

Physician home visits in Ontario: a cross-sectional analysis of patient characteristics and postvisit use of health care services

Lauren Lapointe-Shaw MD PhD, Tara Kiran MD MSc, Andrew P. Costa PhD, Yingbo Na MSc, Samir K. Sinha MD DPhil, Katherine E. Nelson MD PhD, Nathan M. Stall MD, Noah M. Ivers MD PhD, Aaron Jones PhD

Abstract

Background: It is unknown how much of current physician home visit volume is driven by low-complexity or low-continuity visits. Our objectives were to measure physician home visit volumes and costs in Ontario from 2005/06 to 2018/19, and to compare patient characteristics and postvisit use of health care services across home visit types.

Methods: This was a retrospective cross-sectional study using health administrative data. We examined annual physician home visit volumes and costs from 2005/06 to 2018/19 in Ontario, and characteristics and postvisit use of health care services of residents who received at least 1 home visit from any physician in 2014/15 to 2018/19. We categorized home visits as palliative, provided to a patient who also received home care services or “other,” and compared characteristics and outcomes between groups.

Results: A total of 4 418 334 physician home visits were performed between 2005/06 and 2018/19. More than half (2 256 667 [51.1%]) were classified as “other” and accounted for 39.1% (\$22 million) of total annual physician billing costs. From 2014/15 to 2018/19, of the 413 057 home visit patients, 240 933 (58.3%) were adults aged 65 or more, and 323 283 (78.3%) lived in large urban areas. Compared to the palliative care and home care groups, the “other” group was younger, had fewer comorbidities, and had lower rates of emergency department visits and hospital admissions in the 30 days after the visit.

Interpretation: About half of physician home visits in 2014/15 to 2018/19 were to patients who were receiving neither palliative care nor home care, a group that was younger and healthier, and had low use of health care services after the visit. There is an opportunity to refine policy tools to target patients most likely to benefit from physician home visits.

Homebound people face challenges accessing preventive, chronic and acute care, which leads to adverse health effects and an overreliance on emergency and hospital-based services.¹⁻³ Home-based primary care⁴ can reduce the use of emergency department visits and hospital admissions for homebound older adults,⁵⁻⁸ can provide essential information about patients’ needs and home life,⁹ and is perceived positively by patients, caregivers and providers.¹⁰⁻¹² For many homebound older adults, strengthening primary care at home has the twin benefits of shifting care out of hospitals and delaying the need for residential long-term care.¹³ Similarly, patients near the end of life have complex health care needs, yet often prefer to spend their last days at home with loved ones rather than in a residential hospice setting.¹⁴ Physician home visits may also increase the likelihood of death occurring at home, which is preferred by many patients.^{15,16}

Access to physician home visits is essential to meet the needs of those receiving palliative care and other homebound patients. Although rates of physician home visits are still declining in

some regions, financial incentives have driven a resurgence in these visits in the United States.¹⁷⁻¹⁹ Yet, to our knowledge, there have been no population-based studies of physician home visit provision in Canada aside from 2 studies in specific subgroups (palliative care¹⁶ and home care⁸ recipients). Financial incentives for physician home visits were introduced in 2005 and 2012 in Ontario, Canada’s most populous province.^{20,21} However, incentives may reward providers and companies that aim to maximize profits by offering short, low-complexity visits, disconnected from patients’ existing health care teams.

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Correspondence to: Lauren Lapointe-Shaw, lauren.lapointe.shaw@utoronto.ca

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It is unknown how much of current physician home visit volume and billing costs are driven by low-complexity or low-continuity visits. Our objectives were to measure physician home visit volumes and billing costs in Ontario from 2005/06 to 2018/19, and to compare patient characteristics and post-visit use of health care services across home visit types. We hypothesized that many recipients of physician home visits were receiving neither palliative care nor additional home care, and aimed to explore how this group's characteristics and postvisit use of health care services differed from those of the palliative and home care groups.

Methods

Study design and setting

This retrospective cross-sectional study used health administrative data sets linked by means of unique encoded identifiers and analyzed at ICES in Ontario. ICES holds information on physician and emergency department visits, hospital stays and publicly funded home health care in Ontario (databases used are listed in Appendix 1, Table S1, available at www.cmajopen.ca/content/10/3/E732/suppl/DC1). Because of the universal nature of coverage of physician and hospital services under the Ontario Health Insurance Plan, this study was population based.

With 14.5 million residents, Ontario accounts for more than 38% of Canada's total population.²² Public health insurance is provided without premium or copay through the Ontario Health Insurance Plan. Overall, 93% of Ontario residents report having a primary care provider, with 82% formally enrolled to a physician working in a Patient Enrolment Model,²³ a model in which physicians work in groups, have shared responsibility for after-hours care, and receive some blended payments and incentives. Primary care physicians not practising in a patient enrolment model work independently and are paid on a fee-for-service basis.²⁴

To incentivize the provision of physician home visits, the Ontario Ministry of Health has long offered special visit premiums for visits in a home setting. However, in 2005, a more remunerative special visit premium was introduced for palliative home visits, with a dollar value 3 times that of the corresponding code for a regular home visit.²⁰ In 2012, additional annual bonus payments were introduced, paying physicians who provide the highest volume of nonpalliative primary care home visits up to an additional \$8000 annually (Appendix 1, Tables S2A and S2B).²¹

We used the STROBE checklist for cross-sectional, observational studies.²⁵

Study population

For our population-level analysis of physician home visits over time, we included all Ontario residents with a valid health card and at least 1 home visit between Apr. 1, 2005, and Mar. 31, 2019. We defined a physician home visit using a combination of dedicated home visit billing codes (Appendix 1, Table S3) and other assessment codes with a location of "home."²⁶ Physicians who performed home visits could be from any specialty (family medicine or other).

For our patient-level analysis, we further narrowed the inclusion period to the 5 most recent years (2014/15 to 2018/19), as these would be most relevant to current policy-maker decision-making. We selected the first physician home visit per patient and excluded all others.

Measures

Stratification of physician home visits

We categorized physician home visits by the type of recipient (palliative care, home care or other). We used billing codes to determine whether the visit was palliative (Appendix 1, Table S3). We categorized recipients as receiving home care if they had 2 or more services in the previous 30 days provided by personal support workers, nurses or other allied health care professionals, but not physicians. We used home care as a proxy for a level of functional impairment that would impede attendance at medical appointments outside of a home setting. We defined "other" visits as visits that were neither palliative nor to a home care recipient. We did not know a priori what types of visits would be included in this group, although on-demand appointments for viral illnesses were likely candidates.

Home visit volume and cost over time

We used Statistics Canada's Ontario population estimates to calculate annual physician home visit volume per 10 000 people.²² We also measured the annual total cost of physician billings associated with encounters that had at least 1 home visit code, stratified by type (palliative, home care or other).

Patient characteristics and postvisit use of health care services

Patient-level baseline characteristics included the following demographic characteristics: age, sex, urban versus rural residence,²⁷ census-based neighbourhood income quintile, immigrant status²⁸ and limited proficiency in English or French (available for all immigrants landing in Ontario after 1985). We also included the count of comorbidities over the previous 2 years using Johns Hopkins Aggregated Diagnosis Groups;²⁹ use of health care services over the previous 2 years, grouped into low (≤ 2), moderate (3) and high (4–5) Resource Utilization Bands;²⁹ emergency department visits in the previous 30 days; hospital discharge in the previous 30 days; count of outpatient physician visits in the previous year; home care in the previous 30 days; emergency department visit or hospital admission for a mental health condition in the previous 2 years;³⁰ history of dementia,³¹ asthma,^{32,33} diabetes,³⁴ chronic obstructive pulmonary disease³⁵ or congestive heart failure;³⁶ and postpartum status.³⁷ We also included information on primary care attachment. Operational definitions of all variables are provided in Appendix 1, Table S4.

The Resident Assessment Instrument – Home Care is a validated tool covering social, functional and health dimensions.^{38–40} This tool is used for the roughly 40% of Ontario home care recipients who are "long-stay" or expected to have care needs beyond 60 days, and is typically completed every

6 months.⁴¹⁻⁴³ For the subgroup of patients who had a Resident Assessment Instrument – Home Care completed within 6 months before the index home visit, we reported whether the recipient had hearing impairment, vision impairment or a caregiver in the home, used an assistive device or was dependent on others for locomotion, as well as their homebound status.³

We included the following variables relating to relational continuity between patient and physician: whether the patient was formally enrolled to the home visiting physician, whether the patient was enrolled to a physician in the same group as the home visiting physician, and whether the patient was known to the home visiting physician from another encounter in the previous year. In addition, we reported patient events after the index physician home visit: repeat home visits in the subsequent year, and office physician visit, emergency department visits or urgent hospital admission within 30 days.

Statistical analysis

We plotted the annual count of home visits per 10 000 Ontarians and the annual total cost of physician home visit billings over time, stratified by type of recipient (palliative care, home care or other).

In our patient-level analysis, we described baseline, patient-physician dyad and postvisit characteristics using counts and frequencies, as well as medians and interquartile range. We reported pairwise comparisons using standardized mean differences, with a threshold of 0.1 (10%) considered meaningful.⁴⁴ All analyses were executed in SAS software, version 9.4 (SAS Institute).

Subgroup analyses

We examined 2 subgroups: rural residents and patients less than age 18 years at the time of the index home visit. For the latter group, we determined whether each patient had a history of a pediatric complex chronic medical condition.⁴⁵

Ethics approval

This study was exempt from ethics review under section 45 of Ontario’s *Personal Health Information Protection Act*.

Results

Physician home visit volume and cost

A total of 4 418 334 physician home visits were performed between 2005/06 and 2018/19. The population-adjusted annual home visit volume was 224 per 10 000 people in 2005/06. It declined slightly from 2005/06 to 2007/08, remained stable from 2007/08 to 2012/13, and then increased to a maximum of 307 per 10 000 people in 2018/19, an increase of 37% relative to 2005/06 (Figure 1). Although palliative visits accounted for only 906 468 (20.5%) of all physician home visits, the volume of palliative visits per 10 000 people increased more than sevenfold and accounted for 88.5% of the growth in home visit volume over the study period. Home care recipients received 1 255 199 (28.4%) of all physician home visits, and patients in the “other” group received 2 256 667 visits (51.1%).

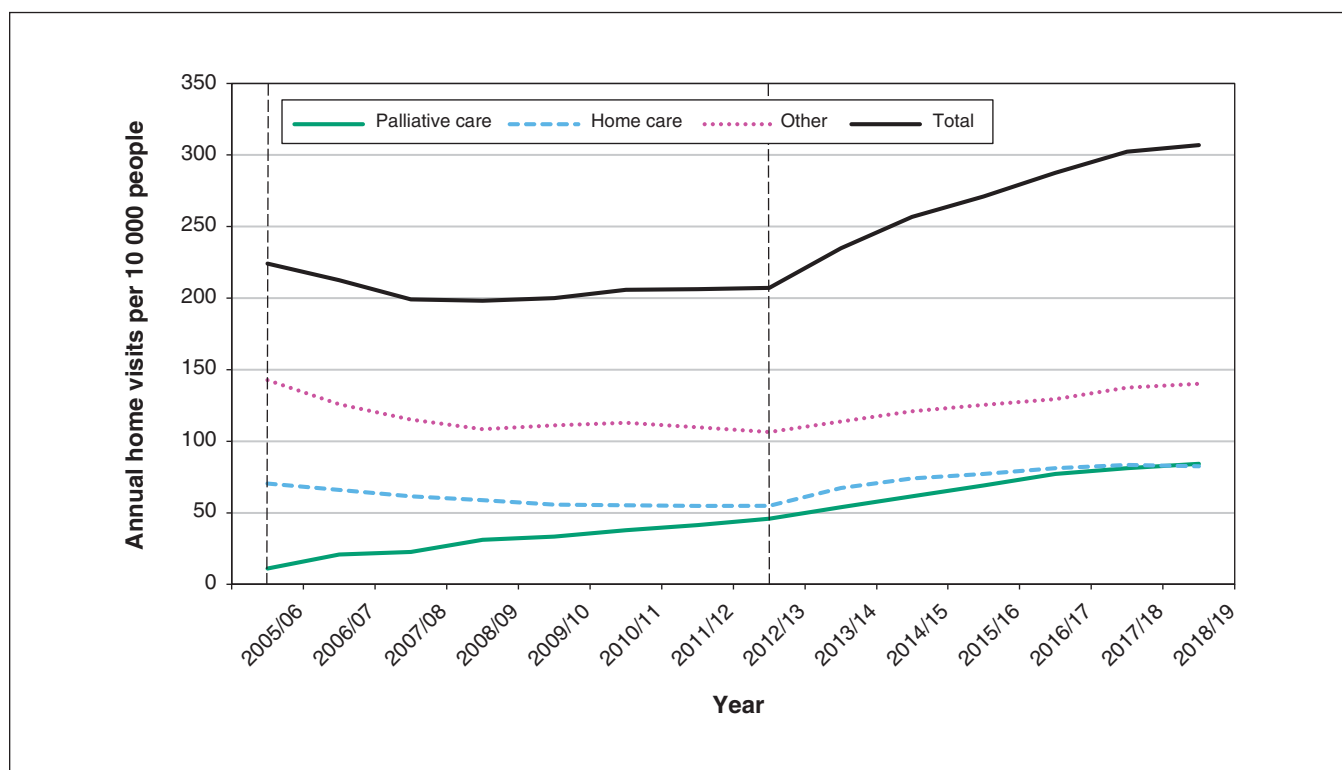


Figure 1: Annual physician home visits per 10 000 people in Ontario, 2005/06 to 2018/19, by type of visit. Dotted vertical lines at 2005/06 and 2012/13 mark the introduction of premium billing codes for palliative home visits and higher-volume incentives for primary care home visits, respectively.

The total annual cost of billings for physician home visits peaked at \$56.3 million in 2018/19 (Figure 2). Palliative visits accounted for 40.7% (\$22.9 million) of this cost, home care visits for 20.2% (\$11.4 million), and “other” visits for 39.1% (\$22 million).

Patient characteristics

Of the 4 418 334 physician home visits, 2 445 955 occurred before Apr. 1, 2014, 1005 were excluded because the health card number was invalid or the patient was ineligible for the Ontario Health Insurance Plan, and 1 558 317 were visits other than the index visit. The remaining 413 057 patients received at least 1 physician home visit from 2014/15 to 2018/19. Of the 413 057, 71 963 (17.4%) received 1 repeat home visit in the subsequent year, and 131 338 (31.8%) received 2 or more repeats visits in the subsequent year.

Of the 413 057 patients, 53 997 (13.1%) were children, 118 127 (28.6%) were adults less than age 65, and 240 933 (58.3%) were adults aged 65 or more (Table 1). More than half (238 087 [57.6%]) were female, and the majority (323 283 [78.3%]) resided in large urban settings. More than half (239 274 [57.9%]) were high health care users, but the majority (261 465 [63.3%]) had not received any home care in the previous month. Three-quarters (307 637 [74.5%]) were formally enrolled to a primary care physician; however, the physician who made the home visit(s) was their primary care physician or another physician in the same group in only 133 830 cases (32.4%).

Comparison between physician home visit types

Of all patients who received a first physician home visit in 2014/15 to 2018/19, 78 463 (19.0%) had a palliative visit, and 83 151 (20.1%) received home care; the remaining 251 443 patients (60.9%) were classified as receiving “other” care. Compared to palliative care and home care recipients, the “other” group contained more children and young adults, more people living in a large urban setting and more immigrants (Table 1). They also had fewer comorbidities, with over a third (94 372 [37.5%]) in the lowest comorbidity category. Although the proportion of patients with a history of dementia in the “other” group was lower than that in the palliative care and home care groups, it was still substantial, at 10.3% (*n* = 25 997). The “other” group also had the lowest rates of health care use over the previous 2 years, including fewer outpatient physician visits in the previous year and lower proportions with an emergency department visit or hospital discharge in the previous 30 days. Notably, fewer patients in the “other” group were formally enrolled to a primary care physician, and this group also had the highest proportion of patients with no primary care visits in the previous 2 years.

Only 62 722 other home visits (24.9%) were with the patient’s primary care provider, similar to the palliative care group but considerably less than the home care group (37 522 [45.1%]) (Table 1). Patients in the “other” group had fewer home visits with a physician who was known to them from any visit in the previous year than patients in the palliative care and home care groups.

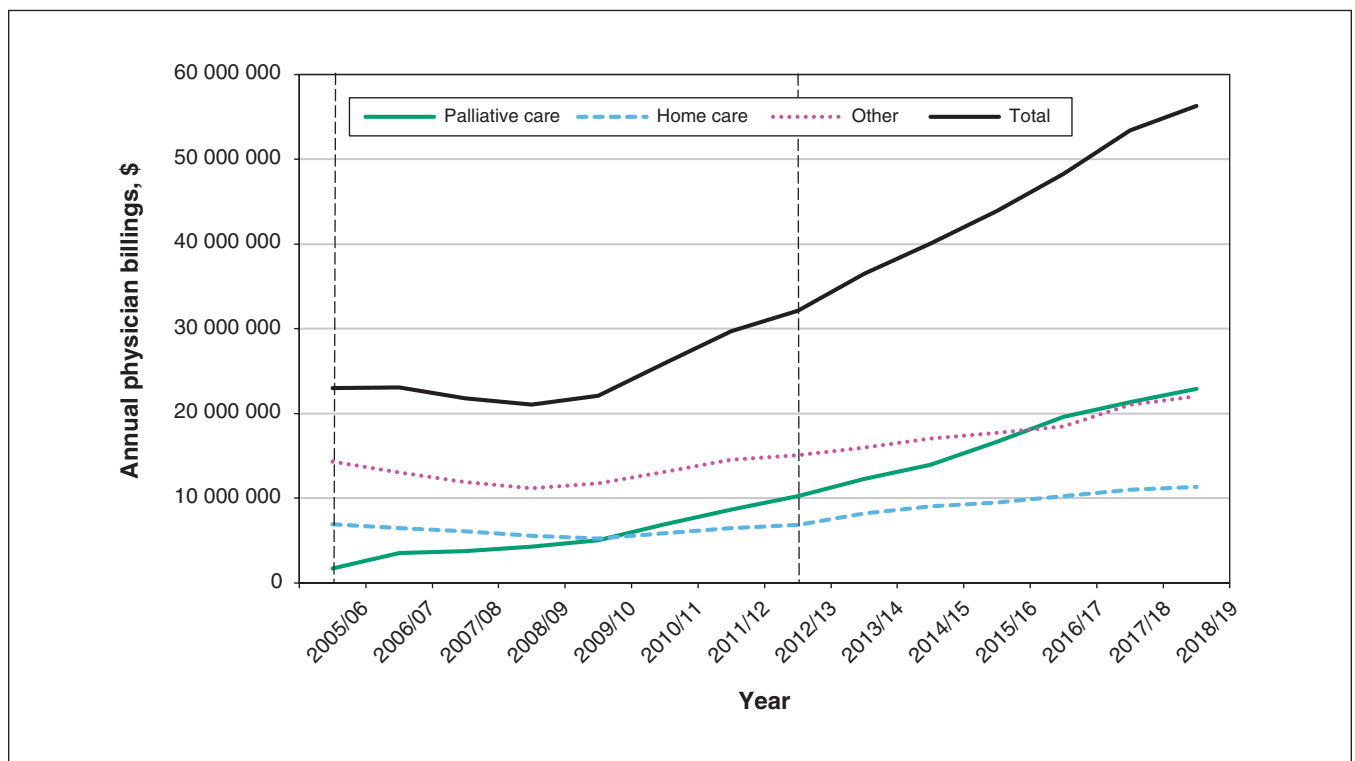


Figure 2: Annual total physician billings for home visits in Ontario, 2005/06 to 2018/19, by type of visit. Dashed vertical lines at 2005/06 and 2012/13 mark the introduction of premium billing codes for palliative home visits and higher-volume incentives for primary care home visits, respectively.

Table 1 (part 1 of 2): Characteristics of patients who received a physician home visit in Ontario from Apr. 1, 2014, to Mar. 1, 2019

Characteristic	No. (%) of patients*				SMD other v. palliative care†	SMD other v. home care†
	Palliative care n = 78 463	Home care n = 83 151	Other n = 251 443	Total n = 413 057		
Age, yr						
< 18	843 (1.1)	326 (0.4)	52 828 (21.0)	53 997 (13.1)	+0.67	+0.71
18–39	1193 (1.5)	987 (1.2)	40 496 (16.1)	42 676 (10.3)	+0.53	+0.55
40–64	16 236 (20.7)	7043 (8.5)	52 172 (20.7)	75 451 (18.3)	0	+0.35
65–79	28 224 (36.0)	20 230 (24.3)	41 640 (16.6)	90 094 (21.8)	−0.45	−0.19
≥ 80	31 967 (40.7)	54 565 (65.6)	64 307 (25.6)	150 839 (36.5)	−0.33	−0.88
Female sex	40 004 (51.0)	52 076 (62.6)	146 007 (58.1)	238 087 (57.6)	+0.14	−0.09
Residence setting						
Large urban	51 490 (65.6)	60 767 (73.1)	211 026 (83.9)	323 283 (78.3)	+0.43	+0.27
Small urban	20 270 (25.8)	15 550 (18.7)	26 293 (10.5)	62 113 (15.0)	−0.41	−0.24
Rural	6011 (7.7)	6202 (7.5)	11 491 (4.6)	23 704 (5.7)	−0.13	−0.12
Missing	692 (0.9)	632 (0.8)	2633 (1.0)	3957 (1.0)	+0.02	+0.03
Neighbourhood income quintile						
1 (lowest)	17 135 (21.8)	20 915 (25.2)	60 541 (24.1)	98 591 (23.9)	+0.05	−0.02
2	16 399 (20.9)	18 876 (22.7)	50 484 (20.1)	85 759 (20.8)	−0.02	−0.06
3	15 433 (19.7)	16 135 (19.4)	44 461 (17.7)	76 029 (18.4)	−0.05	−0.04
4	14 304 (18.2)	13 713 (16.5)	41 730 (16.6)	69 747 (16.9)	−0.04	0
5 (highest)	14 978 (19.1)	13 172 (15.8)	52 670 (20.9)	80 820 (19.6)	+0.05	+0.13
Missing	214 (0.3)	340 (0.4)	1557 (0.6)	2111 (0.5)	+0.05	+0.03
Limited proficiency in English or French	2446 (3.1)	2912 (3.5)	11 330 (4.5)	16 688 (4.0)	+0.07	+0.05
Immigrant	5302 (6.8)	6058 (7.3)	29 739 (11.8)	41 099 (9.9)	+0.18	+0.15
Comorbidity count						
Low (≤ 5)	7609 (9.7)	10 488 (12.6)	94 372 (37.5)	112 469 (27.2)	+0.69	+0.60
Moderate (6–9)	24 012 (30.6)	24 624 (29.6)	91 902 (36.5)	140 538 (34.0)	+0.13	+0.15
High (≥ 10)	46 842 (59.7)	48 039 (57.8)	65 169 (25.9)	160 050 (38.7)	−0.73	−0.68
Comorbidities						
Dementia	12 423 (15.8)	30 459 (36.6)	25 997 (10.3)	68 879 (16.7)	−0.16	−0.65
Mental health condition	2958 (3.8)	5595 (6.7)	10 595 (4.2)	19 148 (4.6)	+0.02	−0.11
Chronic obstructive pulmonary disease	27 703 (35.3)	29 027 (34.9)	37 992 (15.1)	94 722 (22.9)	−0.48	−0.47
Congestive heart failure	17 514 (22.3)	26 027 (34.9)	21 582 (8.6)	65 181 (15.8)	−0.39	−0.59
Asthma	12 182 (15.5)	15 872 (19.1)	47 194 (18.8)	75 248 (18.2)	+0.09	−0.01
Diabetes mellitus	25 309 (32.3)	32 666 (39.3)	45 974 (18.3)	103 949 (25.2)	−0.33	−0.48
Post partum or post birth	101 (0.1)	22 (0.0)	3702 (1.5)	3825 (0.9)	+0.15	+0.17
Resource Utilization Band						
Low (≤ 2)	795 (1.0)	1403 (1.7)	34 735 (13.8)	36 933 (8.9)	+0.50	+0.47
Moderate (3)	9682 (12.3)	14 565 (17.5)	112 603 (44.8)	136 850 (33.1)	+0.77	+0.62
High (4–5)	67 986 (86.6)	67 183 (80.8)	104 105 (41.4)	239 274 (57.9)	−1.07	−0.88
No. of previous outpatient visits, median (IQR)	29 (15–49)	16 (8–27)	8 (4–16)	12 (5–24)	−1.24	−0.63

Table 1 (part 2 of 2): Characteristics of patients who received a physician home visit in Ontario from Apr. 1, 2014, to Mar. 1, 2019

Characteristic	No. (%) of patients*				SMD other v. palliative care†	SMD other v. home care†
	Palliative care n = 78 463	Home care n = 83 151	Other n = 251 443	Total n = 413 057		
Emergency department visit in previous 30 d	32 636 (41.6)	22 904 (27.5)	28 895 (11.5)	84 435 (20.4)	-0.73	-0.41
Hospital discharge in previous 30 d	29 114 (37.1)	19 399 (23.3)	15 120 (6.0)	63 633 (15.4)	-0.82	-0.50
No. of home care visits in previous month						
0	17 246 (22.0)	0 (0.0)	244 219 (97.1)	261 465 (63.3)	+2.38	+8.22
1	4313 (5.5)	0 (0.0)	7224 (2.9)	11 537 (2.8)	-0.13	+0.24
≥ 2	56 904 (72.5)	83 151 (100.0)	0 (0.0)	140 055 (33.9)	+2.30	0
Primary care attachment						
Formally enrolled	62 981 (80.3)	67 793 (81.5)	176 863 (70.3)	307 637 (74.5)	-0.23	-0.26
Other	13 198 (16.8)	14 068 (16.9)	65 233 (25.9)	92 499 (22.4)	+0.22	+0.22
No primary care physician visits	2284 (2.9)	1290 (1.6)	9347 (3.7)	12 921 (3.1)	+0.05	+0.14
Home visit physician was enrolling primary care physician	19 186 (24.5)	37 522 (45.1)	62 722 (24.9)	119 430 (28.9)	+0.01	-0.43
Home visit physician was in same group as enrolled primary care physician	5285 (6.7)	2674 (3.2)	6441 (2.6)	14 400 (3.5)	-0.20	-0.04
Home visit physician was same as enrolled primary care physician or in same group	24 471 (31.2)	40 196 (48.3)	69 163 (27.5)	133 830 (32.4)	-0.08	-0.44
Home visit physician was known to patient from visit in previous year	41 281 (52.6)	50 839 (61.1)	97 002 (38.6)	189 122 (45.8)	-0.28	-0.46

Note: IQR = interquartile range, SMD = standardized mean difference.
 *Except where noted otherwise.
 †An SMD of at least 10% (0.1) was considered to indicate a meaningful difference.

Of the 413 057 patients, 82 375 (19.9%) had a long-stay home care assessment completed in the previous 6 months (Table 2). The values for the palliative care group, home care group and “other” group were 20 518 (26.1%), 51 210 (61.6%) and 10 647 (4.2%), respectively. Among these, patients in the “other” group were least likely to have a caregiver in the home, use an assistive device, depend on others for locomotion or be homebound.

The most common diagnoses in the palliative care group were lung cancer (10 719 [13.7%]), other malignant neoplasm (5508 [7.0%]) and dementia (3497 [4.4%]); 7 of the 10 most frequent diagnoses were cancer-related (Appendix 1, Table S5). The most common diagnoses in the home care group were dementia (8693 [10.5%]), congestive heart failure (3093 [3.7%]) and hypertension (2921 [3.5%]) (Appendix 1, Table S6), and in the “other” group, acute nasopharyngitis (36 397 [14.5%]), acute bronchitis (11 825 [4.7%]) and mental health conditions (10 929 [4.3%]) (Appendix 1, Table S7).

The majority of patients (150 694 [59.9%]) in the “other” group had no repeat physician home visits. They had lower rates of 30-day emergency department visits (33 424 [13.3%]) and hospital admissions (11 496 [4.6%]) than patients in the palliative care and home care groups (Table 3).

Subgroup analysis

Rural patients

Of the 413 057 patients who received a first physician home visit, 23 704 (5.7%) resided in a rural setting. They represented 7.7% (n = 6011) of the palliative care group, 7.5% (n = 6202) of the home care group and 4.6% (n = 11 491) of the “other” group. Differences between the palliative care, home care and “other” groups were similar in direction to those observed in the larger cohort, but the magnitude of the difference was attenuated (Table 4). For example, although patients in the “other” group were younger than those in the palliative care and home care groups, the difference was less than in the broader cohort.

Table 2: Characteristics of baseline assessment of long-stay home care

Characteristic	No. (%) of patients				SMD other v. palliative care	SMD other v. home care
	Palliative care <i>n</i> = 20 518	Home care <i>n</i> = 51 210	Other <i>n</i> = 10 647	Total <i>n</i> = 82 375		
Hearing impairment	3861 (18.8)	11 358 (22.2)	1941 (18.2)	17 160 (20.8)	-0.02	-0.10
Vision impairment	2217 (10.8)	6923 (13.5)	963 (9.0)	10 103 (12.3)	-0.06	-0.14
Caregiver in home	13 617 (66.4)	26 880 (52.5)	4427 (41.6)	44 924 (54.5)	-0.51	-0.22
Assistive device	16 104 (78.5)	45 989 (89.8)	7743 (72.7)	69 836 (84.8)	-0.13	-0.45
Dependent on others for locomotion	11 418 (55.6)	30 649 (59.8)	3960 (37.2)	46 027 (55.9)	-0.38	-0.47
Homebound status						
Homebound	7206 (37.5)	21 070 (43.0)	3109 (30.9)	31 385 (40.1)	-0.14	-0.25
Borderline homebound	6358 (33.1)	16 696 (34.1)	3154 (31.4)	26 208 (33.5)	-0.04	-0.06

Note: SMD = standardized mean difference.

Table 3: Postvisit use of health care services

Service	No. (%) of patients*				SMD other v. palliative care	SMD other v. home care
	Palliative care <i>n</i> = 78 463	Home care <i>n</i> = 83 151	Other <i>n</i> = 251 443	Total <i>n</i> = 413 057		
No. of repeat home visits in subsequent year, median (IQR)	2 (0-5)	1 (0-3)	0 (0-1)	0 (0-2)	-0.65	-0.46
No. of repeat home visits in subsequent year						
0	26 131 (33.3)	32 931 (39.6)	150 694 (59.9)	209 756 (50.8)	+0.55	+0.42
1	12 746 (16.2)	15 739 (18.9)	43 478 (17.3)	71 963 (17.4)	+0.03	-0.04
2	8676 (11.1)	9114 (11.0)	19 353 (7.7)	37 143 (9.0)	-0.12	-0.11
≥ 3	30 910 (39.4)	25 367 (30.5)	37 918 (15.1)	94 195 (22.8)	-0.57	-0.37
No. of repeat home visits with same physician in subsequent year						
0	32 461 (41.4)	43 990 (52.9)	179 348 (71.3)	255 799 (61.9)	+0.63	+0.39
1	13 546 (17.3)	13 800 (16.6)	31 736 (12.6)	59 082 (14.3)	-0.13	-0.11
2	8270 (10.5)	7033 (8.5)	12 738 (5.1)	28 041 (6.8)	-0.21	-0.14
≥ 3	24 186 (30.8)	18 328 (22.0)	27 621 (11.0)	70 135 (17.0)	-0.50	-0.30
Outpatient visit within 30 d	32 499 (41.4)	34 714 (41.7)	109 054 (43.4)	176 267 (42.7)	+0.04	+0.03
Emergency department visit within 30 d	14 514 (18.5)	20 363 (24.5)	33 424 (13.3)	68 301 (16.5)	-0.14	-0.29
Urgent hospital admission within 30 d	10 431 (13.3)	11 751 (14.1)	11 496 (4.6)	33 678 (8.2)	-0.31	-0.33

Note: IQR = interquartile range, SMD = standardized mean difference.
*Except where noted otherwise.

A similar pattern was observed for postvisit use of health care services. One notable difference was that 7142 visits (62.2%) in the “other” group were with the patient’s enrolled primary care physician or another physician in the same group, compared to 69 163 visits (27.5%) in the “other” group for the overall cohort.

Pediatric patients

The 53 997 patients aged less than 18 years represented 1.1% (*n* = 843) of the palliative group, 0.4% (*n* = 326) of the home care group and 21.0% (*n* = 52 828) of the “other” group. Nearly all pediatric home visits (52 828 [97.8%])

Table 4 (part 1 of 2): Characteristics and postvisit use of health care services of patients residing in a rural setting

Variable	No. (%) of patients*				SMD other v. palliative care	SMD other v. home care
	Palliative care n = 6011	Home care n = 6202	Other n = 11 491	Total n = 23 704		
Characteristic						
Age group, yr						
< 18	59 (1.0)	14 (0.2)	511 (4.4)	584 (2.5)	+0.21	+0.28
18–39	73 (1.2)	58 (0.9)	839 (7.3)	970 (4.1)	+0.30	+0.32
40–64	1322 (22.0)	715 (11.5)	2152 (18.7)	4189 (17.7)	–0.08	+0.20
65–79	2491 (41.4)	1883 (30.4)	3128 (27.2)	7502 (31.6)	–0.30	–0.07
≥ 80	2066 (34.4)	3532 (56.9)	4861 (42.3)	10 459 (44.1)	+0.16	–0.30
Female sex	2859 (47.6)	3633 (58.6)	6540 (56.9)	13 032 (55.0)	+0.19	–0.03
Neighbourhood income quintile†						
1 (lowest)	1245 (20.7)	1427 (23.0)	2510 (21.8)	5182 (21.9)	+0.03	–0.03
2	1400 (23.3)	1480 (23.9)	2615 (22.8)	5495 (23.2)	–0.01	–0.03
3	1360 (22.6)	1427 (23.0)	2472 (21.5)	5259 (22.2)	–0.03	–0.04
4	1167 (19.4)	1056 (17.0)	1995 (17.4)	4218 (17.8)	–0.05	+0.01
5 (highest)	838 (13.9)	811 (13.1)	1899 (16.5)	3548 (15.0)	+0.07	+0.10
Limited proficiency in English or French	18 (0.3)	8 (0.1)	30 (0.3)	56 (0.2)	0.01	+0.03
Immigrant	63 (1.0)	32 (0.5)	114 (1.0)	209 (0.9)	0.01	+0.06
Comorbidity count						
Low (≤ 5)	43 (0.7)	102 (1.6)	950 (8.3)	1095 (4.6)	+0.37	+0.31
Moderate (6–9)	804 (13.4)	1119 (18.0)	4432 (38.6)	6355 (26.8)	+0.60	+0.47
High (≥ 10)	5164 (85.9)	4981 (80.3)	6109 (53.2)	16 254 (68.6)	–0.76	–0.60
Comorbidities						
Dementia	682 (11.3)	1796 (29.0)	2210 (19.2)	4688 (19.8)	+0.22	–0.23
Mental health condition	198 (3.3)	388 (6.3)	759 (6.6)	1345 (5.7)	+0.15	+0.01
Chronic obstructive pulmonary disease	2491 (41.4)	2740 (44.2)	3578 (31.1)	8809 (37.2)	–0.22	–0.27
Congestive heart failure	1319 (21.9)	1975 (31.8)	1894 (16.5)	5188 (21.9)	–0.14	–0.36
Asthma	857 (14.3)	1050 (16.9)	1978 (17.2)	3885 (16.4)	+0.08	+0.01
Diabetes mellitus	1838 (30.6)	2305 (37.2)	3035 (26.4)	7178 (30.3)	–0.09	–0.23
Post partum or post birth	‡	‡	52 (0.5)	‡	0.07	0.09
Resource Utilization Band						
Low (≤ 2)	43 (0.7)	102 (1.6)	950 (8.3)	1095 (4.6)	+0.37	+0.31
Moderate (3)	804 (13.4)	1119 (18.0)	4432 (38.6)	6355 (26.8)	+0.60	+0.47
High (4–5)	5164 (85.9)	4981 (80.3)	6109 (53.2)	16 254 (68.6)	–0.76	–0.60
No. of previous outpatient visits, median (IQR)	25 (13–43)	14 (7–24)	9 (4–16)	13 (6–24)	–1.11	–0.52
Emergency department visit in previous 30 d	2790 (46.4)	2178 (35.1)	2405 (20.9)	7373 (31.1)	–0.56	–0.32
Hospital discharge in previous 30 d	2214 (36.8)	1908 (30.8)	1313 (11.4)	5435 (22.9)	–0.62	–0.49
No. of home care visits in previous 30 d						
0	1431 (23.8)	0 (0.0)	10 801 (94.0)	12 232 (51.6)	+2.04	+5.60
1	318 (5.3)	0 (0.0)	690 (6.0)	1008 (4.3)	+0.03	+0.36
≥ 2	4262 (70.9)	6202 (100.0)	0 (0.0)	10 464 (44.1)	–2.21	0

Table 4 (part 2 of 2): Characteristics and postvisit use of health care services of patients residing in a rural setting

Variable	No. (%) of patients*				SMD other v. palliative care	SMD other v. home care
	Palliative care n = 6011	Home care n = 6202	Other n = 11 491	Total n = 23 704		
Primary care attachment						
Formally enrolled	4878 (81.2)	5148 (83.0)	9206 (80.1)	19 232 (81.1)	-0.03	-0.07
Other	934 (15.5)	935 (15.1)	1958 (17.0)	3827 (16.1)	+0.04	+0.05
No primary care	199 (3.3)	119 (1.9)	327 (2.8)	645 (2.7)	-0.03	+0.06
Home visit physician was enrolling primary care physician	2493 (41.5)	3985 (64.3)	6330 (55.1)	12 808 (54.0)	+0.27	-0.19
Home visit physician was in same group as enrolled primary care physician	749 (12.5)	416 (6.7)	812 (7.1)	1977 (8.3)	-0.18	+0.01
Home visit physician was same as enrolled primary care physician or in same group	3242 (53.9)	4401 (71.0)	7142 (62.2)	14 785 (62.4)	+0.17	-0.19
Home visit physician was known to patient from visit in previous year	4281 (71.2)	5131 (82.7)	8267 (71.9)	17 679 (74.6)	+0.02	-0.26
Postvisit use of health care services						
No. of repeat home visits in subsequent year, median (IQR)	1 (0-4)	1 (0-3)	0 (0-2)	1 (0-3)	-0.33	-0.22
No. of repeat home visits in subsequent year						
0	2278 (37.9)	2537 (40.9)	6001 (52.2)	10 816 (45.6)	+0.29	+0.23
1	995 (16.6)	1222 (19.7)	1938 (16.9)	4155 (17.5)	+0.01	-0.07
2	639 (10.6)	653 (10.5)	980 (8.5)	2272 (9.6)	-0.07	-0.07
≥ 3	2099 (34.9)	1790 (28.9)	2572 (22.4)	6461 (27.3)	-0.28	-0.15
No. of repeat home visits with same physician in subsequent year						
0	2658 (44.2)	2833 (45.7)	6309 (54.9)	11 800 (49.8)	+0.21	+0.19
1	1077 (17.9)	1195 (19.3)	1895 (16.5)	4167 (17.6)	-0.04	-0.07
2	635 (10.6)	611 (9.9)	938 (8.2)	2184 (9.2)	-0.08	-0.06
≥ 3	1641 (27.3)	1563 (25.2)	2349 (20.4)	5553 (23.4)	-0.16	-0.11
Outpatient visit within 30 d	2307 (38.4)	2138 (34.5)	4141 (36.0)	8586 (36.2)	-0.05	+0.03
Emergency department visit in previous 30 d	1274 (21.2)	1594 (25.7)	1887 (16.4)	4755 (20.1)	-0.12	-0.23
Urgent hospital admission in previous 30 d	918 (15.3)	916 (14.8)	786 (6.8)	2620 (11.1)	-0.27	-0.26
Note: IQR = interquartile range, SMD = standardized mean difference. *Except where noted otherwise. †Values missing for 2 patients. ‡Cells suppressed to prevent re-identification of groups with fewer than 6 people.						

were classified as other (Table 5). Nearly all patients (50 035 [94.7%]) in the “other” group lived in large urban areas. Similar to findings in the larger cohort, patients in the “other” group had lower rates of pre- and postvisit use of health care services than those in the palliative care and home care groups. Patients in the “other” group were least likely to have a home visit with a physician who was their

enrolling primary care physician or any physician known to them from another visit in the previous year. The most common diagnoses for patients in the “other” group were similar to those for the “other” group in the overall cohort: acute nasopharyngitis (17 331 [32.8%]), other viral diseases (3186 [6.0%]) and serous otitis media (2745 [5.2%]) (Appendix 1, Table S8).

Table 5 (part 1 of 2): Characteristics and postvisit use of health care services of patients less than age 18 years

Variable†	No. (%) of patients*				SMD other v. palliative care	SMD other v. home care
	Palliative care n = 843	Home care n = 326	Other n = 52 828	Total n = 53 997		
Characteristic						
Age, mean ± SD, yr	5.37 ± 5.42	7.94 ± 6.06	5.49 ± 5.07	5.50 ± 5.08	+0.02	-0.44
Age group, yr						
≤ 1	348 (41.3)	84 (25.8)	15 536 (29.4)	15 968 (29.6)	-0.25	+0.08
2–5	161 (19.1)	55 (16.9)	16 216 (30.7)	16 432 (30.4)	+0.27	+0.33
6–12	198 (23.5)	83 (25.5)	13 881 (26.3)	14 162 (26.2)	+0.06	+0.02
13–17	136 (16.1)	104 (31.9)	7195 (13.6)	7435 (13.8)	-0.07	-0.45
Female sex	390 (46.3)	135 (41.4)	25 144 (47.6)	25 669 (47.5)	+0.03	+0.12
Residence setting						
Large urban	573 (68.0)	272 (83.4)	50 035 (94.7)	50 880 (94.2)	+0.73	+0.37
Small urban	192 (22.8)	31 (9.5)	2009 (3.8)	2232 (4.1)	-0.58	-0.23
Rural	59 (7.0)	14 (4.3)	511 (1.0)	584 (1.1)	-0.31	-0.21
Missing	19 (2.3)	9 (2.8)	273 (0.5)	301 (0.6)	-0.15	-0.18
Neighbourhood income quintile‡						
1 (lowest)	155 (18.4)	82 (25.2)	12 521 (23.7)	12 758 (23.6)	+0.13	-0.03
2	156 (18.5)	66 (20.2)	9139 (17.3)	9361 (17.3)	-0.03	-0.08
3	156 (18.5)	61 (18.7)	8912 (16.9)	9129 (16.9)	-0.04	-0.05
4	193 (22.9)	58 (17.8)	9326 (17.7)	9577 (17.7)	-0.13	0
5 (highest)	175 (20.8)	54 (16.6)	12 736 (24.1)	12 965 (24.0)	+0.08	+0.19
Limited proficiency in English or French	¶	¶	917 (1.7)	¶	0.07	0.04
Immigrant	14 (1.7)	11 (3.4)	1304 (2.5)	1329 (2.5)	+0.06	-0.05
Comorbidities§						
Any complex chronic medical condition	468 (55.5)	227 (69.6)	2041 (3.9)	2736 (5.1)	-1.37	-1.87
Mental health condition	¶	¶	590 (1.1)	¶	0.01	0.01
Asthma	158 (18.7)	98 (30.1)	9358 (17.7)	9614 (17.8)	-0.03	-0.29
Post partum or post birth	89 (10.6)	¶	2239 (4.2)	¶	-0.24	¶
No. of previous outpatient visits, median (IQR)	16 (6–49)	14 (8–27)	5 (3–9)	5 (3–10)	-0.84	-1.13
Emergency department visit in previous 30 d	138 (16.4)	52 (16.0)	2873 (5.4)	3063 (5.7)	-0.36	-0.35
Hospital discharge in previous 30 d	219 (26.0)	53 (16.3)	1376 (2.6)	1648 (3.1)	-0.71	-0.48
No. of home care visits in previous 30 d						
0	526 (62.4)	0 (0.0)	52 721 (99.8)	53 247 (98.6)	+1.09	+31.39
1	54 (6.4)	0 (0.0)	107 (0.2)	161 (0.3)	-0.32	+0.06
≥ 2	263 (31.2)	326 (100.0)	0 (0.0)	589 (1.1)	-0.95	0
Primary care attachment						
Formally enrolled	394 (46.7)	122 (37.4)	22 919 (43.4)	23 435 (43.4)	-0.07	+0.12
Other	293 (34.8)	158 (48.5)	25 079 (47.5)	25 530 (47.3)	+0.26	-0.02
No primary care	156 (18.5)	46 (14.1)	4830 (9.1)	5032 (9.3)	-0.27	-0.16

Table 5 (part 2 of 2): Characteristics and postvisit use of health care services of patients less than age 18 years

Variable†	No. (%) of patients*				SMD other v. palliative care	SMD other v. home care
	Palliative care n = 843	Home care n = 326	Other n = 52 828	Total n = 53 997		
Home visit physician was enrolling primary care physician	152 (18.0)	40 (12.3)	3070 (5.8)	3262 (6.0)	-0.38	-0.23
Home visit physician was same as enrolled primary care physician or in same group	179 (21.2)	43 (13.2)	3811 (7.2)	4033 (7.5)	-0.41	-0.20
Home visit physician was known to patient from visit in previous year	515 (61.1)	101 (31.0)	7735 (14.6)	8351 (15.5)	-1.09	-0.40
Postvisit use of health care services						
No. of repeat home visits in subsequent year, median (IQR)	0 (0–4)	0 (0–2)	0 (0–1)	0 (0–1)	-0.37	-0.24
No. of repeat home visits in subsequent year						
0	443 (52.6)	176 (54.0)	33 704 (63.8)	34 323 (63.6)	+0.23	+0.20
1	75 (8.9)	62 (19.0)	10 103 (19.1)	10 240 (19.0)	+0.30	0
2	56 (6.6)	34 (10.4)	4168 (7.9)	4258 (7.9)	+0.05	-0.09
≥ 3	269 (31.9)	54 (16.6)	4853 (9.2)	5176 (9.6)	-0.59	-0.22
No. of repeat home visits with same physician in subsequent year						
0	516 (61.2)	241 (73.9)	44 052 (83.4)	44 809 (83.0)	+0.51	+0.23
1	91 (10.8)	46 (14.1)	5716 (10.8)	5853 (10.8)	0	-0.10
2	64 (7.6)	14 (4.3)	1577 (3.0)	1655 (3.1)	-0.21	-0.07
≥ 3	172 (20.4)	25 (7.7)	1483 (2.8)	1680 (3.1)	-0.57	-0.22
Outpatient visit within 30 d	385 (45.7)	159 (48.8)	19 895 (37.7)	20 439 (37.9)	-0.16	-0.23
Emergency department visit within 30 d	111 (13.2)	57 (17.5)	4803 (9.1)	4971 (9.2)	-0.13	-0.25
Urgent hospital admission within 30 d	62 (7.4)	33 (10.1)	493 (0.9)	588 (1.1)	-0.33	-0.41

Note: IQR = interquartile range, SD = standard deviation, SMD = standardized mean difference.
 *Except where noted otherwise.
 †“Home visit physician was in same group as enrolled primary care physician” suppressed owing to small numbers.
 ‡Values missing for 207 patients.
 §Dementia, chronic obstructive pulmonary disease and congestive heart failure were not reported in this group.
 ¶Cells suppressed to prevent re-identification of groups with fewer than 6 people.

Interpretation

After a plateau from 2007/08 to 2012/13, the annual rate of physician home visits in Ontario increased to 307 per 10 000 people in 2018/19. Overall, 61% of patients who received their first physician home visit received neither palliative care nor home care. This “other” group was younger and urban, and had fewer comorbidities and lower rates of prior health care use than those receiving palliative home visits or home care. This group also had the least repeat physician home visits, subsequent emergency department visits and hospital admissions. These findings suggest that patients who receive physician home visits for neither palliative care

nor home care are an overall younger, healthier population that may access physician home visits for reasons other than a physical inability to leave home.

Patients in the “other” group had the lowest rate of previous encounters with the home visiting physician. As has been described for walk-in clinic encounters,⁴⁶ we found the most common diagnoses in the “other” group were acute viral illnesses. Rural patients had lower volumes of “other” visits, and the “other” visits they did have were more often with their own physician. On-demand physician home visits, marketed in urban areas, come at the cost of relational and informational discontinuity with the usual primary care provider. Whether because of a lack of attachment to a primary care

provider, insufficient after-hours access to their usual provider or a desire for convenience, this trade-off may be acceptable to patients.⁴⁷

A greater proportion of the “other” group than the palliative care and home care groups were immigrants, which may reflect the urban setting where on-demand home visit services are offered. Alternatively, it may suggest that broad availability of physician home visits contributes to equity of access for those with inflexible work hours or caregiving responsibilities. Notably, many patients in the “other” group lacked a usual provider of primary care. Physician home visit companies offer low-barrier medical care to those who otherwise might present to an emergency department. Beyond access, it is not known how such visits contribute to other dimensions of quality health care, such as efficiency and effectiveness.⁴⁸

Since 2005, when palliative special visit premiums were introduced in Ontario,²⁰ the volume of palliative home visits has increased steadily. This is good news, as many patients receiving palliative care have a high symptom burden, limited mobility outside the home and high health care needs.^{49,50} The annual volume of physician home visits also had a notable inflection point in 2012/13, when volume bonuses for primary care home visits were increased substantially.²¹ After 2012/13, we observed a steady rise in the annual volume of home care visits and other visits. Still, this may not be enough to meet the needs of the growing homebound population.³ European countries have much higher rates of home visit provision than North America: more than 60% of primary care physicians surveyed in the United Kingdom, the Netherlands and Switzerland reported providing home visits commonly, compared to 19% in Canada and 6% in the US.⁵¹ The volume of physician home visits in the US has risen substantially over the past 20 years, as a result of increased fee-for-service payments through Medicare, special funding through demonstration projects and health care reform prioritizing high-value care.¹⁷ Notably, hospitals and accountable care organizations have found home visits to be cost-saving owing to avoided readmissions, and fewer hospital and nursing home bed-days.^{9,12,17}

Until 2019, Ontario’s particular incentive structure did little to ensure that patients who received physician home visits were those who would otherwise have had high health care use. In 2019, the physician fee schedule was changed to limit home visit premiums to “frail elderly or housebound” patients.⁵² This should reduce the number of “other” home visits; however, the interpretation of any subsequent changes in visit volumes will be confounded by the onset of the COVID-19 pandemic: in spring 2020, the number of physician home visits had declined by 60% compared to the previous year.²⁶ Since the onset of COVID-19, direct-to-consumer telemedicine, as well as virtual visits with one’s usual provider, may have partly replaced physician home visits. It will be essential to examine how and whether physician home visits rebound, to evaluate the effect of the 2019 fee schedule change and to ensure that the needs of Ontario’s growing homebound population³ are met. Additional policy changes to target home visits to needy populations could include linking home visit remuneration to palliative care

training or home care rosters, while ensuring access for those who rely on unpaid or private home care supports.

Limitations

We could not capture home visits provided by salaried nurse practitioners, who often work in team-based primary care models. As a result, our results underestimate the total number of home visits by all primary care providers in Ontario. We used receipt of home care as a proxy for functional dependency or homebound status. However, we could not identify receipt of private home care or support by unpaid caregivers. We reported only costs for home visit billing codes, not total health care system costs. Home visits may reduce other health care use, including emergency department visits. We did not measure changes over time in the distribution of home visit diagnoses, nor did we attempt to determine whether palliative care codes were being overused. The home visits codes used in our study have not been validated against chart review. Fraudulent claims (i.e., for home visits that never occurred) are expected to be very rare. Finally, although our findings are from Ontario, they are likely generalizable to settings with similar physician payment structures, that is, physician remuneration through fee-for-service and capitation-based models.

Conclusion

We found that physician home visits increased by 37% from 2005/06 to 2018/19 in Ontario. Most of this growth was explained by a more than sevenfold increase in palliative home visits. Yet, 51% of all physician home visits were to patients who were receiving neither palliative care nor home care. This group was younger and healthier, and had lower levels of use of health care services than their comparators. Such home visits may facilitate access at the expense of continuity of care. Our findings will inform payment models and regulatory frameworks to support the provision of physician home visits to those who are most likely to benefit. Further research is needed on the efficiency and effectiveness of low-complexity and low-continuity home visits, and to monitor the recovery of necessary physician home visits in the wake of the COVID-19 pandemic.

References

1. Musich S, Wang SS, Hawkins K, et al. Homebound older adults: prevalence, characteristics, health care utilization and quality of care. *Geriatr Nurs* 2015;36:445-50.
2. Ornstein KA, Leff B, Covinsky KE, et al. The epidemiology of the homebound in the United States. *JAMA Intern Med* 2015;175:1180-6.
3. Lapointe-Shaw L, Jones A, Ivers NM, et al. Homebound status among older adult home care recipients in Ontario, Canada. *J Am Geriatr Soc* 2022;70:568-78.
4. Stall N, Nowaczynski M, Sinha SK. Back to the future: home-based primary care for older homebound Canadians: part 2: where we are going. *Can Fam Physician* 2013;59:243-5.
5. Stall N, Nowaczynski M, Sinha SK. Systematic review of outcomes from home-based primary care programs for homebound older adults. *J Am Geriatr Soc* 2014;62:2243-51.
6. McGregor MJ, Cox MB, Slater JM, et al. A before-after study of hospital use in two frail populations receiving different home-based services over the same time in Vancouver, Canada. *BMC Health Serv Res* 2018;18:248.
7. Rosenberg T. Acute hospital use, nursing home placement, and mortality in a frail community-dwelling cohort managed with Primary Integrated Interdisciplinary Elder Care at Home. *J Am Geriatr Soc* 2012;60:1340-6.

8. Jones A, Bronskill SE, Seow H, et al. Physician home visit patterns and hospital use among older adults with functional impairments. *J Am Geriatr Soc* 2020;68:2074-81.
9. Frazee TK, Beidler LB, Briggs ADM, et al. 'Eyes in The Home': ACOs use home visits to improve care management, identify needs, and reduce hospital use. *Health Aff (Millwood)* 2019;38:1021-7.
10. Shafir A, Garrigues SK, Schenker Y, et al. Homebound patient and caregiver perceptions of quality of care in home-based primary care: a qualitative study. *J Am Geriatr Soc* 2016;64:1622-7.
11. Smith-Carrier T, Sinha SK, Nowaczynski M, et al. It 'makes you feel more like a person than a patient': patients' experiences receiving home-based primary care (HBPC) in Ontario, Canada. *Health Soc Care Community* 2017;25:723-33.
12. Edes T, Kinoshian B, Vuckovic NH, et al. Better access, quality, and cost for clinically complex veterans with home-based primary care. *J Am Geriatr Soc* 2014;62:1954-61.
13. Ploeg J, Feightner J, Hutchison B, et al. Effectiveness of preventive primary care outreach interventions aimed at older people: meta-analysis of randomized controlled trials. *Can Fam Physician* 2005;51:1244-5.
14. Gomes B, Calanzani N, Gysels M, et al. Heterogeneity and changes in preferences for dying at home: a systematic review. *BMC Palliat Care* 2013;12:7.
15. Brown CRL, Webber C, Seow HY, et al. Impact of physician-based palliative care delivery models on health care utilization outcomes: a population-based retrospective cohort study. *Palliat Med* 2021;35:1170-80.
16. Tanuseputro P, Beach S, Chalifoux M, et al. Associations between physician home visits for the dying and place of death: a population-based retrospective cohort study. *PLoS One* 2018;13:e0191322.
17. Schuchman M, Fain M, Cornwell T. The resurgence of home-based primary care models in the United States. *Geriatrics (Basel)* 2018;3:41.
18. Landers SH, Gunn PW, Flocke SA, et al. Trends in house calls to Medicare beneficiaries. *JAMA* 2005;294:2435-6.
19. Sairenji T, Jetty A, Peterson LE. Shifting patterns of physician home visits. *J Prim Care Community Health* 2016;7:71-5.
20. Memorandum of agreement between the Ontario Medical Association (the "OMA") and Her Majesty the Queen in Right of Ontario as represented by the Minister of Health and Long-Term Care (the "MOHLTC"). Toronto: Ontario Medical Association, Ministry of Health and Long-Term Care; 2004.
21. Ontario Ministry of Health and Long-Term Care. Home visits special premium payment and reporting (CCM, FHG, FHN, FHO). *INFOBulletin* 2013;11089.
22. *Population estimates, quarterly*. Ottawa: Statistics Canada; 2021. Available: <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000901> (accessed 2021 June 3).
23. Primary care performance in Ontario. Toronto: Health Quality Ontario. 2020. Available: <https://www.hqontario.ca/System-Performance/Primary-Care-Performance> (accessed 2021 June 14).
24. Kiran T, Kopp A, Glazier RH. Those left behind from voluntary medical home reforms in Ontario, Canada. *Ann Fam Med* 2016;14:517-25.
25. von Elm E, Altman DG, Egger M, et al. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *BMJ* 2007;335:806-8.
26. Glazier RH, Green ME, Wu FC, et al. Shifts in office and virtual primary care during the early COVID-19 pandemic in Ontario, Canada. *CMAJ* 2021;193:E200-10.
27. Kralj B. Measuring rurality – RIO 2008. BASIC: methodology and results. Available: <https://policycommons.net/artifacts/1227502/measuring-rurality/1780574/> (accessed 2022 July 25).
28. Rezai MR, Maclagan LC, Donovan LR, et al. Classification of Canadian immigrants into visible minority groups using country of birth and mother tongue. *Open Med* 2013;7:e85-93.
29. Johns Hopkins ACG Case-Mix Adjustment System. Baltimore: Johns Hopkins University. Available: <https://www.hopkinsacg.org/> (accessed 2019 Apr. 11).
30. Chiu M, Gatov E, Fung K, et al. Deconstructing the rise in mental health-related ED visits among children and youth in Ontario, Canada. *Health Aff (Millwood)* 2020;39:1728-36.
31. Jaakkimainen RL, Bronskill SE, Tierney MC, et al. Identification of physician-diagnosed Alzheimer's disease and related dementias in population-based administrative data: a validation study using family physicians' electronic medical records. *J Alzheimers Dis* 2016;54:337-49.
32. Gershon AS, Wang C, Guan J, et al. Identifying patients with physician-diagnosed asthma in health administrative databases. *Can Respir J* 2009;16:183-8.
33. To T, Dell SD, Dick PT, et al. Defining asthma in children for surveillance. *Am J Respir Crit Care Med* 2004;169:A383.
34. Lipscombe LL, Hwee J, Webster L, et al. Identifying diabetes cases from administrative data: a population-based validation study. *BMC Health Serv Res* 2018;18:316.
35. Gershon AS, Wang C, Guan J, et al. Identifying individuals with physician-diagnosed COPD in health administrative databases. *COPD* 2009;6:388-94.
36. Schultz SE, Rothwell DM, Chen Z, et al. Identifying cases of congestive heart failure from administrative data: a validation study using primary care patient records. *Chronic Dis Inj Can* 2013;33:160-6.
37. Fitzpatrick T, Wilton AS, Guttman A. Development and validation of a simple algorithm to estimate common gestational age categories using standard administrative birth record data in Ontario, Canada. *J Obstet Gynaecol* 2021;41:207-11.
38. Poss JW, Jutan NM, Hirdes JP, et al. A review of evidence on the reliability and validity of Minimum Data Set data. *Health Manage Forum* 2008;21:33-9.
39. Landi F, Tua E, Onder G, et al. Minimum Data Set for home care: a valid instrument to assess frail older people living in the community. *Med Care* 2000;38:1184-90.
40. Hirdes JP, Ljunggren G, Morris JN, et al. Reliability of the interRAI suite of assessment instruments: a 12-country study of an integrated health information system. *BMC Health Serv Res* 2008;8:277.
41. Home care indicator review: summary report. Toronto: Health Quality Ontario; 2017. Available: <https://hqontario.ca/Portals/0/documents/system-performance/home-care-indicator-review-report-2017.pdf> (accessed 2020 Dec. 14).
42. Home and community care in Ontario: presentation to the Premier's Council on Improving Healthcare and Ending Hallway Medicine. Toronto: Home and Community Care Branch, Ministry of Health and Long-Term Care; 2018.
43. Poss J. Mind the gap? Looking at reassessment patterns among Ontario long-stay home care clients. *Proceedings from the 2009 Canadian interRAI Conference*; 2009 June 22-24; Halifax.
44. Austin PC. Using the standardized difference to compare the prevalence of a binary variable between two groups in observational research. *Commun Stat Simul Comput* 2009;38:1228-34.
45. *Children and youth with medical complexity in Canada*. Ottawa: Canadian Institute for Health Information; 2020.
46. Hutchison B, Østbye T, Barnsley J, et al. Patient satisfaction and quality of care in walk-in clinics, family practices and emergency departments: the Ontario Walk-In Clinic Study. *CMAJ* 2003;168:977-83.
47. Fortin Ensign S, Baca-Motes K, Steinhubl SR, et al. Characteristics of the modern-day physician house call. *Medicine (Baltimore)* 2019;98:e14671.
48. Institute of Medicine Committee on Quality of Health Care in America. *Crossing the quality chasm: a new health system for the 21st century*. Washington: National Academies Press; 2001.
49. Seow H, Tanuseputro P, Barbera L, et al. Development and validation of a prediction model of poor performance status and severe symptoms over time in cancer patients (PROVIEW+). *Palliat Med* 2021;35:1713-23.
50. Tanuseputro P, Wodchis WP, Fowler R, et al. The health care cost of dying: a population-based retrospective cohort study of the last year of life in Ontario, Canada. *PLoS One* 2015;10:e0121759.
51. Osborn R, Moulds D, Schneider EC, et al. Primary care physicians in ten countries report challenges caring for patients with complex health needs. *Health Aff (Millwood)* 2015;34:2104-12.
52. Ontario Ministry of Health. Kaplan Board of Arbitration Award — Appropriateness Working Group (AWG): changes to the schedule of benefits for physician services (schedule) effective October 1, 2019. *INFOBulletin* 2019;4726.

Affiliations: Division of General Internal Medicine and Geriatrics (Lapointe-Shaw, Sinha, Stall), University Health Network and Sinai Health System; Department of Medicine (Lapointe-Shaw, Sinha, Stall), University of Toronto; Women's College Hospital Institute for Health System Solutions and Virtual Care (Lapointe-Shaw, Ivers), Women's College Hospital; ICES (Lapointe-Shaw, Kiran, Costa, Na, Nelson, Ivers, Jones); Institute of Health Policy, Management and Evaluation (Lapointe-Shaw, Kiran, Sinha, Stall, Ivers), University of Toronto; Department of Family and Community Medicine (Kiran, Sinha, Ivers), University of Toronto; Department of Family and Community Medicine (Kiran) and MAP Centre for Urban Health Solutions (Kiran), St. Michael's Hospital, Toronto, Ont.; Department of Health Research Methods, Evidence, and Impact (Costa, Jones), McMaster University; Centre for Integrated Care (Costa), St. Joseph's Health System, Hamilton, Ont.; Department of Paediatrics (Nelson), The Hospital for Sick Children; Department of Family and Community Medicine (Ivers), Women's College Hospital, Toronto, Ont.

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Data sharing: The data set from this study is held securely in coded form at ICES. Although legal data-sharing agreements between ICES and data providers (e.g., health care organizations and government) prohibit ICES from making the data set publicly available, access may be granted to those who meet prespecified criteria for confidential access, available at

<https://www.ices.on.ca/DAS> (email: das@ices.on.ca). The full data set creation plan and underlying analytic code are available from the authors on request, with the understanding that the computer programs may rely on coding templates or macros that are unique to ICES and are therefore either inaccessible or may require modification.

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