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# Nurse practitioner and physician end-of-life home visits and end-of-life outcomes

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► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/spcare-2023-004392>).

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Received 7 June 2023

Accepted 13 October 2023



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**To cite:** Scott MM, Ramzy A, Isenberg SR, et al. *BMJ Supportive & Palliative Care* Epub ahead of print: [please include Day Month Year]. doi:10.1136/spcare-2023-004392

## ABSTRACT

**Objectives** Physicians and nurse practitioners (NPs) play critical roles in supporting palliative and end-of-life care in the community. We examined healthcare outcomes among patients who received home visits from physicians and NPs in the 90 days before death.

**Methods** We conducted a retrospective cohort study using linked data of adult home care users in Ontario, Canada, who died between 1 January 2018 and 31 December 2019. Healthcare outcomes included medications for pain and symptom management, emergency department (ED) visits, hospitalisations and a community-based death. We compared the characteristics of and outcomes in decedents who received a home visit from an NP, physician and both to those who did not receive a home visit.

**Results** Half (56.9%) of adult decedents in Ontario did not receive a home visit from a provider in the last 90 days of life; 34.5% received at least one visit from a physician, 3.8% from an NP and 4.9% from both. Compared with those without any visits, having at least one home visit reduced the odds of hospitalisation and ED visits, and increased the odds of receiving medications for pain and symptom management and achieving a community-based death. Observed effects were larger in patients who received at least one visit from both.

**Conclusions** Beyond home care, receiving home visits from primary care providers near the end of life may be associated with better outcomes that are aligned with patients' preferences—emphasising the importance of NPs and physicians' role in supporting people near the end of life.

## WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Home-based end-of-life care is associated with improved end-of-life outcomes.
- ⇒ Limited existing evidence on the effectiveness of home-based nurse practitioner-led primary care.

## WHAT THIS STUDY ADDS

- ⇒ Home visits from a nurse practitioner, physician or both are associated with improved end-of-life outcomes.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ Results highlight the importance of primary care providers in supporting reduced acute care use at the end of life and in enabling community-based deaths.
- ⇒ Family physicians and nurse practitioners provide critical support for individuals residing in the community at the end of life, and more research is needed to examine the effectiveness of interprofessional and collaborative practice models involving a mix of physicians and nurse practitioners.

## INTRODUCTION

Challenges with access to adequate and timely primary care have become a crisis across healthcare systems worldwide.<sup>1</sup> The growing demand for physicians to provide care in the community to an increasingly complex patient population<sup>2</sup> has led health system planners to consider increasing the number of interprofessional teams within the primary care setting to meet current demands.<sup>3</sup> For example, this expansion includes integrating shared

care models with nurse practitioners (NPs), who are registered nurses with additional qualifications and experience that enable them to practice as autonomous licensed primary healthcare providers.<sup>4</sup> In Canada, NPs first began practising in the 1960s and their scope of practice includes health promotion, disease prevention, curative care, rehabilitative care, prescribing controlled substances and supportive care for people with life-limiting illness or near the end of life.<sup>5</sup>

Internationally, governments have prioritised the need to enhance palliative care delivery, especially in home and community care.<sup>6,7</sup> Existing evidence on the provision of end-of-life home visits has predominantly focused on the role of physicians and the receipt of home care services (including services provided by registered nurses, personal support workers and allied health professionals).<sup>8</sup> Physician home visits and palliative home care have been demonstrated to lead to better patient–provider communication about care planning, improved health-related quality of life, reduced hospitalisations and increased likelihood of dying at home.<sup>9</sup> Despite the potential to expand primary care’s capacity and meet the needs of those near the end of life through interprofessional models involving NPs, few studies have examined the relationship between NP-led home visits and patient outcomes, especially using large population-level data sources.<sup>10</sup>

In this study, we described the provision of home visits by primary care providers at the end of life in a population-based cohort of deceased home care users. We compared across characteristics and healthcare outcomes—including hospitalisations, emergency department (ED) visits, symptom management and location of death—in those who received visits from physicians and NPs to those who did not receive any home visits from a provider near the end of life.

## METHODS

### Setting and design

We conducted a retrospective cohort study examining the outcomes of decedent home care clients in Ontario, Canada, who did and did not receive home visits from an NP, physician or both in their last 90 days of life.

### Context

Under the Canada Health Act, all medically necessary hospital, diagnostic and physician services in Canada are funded through an interlocking federal, provincial and territorial system. The extent of coverage for non-medical services (eg, home care services and long-term care) vary across provinces and territories. Services not covered by most federal and provincial healthcare plans include vision and dental care, outpatient prescription drugs for populations under the age of 65, and most outpatient rehabilitative and restorative care. Those deemed ineligible for the provincial healthcare plan (eg, the Ontario Health Insurance Plan (OHIP)) can appeal provincially, apply for federal health coverage,

pay for healthcare out-of-pocket or purchase private health insurance. Eligibility for provincial and territorial healthcare insurance programmes are unique to each region and based on length of time spent in residence, as well as citizenship or immigration and refugee designation.

In Ontario, people who require support to remain at home may be referred for home care, which includes publicly funded rehabilitative care, nursing care (including NP home visits), personal care and general support with instrumental activities of daily living (ADL). Referrals can be made by healthcare professionals, family members or patients themselves. Services are provided based on patients’ needs, which are routinely assessed using the interRAI Home Care (interRAI HC) Assessment Instrument,<sup>11</sup> and funded by the Ontario Ministry of Health. Across Canada, InterRAI instruments are licensed and routinely used for home care, long-term care and in some complex continuing care settings for the assessment of care needs. Home visits provided by physicians are covered by OHIP.

### Data sources

We used population-based, person-level health administrative data housed at ICES (formerly known as the Institute for Clinical Evaluative Sciences) to derive the study population and outcomes of interest (see detailed database descriptions in online supplemental appendix I). Data held at ICES contain administrative information (eg, date of healthcare encounter, services provided) associated with healthcare encounters at the individual level and services covered under the provincial health insurance plan.

Briefly, we identified decedents and derived their baseline demographic information and vital statistics from the Registered Person’s Database. Home visits were identified using the Home Care Database (HCD) and OHIP claims for NPs and physicians, respectively. We used the Canadian Institute for Health Information’s Discharge Abstract Database, the Continuing Care Reporting System database, and the National Ambulatory Care Reporting System (NACRS) to identify active chronic conditions, individuals’ acute care utilisation, and death within an institution (see online supplemental appendix I for variables and corresponding database). Additional clinical characteristics and needs of a subset of patients were derived from the interRAI HC database for those who had an assessment within 3 months prior to death. The Ontario Drug Benefit claims database (ODB) was used to ascertain claims for medications related to pain and symptom management. These datasets were linked using unique encoded identifiers and analysed at ICES.

### Study population

We identified all decedents who had a home care record in the last 90 days of life and died between 1

January 2018 and 31 December, 2019. We used home care clients to ensure the entire cohort was eligible for NP home visits, which were identified through the HCD. We excluded individuals aged <19 years or >115 years, those not eligible for OHIP at any point in the last year of life, and those living in a long-term care home in the last 90 days of life, as institutionalised individuals and those without OHIP coverage would be ineligible for home-based services.

### Exposure

We compared decedents who did not receive any home visits to those who had received at least one home visit delivered by only an NP, only a physician (included all practising physician specialties), or both an NP and physician during the last 90 days of life. Physician-delivered home visits were captured using OHIP billing codes (online supplemental appendix II). NP-delivered palliative home visits were captured through a HCD record, as visits delivered by NPs outside of the provincial home care programme are not captured in health administrative data.

### Outcomes

Our outcomes were at least one ED visit, at least one hospital admission, at least one medication claim related to pain and symptom management occurring during the last 3 weeks of life and death in the community. We captured symptom management using claims made to the ODB programme, which covers most of the drug costs for those receiving end-of-life home care services and those aged 65 years or above. Symptom management claims were summarised according to pharmacological treatments for three common end-of-life symptoms: pain management, delirium or agitation, terminal secretions or nausea (full list in online supplemental appendix III). We defined community death as deaths that were not captured within institutional records, which could include home or a hospice setting (see online supplemental appendix I for databases used).

### Study Variables

We characterised patients according to their age, sex, geography, neighbourhood income and the local health integration network (LHIN) (ie, regional health authority) within which they resided. We only captured income quintiles for urban areas since using rural postal codes representing much larger geographical areas can result in considerable income misclassification.<sup>12</sup> We captured the prevalence and count of 17 health conditions, which were determined using all healthcare utilisation records and diagnosis codes within 2 years prior to the index date, based on previously developed and validated methods.<sup>13–26</sup> We collapsed all cardiovascular-related diseases (ie, acute myocardial infarction, congestive heart failure, coronary heart disease and hypertension) and respiratory

diseases (ie, asthma and chronic obstructive pulmonary disease), as these are associated with similar care trajectories. We captured patients' care characteristics during their last 90 days of life, including the types of formal home care services received (eg, personal support or nursing), average hours of home care services received, and level of any inpatient palliative care involvement during a hospital stay.<sup>27</sup> We captured the primary care model to which patients belonged, namely whether patients were rostered through a blended capitation model, blended fee-for-service model or received services through a traditional fee-for-service model. Blended capitation and blended fee-for-service models are remuneration models used by over half of Ontario-based family physicians, in which physicians receive payments for providing a basket of services to enrolled patients versus a non-blended traditional fee-for-service model where remuneration is from direct billing of services and is used by all other physician specialties. We stratified home care hours based on those deemed to be in their last few months of life vs not, since this end-of-life designation is associated with higher service provision, including equipment and home-based hospice supports.<sup>28</sup>

### Statistical analysis

We summarised demographic and clinical characteristics using descriptive statistics, stratified by receipt of home visits and provider type, using  $\chi^2$  and analysis of variance (ANOVA) tests. Logistic regression models examined the independent relationship between the receipt of one or more home visit and each outcome, defined dichotomously. We modelled acute care use and symptom management occurring during the last 3 weeks of life, controlling for age, sex, rurality, local health region, chronic conditions, formal home care hours occurring 90–22 days before death, previous hospitalisations and previous inpatient palliative care encounters occurring prior to the last 90 days of life, primary care model and number of days spent in the community during the last 90 days of life and before the outcome occurred. Restricting formal home care hours to a timeframe of 22–90 days before death, ensured they occurred prior to outcomes. We modelled death in the community, controlling for all the same covariates as above occurring anytime during the last 90 days of life.

This reporting of methods and results in this paper adheres to the Reporting of Studies Conducted using Observational Routinely-collected Data (RECORD) statement and reporting guideline.<sup>29</sup>

### Sensitivity analyses

We conducted sensitivity analyses using a subset of those with an interRAI HC assessment completed 90–22 days before death to address possible confounding by differences in clinical severity and care needs which can influence outcomes and to

reduce selection bias of those with better support in the community having a higher likelihood of community death. We estimated logistic regression models with all previously included covariates and additional clinical and social variables in a nested analysis: first, we included clinical variables pertaining to patients' function (using the ADL Self-Performance Scale), overall health stability (using the Changes in Health, End-Stage Disease and Signs and Symptoms Scale) and cognition (using the Cognitive Performance Scale); then, we added covariates pertaining to the availability of social support, including the presence of a live-in caregiver and caregiver distress. This nested analysis allowed us to compare the relative contribution of additional clinical as well as social characteristics to the model fit and their association with the outcomes of interest.

## RESULTS

### Descriptive results

The cohort included 103 664 Ontario eligible decedents (a cohort creation flow diagram can be found in online supplemental appendix IV). The mean age was 77.8 (SD: 13.1) years, with over 80% of individuals aged 65 years or older (table 1). During the last 90 days of life, one-third (34.5%) of the cohort received at least one home visit from a physician, 3.8% received at least one home visit from an NP and 4.9% received at least one home visit from both an NP and a physician. Significant differences in characteristics of decedents visited by an NP only compared with those visited by a physician only included being younger (mean age: 74.4 SD±13.2 vs 78.6 SD±13.2), male (53.1% vs 48.3%) and living in rural areas (19.5% vs 10.9%). Furthermore, greater proportions of those visited by an NP only lived in rural and northern geographical health regions, which also had the lowest proportion of home visits delivered (figure 1—LHINs 13 and 14) compared with more central locations. A high proportion of decedents rostered within capitation-based models, including family health teams, received NP home visits (table 2).

### Home visits associated with end-of-life outcomes

Compared with not receiving a home visit, receiving at least one home visit from an NP, a physician or both an NP and a physician was associated with reduced odds of being hospitalised at least once in the last 3 weeks of life (OR 0.54, 95% CI 0.50 to 0.59; OR 0.47, 95% CI 0.46 to 0.49; OR 0.31, 95% CI 0.28 to 0.34), respectively (figure 2). Similarly, receiving at least one home visit from an NP, a physician or both an NP and physician was associated with reduced odds of visiting the ED at least once in the last 3 weeks of life (OR 0.75, 95% CI 0.67 to 0.83; OR 0.72, 95% CI 0.68 to 0.75; OR 0.50, 95% CI 0.43 to 0.58), respectively. Receiving a home visit from an NP, a physician or both was also associated with increased odds of receiving medication

for symptom management in the last 3 weeks of life (OR 2.54, 95% CI 2.33 to 2.76; OR 2.39 95% CI 2.30 to 2.48; OR 3.48, 95% CI 3.14 to 3.84), respectively. Finally, having at least one home visit from an NP, a physician or both was associated with increased odds of dying in the community (OR 2.98, 95 %CI 2.75 to 3.24; OR 4.58, 95% CI 4.42 to 4.74; OR 7.20, 95% CI 6.57 to 7.89), respectively.

### Sensitivity analyses

Sensitivity analyses were conducted on a subset of 16 307 individuals (15.7% of cohort) who had completed an interRAI HC assessment in the 90–22 days before death. This subgroup had similar baseline characteristics to the overall cohort (online supplemental appendix V). Aside from the odds of ED visits becoming insignificant, associations observed in the main results were not significantly changed by adding clinical or social support characteristics to the models, including for caregiver distress (online supplemental appendix V).

### INTERPRETATION

In this analysis, we observed home visits provided near the end of life were associated with reduced the odds of acute care use, increased the odds of medication prescription for symptom management, and increased the odds of dying in the community. Furthermore, the magnitude of the association between each outcome and home visits was largest when NPs and physicians both provided at least one home visit to the patient as they approached the end of life.

There is a growing body of literature on the role and benefits of integrating NPs into home and community primary care.<sup>10 30 31</sup> Our results support and contribute to this evidence base by examining the receipt of palliative home visits from NPs and describing its correlation with healthcare use and outcomes at a population level. Specifically, our findings are aligned with existing data indicating that end-of-life home visits from primary care providers are uncommon, yet associated with improved outcomes.<sup>32</sup> With a rapid need to respond to the current crisis in primary care provision, considerations for funding and establishing more robust evidence on NPs and integrated interdisciplinary teams are paramount, especially for vulnerable patients near the end of life.<sup>33</sup> Capitation-based remuneration models are offered to physician groups and often are affiliated with interprofessional teams in Ontario.<sup>34</sup> The results that greater proportions of decedents belonging to capitation-based models had a home visit from both an NP and physician may suggest these models support community-based NPs and physicians working alongside one another.

Geographical differences in visit provision observed in this study is aligned with international literature which has highlighted several challenges to providing consistent services across regions.<sup>35</sup> Variations observed

**Table 1** Patient characteristics of all decedents who died between 1 January 2018 and 31 December 2019 who received formal home care services in their last 90 days of life (captured 90 days before death)

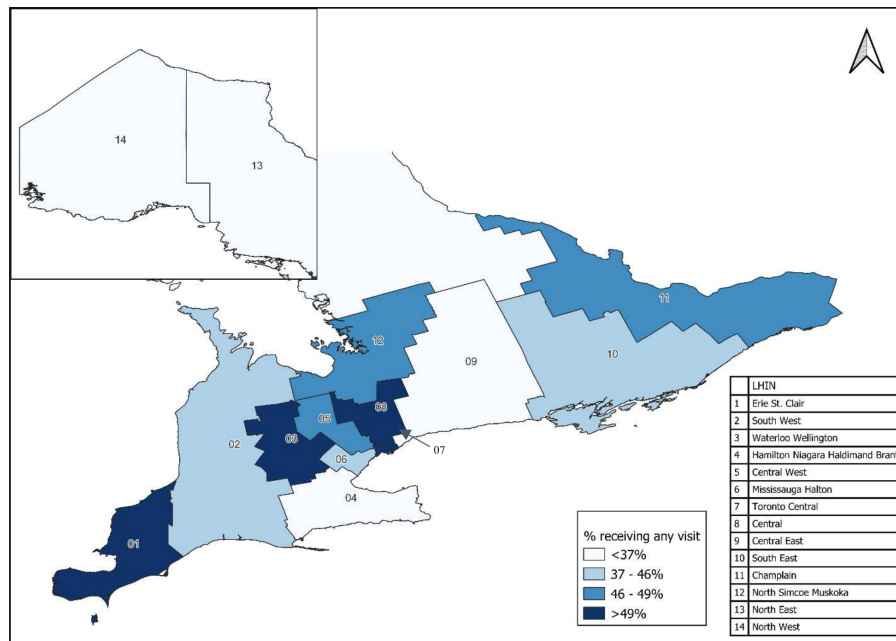
Overall		No (%)* without home visit from NP or MD n=58 945	No (%)* with a home visit from only NP n=3906	No (%)* with a home visit from only MD n=35 720	No (%)* with a home visit from both NP and MD n=5093	Total no (%)* home care clients n=103 664	P value
Sex	Female	27 963 (47.4)	1831 (46.9)	18 450 (51.7)	2594 (50.9)	50 838 (49.0)	<0.0001
Age	Mean (±SD)	77.8 ±12.9	74.4 ±13.2	78.6 ±13.2	75.3 ±13.5	77.82±13.1	<0.0001
	18–44	889 (1.5)	83 (2.1)	532 (1.5)	102 (2.0)	1606 (1.5)	
	45–54	1984 (3.4)	194 (5.0)	1216 (3.4)	244 (4.8)	3638 (3.5)	
	55–64	6325 (10.7)	583 (14.9)	3666 (10.3)	731 (14.4)	11 305 (10.9)	
	65–74	11 841 (20.1)	1013 (25.9)	6749 (18.9)	1154 (22.7)	20 757 (20.0)	
	75–84	16 884 (28.6)	1076 (27.5)	9628 (27.0)	1437 (28.2)	29 025 (28.0)	
	85–94	17 722 (30.1)	800 (20.5)	11 214 (31.4)	1178 (23.1)	30 914 (29.8)	
	95+	3300 (5.6)	157 (4.0)	2715 (7.6)	247 (4.8)	6419 (6.2)	
Rurality	Rural	8129 (13.8)	761 (19.5)	3906 (10.9)	654 (12.8)	13 450 (13.0)	<0.0001
	Urban	50 648 (85.9)	3135 (80.3)	31 706 (88.8)	4427 (86.9)	89 937 (86.7)	
	Missing	155 (0.3)	8 (0.2)	104 (0.3)	10 (0.2)	277 (0.3)	
Urban Neighbourhood Income Quintiles	1 (lowest)	13 479 (22.9)	723 (18.5)	6763 (18.9)	884 (17.4)	21 849 (21.1)	<0.0001
	2	11 579 (19.6)	675 (17.3)	6855 (19.2)	917 (18.0)	20 026 (19.3)	
	3	9700 (16.5)	675 (17.3)	6328 (17.7)	865 (17.0)	17 568 (16.9)	
	4	8273 (14.0)	575 (14.7)	5783 (16.2)	888 (17.4)	15 519 (15.0)	
	5 (highest)	7617 (12.9)	487 (12.5)	5977 (16.7)	873 (17.1)	14 954 (14.4)	
	Missing	13 (0.0)	2 (0.1)	4 (0.0)	2 (0.0)	21 (0.0)	
LHIN							
	Erie St. Clair	3083 (5.2)	611 (15.6)	1585 (4.4)	882 (17.3)	6161 (5.9)	<0.0001
	South West	4841 (8.2)	383 (9.8)	2906 (8.1)	785 (15.4)	8915 (8.6)	
	Waterloo wellington	2761 (4.7)	149 (3.8)	2184 (6.1)	407 (8.0)	5501 (5.3)	
	Hamilton niagara haldimand brant	8332 (14.1)	353 (9.0)	3870 (10.8)	666 (13.1)	13 221 (12.8)	
	Central West	2545 (4.3)	136 (3.5)	1810 (5.1)	212 (4.2)	4703 (4.5)	
	Mississauga halton	3515 (6.0)	411 (10.5)	1962 (5.5)	547 (10.7)	6435 (6.2)	
	Toronto central	3592 (6.1)	56 (1.4)	3564 (10.0)	179 (3.5)	7391 (7.1)	
	Central	5635 (9.6)	172 (4.4)	5124 (14.3)	279 (5.5)	11 210 (10.8)	
	Central East	8165 (13.9)	570 (14.6)	3482 (9.7)	243 (4.8)	12 460 (12.0)	
	South East	3330 (5.6)	140 (3.6)	1703 (4.8)	128 (2.5)	5301 (5.1)	
	Champlain	5144 (8.7)	186 (4.8)	4029 (11.3)	409 (8.0)	9768 (9.4)	
	North Simcoe Muskoka	2559 (4.3)	104 (2.7)	1955 (5.5)	114 (2.2)	4732 (4.6)	
	North East	3984 (6.8)	417 (10.7)	1344 (3.8)	174 (3.4)	5919 (5.7)	
	North West	1457 (2.5)	218 (5.6)	200 (0.6)	68 (1.3)	1943 (1.9)	
	Missing	2 (0.0)	0 (0.0)	2 (0.0)	0 (0.0)	4 (0.0)	
Count of chronic conditions mean (±SD)		5.40 ±2.4	4.87 ±2.3	5.21 ±2.4	4.96 ±2.3	5.29±2.4	0.0005
Acute myocardial infarction		1475 (2.5)	86 (2.2)	638 (1.8)	89 (1.7)	25 783 (24.9)	<0.0001
Arrhythmia		15 437 (26.2)	761 (19.5)	8577 (24.0)	1008 (19.8)	38 780 (37.4)	<0.0001
Asthma		10 184 (17.3)	641 (16.4)	5873 (16.4)	808 (15.9)	32 882 (31.7)	<0.0001
Cancer		25 904 (43.9)	2635 (67.5)	21 545 (60.3)	3617 (71.0)	80 365 (77.5)	<0.0001
Congestive heart failure		20 531 (34.8)	900 (23.0)	10 225 (28.6)	1226 (24.1)	84 792 (81.8)	<0.0001
Chronic obstructive pulmonary disease		14 998 (25.4)	1003 (25.7)	7937 (22.2)	1090 (21.4)	25 783 (24.9)	<0.0001
Coronary heart disease		23 398 (39.7)	1233 (31.6)	12 535 (35.1)	1614 (31.7)	25 028 (24.1)	<0.0001
Dementia		11 054 (18.8)	466 (11.9)	6865 (19.2)	622 (12.2)	17 506 (16.9)	0.0012
Diabetes		24 707 (41.9)	1373 (35.2)	12 556 (35.2)	1798 (35.3)	33 608 (32.4)	<0.0001
Hypertension		47 058 (79.8)	2774 (71.0)	26 930 (75.4)	3603 (70.7)	53 701 (51.8)	<0.0001
Mental health conditions†		20 103 (34.1)	1161 (29.7)	11 152 (31.2)	1541 (30.3)	19 007 (18.3)	<0.0001
Mood and anxiety disorders		31 697 (53.8)	1987 (50.9)	19 706 (55.2)	2753 (54.1)	40 434 (39.0)	<0.0001
Osteoarthritis		41 087 (69.7)	2479 (63.5)	24 849 (69.6)	3415 (67.1)	33 957 (32.8)	<0.0001
Osteoporosis		7355 (12.5)	415 (10.6)	4987 (14.0)	597 (11.7)	56 143 (54.2)	<0.0001
Renal failure		18 243 (30.9)	846 (21.7)	8803 (24.6)	1115 (21.9)	71 830 (69.3)	<0.0001
Rheumatoid arthritis		2289 (3.9)	133 (3.4)	1203 (3.4)	159 (3.1)	13 354 (12.9)	<0.0001
Stroke		3006 (5.1)	121 (3.1)	1656 (4.6)	196 (3.8)	29 007 (28.0)	<0.0001

Per cent (%) represents the total column percent; p values for all covariates were &lt;0.001.

\*Unless otherwise indicated.

†Conditions include schizophrenia spectrum and other psychotic disorders, trauma-related and stressor-related disorders, and intentional self-injury.

LHIN, local health integration network; NP, nurse practitioner.



**Figure 1** Percentage of home care patients who received a home visit from a primary care provider (NP and/or physician) during their last 3 months of life across local health integration networks (LHINs) who died between 1 January 2018 and 31 December 2019. NP, nurse practitioner.

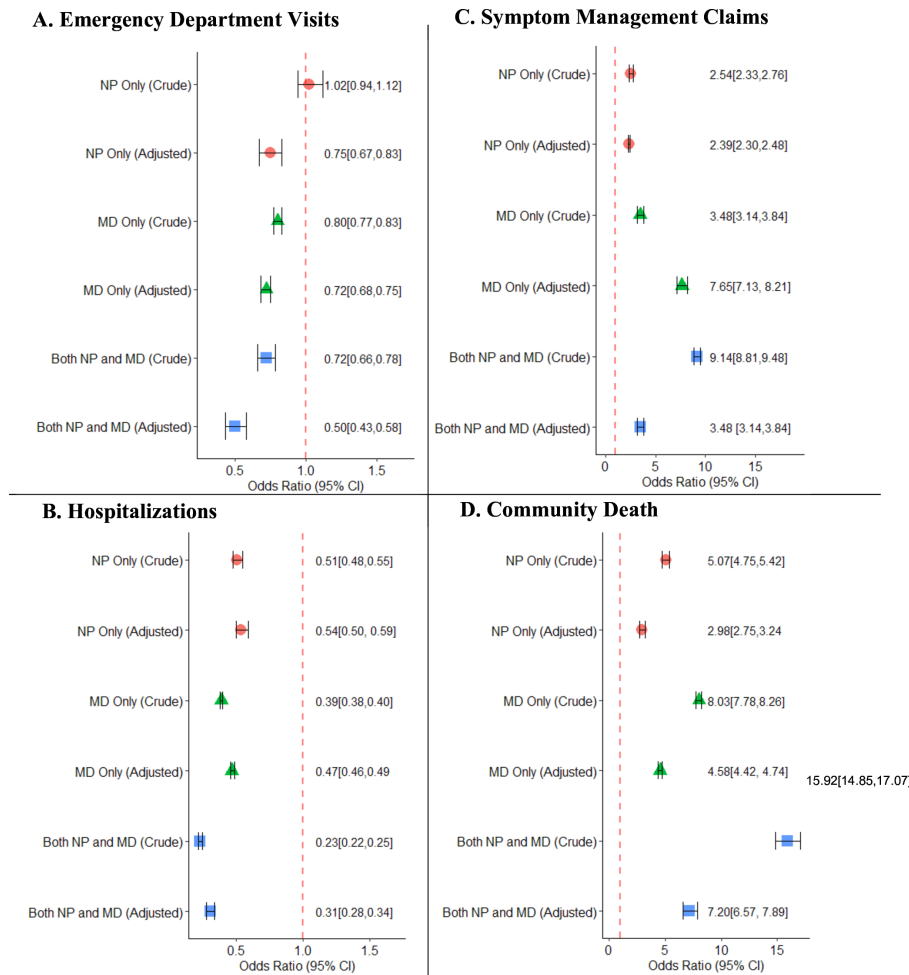
may be partially due to differences in regionally funded programmes across Ontario, driven by the priorities of local policy and decision-makers or measures to augment service provision in traditionally underserved areas (eg, rural and remote areas). Previous research has highlighted the importance of NPs practising in

rural and underserved areas for increasing the reach of primary care and alleviating some of the existing pressure and growing demand for community care.<sup>36</sup> The number of practising NPs in Canada has increased to more than 7000 over the past few decades, with the largest workforce of NPs in Ontario, and the creation

**Table 2** Care characteristics during the last 90 days of life of all decedents who died between 1 January 2018 and 31 December 2019 and who received formal home care services in their last 90 days of life

Characteristic	No (%)* without home visit from NP or MD n=58 945	No (%)* with a home visit from only NP n=3906	No (%)* with a home visit from only MD n=35 720	No (%)* with a home visit from both NP and MD n=5093	Total no (%)* home care clients n=103 664	P value	
Days spent in the community mean (±SD)	65.4 ±26.0	77.2 ±17.5	77.6 ±17.2	81.6 ±13.5	70.8±23.4		
Primary care model	Not rostered	10 573 (17.9)	795 (20.4)	6683 (18.7)	967 (19.0)	19 018 (18.3)	<0.0001
	Family health team	18 353 (31.1)	1158 (29.6)	10 206 (28.6)	1663 (32.7)	31 380 (30.3)	
	Enhanced FFS	12 611 (21.4)	826 (21.1)	8057 (22.6)	1073 (21.1)	22 567 (21.8)	
	Capitation	16 768 (28.4)	1072 (27.4)	10 404 (29.1)	1361 (26.7)	29 605 (28.6)	
	Other	640 (1.1)	55 (1.4)	370 (1.0)	29 (0.6)	1094 (1.1)	
Receipt and intensity of inpatient palliative care†	High/medium	21 301 (36.1)	1567 (40.1)	12 598 (35.3)	1625 (31.9)	37 091 (35.8)	<0.0001
	Low	16 420 (27.9)	668 (17.1)	5598 (15.7)	644 (12.6)	23 330 (22.5)	
	None	13 108 (22.2)	494 (12.6)	5395 (15.1)	631 (12.4)	19 628 (18.9)	
	Missing	8116 (13.8)	1177 (30.1)	12 129 (34.0)	2193 (43.1)	23 615 (22.8)	
Hours of home care support per days in community (with EOL designation)	Nursing, mean (±SD)	0.2 ±0.5	0.3 ±0.4	0.3 ±0.6	0.4 ±0.8	0.3±0.6	<0.0001
	Personal support, mean (±SD)	0.5 ±1.0	0.8 ±1.5	0.8 ±1.3	0.98 ±1.6	0.8±1.3	<0.0001
Hours of home care support per days in community (non-EOL designation)	Nursing, mean (±SD)	0.2 ±0.4	0.2 ±0.2	0.2 ±0.4	0.2 ±0.3	0.2±0.4	<0.0001
	Personal support, mean (±SD)	0.8 ±1.0	0.7 ±1.0	0.9 ±1.1	0.7 ±1.1	0.8±1.0	<0.0001

p values for all outcomes were <0.001.  
 \*Unless otherwise indicated.  
 †Intensity of inpatient palliative care involvement was defined using the palliative designation of physicians and diagnosis codes on discharge reports as previously defined and adapted.<sup>27</sup>  
 EOL, end of life; FFS, fee-for-service; NP, nurse practitioner.



**Figure 2** Crude and adjusted results of regression analyses of association between hospitalisation, emergency department visits, symptom management claims and a community death and receipt of a home visit from only a nurse practitioner (NP), physician or both compared with no home visit.

of additional positions is expected in the near future.<sup>37</sup> Our finding that a higher proportion of rural decedents were receiving a home visit from NPs may be related to the growth in this profession and suggest that the NP workforce might be able to help address regional disparities—an increasingly important aspect to highlight, since providing home visits increases patients' odds of receiving care and dying at home, a desired place of care during the end-of-life period for many patients.<sup>38</sup>

Despite growing evidence that interprofessional primary care is valuable and effective,<sup>3</sup> notable barriers exist to successful NP integration, including physicians' lack of knowledge of NPs' scope of practice and role.<sup>39</sup> Existing care models can influence care provision and practice patterns. For example, future research and policy could focus on identifying and describing interprofessional primary care teams and, where appropriate, supporting the integration of NPs into primary care. This could be done through identifying which models are best suited to collaboration or shared care and providing guidance on role definition within an integrated team.

### Limitations

This study is the first to describe, at a population level, the provision of home visits from NPs to those at the end of life—by leveraging the rich health administrative data in Ontario, the most populous province in Canada. However, as with all administrative data-driven research, there are limitations. First, this study identified NP visits using data from the publicly funded home care programme. While this captures many NPs, most practising in Ontario are salaried without recording individual service codes, with data from 2020 showing 34.8% worked in hospitals, 27.0% in community health, 2.9% in long-term care and 31.7% in other places of work.<sup>37</sup> Although this is a limitation of our study, it suggests that we have likely underestimated the involvement of NPs in end-of-life care, and those working in other primary care settings may have contributed to the positive care outcomes observed across all and any exposure groups. Second, we found a higher proportion of decedents received a physician home visit (34.5%) in our home care cohort than previous research on all Ontario decedents nearing the end of life (20.4%).<sup>32</sup> This reduces generalisability of these results to formal home care recipients, a characteristic which may increase

individuals' likelihood of receiving home visits, due to referrals or connections through the home care system, yet still represents a majority (60%)<sup>40</sup> of Ontario decedents. Third, our data only captures if a patient was visited by both providers and cannot be used to infer a collaboration between providers.

## CONCLUSIONS

Receiving a home visit at the end of life from an NP, physician or both is associated with reduced acute care use, increased symptom management medications, and more community deaths. These results support evidence on the benefits of integrating NPs into primary care, particularly supporting their involvement in end-of-life, community-based care.

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**Acknowledgements** This study was supported by ICES, which is funded by an annual grant from the Ontario Ministry of Health (MOH) and the Ministry of Long-Term Care (MLTC). This project has been funded in part by a contribution from Health Canada, Health Care Policy and Strategies Program. This document used data adapted from the Statistics Canada Postal CodeOM Conversion File, which is based on data licensed from Canada Post Corporation, and/or data adapted from the Ontario Ministry of Health Postal Code Conversion File, which contains data copied under licence from Canada Post Corporation and Statistics Canada. Parts of this material are based on data and information compiled and provided by: CIHI, the Ontario Ministry of Health, and Ontario Registrar General (ORG) information on deaths, the original source of which is Service Ontario. We thank IQVIA Solutions Canada Inc. for use of their Drug Information File.

**Contributors** MS and AR were the lead authors, ABE and RM conducted the analysis, and all the other authors (SRI, CW, MM, MH, CEK, CAK, DM, AS, DP, SB, CB, PT, SD, KM, CH, DC, DM, ATH) were involved with all stages including design, conception, interpretation of the data, drafting or revising for intellectual content and final approval of the version submitted for publication. ATH is responsible for the overall content as guarantor and accepts full responsibility for the finished work as well as the conduct of the study, had access to the data, and controlled the decision to publish.

**Funding** This project has been funded in part by a contribution from Health Canada, Health Care Policy and Strategies Program. This work was also supported by the Canadian Institutes of Health Research (funding reference numbers PO4—187020 and PJT—185966).

**Disclaimer** The analyses, conclusions, opinions, statements and views expressed therein are those of the author and do not necessarily reflect those of ORG or the Ministry of Government Services or CIHI. The views expressed herein do not necessarily represent the views of Health Canada.

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**Competing interests** None declared.

**Patient consent for publication** Not applicable.

**Ethics approval** The use of the data in this project is authorised under section 45 of Ontario's Personal Health Information Protection Act (PHIPA) and thus did not require review by a Research Ethics Board.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** The dataset from this study is held securely in coded form at ICES. While data sharing agreements prohibit ICES from making the dataset publicly available, access may be granted to those who meet pre-specified criteria for confidential access, available at [www.ices.on.ca/DAS](http://www.ices.on.ca/DAS). The full dataset creation plan and underlying analytic code are available from the authors upon request, understanding that the computer programs may rely upon coding templates or macros that are unique to ICES and are therefore either inaccessible or may require modification.

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## Appendix I

### ICES Databases and their use in this study

ICES Databases	Description	Study variables
Client Agency Program Enrolment (CAPE) Database	CAPE provides information on primary care physicians' care organization and remuneration model. This data was provided by the (former) Ontario Ministry of Health and Long-Term Care (MOHLTC).	Physician remuneration for capitation-based models
Continuing Care Reporting System (CCRS)	CCRS is updated quarterly and contains demographic, administrative, clinical and resource utilization information on those in continuing care services in hospitals or long-term care homes.	Identifying institutional deaths in long-term care
Corporate Provider Database (CPDB)	CPBD provides practice information on providers' practice characteristics in Ontario. This data is updated quarterly.	Physician group practice and remuneration model
Discharge Abstract Database (DAD)	The DAD includes information on all hospitalizations based on a retrospective chart review including International Classification of Diseases-10 (ICD-10) diagnoses codes (up to 16 diagnoses codes for each discharge record), procedures performed during hospitalization, physician providing care, hospital administrative information, and patients' demographic information.	Hospitalizations and hospital deaths
Drug Identification Number (DIN) database	The DIN provides information on drugs administered in Ontario for controlled substances and for patients eligible for publicly covered benefits.	Medication claims Chronic conditions - multimorbidity score
Home Care Database (HCD)	The HCD provides clinical information for planning and reporting, information on assessments, admission to programs and service records.	Cohort creation – those who were enrolled in home care
Inter Resident Assessment Instrument (RAI) - Home Care Source (HSSO) – (RAIHC)	The Inter RAI-HC, included information from January 2018 and is a standardized clinical assessment that collects clinical and caregiver information for patients living at home with formal services.	Detailed clinical and caregiver information for sensitivity analyses
Local Health Integration Network (LHIN) data	The LHIN provides health service availability and the geographic bounds of the designated LHINs in Ontario.	Geographic distribution
National Ambulatory Care Reporting System (NACRS)	The NACRS holds data on visits to healthcare institutions. This includes demographics, the setting visited (e.g., day surgery, emergency department, cancer care unit), and clinical data (e.g., diagnosis, treatment).	Emergency department visits and institutional deaths
Ontario Health Insurance Plan (OHIP) Claims Database	The OHIP database holds all billing claims paid for by the Ontario Health Insurance Plan. Each record represents the delivery of a service from a particular physician to a particular patient and includes the date, the fee paid, and the number of times it was billed.	Home visit delivery (primary outcome), billing percentage - palliative care designation, institutional deaths in designated Palliative Care Unit.

Ontario Drug Benefits (ODB)	The ODB provides information on drugs administered in Ontario to patients eligible for publicly covered benefits (those <25 or >65 years of age or eligible for disability).	Medication claims Chronic conditions - multimorbidity score
Registered Persons Database (RPDB)	The RPDB holds information on each individual who has ever had an active Ontario health card number. This data was provided by the (former) Ministry of Health and Long-Term Care (MOHLTC). The most relevant information in this dataset are demographic information, geographic information, and eligibility of OHIP coverage.	Age, sex, postal code, death information
Statistics Canada - Postal Code Conversion File Plus (PCCF+)	This is an ICES derived macro designed to link PCCF files to other census geographic identifiers and was used to create urban/rural flags, neighbourhood income quintiles, dissemination area/enumeration area, census division, and latitude/longitude. This macro is updated according to changes in census data from which it is derived.	Converts postal code from the RPDB to determine: Rurality, Income quintile, Census division, LHIN, population size of practice location

## Appendix II

### The billing fee codes used to identify a physician home visit from the Ontario Health Insurance Plan (OHIP) database

OHIP codes	Description
A900	Complex house call assessment (frail elderly or housebound patients)
A901*	House call assessment (usually billed with B997 or B998)
B960	Travel premium for Special Visits to Patient's Home: Weekdays Daytime (07:00- 17:00) Nonelective OR Elective home visit
B961	Travel premium for Special Visits to Patient's Home: Weekdays Daytime (07:00- 17:00) with Sacrifice of Office Hours Nonelective
B962	Travel premium for Special Visits to Patient's Home: Evenings (17:00- 24:00) Monday through Friday Nonelective
B963	Travel premium for Special Visits to Patient's Home: Sat., Sun. and Holidays (07:00- 24:00) Nonelective
B964	Travel premium for Special Visits to Patient's Home: Nights (00:00- 07:00) Nonelective
B966	Travel premium-palliative care home visit
B990	Special visit to patient's home, weekday/daytime
B992	Special visit to patient's home, weekday/daytime, sacrifice office hours
B993	Special Visits to Patient's Home (other than Long-Term Care Institution), weekends and holidays (non-elective)
B994	Special visit to patient's home, non-elective, evening hours
B996	Special visit to patient's home, night time (first patient)
B998	Special visit to patient's home, palliative care, days, evenings (from 2005)
B986	Travel premium for a geriatric home visit
B987	Geriatric home visit during the night (00:00- 07:00) (first patient)
B988	Geriatric home visit to patient's home on days, evenings, and holidays (07:00-24:00) (first patient)

Legend: OHIP=Ontario Health Insurance Plan,

\*Removed from the Schedule of Benefits – effective October 1, 2019

## Appendix III

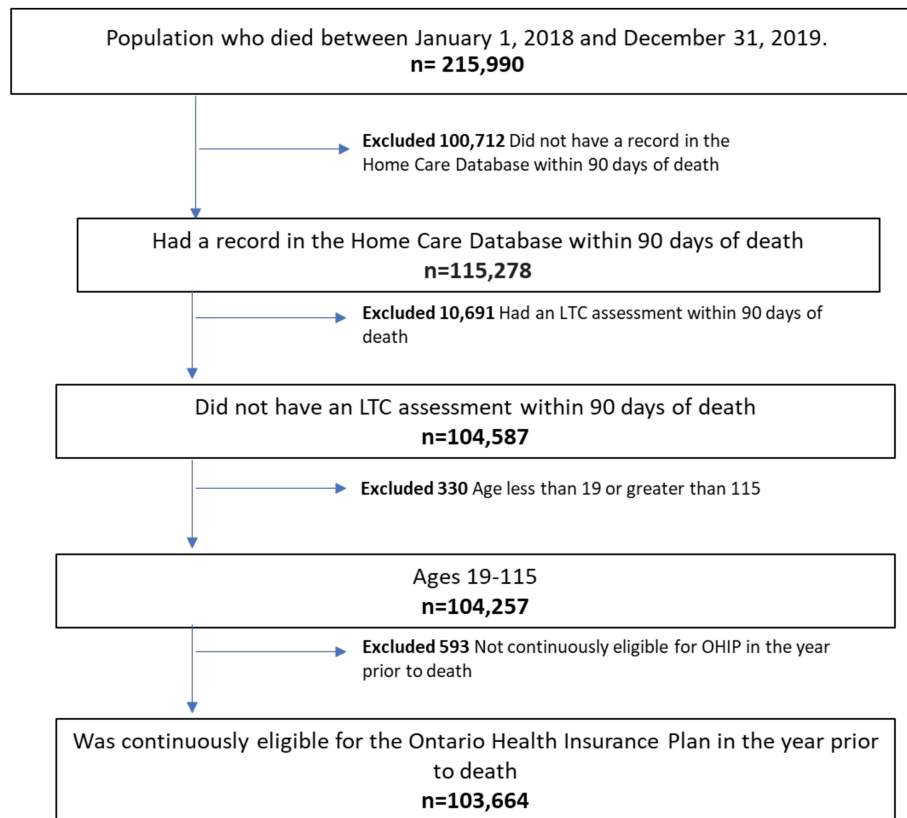
### Home-based symptom management claims: common end-of-life symptoms and their respective pharmacological treatments captured in the Ontario Drug Benefits (ODB) database and the Drug Identification Number (DIN) database

Pain Management	Drug Identification Numbers
Morphine (injectable)	00392561,00392588,00617288,02242484,09857226,09857227
Morphine (oral)	00614505,00690783,00591467,00591475,00607762,00607770,00614491,00621935,00690791
Hydromorphone (oral)	00786535,01916386
Hydromorphone (injectable):	02145901,02145928,02145936,02146126
Acetaminophen (oral)	02027801
Acetaminophen + codeine (oral)	00816027
Dexamethasone (oral):	00042560
Dexamethasone (injectable):	00664227, 01977547
Fentanyl (transdermal):	02282941,02282968,02282976,02282984,02314630,02314649,02314657,02314665,02341387,02341395,02341409,02341417,02275856,02327120,02327147,02327155,02327163,02330113,02330121,02330148,02330156,02386852,02386879,02386887,02396718,02396726,02396734,02396742,09857577,09857579,09857580,09857581,09857582,09857584,09857585,09857587,09857588,09857589,09857590,09857592, 02386844, 02275848, 01937413, 02280345, 01937405, 02341379, 02327112, 02311925
<b>Delirium/agitation</b>	
Lorazepam (injectable)	02243278,09857216
Lorazepam (sublingual)	02041464,02410753,00637742,00637750,00655740,00655759,00655767,00711101,00728187,00728195,00728209,02041413,02041421,02041448,02041456,02041472,02410761,02410745
Midazolam (injectable)	02240286,09857225,02242905,09857436,09857438,09857479
Haloperidol (injectable)	02130297,02130300,09853758,00808652
Phenobarbital (injectable)	02304090,09857296
Phenobarbital (oral)	00645575
Methotrimeprazine (injectable)	01927698
Olanzapine (ODT, sublingual)	02243086,02243087,02243088,02303191,02303205,02303213,02321343,02321351,02321378,02327562,02327570,02327589,02327775,02327783,02327791,02360616,02360624,02360632,02382709,02382717,02382725,02389088,02389096,02389118,02406624,02406632,02406640,02414090,02414104,02414112,02436965,02436973,02436981,02448726,02448734,02448742,02327597,02360640,02448750,02406659,02389126,02437007,02327805,02414120,02243089

<b>Terminal Secretions/nausea</b>	
Scopolamine (injectable)	09857384,09857385,00363839,09857213,00541869,00541877,02242810,02242811,09857236,09857237
Glycopyrrolate (injectable)	02039508,02382857,09857212,09857266,09857521
Metoclopramide (injectable)	02185431, 09857224
Metoclopramide (oral)	02230433
Furosemide (injectable)	00527033, 09857208
Furosemide (oral)	02224720
Atropine (sublingual)	00035017,02023695

## Appendix IV

### Cohort Creation Flowchart



## Appendix V

Sensitivity analysis using clinical and caregiver variables based on the sub-set of the cohort of decedents who died between January 1, 2018 and December 31, 2019 who received formal home care services in their last 90 days of life with completed Resident Assessment Instrument (RAI) home care assessments.

**Table 1: Baseline characteristics of the patients with a complete RAI home care assessment**

Patient characteristic		No home visit from NP or MD	Home visit from only NPs	Home visit from only MD	Home visit from both NP & MD	Total
	Overall	N=9,972	N=499	N=5,262	N=574	N=16,307
Sex	Female	4,897 (49.1%)	249 (49.9%)	2,825 (53.7%)	319 (55.6%)	8,290 (50.8%)
	Male	5,075 (50.9%)	250 (50.1%)	2,437 (46.3%)	255 (44.4%)	8,017 (49.2%)
Age (years)	Mean (SD)	80.95 (11.34)	79.04 (12.02)	83.13 (11.00)	81.14 (11.52)	81.60 (11.32)
	Median (Q1-Q3)	83 (74-89)	81 (72-88)	85 (78-91)	83 (75-89)	84 (75-90)
	18-44	62 (0.6%)	4 (0.8%)	24 (0.5%)	6 (1.0%)	96 (0.6%)
	45-54	180 (1.8%)	15 (3.0%)	77 (1.5%)	9 (1.6%)	281 (1.7%)
	55-64	654 (6.6%)	44 (8.8%)	243 (4.6%)	37 (6.4%)	978 (6.0%)
	65-74	1,625 (16.3%)	99 (19.8%)	690 (13.1%)	91 (15.9%)	2,505 (15.4%)
	75-84	3,003 (30.1%)	151 (30.3%)	1,408 (26.8%)	177 (30.8%)	4,739 (29.1%)
	85-94	3,704 (37.1%)	153 (30.7%)	2,245 (42.7%)	208 (36.2%)	6,310 (38.7%)
	95+	744 (7.5%)	33 (6.6%)	575 (10.9%)	46 (8.0%)	1,398 (8.6%)
Rurality, and Urban Income quintile	Missing postal code	32 (0.3%)	1 (0.2%)	16 (0.3%)	1 (0.2%)	50 (0.3%)
	Rural	1,420 (14.2%)	114 (22.8%)	654 (12.4%)	85 (14.8%)	2,273 (13.9%)
	Urban income quintile - 1	2,416 (24.2%)	84 (16.8%)	1,077 (20.5%)	119 (20.7%)	3,696 (22.7%)
	Urban income quintile - 2	1,948 (19.5%)	77 (15.4%)	1,081 (20.5%)	104 (18.1%)	3,210 (19.7%)
	Urban income quintile - 3	1,630 (16.3%)	90 (18.0%)	864 (16.4%)	87 (15.2%)	2,671 (16.4%)
	Urban income quintile - 4	1,335 (13.4%)	65 (13.0%)	845 (16.1%)	90 (15.7%)	2,335 (14.3%)
	Urban income quintile - 5	1,189 (11.9%)	68 (13.6%)	724 (13.8%)	88 (15.3%)	2,069 (12.7%)
	Urban- Missing Income - n (%)	2 (0.0%)	0 (0.0%)	1 (0.0%)	0 (0.0%)	3 (0.0%)
LHIN	Missing	1 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.0%)
	1- Erie St. Clair	500 (5.0%)	100 (20.0%)	180 (3.4%)	120 (20.9%)	900 (5.5%)
	2- South West	809 (8.1%)	36 (7.2%)	386 (7.3%)	57 (9.9%)	1,288 (7.9%)
	3- Waterloo Wellington	393 (3.9%)	12 (2.4%)	202 (3.8%)	30 (5.2%)	637 (3.9%)
	4- Hamilton Niagara Haldimand Brant	1,310 (13.1%)	40 (8.0%)	563 (10.7%)	56 (9.8%)	1,969 (12.1%)



	5- Central West	360 (3.6%)	23 (4.6%)	264 (5.0%)	29 (5.1%)	676 (4.1%)
	6- Mississauga Halton	557 (5.6%)	52 (10.4%)	293 (5.6%)	64 (11.1%)	966 (5.9%)
	7- Toronto Central	571 (5.7%)	8 (1.6%)	453 (8.6%)	14 (2.4%)	1,046 (6.4%)
	8- Central	935 (9.4%)	25 (5.0%)	792 (15.1%)	57 (9.9%)	1,809 (11.1%)
	9- Central East	1,778 (17.8%)	69 (13.8%)	854 (16.2%)	39 (6.8%)	2,740 (16.8%)
	10- South East	631 (6.3%)	31 (6.2%)	374 (7.1%)	38 (6.6%)	1,074 (6.6%)
	11- Champlain	827 (8.3%)	16 (3.2%)	422 (8.0%)	30 (5.2%)	1,295 (7.9%)
	12- North Simcoe Muskoka	385 (3.9%)	7 (1.4%)	272 (5.2%)	18 (3.1%)	682 (4.2%)
	13- North East	647 (6.5%)	39 (7.8%)	177 (3.4%)	15 (2.6%)	878 (5.4%)
	14- North West	268 (2.7%)	41 (8.2%)	30 (0.6%)	7 (1.2%)	346 (2.1%)
Comorbidities	AMI	257 (2.6%)	14 (2.8%)	108 (2.1%)	8 (1.4%)	387 (2.4%)
	Coronary	4,365 (43.8%)	196 (39.3%)	2,236 (42.5%)	238 (41.5%)	7,035 (43.1%)
	CHF	3,954 (39.7%)	166 (33.3%)	2,032 (38.6%)	192 (33.4%)	6,344 (38.9%)
	Hypertension	8,436 (84.6%)	391 (78.4%)	4,432 (84.2%)	464 (80.8%)	13,723 (84.2%)
	Heart Diseases	8,855 (88.8%)	410 (82.2%)	4,659 (88.5%)	485 (84.5%)	14,409 (88.4%)
	Arrythmia	2,934 (29.4%)	119 (23.8%)	1,606 (30.5%)	143 (24.9%)	4,802 (29.4%)
	COPD	2,653 (26.6%)	145 (29.1%)	1,351 (25.7%)	124 (21.6%)	4,273 (26.2%)
	Asthma	1,751 (17.6%)	76 (15.2%)	940 (17.9%)	95 (16.6%)	2,862 (17.6%)
	Respiratory Diseases	3,447 (34.6%)	180 (36.1%)	1,772 (33.7%)	169 (29.4%)	5,568 (34.1%)
	Cancer	3,752 (37.6%)	280 (56.1%)	2,322 (44.1%)	324 (56.4%)	6,678 (41.0%)
	Dementia	2,862 (28.7%)	112 (22.4%)	1,601 (30.4%)	129 (22.5%)	4,704 (28.8%)
	Diabetes	4,382 (43.9%)	196 (39.3%)	2,077 (39.5%)	244 (42.5%)	6,899 (42.3%)
	Mental Health Conditions	3,658 (36.7%)	150 (30.1%)	1,764 (33.5%)	172 (30.0%)	5,744 (35.2%)
	Mood and anxiety disorders	5,512 (55.3%)	249 (49.9%)	2,933 (55.7%)	311 (54.2%)	9,005 (55.2%)
	Osteoarthritis	7,272 (72.9%)	344 (68.9%)	3,938 (74.8%)	427 (74.4%)	11,981 (73.5%)
	Osteoporosis	1,377 (13.8%)	72 (14.4%)	861 (16.4%)	89 (15.5%)	2,399 (14.7%)
	Renal failure	3,407 (34.2%)	135 (27.1%)	1,631 (31.0%)	169 (29.4%)	5,342 (32.8%)
	Rheumatoid Arthritis	406 (4.1%)	16 (3.2%)	195 (3.7%)	23 (4.0%)	640 (3.9%)
	Stroke	668 (6.7%)	25 (5.0%)	335 (6.4%)	39 (6.8%)	1,067 (6.5%)
Count of chronic conditions	Mean (SD)	5.78 (2.35)	5.38 (2.36)	5.77 (2.34)	5.56 (2.37)	5.76 (2.35)
	Missing	3 (0.0%)	3 (0.6%)	4 (0.1%)	1 (0.2%)	11 (0.1%)

Changes in Health, End-Stage Disease, Signs and Symptoms Scale (i.e. health instability)	0 – No	822 (8.2%)	17 (3.4%)	335 (6.4%)	27 (4.7%)	1,201 (7.4%)
	1 – Minimal	1,779 (17.8%)	58 (11.6%)	769 (14.6%)	53 (9.2%)	2,659 (16.3%)
	2 – Low	2,803 (28.1%)	109 (21.8%)	1,293 (24.6%)	94 (16.4%)	4,299 (26.4%)
	3 – Moderate	2,775 (27.8%)	144 (28.9%)	1,462 (27.8%)	183 (31.9%)	4,564 (28.0%)
	4 – High	1,581 (15.9%)	116 (23.2%)	1,124 (21.4%)	157 (27.4%)	2,978 (18.3%)
	5 – Very High	209 (2.1%)	52 (10.4%)	275 (5.2%)	59 (10.3%)	595 (3.6%)
Activities of Daily Living (ADL) Hierarchy scale	0 – Independent	2,448 (24.5%)	134 (26.9%)	895 (17.0%)	124 (21.6%)	3,601 (22.1%)
	1 – Supervision	987 (9.9%)	38 (7.6%)	466 (8.9%)	43 (7.5%)	1,534 (9.4%)
	2 – Limited	1,788 (17.9%)	81 (16.2%)	860 (16.3%)	96 (16.7%)	2,825 (17.3%)
	3 – Extensive	1,879 (18.8%)	80 (16.0%)	958 (18.2%)	105 (18.3%)	3,022 (18.5%)
	4 – Maximal	1,209 (12.1%)	65 (13.0%)	804 (15.3%)	65 (11.3%)	2,143 (13.1%)
	5 – Dependent	1,330 (13.3%)	73 (14.6%)	941 (17.9%)	93 (16.2%)	2,437 (14.9%)
	6 – Total dependence	331 (3.3%)	28 (5.6%)	338 (6.4%)	48 (8.4%)	745 (4.6%)
Cognitive Performance Scale (i.e., Cognition)	0 – Intact	1,594 (16.0%)	118 (23.6%)	751 (14.3%)	131 (22.8%)	2,594 (15.9%)
	1 – Borderline intact	1,413 (14.2%)	75 (15.0%)	686 (13.0%)	105 (18.3%)	2,279 (14.0%)
	2 – Mild	4,199 (42.1%)	178 (35.7%)	2,188 (41.6%)	195 (34.0%)	6,760 (41.5%)
	3 – Moderate	1,305 (13.1%)	52 (10.4%)	653 (12.4%)	50 (8.7%)	2,060 (12.6%)
	4 – Moderate Severe	218 (2.2%)	12 (2.4%)	109 (2.1%)	13 (2.3%)	352 (2.2%)
	5 – Severe	934 (9.4%)	35 (7.0%)	577 (11.0%)	46 (8.0%)	1,592 (9.8%)
	6 – Very severe	309 (3.1%)	29 (5.8%)	298 (5.7%)	34 (5.9%)	670 (4.1%)
Two Key Informal Helpers - Lives With Person - Primary	0 – No	4,301 (43.1%)	163 (32.7%)	2,273 (43.2%)	207 (36.1%)	6,944 (42.6%)
	1 – Yes, 6 months or less	442 (4.4%)	34 (6.8%)	279 (5.3%)	26 (4.5%)	781 (4.8%)
	2 – Yes, more than 6 months	4,935 (49.5%)	294 (58.9%)	2,607 (49.5%)	334 (58.2%)	8,170 (50.1%)
	3 – No informal helper	294 (2.9%)	8 (1.6%)	103 (2.0%)	7 (1.2%)	412 (2.5%)
Informal Helper Status-Primary Informal Helper Expresses Feelings of Distress, A	Yes	4,103 (41.1%)	201 (40.3%)	2,282 (43.4%)	232 (40.4%)	6,818 (41.8%)

Legend: MD=Physician, NP= Nurse Practitioner, SD=Standard Deviation, LHIN=Local Health Integration network, AMI = Acute Myocardial Infarction, CHF=Congestive Heart Failure, COPD=Chronic Obstructive Pulmonary Disease, ADL=Activities of Daily Living,

**Table 2: Results of Sensitivity Analysis Regression Modelling on subset of cohort with an interRAI assessment completed within 90 days to include additional clinical and caregiver covariates\***

	<b>Nested Model – Clinical characteristics added to base model</b>	<b>Final Model – Nested model + caregiver variables</b>
<b>Exposure</b>	<b>Odds Ratio [95% CI]</b>	<b>Odds Ratio [95% CI]</b>
<b>Death in the Community</b>		
Only NP	3.23 [2.56-4.07]	3.24 [2.57-4.09]
Only FP	3.41 [3.12-3.72]	3.40 [3.11-3.71]
Both NP and FP	5.99 [4.63-7.75]	6.01 [4.64-7.78]
<b>Hospitalization</b>		
Only NP	0.68 [0.54-0.86]	0.68 [0.54-0.86]
Only FP	0.62 [0.57-0.68]	0.62 [0.57-0.68]
Both NP and FP	0.44 [0.33-0.60]	0.44 [0.33-0.60]
<b>ED visits</b>		
Only NP	0.86 [0.63-1.16]	0.85 [0.63-1.16]
Only FP	0.91 [0.80-1.01]	0.90 [0.80-1.02]
Both NP and FP	0.71 [0.46-1.08]	0.70 [0.46-1.08]
<b>Symptom Management</b>		
Only NP	2.52 [2.00-3.17]	2.52 [1.99-3.17]
Only FP	2.06 [1.87-2.27]	2.06 [1.87-2.27]
Both NP and FP	3.46 [2.60-4.61]	3.43 [2.58-4.57]

Legend: CI=Confidence interval, NP=Nurse Practitioner, FP=Family Physician, ED=Emergency Department

\*Adjusted for *age, sex, rurality, local health region, chronic conditions, formal home care hours occurring 90-22 days before death, previous hospitalizations and previous inpatient palliative care encounters occurring prior to the last 90 days of life, primary care model, and number of days spent in the community during the last 90 days of life and before the outcome occurred, Activities of Daily Living (ADL) self-performance score, the Changes in Health, End-Stage Disease and Signs and Symptoms (CHESS) Scale, and the Cognitive Performance Scale (CPS), the presence of a live-in caregiver and caregiver distress.*