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Characteristics of patients attached to near-retirement family physicians: a population-based serial cross-sectional study in Ontario, Canada

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ABSTRACT

Objectives Population ageing is a global phenomenon. Resultant healthcare workforce shortages are anticipated. To ensure access to comprehensive primary care, which correlates with improved health outcomes, equity and costs, data to inform workforce planning are urgently needed. We examined the medical and social characteristics of patients attached to near-retirement comprehensive primary care physicians over time and explored the early-career and mid-career workforce's capacity to absorb these patients.

Design A serial cross-sectional population-based analysis using health administrative data.

Setting Ontario, Canada, where most comprehensive primary care is delivered by family physicians (FPs) under universal insurance.

Participants All insured Ontario residents at three time points: 2008 (12 936 360), 2013 (13 447 365) and 2019 (14 388 566) and all Ontario physicians who billed primary care services (2008: 11 566; 2013: 12 693; 2019: 15 054).

Outcome measures The number, proportion and health and social characteristics of patients attached to near-retirement age comprehensive FPs over time; the number, proportion and characteristics of near-retirement age comprehensive FPs over time. Secondary outcome measures: The characteristics of patients and their early-career and mid-career comprehensive FPs.

Results Patient attachment to comprehensive FPs increased over time. The overall FP workforce grew, but the proportion practicing comprehensiveness declined (2008: 77.2%, 2019: 70.7%). Over time, an increasing proportion of the comprehensive FP workforce was near retirement age. Correspondingly, an increasing proportion of patients were attached to near-retirement physicians. By 2019, 13.9% of comprehensive FPs were 65 years or older, corresponding to 1 695 126 (14.8%) patients. Mean patient age increased, and all physicians served markedly increasing numbers of medically and socially complex patients.

Conclusions The primary care sector faces capacity challenges as both patients and physicians age and fewer physicians practice comprehensiveness. Nearly 15% (1.7 million) of Ontarians may lose their comprehensive FP to retirement between 2019 and 2025. To serve a growing, increasingly complex population, innovative solutions are needed.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Our serial cross-sectional study uses large, population-level health administrative data sets to examine temporal trends in the needs of primary care patients who may soon lose their family physician (FP) to retirement, in turn informing future workforce planning.
⇒ By distinguishing between FPs practicing comprehensive primary care and those who have narrowed their scope of practice, our methodology allows us to identify disparities between the presumed and actual primary care supply.
⇒ By linking the characteristics, including age and sex, of the comprehensive primary care workforce to both the medical and social characteristics of the population served, our methodology facilitates a rich understanding of the resources needed by patients who may soon lose their FP to retirement, and the capacity to meet those needs among those who will remain in the workforce.
⇒ Our methodology allows us to identify trends related to practice preferences among FPs that can be in turn applied to other data sources around primary care trainees and population growth.
⇒ Limitations of this work include that our analyses predate the COVID-19 pandemic, due to limited data availability for more recent years, and that the number of comprehensive FPs in rural areas may be underestimated due to rural physician practice patterns possibly involving a large proportion of hospital-based services.

INTRODUCTION

Primary care is the foundation of high-performing healthcare systems worldwide,[1] and can be defined by four core functions ('the 4 Cs') articulated by Starfield and others: first *Contact* access to the healthcare system, *Continuity* (long-term person-focused care), *Comprehensiveness* (meeting the majority of each patient's physical and mental healthcare needs, including prevention, acute care, chronic care and multimorbidity

care) and *Coordination* of care across the healthcare system, including specialty care, hospitals, home care and community services and support.[1 2] Access to primary care is associated with improved health outcomes, improved health equity and reduced health system costs.[3–9]

An essential enabler of primary care access is an adequate health human resource (HHR) supply, but many jurisdictions are grappling with current and impending shortages. For example, 14.5% (4.6 million) Canadians are without a primary care provider.[10] Virtually every country worldwide is experiencing population ageing,[11] with a high burden of medical complexity[12–15] and an HHR workforce, that is, ageing into retirement.[16–18] Concurrently, many countries, including Canada, the UK and the USA, are experiencing challenges attracting incoming physicians to primary care as a specialty,[19–22] and among those who do, a declining proportion are providing primary care reflective of Starfield's '4 Cs' (hereafter referred to as 'comprehensive primary care'); instead, primary care physicians are increasingly limiting their scope of work to subspecialised areas such as sports medicine, dermatology or palliative care, or to episodic acute care settings, such as walk-in clinics.[23–29] Moreover, the concentration of women in primary care may further reduce HHR capacity, as women primary care physicians have been found to spend more time with patients[30] and receive more patient requests outside of appointments than men.[31 32]

In the context of an ageing population and shifting workforce demographics, HHR planning requires an understanding of the needs of patients who will soon lose their primary care provider due to retirement. To anticipate future need, previous studies often use high-level supply indicators such as number of primary care physicians, and high-level demand indicators such as patient visit rates and durations.[33–36] In-depth analyses tend to be limited to subjurisdictional populations, such as the neighbourhood[36] or early career clinicians,[24] and do not directly link supply (individual clinicians) to demand (patients served by those clinicians).

We conducted an in-depth exploration linking supply and demand at a health system planning level in Ontario, Canada. We examined temporal trends in near-retirement primary care physician characteristics and the medical and social needs of patients attached to these physicians. We also examined early-career and mid-career physician characteristics over time to understand this segment of the workforce's capacity to absorb the patients of near-retirement physicians. We explored hypothesis-generating differences in gender-based workforce trends, including differences in care provision[30 31] and trends around alternative practice models, such as interprofessional team-based care. As Canadian healthcare planning and delivery are within provincial jurisdiction, we focused on the province-level (Ontario). In Ontario, most comprehensive primary care is delivered by family physicians (FPs), most physician services and all permanent residents are covered by government insurance, and health services data are stored centrally in health administrative data sets.

METHODS

The use of data in this study was authorised under section 45 of Ontario's Personal Health Information Protection Act and did not require review by a research ethics board or informed consent. This study is reported following the Strengthening the Reporting of Observational Studies in Epidemiology reporting guideline.[37]

Study design, population and data sources

We conducted a serial cross-sectional population-level analysis. De-identified physician-level and patient-level data came from nine databases which were linked using unique encoded identifiers and analysed at ICES (formerly known as the Institute for Clinical and Evaluative Sciences) (online supplemental eMethods). The study population included all registered Ontario residents covered by the Ontario Health Insurance Plan (OHIP) at three time points: 31 March 2008 (12 936 360), 31 March 2013 (13 447 365) and 31 March 2019 (14 388 566) and all Ontario physicians who billed primary care services (2008: 11 566; 2013: 12 693; 2019: 15 054).

Outcomes and covariates

The primary outcomes were the number, proportion and characteristics of patients attached to a near-retirement age comprehensive FP over three time points, and the number, proportion and characteristics of near-retirement age comprehensive FPs over three time points. Physician characteristics served as exploratory indicators of both existing supply and, for near-retirement physicians, anticipated demand based on the populations of patients they serve. Patient characteristics served as indicators of demand based on medical and socio-demographic complexity.

Based on previous literature finding the average Ontario FP retires at age 70.5 years (with women retiring on average 5 years earlier than men)[38] and accounting for the time needed to train new physicians,[39] three different 'near-retirement' physician age cut-points were examined: ≥55 years, ≥65 years and >70 years.

Comprehensive FPs were defined by applying a previously validated algorithm described below in the Analysis section.[29] Detailed data source, cohort and covariate definitions can be found in the online supplemental eMethods.

Analysis

For our patient cohort, we created cross-sections of patients attached to comprehensive FPs at three time points: 2008, 2013 and 2019.

We began by applying our previously validated algorithm for primary care physician attachment[40] to the population of OHIP-registered Ontario residents; identifying patients attached to a physician providing

longitudinal primary care services based on billing codes and physician-level continuity of care (see online supplemental eMethods—continuity of care). We removed patients seen at community health centres because they cannot be attached to a specific physician, patients that the algorithm attached to non-FPs such as paediatricians and surgeons and patients attached to an FP with missing covariates.

We next created the cohort of FPs linked to the attached patients we identified (2008, 2013 and 2019). We stratified our patient and FP cohorts by physician practice type (scope). For this, we used a previously published algorithm for determining comprehensiveness of primary care practice, where physicians are identified as providing comprehensive care if more than half of their services were for core primary care and if these services fell into at least 7 of 22 activity areas.[29] This resulted in four groups of patients with attachments to four types of FP practice scopes: comprehensive, focused (eg, sports medicine or palliative care), other and those who worked less than 44 days/year. The latter two practice categories were grouped together as 'Other'. Focusing on the 'comprehensive FP' group, we described the characteristics of these physicians and their patients.

Physician analyses were stratified by physician sex and physician age, including the three 'near-retirement' cut-points. Proportions and means with SD were reported for each time point (2008, 2013 and 2019).

Patient and public involvement

None.

RESULTS

Patient cohort

Excluding long-term care home residents, the population of OHIP-eligible Ontario residents in the patient cohort over time was 12 863 036 (2008), 13 371 946 (2013) and 14 312 309 (2019), of whom the following were attached to a comprehensive FP: 2008: n=9 537 353 (77.3%); 2013: n=10 398 003 (85.1%); 2019: n=11 480 975 (86.1%) (figure 1A).

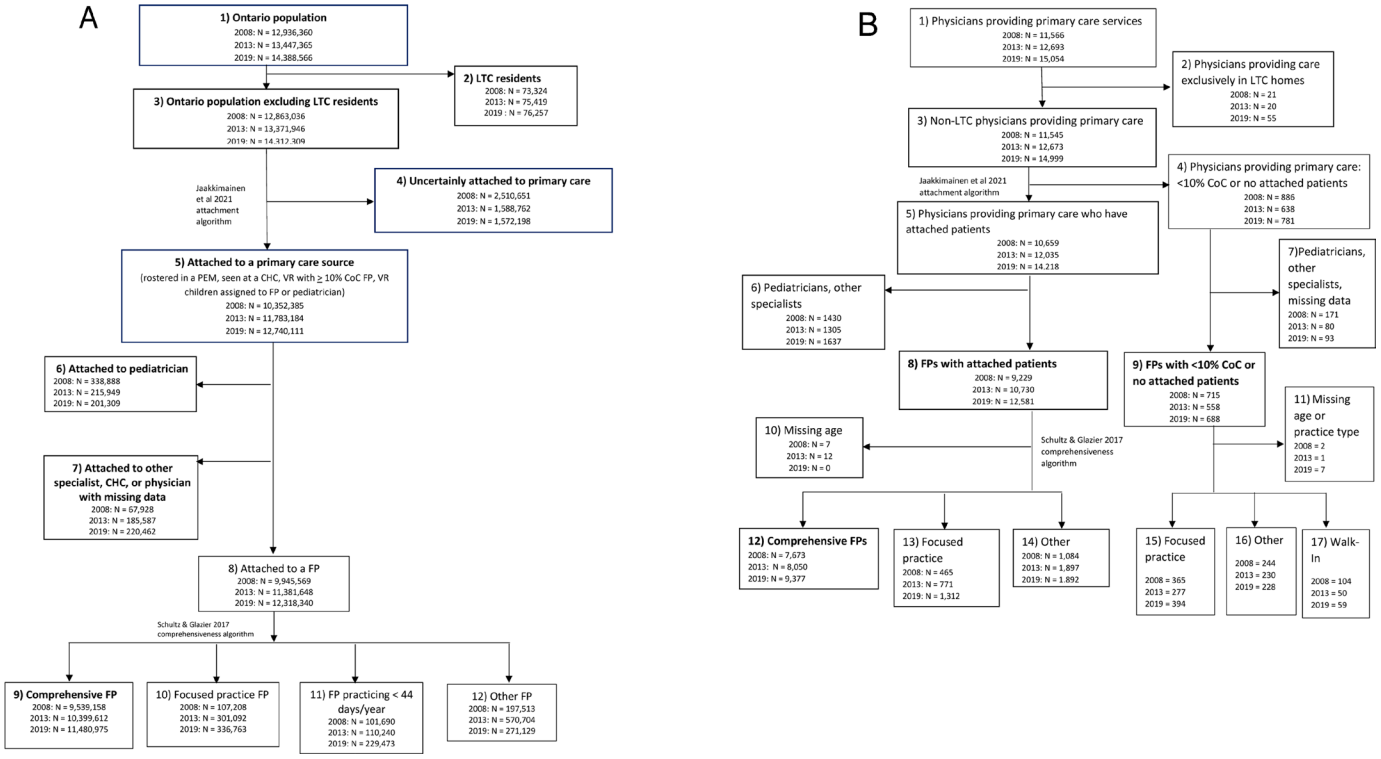


Figure 1 Cohort creation: Patients (A) and physicians (B). (A) Patient is considered VR to the physician with whom the majority of their primary care core visits were made over the preceding 2-year period (Jaakkimainen *et al* 2021). Numerator=the number of patients virtually rostered to a physician. Denominator=all unique patients the same physician had seen over 2 years. Physician CoC <10% corresponds to low CoC (Jaakkimainen *et al* 2021). Comprehensive FP: comprehensive scope of primary care practice. At least 50% of prior year's billings are four core primary care services in at least seven different primary care activity areas (Schultz and Glazier 2017). Focused FP: Narrowed scope of practice, such as sports medicine, palliative care, hospitalist. Other: Not comprehensive and not focused practice. <44 days: worked less than 44 days/year. (B) Numerator = the number of patients virtually rostered to a physician. Denominator = all unique patients the same physician had seen over 2 years. Physician CoC < 10% corresponds to low CoC (Jaakkimainen *et al* 2021). Comprehensive FP: Comprehensive scope of primary care practice. At least 50% of prior year's billings are for core primary care services in at least seven different primary care activity areas (Schultz and Glazier 2017). Focused FP: Narrowed scope of practice, such as sports medicine, palliative care, hospitalist. Other: Not comprehensive and not focused practice, or worked less than 44 days/year. CHC, community Health Centre; CoC, physician-level continuity of care; FP, family physician; LTC, long-term care; VR, virtually rostered.

Physician cohort

The overall FP workforce grew from 9944 physicians in 2008 to 13 269 in 2019 (figure 1B, sum of boxes 8 and 9).

A shift away from comprehensiveness and into other/focused scopes of practice ('non-comprehensive') was seen, with the proportion of all FPs practicing comprehensive primary care declining from 77.2% in 2008 (n=7673) to 70.7% in 2019 (n=9377) (online supplemental eFigure 1). This was driven by declining comprehensiveness among mid-career and near-retirement physician groups (age groups 45 and above). Over time, the proportion of younger physicians (those under 45) practicing comprehensiveness was stable, although in lower proportions than their mid-career counterparts. In the oldest age group, a decreasing proportion practiced comprehensiveness (online supplemental eTable 1).

Online supplemental eTable 2A,B focus specifically on the comprehensive FP workforce and stratify comprehensive FP data by age and sex. Career stage (years in practice) closely followed physician age group for both men and women, and the youngest cohort (age <35) comprised an increasing proportion of the comprehensive workforce over time, shifting from 7.7% in 2008 to 15.1% in 2019. The older cohorts were also found to comprise an increasing proportion of the comprehensive workforce over time, and the absolute numbers of older physicians increased.

Temporal trends for near-retirement comprehensive FPs and their patients

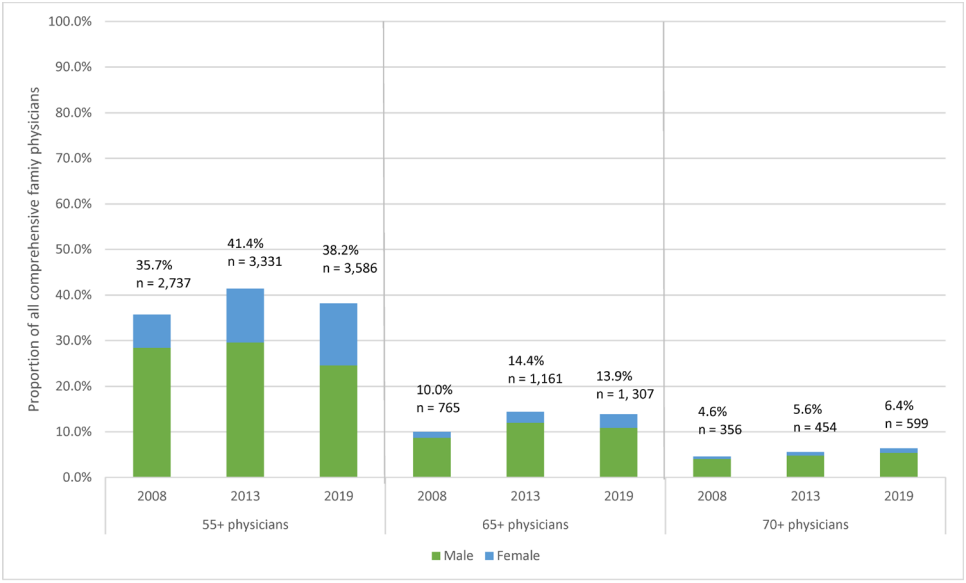
When looking at our three near-retirement cut-points (55+, 65+ and 70+) over time, an increasing proportion of the comprehensive FP workforce was near retirement age (figure 2). Correspondingly, an increasing proportion of patients were attached to near-retirement comprehensive FPs (table 1). Between 2008 and 2019, FPs in the 55+ age group represented a growing proportion of all comprehensive FPs, increasing from 35.7% to 38.2%. In 2019, this corresponded to 3586 physicians and 4 935 992 (43.0%) patients (2019). The proportion of comprehensive FPs in the 65+ group increased from 10.0% in 2008 to 13.9% in 2019 (1307 physicians, 1 695 126 (14.8%) patients). The proportion of comprehensive FPs in the 70+ age group increased from 4.6% in 2008 to 6.4% in 2019 (599 physicians, 666 000 (5.8%) patients).

Temporal characteristics of comprehensive FPs and their patients

Comprehensive FP capacity/workload

Online supplemental eTable 2B shows the mean (SD) roster size for the total population of comprehensive FPs remained consistent over time (2008: 1213 (927); 2013: 1272 (909); 2019: 1209 (837)). Male FPs had consistently larger roster sizes in each age group and at each time point. Both male and female FP roster sizes followed an inverted U pattern with FP age, with practice sizes starting and ending smaller at the extremes of FP age and peaking during mid-career. This pattern was observed at all three time points. That said, male and female older (65+) physicians and younger (<35) physicians cared for larger roster sizes over time.

Working full time equivalent (FTE) also followed an inverted U pattern according to FP age (online supplemental eTable 2B). Consistently, two-thirds of the overall comprehensive FP workforce practiced FTE, with men comprising the majority of the FTE physicians. Older



Total Ns (all comprehensive family physicians):
2008: 7,673
2013: 8,050
2019: 9,377

Figure 2 Comprehensive family physicians by near-retirement group, year and sex. Total Ns (all comprehensive family physicians) for 2008, 2013 and 2019 are 7673, 8050 and 9377, respectively.

Table 1 Characteristics of patients attached to near-retirement comprehensive family physicians over time, by near-retirement group

Patient characteristics		Age 55+ comprehensive FPs		Age 65+ comprehensive FPs		Age 70+ comprehensive FPs	
		N	%	N	%	N	%
Overall (N, % of patients attached to near-retirement physician group)	2008	3 571 661	37.5	690 642	7.2	214 861	2.3
	2013	4 676 625	45.0	1 399 119	13.5	419 172	4.0
	2019	4 935 992	43.0	1 695 126	14.8	666 404	5.8
Aged 65+ (N, % of patients attached to near-retirement physician group)	2008	597 707	16.7	136 394	19.8	45 414	21.1
	2013	846 974	18.1	298 545	21.3	95 833	22.8
	2019	1 003 769	20.3	402 430	23.7	176 473	26.5
Female patients (N, % of patients attached to near-retirement physician group)	2008	1 804 585	50.5	338 656	49.0	103 386	48.1
	2013	2 371 923	50.7	678 971	48.5	201 104	48.0
	2019	2 498 453	50.6	823 090	48.6	317 967	47.7
Rural patients (RIO score 40+) (N, % of patients attached to near-retirement physician group)	2008	233 045	6.5	48 860	7.1	14 323	6.7
	2013	292 357	6.3	88 311	6.3	20 294	4.8
	2019	274 099	5.6	83 691	4.9	33 545	5.0
Highest (4+) RUB (N, % of patients attached to near-retirement physician group)	2008	677 436	19.0	137 995	20.0	44 067	20.5
	2013	878 340	18.8	283 013	20.2	88 182	21.0
	2019	983 818	19.9	350 439	20.7	146 298	22.0
Highest (5+) annual core primary care visits (N, % of patients attached to near-retirement physician group)	2008	2 109 950	59.1	403 026	58.4	127 050	59.1
	2013	2 462 236	52.7	753 388	53.9	227 090	54.2
	2019	2 480 395	50.3	876 487	51.7	346 668	52.0
COPD (N, % of patients attached to near-retirement physician group)	2008	233 498	6.5	51 856	7.5	16 411	7.6
	2013	326 748	7.0	115 669	8.3	37 477	8.9
	2019	337 202	6.8	132 395	7.8	59 350	8.9
CHF (N, % of patients attached to near-retirement physician group)	2008	69 573	2.0	15 645	2.3	4952	2.3
	2013	80 026	1.7	28 187	2.0	9214	2.2
	2019	90 436	1.8	35 567	2.1	15 832	2.4
Diabetes (N, % of patients attached to near-retirement physician group)	2008	327 127	9.2	68 392	9.9	21 389	10.0
	2013	506 014	10.8	170 115	12.2	52 815	12.5
	2019	555 358	11.3	215 696	12.7	92 395	13.9
Frailty (N, % of patients attached to near-retirement physician group)	2008	66 559	1.9	14 875	2.2	4964	2.3
	2013	98 490	2.1	33 005	2.4	10 794	2.6
	2019	114 085	2.3	43 032	2.5	18 597	2.8
Any mental health illness in last 2 years (N, % of patients attached to near-retirement physician group)	2008	825 520	23.1	166 257	24.1	51 802	24.1
	2013	979 987	21.0	311 771	22.3	96 543	23.0
	2019	1 022 523	20.7	355 911	21.0	150 153	22.5
Lowest income quintile (N, % of patients attached to near-retirement physician group)	2008	706 504	19.8	150 381	21.8	48 403	22.5
	2013	876 982	18.8	282 922	20.2	91 236	21.8
	2019	944 888	19.1	348 869	20.6	142 881	21.4
Highest housing instability quintile (N, % of patients attached to near-retirement physician group)	2008	761 397	21.3	165 525	24.0	54 275	25.6
	2013	934 472	20.0	295 059	21.1	92 653	22.2
	2019	1 031 506	20.9	374 322	22.1	155 859	23.4
Highest material deprivation quintile (N, % of patients attached to near-retirement physician group)	2008	736 903	20.6	163 835	23.7	52 733	24.9
	2013	1 045 136	22.4	338 012	24.2	112 097	26.9
	2019	926 043	18.8	352 849	20.8	145 084	21.8

Continued

Table 1 Continued

Patient characteristics		Age 55+ comprehensive FPs		Age 65+ comprehensive FPs		Age 70+ comprehensive FPs	
		N	%	N	%	N	%
Highest neighbourhood ethnic concentration quintile (N, % of patients attached to near-retirement physician group)	2008	962 252	26.9	177 586	25.7	63 167	29.8
	2013	1 335 124	28.6	397 430	28.4	124 062	29.8
	2019	1 521 975	30.8	584 512	34.5	213 182	32.0
Recent immigrant (N, % of patients attached to near-retirement physician group)	2008	269 131	7.5	52 717	7.6	21 202	10.9
	2013	289 772	6.2	83 484	6.0	27 024	7.0
	2019	277 755	5.6	82 560	4.9	28 449	4.3

Interpretation of table 1 rows:
Interpretation of the 'Overall' category: For example, in 2019, 1 695 126 patients were attached to a comprehensive FP aged 65+. This represents 14.8% of all patients who are attached to a comprehensive FP.
Interpretation of each patient category: For example, in 2019, of the 666 404 patients attached to comprehensive FPs over the age of 70 years, 28 449 (4.3%) were recent immigrants.
CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; FPs, family physicians; RIO, Rurality Index of Ontario; RUB, morbidity, based on resource usage band.

physicians increasingly practiced FTE (age 65–69, 2008: 58.4%, 2013: 67.0%, 2019: 72.6%; age 70+, 2008: 32.0%, 2013: 41.6%, 2019: 54.6%), a trend that was driven by an increasing proportion of female FTE comprehensive FPs. Among younger physicians, by 2019, women comprised the majority of the FTE workforce (52.2% of FTE comprehensive FPs<35 years; 55.2% of FTE comprehensive FPs 35–44 years).

Mean (SD) annual core primary care visits provided per patient declined over time (online supplemental eTable 2B): 2008: 7.3 (3.1) visits; 2013: 6.5 (2.6) visits; 2019: 6.0 (2.3) visits. In most comprehensive FP age groups, men and women provided similar numbers of annual visits. Older physicians provided more annual visits compared with their younger counterparts.

In the patient cohort (table 1), at all near-retirement physician cut-offs (55+, 65+ and 70+), a declining proportion over time made a high number (5+) primary care visits in the preceding year, but these proportions remained consistently over 50% in all near-retirement groups and at each time point.

Comprehensive FP practice settings

A declining proportion of comprehensive FPs over time practiced in fee-for-service (FFS) models of care, with alternate payment plan models (APPs), specifically capitation and team-based models of care, becoming increasingly common (online supplemental eFigure 2). In these APP models, physician compensation is primarily a lump sum payment per attached patient, with or without additional government funding for support for interdisciplinary health professionals ('teams') such as nurses, nurse practitioners, social workers and dietitians. In 2008, most comprehensive FPs worked in FFS-based models (76.6%), but by 2019, most practiced in APPs (55.4%) (online supplemental eFigure 2 and eTable 3). Correspondingly, an increasing proportion of patients were served in APP models: 2008: 26.5% (n=2 526 116); 2013: 54.3% (n=5 643 862); 2019: 61.5% (n=7 064 109).

Over time, a stable majority of comprehensive FPs practiced in large urban and urban settings (online supplemental eTable 4A). Trends around age and sex of rural comprehensive FPs resembled trends seen in the overall comprehensive FP population (online supplemental eTable 4B,C).

Patient complexity

The mean age (SD) of comprehensive FPs' patients increased over time (online supplemental eTable 2B): 2008: 33.5 (13.2) years; 2013: 36.5 (12.1) years; 2019: 38.1 (12.0) years. When stratified by physician age and sex, each physician age group served increasingly older patients. Male physicians cared for slightly older patients than did females in each physician age group and at each time point.

The number and proportion of patients aged 65 and older increased over time in each near-retirement group (table 1). This number nearly quadrupled in the oldest (70+ years) FP group (2008: N=45 414, 2019: N=176 473).

Over time, an increasing proportion of comprehensive FPs' practices were comprised of the highest morbidity patients (resource usage band 4+): 2008: 16.5%; 2013: 18.1%; 2019: 19.8% (online supplemental eTable 5). Concordantly, as seen in table 1, the number and proportion of highest morbidity patients attached to near-retirement physicians grew over time. By 2019, 983 818 patients in the highest morbidity category were attached to a physician aged 55+, representing 19.9% of all patients attached to a 55+ physician. 350 439 were attached to a 65+ physician (20.7% of patients attached to a 65+ physician). 146 298 were attached to a 70+ physician (22.0% of patients attached to 70+ a physician), representing a tripling of the absolute number.

While proportions of patients with chronic illness (chronic obstructive pulmonary disease, congestive heart failure, diabetes, frailty, mental illness) remained relatively stable over time, the absolute numbers increased markedly in each near-retirement group (table 1).

The proportions and means of socially complex patients cared for within each comprehensive FP age and sex group increased over time for most indicators (Supplemental eTable 5) and, concordantly, the number of higher social complexity patients increased markedly over time for most near-retirement groups (table 1).

DISCUSSION

In our population-level serial cross-sectional analyses, the number and proportion of patients attached to a comprehensive FP in Ontario, Canada, grew over time. However, reflective of population-level workforce trends,[16] we found an increasing proportion of the comprehensive FP workforce is nearing retirement. Given the average FP retires at age 70.5 years,[38] we anticipate that between 2019 and 2025, nearly 1.7 million Ontarians may lose their current comprehensive FP to retirement.

This number may be an underestimate. Half of all comprehensive FPs are now women, and female FPs retire on average 5 years earlier than males.[38] Further, due to limitations in data availability for more recent years, our analyses predate the COVID-19 pandemic, and surveys from Ontario indicate the pandemic has hastened retirement plans, with almost double the usual proportion of FPs closing their offices during the pandemic (3%, compared with the usual rate of 1.6%/year),[41] and one in five indicating an intention to retire within 5 years.[42]

Although modelling the future capacity of the comprehensive FP workforce was outside the scope of this study, several findings from this study may help inform such modelling. Aligned with previous research,[29] a declining proportion of FPs are practicing comprehensive family medicine. Two-thirds of comprehensive FPs are practicing full-time. Reflective of a generally ageing population, comprehensive FPs cared for increasingly older groups of patients with increasing medical and social complexity over time. Women, who comprised an increasing proportion of the comprehensive FP workforce, served smaller roster sizes than men, which may reflect that a lower proportion of female physicians practiced FTE compared with males.

Modelling may also consider other variables not examined in this study, such as the net number of FPs added to the workforce each year (in Ontario, this has averaged 333 per year over the last 10 years (2013–2022)[43]), the ranking of family medicine as first choice discipline by medical school graduates (in Ontario and other jurisdictions, this has declined in recent years[20–22 44]) and population growth.[45]

Solutions to FP workforce shortages identified in the literature focus on addressing deterrents to the practice of comprehensive primary care, including perceived poor respect for primary care as a profession, inadequate compensation, inadequate training supports for developing and maintaining comprehensive skills and inadequate administrative and interprofessional health supports to manage increasing patient complexity.[21 24 46–50] Our finding of a shift toward APP models underscores the desire among comprehensive FPs for financial stability and the support of an interprofessional team. Further, we identified equity concerns that relate to the large numbers of patients with chronic diseases and complex social needs, all of which are highly amenable to team-based care.[51–53] Concerningly, as of 2019, we found that 47% of older (65+) physicians still practiced in the less popular FFS models of care, serving 761 648 patients; these FFS practices may be less desirable to incoming physicians looking to take over a retiring physician's practice.

In some jurisdictions, the response to primary care workforce shortages has included expanding the scope of practice for non-physician health professionals. For example, several provinces in Canada, including Ontario, now allow pharmacists to prescribe for minor common ailments. However, concerns have been raised around inadequate concurrent investments in comprehensive, team-based primary care (rather than episodic, siloed care), the disruption of continuity for those who do have primary care access, limited pharmacist training in clinical diagnosis and the lack of high-quality evidence around cost-effectiveness and health outcomes.[54 55] Both the USA and Canada have increased nurse practitioner or physician assistant-led primary care. However, a recent US study found that primary care delivered by non-physician practitioners was more costly than care delivered by physicians,[56] and accurate cost comparisons in Canada remain a challenge due to the lack of publicly available data on non-physician overhead spending.

There are some limitations to our study. The FTE indicator is based on physician billings, thereby excluding time spent on non-billable administrative work. Almost half of Canadian FPs report 10–19 hours per week of administrative tasks,[57] so the indicator may underestimate workload and thus the number of FTE FPs. Rural FPs often practice in both primary care and hospital settings[58]; since the comprehensiveness algorithm is based on primary care billings,[29] it may underestimate the number of rural comprehensive FPs. Further, the rurality index scores and methodology have not been updated since 2008 despite the significant population growth and municipal-level changes that have occurred since then. Some physician analyses could not be fully stratified by both age and sex due to small cell sizes. Community health centre patients are not included and we did not examine other clinicians who may provide primary care; however, these clinicians are the main primary care source for only a small minority (approximately 1%) of Ontarians.[59 60] Finally, our analyses do not account for the rise of virtual care and its potential impact on capacity.[61–63]

CONCLUSIONS

Primary care faces many capacity challenges as physicians age into retirement and fewer choose to enter or remain in comprehensive practice. Incentives and supports are needed to grow the comprehensive FP workforce to serve a growing and increasingly complex patient population.

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Data availability statement Data may be obtained from a third party and are not publicly available. The data sets from this study are held securely in coded form at ICES. Data-sharing agreements prohibit ICES from making the data sets publicly available, but access may be granted to those who meet prespecified criteria for confidential access, available at www.ices.on.ca/DAS. The complete data set creation plan, and underlying analytical code are available from the authors upon request, understanding that the programmes may rely upon coding templates or macros unique to ICES.

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