalist after earning a CAC, with marginal remuneration incentives (e.g., encouraging increased care of older patients) or opportunities to apply domain-specific skills (e.g., within memory clinics), may explain similar practice performance observed here. This thesis suggests that higher care quality

may be more readily influenced by practice style rather than training or certification. While the findings demonstrate that COE CACs are meeting the intended objectives of the CFPC, there is a gap in understanding whether added competence is efficacious to funders and meeting the needs of domain-specific patients. There is an opportunity for the CFPC and Ministry of Health to work together to determine mutual expectations, interests, and policies to better support CAC holders in practice.

Strengths and Limitations

Each study in this thesis exhibits methodological strengths and limitations that are discussed in the respective chapters. However, some notable strengths and limitations span across studies.

The chapters in this thesis build upon each other to refine indicator measurement and apply a cohort classification for family physicians within a population-based, administrative data source. The use of sequential methods allowed for a comprehensive investigation of the topic and methodological triangulation, which increased the validity of conclusions. Administrative data permits the analysis of health services and clinical data collected for all persons eligible for provincial health insurance – improving the generalizability of findings and reducing biases of self-reported data (e.g., sampling, recall, and selection bias).[38,39] The use of routinely collected, population-based data supports evidence generation based on examinations of an entire, heterogeneous population, rather than a convenience sample or single site.[40,41] By soliciting

feedback from a diverse panel of experts in the RAM study, I assessed aspects of family physician practice that were most appropriate and important to investigate.[42] Further, I tested and refined technical specifications in Chapter 5 to improve the measurement of indicators. Challenges or limitations in operationalizing the performance measures were balanced between groups.

The measurement of quality indicators was restricted to information collected and available within the administrative data source.[43] Secondary data are susceptible to problems with accuracy and completeness, and are not generated for research purposes.[43,44] This thesis focused on the contributions of physicians to elderly primary care because physician billing claims are readily available in administrative data;[44] this work could not examine care provided by other professionals within primary care teams (e.g., nurse practitioners). In the absence of a validated list of family physicians with focused practices, the classification was sensitive but not specific, and may have overestimated the focused practice workforce. Relying on physician fee codes for reimbursement may not accurately reflect clinical practice and include some activities billed for erroneously.[45] Lastly, this work focused on the community-based primary activities of family physicians; I did not examine their contributions in other settings relevant to their area of focused practice or CAC training (e.g., LTC).

Next Steps in Program of Research

This thesis sets up work to adapt the measurable indicator set in other settings and examine family physicians with focused practices or additional

training in different domains. The indicator specifications can be adapted for use in other provinces to examine the contributions of family physicians elsewhere in caring for older patients. Older adult patient partners will be engaged through a separate consultative process to understand their perspectives on quality primary care. Primary care activities that are important or meaningful to patients will be compared to those prioritized by clinicians and researchers. The approach to classify family physicians with elderly-focused practice and training in administrative data can be leveraged in future work. HHR forecasting can use this classification to model the contributions (supply/demand) of this workforce to primary care and geriatric care systems. The economic efficacy of alternative payment models (like focused practice) and CAC training can be examined. A cohort of older patients could be investigated to understand characteristics associated with access to family physicians with elderly-focused practices or additional training (e.g., geography, race/ethnicity, socioeconomic status, chronic diseases).[46] Lastly, the management of scope of practice-specific patient sub-groups (e.g., persons living with dementia, LTC residents) could be compared for family physicians with/without elderly-focused practices or additional training.

Conclusion

This thesis characterized the medical practice of family physicians with additional skills to care for older adults and examined quality of care for older patients. A modified Delphi procedure proved to be feasible for establishing consensus on measurable quality indicators. Sequential methods allowed for the

technical definitions of endorsed indicators to be refined and operationalized, ultimately enabling comparisons of processes integral to primary care quality. Lastly, this thesis demonstrated that cohort creation of family physicians with focused practices or added competence within a population-based health administrative data source is possible. These methodological contributions can be leveraged in future research to evaluate other CAC domains and adapt the indicator set for quality assessment in other settings.

This thesis demonstrated that quality primary care for older adults is not reliant on whether a patient's family physician has a focused medical practice or added competence. Developing specialized skills through practice experience or other training opportunities may be sufficient to equip family physicians with geriatric competencies to promote high quality care. While findings presented in this thesis about the family physician workforce align with the intentions of the CFPC, more work is needed to understand the efficacy of these policy approaches for funders and patients.

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