

# Physician home visits to rostered patients during their last year of life: a retrospective cohort study

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## Abstract

**Background:** Physician home visits are associated with better health outcomes, yet most patients near the end of life never receive such a visit. Our objectives were to describe the receipt of physician home visits during the last year of life after a referral to home care — an indication that the patient can no longer live independently — and to measure associations between patient characteristics and receipt of a home visit.

**Methods:** We conducted a retrospective cohort study using linked population-based health administrative databases housed at ICES. We identified adult (aged  $\geq 18$  yr) decedents in Ontario who died between Mar. 31, 2013, and Mar. 31, 2018, who were receiving primary care and were referred to publicly funded home care services. We described the provision of physician home visits, office visits and telephone management. We used multinomial logistic regression to calculate the odds of receiving home visits from a rostered primary care physician, controlling for referral during the last year of life, age, sex, income quintile, rurality, recent immigrant status, referral by rostered physician, referral during hospital stay, number of chronic conditions and disease trajectory based on the cause of death.

**Results:** Of the 58 753 decedents referred in their last year of life, 3125 (5.3%) received a home visit from their family physician. Patient characteristics associated with higher odds of receiving home visits compared to office-based or telephone-based care were being female (adjusted odds ratio [OR] 1.28, 95% confidence interval [CI] 1.21–1.35), being 85 years of age or older (adjusted OR 2.42, 95% CI 1.80–3.26) and living in a rural area (adjusted OR 1.09, 95% CI 1.00–1.18). Increased odds were associated with home care referrals by the patient's primary care physician (adjusted OR 1.49, 95% CI 1.39–1.58) and referrals occurring during a hospital stay (adjusted OR 1.20, 95% CI 1.13–1.28).

**Interpretation:** A small proportion of patients near the end of life received home-based physician care, and patient characteristics did not explain the low visit rates. Future work on system- and provider-level factors may be critical to improve access to home-based end-of-life primary care.

Canada is currently facing a growing need for community-based supportive care.<sup>1–3</sup> Primary care is designed to be delivered across all life stages, and many providers practise across different settings of care. At the end-of-life period, care at home is often desired;<sup>4</sup> however, most patients receive acute care during the last few months of life.<sup>5,6</sup> Home visits from physicians during the end-of-life period are associated with better quality of life,<sup>7</sup> reduced acute care use and costs,<sup>8,9</sup> and more out-of-hospital deaths.<sup>8</sup> Yet the majority of dying patients never receive a physician home visit.<sup>10,11</sup> Studies have shown that patient and physician characteristics are associated with home visits, including that physicians who have an existing relationship with their patients may be more likely to perform home visits.<sup>12–14</sup> Furthermore, an existing and ongoing relationship

between patient and provider,<sup>15</sup> known as relational continuity of care, has been found to be associated with improved patient-centred outcomes.<sup>16</sup> End-of-life care, including referring patients to formal home care services (e.g., nursing, personal support worker, occupational therapy) is often coordinated through primary care. Referral to home care services by a physician may indicate clinical signs of decline,

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including a recognition of patients' increased care needs with an inability to live independently. Physician home-based care is not mandated, even after home care services are initiated.<sup>17</sup>

We examined patients with an existing relationship with a family doctor through capitation rostering. It is unknown whether family physicians continue caring for their rostered patients after they are referred to home care services at the end of life, and whether patient factors predict care continuity. Our first objective was to describe end-of-life home visits by rostered physicians to patients in Ontario, Canada, after physician referral to home care services. Secondary objectives were to measure associations between patient characteristics and the receipt of rostered physician home visits; measure outpatient or management care provided by physicians; and explore patterns across different disease trajectories (e.g., cancer v. organ failure).

## Methods

### Study design and population

We identified a population-based retrospective cohort of adult decedents aged 18–104 years who died between Mar. 31, 2013, and Mar. 31, 2018, in Ontario, were rostered to a primary care physician through a capitation remuneration model and had been referred to formal home care services during the last 5 years of life (Appendix 1, available at [www.cmajopen.ca/content/11/4/E597/suppl/DC1](http://www.cmajopen.ca/content/11/4/E597/suppl/DC1)). We excluded patients who were ineligible for the Ontario Health Insurance Plan 3 years before death and those admitted to a residential long-term care institution after referral. We identified patients and their characteristics using multiple linked health administrative databases (Appendix 2, available at [www.cmajopen.ca/content/11/4/E597/suppl/DC1](http://www.cmajopen.ca/content/11/4/E597/suppl/DC1)). If a person was referred more than once, the referral within or closest to the last 12 months of life was used. We chose home care referral by a physician as an index event since it indicates physician recognition of increasing patient need.

### Study setting and data sources

Rostered patients are a function of capitation-based remuneration models for providers in which monthly lump sum payments are given for each rostered patient to encourage retention of long-term provider–patient relationships and to increase care continuity across all life of the patient.<sup>18,19</sup> At our study site, physician home visits are remunerated as an additional service in addition to annual capitation payments, and referral to home care or to other physicians conducting home visits (e.g., palliative care specialists) does not reduce annual remuneration. In Ontario between 2017 and 2018, 75% of primary care physicians belonged to a remuneration model with patient enrolment, and 73% of the population were rostered to a physician.<sup>20</sup>

We determined rostering using the Client Agency Program Enrolment data set, which captures patients' enrolment to capitation-based models. Referral by a physician to home care services and services provided were captured in the Ontario Health Insurance Plan Claims Database, which con-

tains all physician billings for all remuneration models, including shadow billing used in capitation-based remuneration. We identified emergency department visits using the National Ambulatory Care Reporting System, which holds ambulatory care records. Hospital admission records were from the Discharge Abstract Database, which contains records of each acute care admission. We determined death using Ontario Vital Statistics data. These data sets were linked with the use of unique encoded identifiers and analyzed at ICES.

### Primary and secondary outcomes

The primary outcome was receipt of community-based care from a rostered physician after referral to home care services, captured according to the following hierarchy: 1) the patient received at least 1 home visit from their rostered physician, 2) the patient received office-based or telephone-based care from their rostered physician or 3) the patient did not receive any care from their rostered physician.

Secondary outcomes included the frequency of physician home visits received after the patient's referral to home care services during their last year of life, the presence and number of home visits provided by nonrostered physicians (such as palliative care physicians), visit patterns across patients' disease trajectories, and timing of the referral to home care in relation to the patient's death, including whether it occurred during a hospital stay. Since palliative care has only recently been recognized as a medical specialty, we used a validated algorithm designed to identify palliative care physicians in health administrative data<sup>21</sup> based on their proportion of palliative care billings across the previous 2 years of practice, with those billing 10% or more identified as specialists and those billing less than 10% as generalists.

Patient characteristics were age, sex, area-level income quintile, immigration status, rurality based on postal code at the time of death, disease trajectory based on the cause of death, and number and prevalence of chronic conditions, based on algorithms previously developed at ICES.<sup>22–30</sup>

We categorized decedents according to major illness trajectories, as in previous research.<sup>4,31,32</sup> The trajectories were terminal illness (e.g., cancer), organ failure (e.g., chronic heart failure), frailty (e.g., Alzheimer disease), sudden death (i.e., unexpected, such as an accident) and other. These trajectories were validated with the use of the *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* codes and a modified Delphi process to discriminate how cause of death corresponds to similar costs of health care use and illness trajectories.<sup>33</sup> Subsequent research showed these trajectories to be aligned with initiation and intensity of palliative care services.<sup>4</sup>

### Statistical analysis

For descriptive analyses of patients referred to home care in their last year of life, we calculated frequencies and percentages for categorical and binary variables, and means and standard deviations (SDs) for continuous variables. We described visit characteristics, including visits provided by nonrostered physicians, according to patients' disease trajectories. We

**Table 1: Patient characteristics according to physician visits and referral to home care in their last year of life for decedents who had a rostered physician for at least 6 months before referral**

| Characteristic                       | No. (%) of patients        |   |  |  |
|--------------------------------------|----------------------------|---|--|--|
|                                      | Total<br><i>n</i> = 58 753 | With home visit from<br>rostered physician<br><i>n</i> = 3125 | With office-based or<br>telephone-based care<br>from rostered physician<br><i>n</i> = 16 162 | Without care from<br>rostered physician<br><i>n</i> = 39 466 |
| <b>Age, yr</b>                       |                            |   |  |  |
| 18–44                                | 1099 (1.9)                 | 24 (2.2)  | 232 (21.1)   | 843 (76.7)   |
| 45–59                                | 5731 (9.8)                 | 176 (3.1)   | 1286 (22.4)  | 4269 (74.5)  |
| 60–84                                | 34 568 (58.8)              | 1572 (4.5)  | 9646 (27.9)  | 23 350 (67.5)  |
| ≥ 85                                 | 17 355 (29.5)              | 1353 (7.8)  | 4998 (28.8)  | 11 004 (63.4)  |
| <b>Sex</b>                           |                            |   |  |  |
| Female                               | 27 602 (47.0)              | 1657 (6.0)  | 7368 (26.7)  | 18 577 (67.3)  |
| Male                                 | 31 151 (53.0)              | 1468 (4.7)  | 8794 (28.2)  | 20 889 (67.1)  |
| <b>Neighbourhood income quintile</b> |                            |   |  |  |
| 1st (lowest)                         | 13 223 (22.5)              | 643 (4.9)   | 3703 (28.0)  | 8877 (67.1)  |
| 2nd                                  | 12 868 (21.9)              | 659 (5.1)   | 3581 (27.8)  | 8628 (67.1)  |
| 3rd                                  | 11 581 (19.7)              | 605 (5.2)   | 3144 (27.1)  | 7832 (67.6)  |
| 4th                                  | 10 644 (18.1)              | 607 (5.7)   | 2939 (27.6)  | 7098 (66.7)  |
| 5th (highest)                        | 10 328 (17.6)              | 603 (5.8)   | 2766 (26.8)  | 6959 (67.4)  |
| Missing                              | 109 (0.2)                  | 8 (7.3)   | 29 (26.6)  | 72 (66.1)  |
| Rural residence                      | 6924 (11.8)                | 466 (6.7)   | 2092 (30.2)  | 4366 (63.1)  |
| Canadian born                        | 54 996 (93.6)              | 3001 (5.5)  | 15 304 (27.8)  | 36 691 (66.7)  |
| <b>No. of comorbidities</b>          |                            |   |  |  |
| 0                                    | 505 (0.9)                  | 29 (5.7)  | 153 (30.3)   | 323 (64.0)   |
| 1                                    | 5763 (9.8)                 | 266 (4.6)   | 1371 (23.8)  | 4126 (71.6)  |
| 2                                    | 11 315 (19.3)              | 567 (5.0)   | 3031 (26.8)  | 7717 (68.2)  |
| 3                                    | 13 058 (22.2)              | 685 (5.2)   | 3563 (27.3)  | 8810 (67.5)  |
| 4                                    | 11 293 (19.2)              | 613 (5.4)   | 3237 (28.7)  | 7443 (65.9)  |
| ≥ 5                                  | 16 819 (28.6)              | 965 (5.7)   | 4807 (28.6)  | 11 047 (65.7)  |
| <b>Prevalent conditions</b>          |                            |   |  |  |
| AMI                                  | 948 (1.6)                  | 50 (5.3)  | 282 (29.7)   | 616 (65.0)   |
| Arrhythmia                           | 6320 (10.8)                | 365 (5.8)   | 2009 (31.8)  | 3946 (62.4)  |
| Asthma                               | 10 110 (17.2)              | 530 (5.2)   | 2901 (28.7)  | 6679 (66.1)  |
| Cancer                               | 35 706 (60.8)              | 1744 (4.9)  | 8682 (24.3)  | 25 280 (70.8)  |
| CHF                                  | 17 458 (29.7)              | 1069 (6.1)  | 5118 (29.3)  | 11 271 (64.6)  |
| COPD                                 | 14 690 (25.0)              | 855 (5.8)   | 4403 (30.0)  | 9432 (64.2)  |
| Coronary                             | 7569 (12.9)                | 420 (5.5)   | 2474 (32.7)  | 4675 (61.8)  |
| Dementia                             | 7599 (12.9)                | 611 (8.0)   | 1899 (25.0)  | 5089 (67.0)  |
| Diabetes                             | 22 401 (38.1)              | 1140 (5.1)  | 6551 (29.2)  | 14 710 (65.7)  |
| Hypertension                         | 45 234 (77.0)              | 2528 (5.6)  | 13 007 (28.8)  | 29 699 (65.7)  |
| IBD                                  | 733 (1.2)                  | 31 (4.2)  | 209 (28.5)   | 493 (67.3)   |
| Other mental health                  | 5215 (8.9)                 | 251 (4.8)   | 1310 (25.1)  | 3654 (70.1)  |
| Renal disease                        | 11 407 (19.4)              | 584 (5.1)   | 2965 (26.0)  | 7858 (68.9)  |
| Stroke                               | 2191 (3.7)                 | 136 (6.2)   | 547 (25.0)   | 1508 (68.8)  |
| <b>Disease trajectory</b>            |                            |   |  |  |
| Terminal illness                     | 29 858 (50.8)              | 1384 (4.6)  | 6942 (23.3)  | 21 532 (72.1)  |
| Organ failure                        | 16 149 (27.5)              | 984 (6.1)   | 5179 (32.1)  | 9986 (61.8)  |
| Frailty                              | 8741 (14.9)                | 599 (6.9)   | 2782 (31.8)  | 5360 (61.3)  |
| Sudden death                         | 615 (1.0)                  | 17 (2.8)  | 239 (38.9)   | 359 (58.4)   |
| Other                                | 2879 (4.9)                 | 114 (4.0)   | 846 (29.4)   | 1919 (66.7)  |
| Missing                              | 511 (0.9)                  | 27 (5.3)  | 174 (34.1)   | 310 (60.7)   |

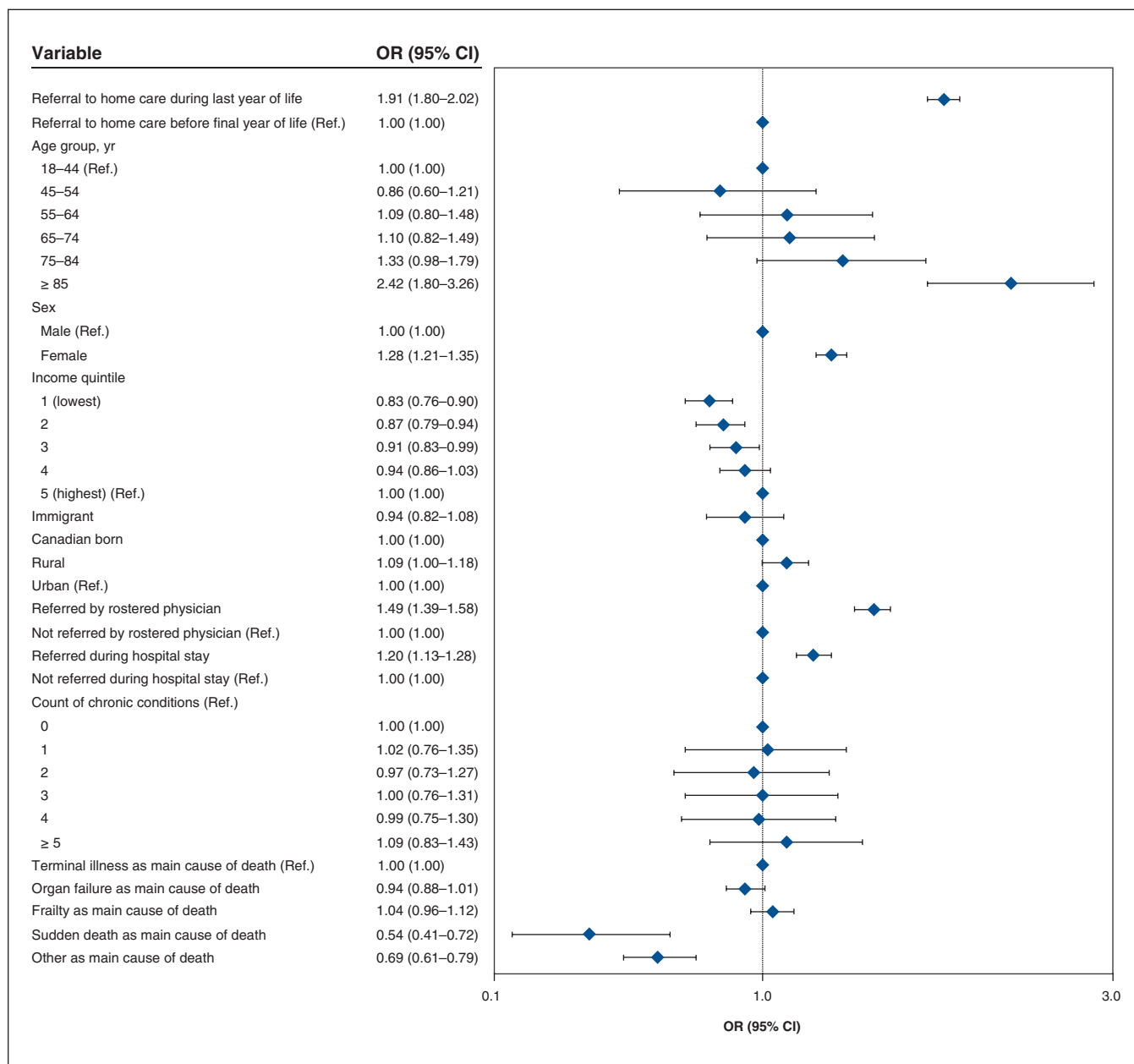
Note: AMI = acute myocardial infarction, CHF = congestive heart failure, COPD = chronic obstructive pulmonary disease, IBD = inflammatory bowel disease.

calculated the rate of home visits in the last year of life using person-time, excluding the number of days patients spent in hospital. We assessed associations between each variable and the primary outcome. We fitted a multinomial logistic regression model to calculate the odds of patients receiving a home visit from their rostered physician or no care from their rostered physician during their last year of life compared to the reference category of receiving any office-based or telephone-based care from their rostered physician. We chose this reference group since it likely represents the most typical provision of primary care, representing 98.4% of all primary care visits in Ontario during 2019.<sup>34</sup> We ran the regression models on all

patients referred to home care in their last 5 years of life, controlling for referral during the last year of life, age, sex, income quintile, rurality, recent immigrant status, referral by rostered physician, referral during hospital stay, number of chronic conditions and disease trajectory based on the cause of death. We reported adjusted odds ratios (ORs) and 95% confidence intervals (CIs).

### Ethics approval

The use of data in this project was authorized under section 45 of Ontario's *Personal Health Information Protection Act*, which does not require review by a research ethics board.



**Figure 1:** Results of a multinomial logistic regression on receiving a home visit from a rostered primary care physician compared to receiving other community-based care from a rostered physician after referral to home care services for patients referred to home care during the last 5 years of life who died between Mar. 31, 2013, and Mar. 31, 2018, in Ontario. Note: CI = confidence interval, OR = odds ratio, Ref. = reference category.

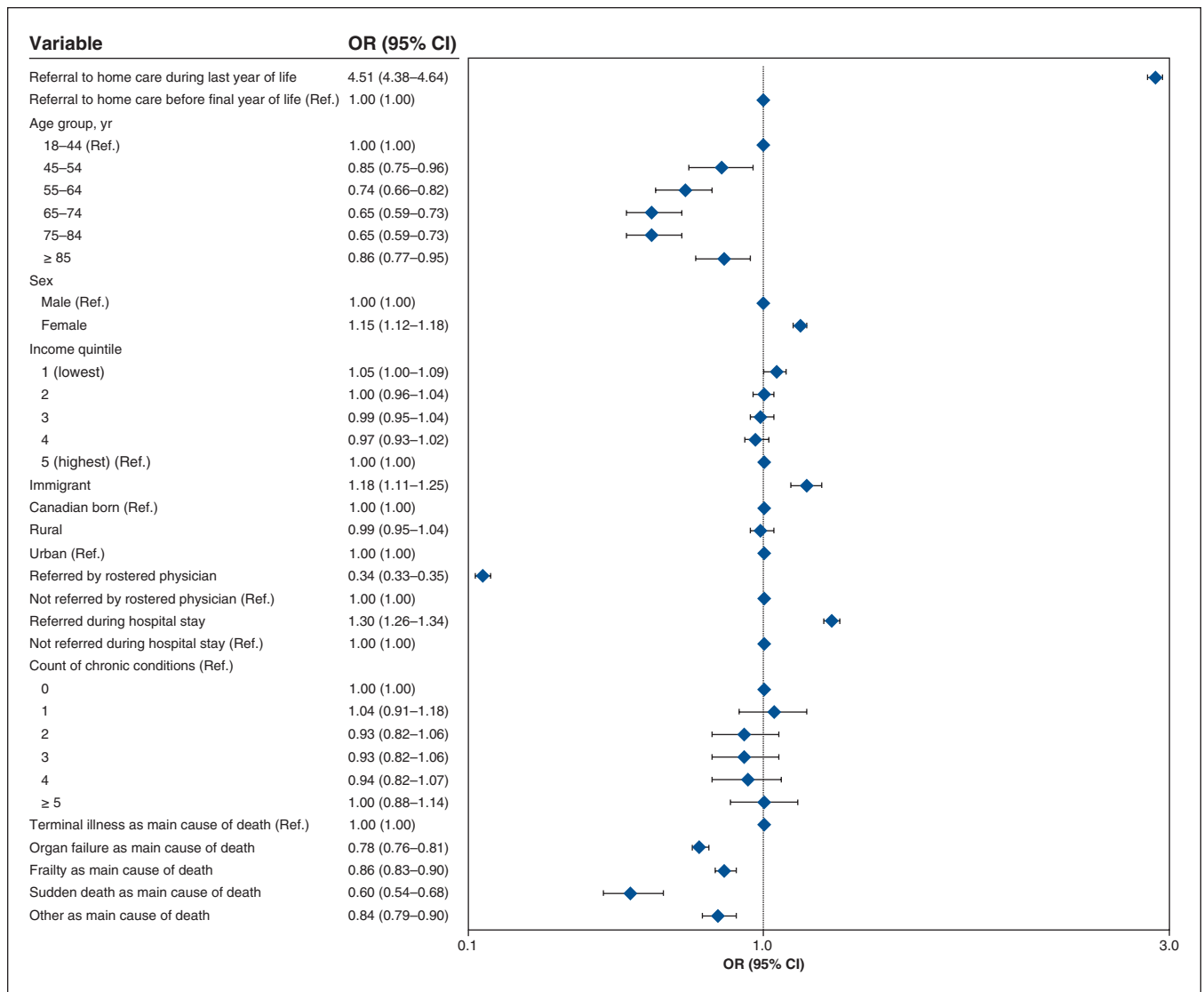
## Results

A total of 105 816 patients referred to home care during the last 5 years of life (of whom 104 510 had complete data) constituted the full cohort, and the descriptive cohort was composed of 58 753 of the 105 816 patients who were referred in the last year of life (Appendix 1). More than half (34 568 [58.8%]) of the patients in the descriptive cohort were aged 60–84 years, there were more males (31 151 [53.0%]) than females, most patients (51 829 [88.2%]) lived in urban areas, and 16 819 patients (28.6%) had 5 or more chronic conditions (Table 1). Just over half (29 858 [50.8%]) of patients died from a terminal illness, 16 149 (27.5%) died from organ failure, 8741 (14.9%) died from frailty, 615 (1.0%) died from sudden death, and 2879 (4.9%) died from other causes.

## Primary outcome

Of the patients referred to home care in their last year of life, 3125 (5.3%) received a home visit from their rostered physician, 16 162 (27.5%) received office-based or telephone-based care from their rostered physician, and 39 466 (67.2%) did not receive any care from their rostered physician after referral.

In the adjusted model, the relative odds of receiving a home visit rather than an office visit or telephone management were 1.28 (95% CI 1.21–1.35) times higher for females than for males, 2.42 (95% CI 1.80–3.26) times higher for those aged 85 years or older than for those aged 18–44 years, and 1.09 (95% CI 1.00–1.18) times higher for those living in rural areas than for those in urban areas (Figure 1). Compared to patients referred to home care by a nonrostered physician, those referred by their rostered physician (19.7% of the cohort) had 1.49 (95% CI 1.13–1.28) the odds of receiving a



**Figure 2:** Results of a multinomial logistic regression on not receiving any care from a rostered primary care physician compared to receiving other community-based care from a rostered physician after referral to home care services for patients referred to home care during the last 5 years of life. Note: CI = confidence interval, OR = odds ratio, Ref. = reference category.

home visit rather than office-based or telephone-based care. Similarly, patients referred during a hospital stay had 1.20 (95% CI 1.13–1.28) times the odds of receiving a home visit rather than an office visit or telephone management from their rostered physician during the last year of life compared to those referred outside a hospital stay.

In the multinomial model, the odds of not receiving any care from a rostered physician compared to receiving typical primary care though office-based or telephone-based care were significantly higher for females (OR 1.15, 95% CI 1.12–1.18), for those who immigrated to Canada (OR 1.18, 95% CI 1.11–1.25), when referral to home care was during a hospital stay (OR 1.30, 95% CI 1.26–1.34) and when referral was during the patient's last year of life (OR 4.51, 95% CI 4.38–4.64) (Figure 2).

### Secondary outcomes

Of the patients who did not receive any community-based care from their rostered physician, 12 257 (31.1%) received outpatient care (home visit, office visit or telephone management) from nonrostered physicians. Palliative care generalists and specialists provided outpatient care to 18 694 patients (31.8%) and 10 280 patients (17.5%), respectively (Table 2). Within the subgroup analysis of patients' disease trajectory, those with a terminal illness had an average of 1.08 home visits (SD 3.49) from a rostered physician in their last year of life and the highest mean number (2.78 [SD 9.08]) of home visits provided by palliative care specialists (Table 3). Those who died from frailty had an average of 1.57 home visits (SD 3.97) from a rostered physician in their last year of life and the highest mean number (0.32 [SD 2.78]) of home visits from a rostered physician after referral to home care. The fully adjusted model, which considered all characteristics and covariates outlined in the methods, showed that frailty was not significantly associated with receiving a home visit from a rostered physician. Sudden death and "other" main causes of death were associated with reduced odds of receiving a home visit from a rostered physician (OR 0.51, 95% CI 0.41–0.72) and of

receiving no care from a rostered physician (OR 0.69, 95% CI 0.61–0.79) (double negative: reduced odds of no care indicates higher odds of care, but not as home visits) compared to office-based or telephone-based care (data not shown).

### Rate of visits

The rate of home visits per 1000 person-days by rostered primary care physicians in the last year of life remained relatively low from 12 to 4 months before death, increasing in the last 3 months of life (Figure 3). Home visits by a nonrostered physician occurred at a higher rate than those by a rostered physician, with an increase during the last 4 months of life.

### Interpretation

Of adult patients who died between Mar. 31, 2013, and Mar. 31, 2018, in Ontario and were referred to home care services in their last year of life, 67.2% did not receive any care from their rostered physician after referral, and 5.3% received a home visit from their rostered physician after referral. Patient characteristics associated with higher odds of receiving home visits from a rostered physician were being female, being 85 years of age or older and living in a rural area; however, visit rates still remained low. These results suggest that patient characteristics are not the driving factor in receiving a home visit from a physician near the end of life. Referrals to home care by the rostered physician compared to another health care provider and referrals during a hospital stay were also associated with higher odds of subsequent home visit delivery rather than typical primary care, such as an office visit or telephone management.

Previous literature has highlighted unmet palliative care needs, including that only 1 in 5 Ontarians receive a home visit from any physician in their last year of life.<sup>35</sup> Our results show that these gaps remain, particularly at the end of life. Even if we assume that the 42.9% of patients who received care from nonrostered physicians received handover care,

**Table 2: Number of patients visited by a physician in their last year of life according to outcomes of interest**

| Outcome*  | No. (%) of patients |  |   |   |
|---|---------------------|--|---|---|
|   | Total<br>n = 58 753 | With home visit from<br>rostered physician<br>n = 3125 | With office-based or<br>telephone-based care<br>from rostered physician<br>n = 16 162 | Without care from<br>rostered physician<br>n = 39 466 |
| Received care from nonrostered physician            | 25 206 (42.9)       | 1975 (63.2)  | 10 974 (67.9)   | 12 257 (31.1)   |
| Received care from palliative care specialist       | 10 280 (17.5)       | 867 (27.7)   | 3527 (21.8)   | 5886 (14.9)   |
| Received care from palliative care generalist       | 18 694 (31.8)       | 1449 (46.4)  | 8879 (54.9)   | 8366 (21.2)   |
| Received care from other family physician           | 3541 (6.0)          | 248 (7.9)  | 1863 (11.5)   | 1430 (3.6)  |
| Received care from other specialist (nonpalliative) | 19 203 (32.7)       | 1507 (48.2)  | 10 576 (65.4)   | 7120 (18.0)   |

\*Outcomes are not mutually exclusive.

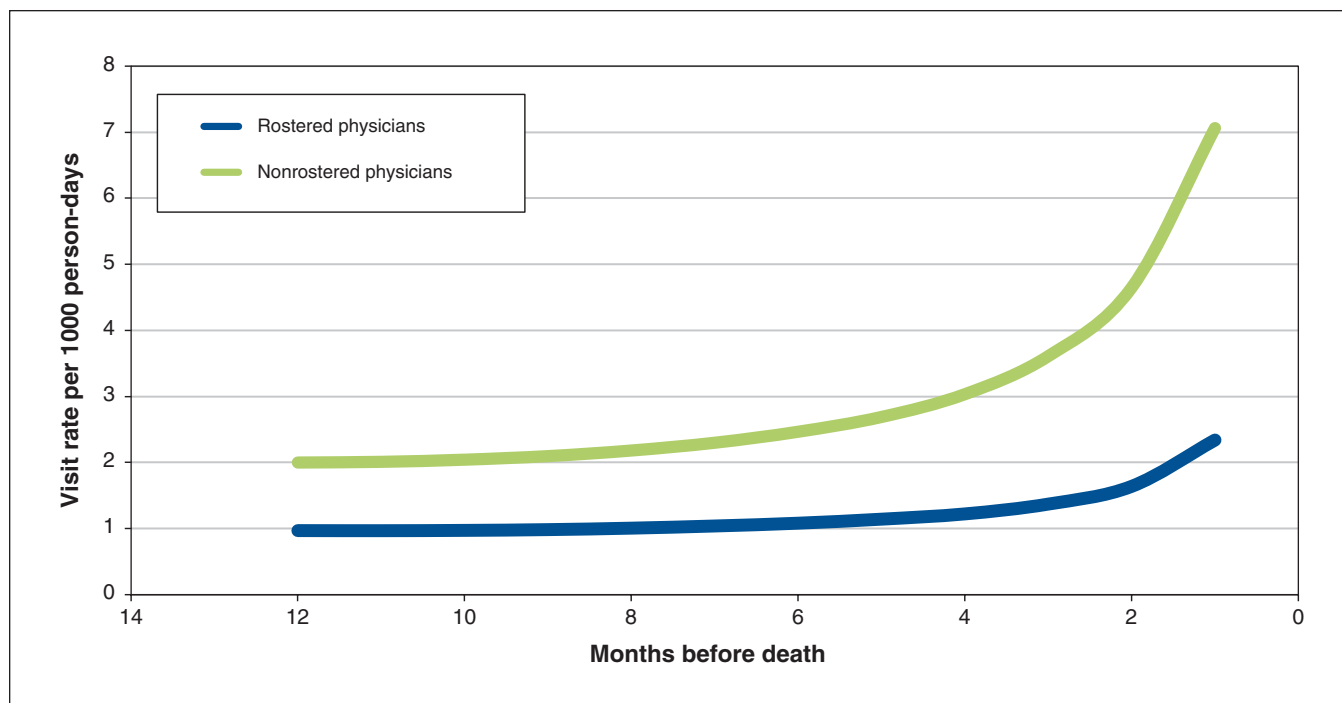
there remained 24.3% of decedents referred to home care who did not receive outpatient services from any physician during their last year of life. Although these rates are low, we observed an increased rate of home visits across the last months of life, which aligns with previous end-of-life literature showing that outpatient physician care intensified during the last 3 months of life.<sup>36–38</sup> This finding highlights how

patients' care needs increase as they approach death. Our home visit rate accounted for the days patients spent in hospital, since they would be ineligible to receive a home visit from their rostered physician in the last year of life. However, a substantial number of community-dwelling patients were not visited at home or in office, or managed over the telephone by rostered physicians near the end of life.

**Table 3: Characteristics of physician visits to patients in their last year of life according to patient's illness trajectory**

| Characteristic  | Illness trajectory; no. (%) of patients* |                                       |                                    |                            |                                |                          |
|---|--|---------------------------------------|------------------------------------|----------------------------|--------------------------------|--------------------------|
|   | Total<br><i>n</i> = 58 242†              | Terminal illness<br><i>n</i> = 29 858 | Organ failure<br><i>n</i> = 16 149 | Frailty<br><i>n</i> = 8741 | Sudden death<br><i>n</i> = 615 | Other<br><i>n</i> = 2879 |
| No. of visits from rostered physician, mean ± SD  | 1.28 ± 3.63                              | 1.08 ± 3.49                           | 1.51 ± 3.79                        | 1.57 ± 3.97                | 1.53 ± 3.37                    | 1.19 ± 2.93              |
| Received care from nonrostered physician  | 24 995 (42.9)                            | 14 048 (47.0)                         | 6209 (38.4)                        | 3403 (38.9)                | 300 (48.8)                     | 1035 (35.9)              |
| Received care from palliative care specialist   | 10 241 (17.6)                            | 8214 (27.5)                           | 1229 (7.6)                         | 584 (6.7)                  | 28 (4.6)                       | 186 (6.5)                |
| Received care from palliative care generalist   | 18 517 (31.8)                            | 10 183 (34.1)                         | 4730 (29.3)                        | 2553 (29.2)                | 225 (36.6)                     | 826 (28.7)               |
| Received care from other family physician   | 3500 (6.0)                               | 1373 (4.6)                            | 1157 (7.2)                         | 665 (7.6)                  | 97 (15.8)                      | 208 (7.2)                |
| Received care from other specialist (nonpalliative)   | 19 005 (32.6)                            | 9702 (32.5)                           | 5321 (32.9)                        | 2808 (32.1)                | 283 (46.0)                     | 891 (30.9)               |
| No. of visits from palliative care specialist physician, mean ± SD                                    | 1.70 ± 7.11                              | 2.78 ± 9.08                           | 0.61 ± 3.95                        | 0.51 ± 3.50                | 0.43 ± 3.83                    | 0.54 ± 3.86              |
| No. of visits from palliative care generalist physician, mean ± SD                                    | 1.83 ± 5.37                              | 2.10 ± 5.78                           | 1.57 ± 5.02                        | 1.44 ± 4.65                | 2.18 ± 6.07                    | 1.62 ± 4.58              |
| No. of visits from other family physician, mean ± SD  | 0.19 ± 1.49                              | 0.13 ± 1.10                           | 0.24 ± 1.73                        | 0.26 ± 1.81                | 0.80 ± 3.88                    | 0.23 ± 1.51              |
| Referred during hospital stay   | 22 254 (38.2)                            | 10 854 (36.4)                         | 6525 (40.4)                        | 3444 (39.4)                | 243 (39.5)                     | 1188 (41.3)              |
| No. of hospital admissions after index referral to home care, mean ± SD                               | 1.67 ± 1.37                              | 1.59 ± 1.35                           | 1.81 ± 1.46                        | 1.63 ± 1.32                | 1.54 ± 1.48                    | 1.73 ± 1.18              |
| Referred by palliative care specialist during hospital stay   | 2028 (3.5)                               | 1546 (5.2)                            | 294 (1.8)                          | 143 (1.6)                  | 1–5‡                           | 40–44‡                   |
| No. of hospital admissions with palliative care, mean ± SD  | 0.28 ± 0.51                              | 0.36 ± 0.57                           | 0.20 ± 0.43                        | 0.17 ± 0.40                | 0.10 ± 0.32                    | 0.16 ± 0.39              |
| Referred by rostered physician during hospital stay   | 900 (1.5)                                | 389 (1.3)                             | 332 (2.1)                          | 135 (1.5)                  | 6 (1.0)                        | 38 (1.3)                 |
| Referred by rostered physician at any time in last 5 yr of life                                       | 11 463 (19.7)                            | 4345 (14.6)                           | 4147 (25.7)                        | 2233 (25.5)                | 121 (19.7)                     | 617 (21.4)               |
| Incidence rate of home visits from rostered physician after index referral to home care, mean ± SD    | 0.27 ± 2.75                              | 0.27 ± 2.79                           | 0.27 ± 2.89                        | 0.32 ± 2.78                | 0.07 ± 0.57                    | 0.14 ± 1.48              |
| Incidence rate of home visits from nonrostered physician after index referral to home care, mean ± SD | 0.54 ± 3.67                              | 0.77 ± 4.47                           | 0.30 ± 2.56                        | 0.34 ± 2.95                | 0.08 ± 0.69                    | 0.12 ± 1.03              |

Note: SD = standard deviation.  
\*Except where noted otherwise.  
†Slightly lower total as cause of death information was missing for some patients.  
‡Range provided for small cells to prevent the risk of disclosure.



**Figure 3:** Rate of home visits per 1000 person-days delivered to patients during their last year of life by rostered and nonrostered physicians after referral to home care services among decedents referred to home care during the last 5 years of life.

Alternative payment plans for primary care physicians who consistently care for their patients were introduced in Canada and other jurisdictions to increase comprehensive care, coordination and accountability, and to promote interdisciplinary care.<sup>39</sup> Physicians in such plans are encouraged to make home visits through financial incentives (e.g., all payments are 100% payable outside of the capitation rate, and bonuses are provided for a certain number of visits per year).<sup>17</sup> Since then, international studies have shown a lower volume of care provision and fewer follow-up visits associated with these models.<sup>40,41</sup> Although we do not compare remuneration models in this study, this provides insight into why the proportions of patients referred to home care (19.7%) and subsequently receiving a home visit by a rostered physician (5.3%) were low. Nonetheless, almost half of our patients (42.9%) received outpatient care from nonrostered physicians, which suggests that hand-off or shared care may be happening.

**Limitations**

A strength of this study is that it describes end-of-life home visits delivered by physicians with an existing patient relationship using reliable population-based linked health administrative data of all registered residents in Canada’s most populous province.

Limitations include the fact that, because health administrative data do not capture all clinical characteristics or care coordination precisely, hand-off care between different primary care providers can only be deduced. We used cause of death information, which is updated only until 2018, which limited the span of recent data. This study focused on the

provision of home visits from primary care physicians owing to data limitations. In Ontario, nurse practitioners also provide home visits; thus, our study captured only a portion of the community-based primary care. We restricted our cohort to patients with a rostered physician who were referred by a physician to home care services. This referral is a clinical and system-level signal of increased care needs that we hypothesized would lead to physician involvement. We did not ascertain whether patients received other home care services after referral or privately funded services, and we did not exclude patients who subsequently were admitted to hospital; however, we accounted for hospital days in calculating visit rates. Finally, it is important to acknowledge that many patients in Ontario do not have a rostered physician, which may limit generalizability to jurisdictions with complete rostering, and they may be further marginalized without a consistent provider relationship.

**Conclusion**

Most patients in Ontario referred by a physician to home care did not receive a subsequent home visit from their rostered physician during their last year of life. This finding shows that patient characteristics are not the primary determinant of who receives a home visit. Our findings highlight the need for research that could enable primary care providers to remain involved as care needs increase. Research is also needed to evaluate the feasibility of increasing rostered physicians’ capacity to provide home-based supportive care, to explore physician- and system-related factors that influence the provision of home visits, and to outline the required supports for handover or shared-care models.



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**Data sharing:** The data set for this study is held securely in coded form at ICES. Although data-sharing agreements prohibit ICES from making the data set publicly available, access may be granted to those who meet pre-specified criteria for confidential access, available at <https://www.ices.on.ca/DAS>. 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 inaccessible or may require modification.

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