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3 1 **Title:**
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6 2 The primary care and other health system use of home care patients: a retrospective cohort analysis
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8

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45 39 Ontario MOHLTC is intended or should be inferred.
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52 40 **Data sharing statement**
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3 41 The dataset from this study is held securely in coded form at ICES. While data sharing agreements
4
5 42 prohibit ICES from making the dataset publicly available, access may be granted to those who meet pre-
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7 43 specified criteria for confidential access, available at www.ices.on.ca/DAS. The full dataset creation plan
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9 44 and underlying analytic code are available from the authors upon request, understanding that the
10
11 45 computer programs may rely upon coding templates or macros that are unique to ICES and are
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13 46 therefore either inaccessible or may require modification.
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17 **Author contributions**

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20 48 Aaron Jones and Andrew Costa conceived the study and developed the design in consultation with
21
22 49 the authors. Aaron Jones completed the analysis and drafted the initial manuscript. All authors
23
24 50 contributed to the interpretation of data, the critical revision of the manuscript for important
25
26 51 intellectual content, and approved the final version submitted for publication.
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3 61 **Abstract**
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6 62 **Background**
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9 63 Robust and integrated primary care and home care are core components of effective chronic disease
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11 64 management in the community. However, primary care use by home care patients is not well studied.
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14 65 We examined the primary care and other health system use of a cohort of home care patients.
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17 66 **Methods**
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20 67 We conducted a population-based retrospective cohort study of publicly-funded home care patients in
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22 68 Ontario, Canada from October 2014 to September 2016. Primary outcomes were patterns of primary
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24 69 care physician visits including coordination with home care, home visits, and afterhours/weekend visits
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26 70 within six months of a home care assessment. Secondary outcomes included specialist physician visits,
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28 71 emergency department use, home care visits, and long-term care home placement. Multivariable
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30 72 models examined associations between patient characteristics and subsequent patterns of primary care
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32 73 use.
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36 74 **Results**
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39 75 Our cohort identified 226,054 home care patients with a median age of 81. Following assessment, home
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41 76 care patients visited primary care physicians at a rate of 0.78 visits per month. Physician-based home
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43 77 care coordination codes were billed for 3.9% of patients. Primary care home visits were received by
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45 78 13.1% of patients, and 15.1% of patients utilized afterhours/weekend primary care.
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49 79 **Interpretation**
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52 80 Publicly-funded home care patients frequently visited a primary care physician but billing claims for
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54 81 coordination between primary care and home care were infrequent. Physician home visits were more
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3 82 likely to be received by the oldest and most functionally impaired patients, suggesting that home visits
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5 83 are responsive to the needs of home care patients.
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10 11 85 **Background**

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14 86 Chronic disease management models frequently emphasize the importance of quality primary care for
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16 87 effective chronic disease management in the community.¹⁻³ Coordinated care can reduce depressive
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18 88 symptoms and improve the functional status of older adults with multimorbidity.⁴ Home-based primary
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20 89 care has been shown to reduce emergency department (ED) visits and hospitalizations in homebound
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22 90 older adults.⁵ Access to timely primary care and afterhours primary care could reduce ED visits.^{6,7}
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24 91 However, research suggests that older adults with complex care needs frequently experience
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26 92 fragmentation of care and difficulty accessing primary care⁸.

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31 93 Home care patients are a population of complex community-dwelling older adults characterized by
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33 94 multiple chronic conditions, need for support in activities of daily living, and a high risk of adverse
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35 95 outcomes.^{9,10} Aging strategies have frequently called for robust and responsive primary care and home
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37 96 care to enable seniors to live well in the community as long as possible^{11,12}. However, the patterns of
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39 97 primary care use by home care patients have not been well studied.
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43 98 The objective of this study was to describe the primary care physician use of publicly-funded home care
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45 99 patients in Ontario, including coordination between home care and primary care and advanced access to
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47 100 primary care such as home visits and afterhours/weekend care. We examined associations between
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49 101 patient characteristics and primary care use and also described the use of other health sectors to
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51 102 contextualize our findings.
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54 55 103 **Methods**

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104 **Study Design and Data Sources**

105 This study identified a population-based, retrospective cohort of adults in Ontario, Canada who received
106 a comprehensive home care assessment and used multiple health administrative databases to identify
107 patterns of health system use following the assessment. A description of all data sources can be found
108 in Appendix 1. These datasets were linked using unique encoded identifiers and analyzed at ICES. This
109 study was a granted an exemption of formal ethics review from the Hamilton Integrated Research Ethics
110 Board.

111 **Study Cohort**

112 All publicly-funded home care patients in Ontario who are receiving on-going care are periodically
113 assessed with the Resident Assessment Instrument for Home Care (RAI-HC), a comprehensive clinical
114 assessment¹³. We selected all RAI-HC assessments of adult (19+), home care patients completed in
115 Ontario between October 1, 2014 and September 30, 2016. If an individual was assessed more than
116 once during the period, their most recent assessment was selected. The assessment date was
117 considered the index date for follow-up. Patients receiving palliative home care at baseline were
118 excluded from the cohort as their health utilization patterns and outcomes vary greatly from other
119 home care patients.

120 **Baseline Characteristics**

121 Patient characteristics were identified from the baseline assessment and included demographic, health
122 and functional characteristics, frailty¹⁰, and health-related quality of life¹⁴. We identified patients with
123 three key conditions known to be primary drivers of home care: congestive heart failure, chronic
124 pulmonary obstructive disease (COPD), and dementia.¹⁵⁻¹⁷ Similar to other studies¹⁸ we also classified
125 each patient's primary care enrollment models at baseline. The three main model types are: a) Family

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3 126 Health Teams, which are team-based, interprofessional primary health care organizations funded
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5 127 primarily through capitation payments; b) Other blended capitation models that are funded similarly but
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7 128 lack the explicit interprofessional approach; and c) Enhanced fee-for-service models which are funded
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9 129 primarily through billing claims. A few rural and specialty models were grouped together in an “Other”
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11 130 category and patients not rostered with a physician were considered a distinct category.
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15 131 **Primary care use among home care patients**

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18 132 We linked the index assessment records to other health administrative databases to identify health
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20 133 service use within six months (182 days) of the assessment date. A six-month follow-up was chosen as it
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22 134 aligns with the standard RAI-HC assessment interval and at least three-quarters of patients can be
23
24 135 expected to experience a meaningful clinical change within six months¹⁹. Primary care physician (PCP)
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26 136 visits were defined as office, home, or phone-based services provided by a general practice/family
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28 137 practice physician or community medicine physician with a maximum of one visit per patient per
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30 138 physician per day. We identified primary care coordination with home care using billing codes specific to
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32 139 PCP supervision of home care or participation of a PCP in a case conference concerning a home care
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34 140 patient. For measures of advanced access, we identified PCP visits to a patient’s home and PCP visits
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36 141 that occurred afterhours or on a weekend or holiday. Details of the calculation of each physician
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38 142 measure can be found in Appendix 2.
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43 143 **Other health system use among home care patients**

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46 144 To contextualize the primary care use, we also measured other health sector use of patients and their
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48 145 transitions between care settings. Specialist physician visits were defined similarly to primary care and
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50 146 included all physicians other than general practice/family practice, community medicine, and pediatrics.
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52 147 Home care use was measured as hours of personal support and number of home nursing visits. Other
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54 148 measures included: unplanned ED visits, unplanned acute hospital admissions, long-term care home
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3 149 admission, and death. We also tracked the care setting of the patient (community, hospital, long-term
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5 150 care, dead) across the six-month follow-up period and calculated the total number of transitions in care
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8 151 settings.

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11 152 **Descriptive analysis**

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14 153 We reported the proportions of patients with any PCP visit, PCP coordination with home care, PCP home
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16 154 visit, and PCP afterhours/weekend visit, and the rate of PCP visits per month. We also reported the
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18 155 proportion of patients with any specialist physician visit, the average number of specialties seen and the
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20 156 rate of specialist physician visits per month. For home care we reported the proportions of patients
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22 157 who received or were authorized at baseline for personal support and home nursing as well as the rate
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24 158 of visits/hours per month among patients with the service. Other measures reported included the
25
26 159 proportions of patients with an unscheduled ED visit, acute hospital admission, and long-term care
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29 160 home admission, the rate of ED visits per month, the average number of transitions of care settings, and
30
31 161 the proportion of patients who died in the follow-up window.

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35 162 All rates were based on the number of days during follow-up that the patient spent in the community,
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37 163 i.e. not dead, in a long-term care home, or in hospital. Home care use rates were additionally restricted
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39 164 to exclude days after home care services were discharged when applicable. Monthly rates were
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41 165 produced by multiplying the daily rate by 30. Additionally, the proportion of patients who received a
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43 166 PCP home visit was reported by functional impairment strata and we stratified the proportion of
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45 167 patients with PCP coordination with home care by Ontario's 14 health regions to explore potential
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47 168 variation in the rates based on regional initiatives to promote coordination. All descriptive measures
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50 169 were reported both for the entire cohort as well as the important subpopulations with congestive heart
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52 170 failure, COPD, and dementia.

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172 **Multivariable analysis**

173 We fit multivariable regression models to examine associations between patient characteristics and the
174 primary care use measures. The rate of PCP visits was fit with a quasi-poisson generalized linear model²⁰
175 with an offset term for days spent in the community. The proportions of PCP coordination with home
176 care, PCP home visit, and a PCP afterhours/weekend visit were separately fit with logistic regression
177 models. Each model included the following independent variables: sex, age, region, rurality, patient
178 enrollment model type, home care services received or authorized at baseline, functional impairment,
179 cognitive impairment, mood symptoms, comorbid conditions, and number of concurrent medications.
180 Results were reported as rate ratios or odds ratios with 95% confidence intervals. All analyses were
181 performed using SAS 9.4.

182 **Results**

183 Our cohort identified 226,054 adult home care patients with an assessment between October 1, 2014
184 and September 30, 2016. The median age of patients in the cohort was 81 years and just under two-
185 thirds (63%) were female (Table 1). Over 40% of patients needed at least limited assistance with
186 personal hygiene, locomotion, eating, or toileting, and over 60% had at least a mild cognitive
187 impairment. Around 13% of patients had a diagnosis of congestive heart failure at baseline, 20% had
188 COPD, and 25% had a diagnosis of dementia. Roughly 30% of patients were enrolled in each of the three
189 broad types of primary care patient enrollment models at baseline. Transitions between care settings
190 across the follow-up period were common (Figure 1). At the end of six months, 71% of the patients were
191 still living in the community, 13% were in long-term care homes, 4% were in hospitals, and 13% had
192 died.

193 **Table 1: Baseline characteristics of adult home care patients, Ontario, September 2014 to October 2016**

194 <Insert Table 1 here >

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3 195 **Figure 1: Transitions between care settings, adult home care patients, Ontario, September 2014 to**
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5 196 **October 2016**

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7 197 <Insert Figure 1 here>

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10 198 **Primary care use among home care patients**

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13 199 The overall PCP visit rate during the follow-up period was 0.78 visits per month (Table 2), with 84% of
14 200 patients having at least one PCP visit. Billing claims related to PCP coordination with home care
15 201 occurred in only 3.9% of patients. PCP home visits were received by 13.1% of patients and 15.1% of
16 202 patients used after hours/weekend primary care. Patients with congestive health failure and COPD had
17 203 somewhat higher primary care use than patients than the overall population. Among the most impaired
18 204 patients, just over one-quarter (27.5%) received a PCP home visit (Table 3). Stratifying PCP coordination
19 205 with home care by health regions revealed significant regional variation in the use of the codes,
20 206 particularly in the differential between family health teams and other patient enrollment models
21 207 (Appendix 3).

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24 208 **Table 2: Primary care physician and other health system use, adult home care patients, Ontario,**
25 209 **September 2014 to October 2016**

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27 210 <Insert Table 2 here>

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29 211 **Table 3: Proportion of patients with a PCP home visit by functional impairment strata**

30 212 <Insert Table 3 here>

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33 213 **Other health system use among home care patients**

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35 214 Around three-quarter of patients received personal support while just over a third received home
36 215 nursing. Nearly half of patients visited the ED and over a quarter had an unplanned hospital admission
37 216 across the six-month follow-up. Patients with congestive heart failure or COPD had higher rates of ED

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3 217 visits, hospitalizations, and death. Patients with dementia had similar ED, and hospital utilization as the
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5 218 overall population, but were significantly more likely to be admitted to a long-term care home.
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9 **219 Multivariable analysis**

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11 220 Increasing age, enrollment in an enhanced fee-for-service model, home care nursing, and having 9 or
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13 221 more prescription medications at baseline was associated with greater primary care use (Table 3). PCP
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15 222 coordination with home care was more common when a patient was enrolled with a family health team,
16
17 223 receive or was authorized at baseline for home care nursing, or resided in southern Ontario. Age, severe
18
19 224 functional impairment, and home care nursing were strongly associated with an increased likelihood of
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21 225 receiving a PCP home visit. Finally, enrollment in an enhanced fee-for-service model was associated
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23 226 with higher likelihood of an afterhours/weekend primary care visit, while living in eastern or northern
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25 227 Ontario or in a rural location was negatively associated.
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30 **228 Table 4: Multivariable regression models of PCP use**

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32 229 <Insert Table 4 here>
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36 **230 Interpretation**

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38 231 Publicly-funded home care patients with continuing care needs frequently utilized primary care and
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40 232 other health services within six months of assessment. Nearly all of the patients visited a primary care
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42 233 physician at least once, however just under 4% had a billing for home care coordination, 13% had a
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44 234 primary care physician home visit, and 15% used primary care afterhours or a weekend or holiday.
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46 235 Coordination codes were more common in interprofessional primary care practices while afterhours
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48 236 care was more prevalent in non-capitated practices. Physician home visits were more likely to be
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50 237 received by the oldest and most functionally impaired patients.
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3 238 Comparing primary care use between studies can be imprecise due to differences in methodology and
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5 239 time frames, but a study with similar primary care definitions to ours reported a PCP visit rate of 0.52
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7 240 visits per month among all older adults in Ontario²¹. As home care patients in our study had a PCP visit
8
9 241 rate of 0.78 per month, this suggests home care patients had around 50% higher primary care use than a
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11 242 general older adult population. Looking at other health sectors, comparisons with the same study
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13 243 suggest home care patients had twice the specialist physician use and 3.5 times the ED visits of an older
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15 244 adult population.
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19 245 The billing codes specific to PCP coordination with home care were rarely used. This could suggest low
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21 246 levels of coordination possibly due to difficulties in communication and lack of integration between
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23 247 home care and primary care²². However, it may also be the result of the coordination codes not being
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25 248 billed due to lack of awareness of the specific codes or a sense that the codes are not worth the effort of
26
27 249 claiming. Family health teams were considerably more likely than other enrollment models to bill the
28
29 250 coordination codes, which could be due to their interprofessional orientation, or that regional planning
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31 251 organizations specifically target family health teams in initiatives to promote coordination. For
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33 252 example, in some regions home care coordinators have been aligned with specific family health teams
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35 253 and may work out of the same office²³. There was significant variation in the overall frequency of
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37 254 coordination billing between different health planning regions, as well as in the difference between
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39 255 family health teams and other models, suggesting that regional initiatives to promote coordination
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41 256 influenced the rate of billing.
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47 257 Older patients with severe functional impairments were much more likely to receive a primary care
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49 258 home visit than those without impairments, which suggests physician home visits are responsive to the
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51 259 functional needs of patients. Around one quarter of patients (27.5%) with a severe functional
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53 260 impairment received a PCP home visit, which is slightly higher than the 22% of a palliative patients in
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3 261 Ontario reported to have received a physician home visit in the last six months of life²⁴. Even among
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5 262 patients with the lowest levels of functional impairment however, almost 10% received a home visit.
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7 263 Historically part of general practice, physician house calls in Canada have become more frequent
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10 264 recently after falling in previous decades partially due to changes in how primary care was funded^{25–28}.
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13 265 Finally, home care patients enrolled in non-capitated models were considerably more likely than those
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15 266 enrolled in capitation-based models to use afterhours or weekend primary care. This effect has been
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17 267 previously noted, including in a study done shortly after the implementation of the first capitation
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19 268 models in Ontario.²⁹ All enrollment models are mandated to make a minimum amount of afterhours
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21 269 care available but differences how these models are funded could be contributing to fewer afterhours
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23 270 visits in the capitated models.
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27 272 **Limitations**

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32 273 Our study has a number of strengths, including having a large, population-based sample and ability to
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34 274 measure health service use across multiple sectors. There are also some important limitations. Our
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36 275 measure of coordination between primary care and home care relies on three specific billing codes. The
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38 276 degree to which this measure underrepresents the true level of coordination cannot be ascertained by
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40 277 this study and would require qualitative, primary data collection. Also, findings around Ontario-specific
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42 278 primary care models or billing codes may have less generalizability.
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46 279 **Conclusion**

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50 280 We found that home care patients with continuing care needs in Ontario, Canada frequently visited a
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52 281 primary care physician. Physician billing claims specific to coordination between primary care and home
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54 282 care were rarely utilized but may underrepresent the true level of coordination. Physician home visits
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3 283 were more likely to be received the oldest and most functionally impaired patients, suggesting
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5 284 responsiveness to patient needs. These findings provide important data on the primary care use of
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7 285 home care patients and can inform future research on how patterns of primary care and home care can
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10 286 influence the health outcomes of home care patients.
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Table 1: Baseline characteristics of adult home care patients in Ontario, September 2014 to October 2016

Patient Characteristics	No. (%) of patients n=226,054
Demographics	
Age, yrs (Median (Q1-Q3))	81 (71-88)
Sex, female	83978 (62.9)
Lived Alone	110137 (48.7)
Health	
Activities of Daily Living (ADL) impairment ¹	
Independent/Supervision	127725 (56.5)
Limited/Extensive	72220 (32.0)
Maximal/ Dependent	26109 (11.6)
Cognitive impairment ²	
Intact / Borderline intact	85613 (37.9)
Mild / Moderate	121081 (53.6)
Severe	19360 (8.6)
Mood symptoms ³	
No symptoms	108918 (48.2)
Some symptoms	59684 (26.4)
Daily symptoms	57452 (25.4)
Bladder incontinence	94535 (41.8)
Fall in last 90 days	91962 (40.7)
Five or more concurrent medications	189760 (83.9)
Congestive heart failure	29875 (13.2)
COPD	44209 (19.6)
Dementia	58413 (25.8)
Frailty Index	
Robust (0-0.19)	46043 (20.4)
Pre-frail (0.2-0.29)	68562 (30.3)
Frail (>= 0.3)	111449 (49.3)
Health-related quality of life (Median (Q1-Q3)) ⁴	0.19 (-0.01-0.42)
Patient Enrollment Model Type	
Enhanced fee-for-service	73150 (28.7)
Family health team	75031 (32.4)
Other capitation	64908 (33.2)
Other	8403 (2.0)
Not enrolled	4562 (3.7)

1 ADL Hierarchy Scale: Includes personal hygiene, locomotion, eating and toileting

2 Cognitive Performance Scale

3 Depression Rating Scale

4 HUI3 scores are based on a scale where 1 represents perfect health and 0 represents dead

The range of the values is -0.36 to 1 with scores less than 0 representing states worse than dead

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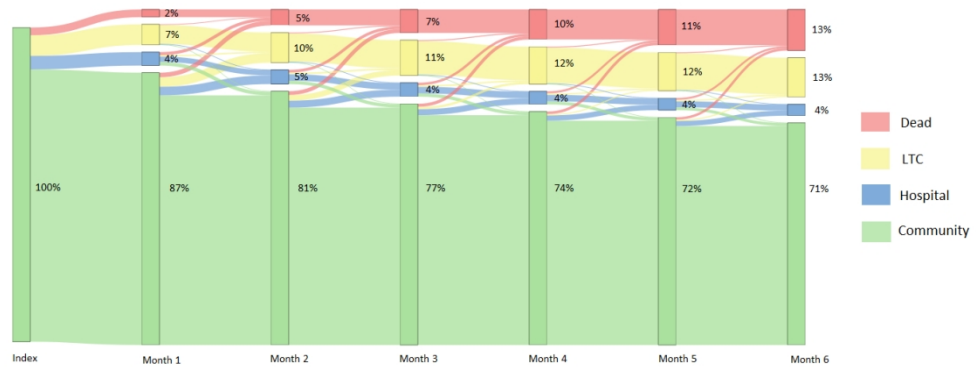


Figure 1: Transitions between care settings, adult home care patients, Ontario, September 2014 to October 2016

Table 2: Primary care physician and other health system use, adult home care patients, Ontario, September 20

Health Utilization Measure	All n=226,054	Chronic Conditions		
		Heart Failure n=29,875	COPD n=44,209	Dementia n=58,413
Primary Care				
Any PCP visit (%)	84.4%	85.7%	85.7%	82.0%
Rate of PCP visits per month	0.78	0.94	0.86	0.79
Any PCP home care coordination (%)	3.9%	5.1%	4.7%	3.5%
Any PCP home visit (%)	13.1%	16.3%	13.5%	14.8%
Any PCP afterhours/weekend visit (%)	15.1%	15.2%	15.2%	13.2%
Other Health Sectors				
Any specialist visit (%)	68.1%	70.8%	70.4%	55.5%
Rate of specialist visits per month	0.60	0.70	0.64	0.42
Average count of specialties seen	1.50	1.64	1.62	1.00
Any personal support (%)	71.8%	77.7%	73.8%	78.5%
Any home nursing (%)	35.7%	46.3%	41.5%	24.5%
Rate of personal support hours per month	22.3	23.4	20.4	29.3
Rate of home nursing visits per month	6.8	6.3	6.1	5.1
Any ED visit (%)	46.9%	58.4%	55.0%	46.7%
Any acute care hospitalization (%)	27.2%	40.2%	34.3%	27.7%
LTCH admission (%)	15.7%	15.5%	13.4%	34.1%
Death (%)	13.2%	23.2%	17.3%	14.7%
Rate of ED visits per month	0.17	0.25	0.23	0.15
Transitions of care settings (%) ¹				
0	60.4%	50.0%	56.3%	47.5%
1-2	28.4%	33.7%	29.4%	40.7%
3+	11.2%	16.4%	14.4%	11.8%

¹ Includes transfers between any of the following: community, acute hospital, rehab hospital, mental health hospital, continuing care hospital, or long-term care home

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Table 3: Proportion of patients with a PCP home visit by functional impairment strata

ADL Impairment	PCP home visit (%)
Independent/Supervision	9.3
Limited/Extensive	14.5
Maximal/ Dependent	27.5

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Table 4: Multivariable regression models of PCP use

Variable		PCP visits		PCP home care coordination	
		Rate Ratio	95% CI	Odds Ratio	95% CI
Sex	Female vs. Male	0.97	(0.95, 0.98)	1.01	(0.96, 1.06)
Age	19-59	(ref)	(ref)	(ref)	(ref)
	60-69	1.02	(0.98, 1.05)	0.94	(0.86, 1.03)
	70-79	1.08	(1.05, 1.12)	1.01	(0.93, 1.10)
	80-89	1.15	(1.11, 1.18)	1.02	(0.95, 1.11)
	90+	1.20	(1.16, 1.25)	1.02	(0.93, 1.12)
Region ¹	Central	(ref)	(ref)	(ref)	(ref)
	East	0.96	(0.94, 0.99)	0.95	(0.89, 1.01)
	North	0.84	(0.81, 0.87)	1.11	(1.02, 1.20)
	South	1.07	(1.05, 1.09)	1.41	(1.34, 1.48)
Rurality ²	Rural vs. Urban	0.96	(0.94, 0.99)	1.06	(1.00, 1.13)
Patient enrollment model type ³	EFS	(ref)	(ref)	(ref)	(ref)
	FHT	0.77	(0.76, 0.79)	2.73	(2.57, 2.90)
	Other Capitation	0.80	(0.78, 0.82)	1.24	(1.16, 1.32)
	Other	0.66	(0.62, 0.71)	0.87	(0.70, 1.07)
	Not enrolled	0.79	(0.75, 0.83)	0.66	(0.55, 0.79)
Home care services	Personal support	0.98	(0.96, 1.00)	1.18	(1.12, 1.25)
	Nursing	1.34	(1.31, 1.36)	3.21	(3.07, 3.36)
Function	Independent/Supervision	(ref)	(ref)	(ref)	(ref)
	Mild/Moderate impairment	1.01	(0.99, 1.03)	1.06	(1.01, 1.12)
	Severe impairment	1.05	(1.02, 1.08)	1.06	(0.98, 1.14)
Cognition	Independent/Supervision	(ref)	(ref)	(ref)	(ref)
	Mild/Moderate impairment	0.98	(0.97, 1.00)	0.94	(0.90, 0.99)
	Severe impairment	0.98	(0.94, 1.02)	1.00	(0.91, 1.09)
Mood	No symptoms	(ref)	(ref)	(ref)	(ref)
	Some symptoms	1.10	(1.08, 1.13)	1.12	(1.06, 1.18)
	Daily symptoms	1.22	(1.19, 1.24)	1.17	(1.11, 1.24)
Chronic conditions	CHF	1.12	(1.09, 1.14)	1.08	(1.01, 1.14)
	COPD	1.07	(1.05, 1.09)	1.06	(1.04, 1.12)
	Dementia	1.04	(1.02, 1.07)	0.99	(0.93, 1.05)
Number of medications	0-4	(ref)	(ref)	(ref)	(ref)
	5-8	1.17	(1.14, 1.21)	1.03	(0.95, 1.11)
	9+	1.38	(1.34, 1.42)	1.15	(1.07, 1.23)

1: Region is defined by the first letter of a postal code: P - North, K - East, M,N - Central, L - South

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2: Rural is defined as having a postal code with a Rurality Index of Ontario 2008 score \geq 40
3: EFS - Enhanced fee-for-service, FHT - Family Health Team

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PCP home visit		PCP afterhours/ weekend visit	
Odds Ratio	95% CI	Odds Ratio	95% CI
1.05	(1.02, 1.08)	1.08	(1.04, 1.1)
(ref)	(ref)	(ref)	(ref)
1.34	(1.25, 1.44)	0.91	(0.86, 0.95)
1.80	(1.69, 1.92)	0.95	(0.91, 1.00)
2.63	(2.47, 2.79)	0.96	(0.92, 1.00)
3.89	(3.65, 4.14)	0.96	(0.91, 1.01)
(ref)	(ref)	(ref)	(ref)
0.82	(0.79, 0.85)	0.55	(0.53, 0.57)
0.61	(0.58, 0.65)	0.50	(0.47, 0.53)
1.00	(0.97, 1.03)	1.10	(1.07, 1.13)
0.88	(0.84, 0.92)	0.63	(0.60, 0.65)
(ref)	(ref)	(ref)	(ref)
0.78	(0.76, 0.81)	0.40	(0.39, 0.41)
0.81	(0.79, 0.84)	0.64	(0.63, 0.66)
1.03	(0.93, 1.14)	0.32	(0.28, 0.37)
1.03	(0.96, 1.10)	0.44	(0.41, 0.47)
1.46	(1.41, 1.51)	1.12	(1.09, 1.15)
2.08	(2.02, 2.13)	1.22	(1.19, 1.26)
(ref)	(ref)	(ref)	(ref)
1.39	(1.35, 1.43)	1.00	(0.97, 1.03)
2.69	(2.59, 2.80)	1.27	(1.22, 1.32)
(ref)	(ref)	(ref)	(ref)
1.07	(1.03, 1.10)	0.90	(0.88, 0.92)
1.08	(1.03, 1.13)	0.90	(0.86, 0.95)
(ref)	(ref)	(ref)	(ref)
1.02	(0.99, 1.06)	1.05	(1.02, 1.08)
1.10	(1.07, 1.14)	1.12	(1.09, 1.16)
1.03	(0.99, 1.07)	0.97	(0.93, 1.00)
1.08	(1.04, 1.12)	1.05	(1.02, 1.08)
0.91	(0.88, 0.94)	0.80	(0.78, 0.83)
(ref)	(ref)	(ref)	(ref)
1.08	(1.03, 1.13)	1.13	(1.09, 1.17)
1.20	(1.15, 1.25)	1.22	(1.18, 1.27)

Appendix 1: Database

ICES Databases
<i>Discharge Abstract Database(DAD)</i>
<i>Ontario Health Insurance Policy Claims (OHIP)</i>
<i>National Ambulatory Care Reporting System (NACRS)</i>
<i>Home care Database(HCD)</i>
<i>Resident Assessment Instrument (RAI)- Home care source (OACCAC)</i>
<i>Ontario Mental Health Reporting System (OMHRS)</i>
<i>National Rehabilitation Reporting System(NRS)</i>
<i>Continuing Care Reporting System(CCRS)</i>
<i>The Corporate Provider Database (CPDB)</i>

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*Registered Persons
Database(RPDB)*

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as used in the study

Description
<p>The DAD is compiled by the Canadian Institute for Health Information and contains administrative, clinical (diagnoses and procedures/interventions), demographic, and administrative information for all admissions to acute care hospitals, rehab, chronic, and day surgery institutions in Ontario. At ICES, consecutive DAD records are linked together to form ‘episodes of care’ among the hospitals to which patients have been transferred after their initial admission.</p>
<p>The OHIP claims database contains information on inpatient and outpatient services provided to Ontario residents eligible for the province’s publicly funded health insurance system by fee-for-service health care practitioners (primarily physicians) and “shadow billings” for those paid through non-fee-for-service payment plans. The main data elements include patient and physician identifiers (encrypted), code for service provided, date of service, associated diagnosis, and fee paid.</p>
<p>The NACRS is compiled by the Canadian Institute for Health Information and contains administrative, clinical (diagnoses and procedures), demographic, and administrative information for all patient visits made to hospital- and community-based ambulatory care centres (emergency departments, day surgery units, hemodialysis units, and cancer care clinics). At ICES, NACRS records are linked with other data sources (DAD, OMHRS) to identify transitions to other care settings, such as inpatient acute care or psychiatric care.</p>
<p>The HCD is a clinical client centric database that captures all services that are provided by or coordinated by Community Care Access Centres (CCACs). The data elements captured include information on: client, intake, assessment, admission & discharge, diagnosis and surgical procedure, and care delivery. ICES receives home care data from the Ontario Ministry of Health and Long-Term Care (MOHLTC). The primary purpose of the information collected through the HCD is to aid in planning and better clinical insight into clients who encounter service through CCACs.</p>
<p>The RAIHC database is managed by the Community Care Access Centres (CCACs) and is a standardized clinical assessment to all long-stay home care clients in Ontario defined as clients receiving ongoing support for at least 60 consecutive days. Data collected include comprehensive clinical, functional and resource utilization information that are used to inform client needs. When used over time, it provides the basis for an outcome-based assessment of the person’s response to care or services.</p>
<p>The OMHRS is compiled by the Canadian Institute for Health Information and contains administrative, clinical (diagnoses and procedures), demographic, and administrative information for all admissions to adult designated inpatient mental health beds. This includes beds in general hospitals, provincial psychiatric facilities, and specialty psychiatric facilities. Clinical assessment data is ascertained using the Resident Assessment Instrument for Mental Health (RAI-MH), but different amounts of information are collected using this instrument depending on the length of stay in the mental health bed. Multiple assessments may occur</p>
<p>The NRS is compiled by the Canadian Institute for Health Information and contains client data collected from participating adult inpatient rehabilitation facilities and programs across Canada. Main data elements contain socio-demographic information, administrative data (e.g. referral, admission and discharge), health characteristics, activities and participation (e.g. ADL, communication, social interaction), and interventions.</p>
<p>The CCRS database is compiled by the Canadian Institute for Health Information and contains demographic, clinical, functional, and resource utilization information for individuals receiving facility-based continuing care (also known as extended, auxiliary, or complex chronic care) in Ontario hospitals and residential care providing 24 hour nursing services (i.e. nursing home). Clinical assessment data (on the physical, functional, cognitive, and social domains of health) is ascertained using the Resident Assessment Instrument Minimum Data Set (RAI-MDS) version 2.0 which is administered by trained healthcare professionals.</p>
<p>The Corporate Provider Database (CPDB) contains information on all physician and some non-physician (such as chiropractors, physiotherapists, and optometrist) providers funded by the Ministry, either through OHIP or other funding arrangements. The data includes demographic, eligibility, specialty, practice location, (encrypted) provider billing number, limited demographic information (year of birth, gender, year of graduation, specialty, and location of practice).</p>

1 The RPDB provides basic demographic information (age, sex, location of residence, date of birth, and date of
2 death for deceased individuals) for those issued an Ontario health insurance number. The RPDB also
3 indicates the time periods for which an individual was eligible to receive publicly funded health insurance
4 benefits and the best known postal code for each registrant on July 1st of each year.
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Appendix 2: Definitions of physician utilization measures

Measure	Database	Field	Values
PCP Visit	OHIP	Spec	00 - FP/GP
			05 - Commu
	OHIP	Feecode	Any feecod
			G202
			G212
			G372
			G373
			G365
			G538
			G539
G590			
G591			
PCP coordination with home care	OHIP	Spec	00 - FP/GP
			05 - Commu
	OHIP	Feecode	K071
			K072
K124			
PCP home visit	OHIP	Spec	00 - FP/GP
			05 - Commu
	OHIP	Feecode	A900
			A901
			B960
			B961
			B962
			B963
			B964
			B966
			B990
			B992
			B993
			B994
B996			
B997			
B998			
PCP afterhours/weekend visit	OHIP	Spec	00 - FP/GP
			05 - Commu
	OHIP	Feecode	Q012
			Q016
			Q017
			B962
			B963
			B964
			B994
			B993
B996			

A962

A963

A964

A994

A998

A996

A888

Physician specialist visits	OHIP: Spec	Not 00 - FP,
	OHIP: Location	Any feecod

Note: Visits were limited to 1 per patient per physician per day

Note: Visits were excluded if patient was in LTCH at time of billing

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Appendix 3. Proportion of patients with a PCP coordination with home care k

LHIN	PCP home care coordination (%)	
	FHT	non-FHT
Erie St. Clair	3.7	3.7
South West	6.6	6.2
Waterloo Wellington	5.3	1.5
Hamilton Niagara Haldimand Brant	12.5	3.2
Central West	23.1	6.2
Mississauga Halton	1.7	1.7
Toronto Central	3.0	2.3
Central	3.5	2.4
Central East	3.0	1.7
South East	12.6	3.7
Champlain	2.4	1.1
North Simcoe Muskoka	4.8	2.6
North East	4.0	4.2
North West	9.0	1.2

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3 billing code by LHIN and FHT vs. non-FHT
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STROBE Statement—Checklist of items that should be included in reports of <i>cohort studies</i>			
	Item No	Recommendation	Line #
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	2
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	61-83
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	86-97
Objectives	3	State specific objectives, including any prespecified hypotheses	98-102
Methods			
Study design	4	Present key elements of study design early in the paper	105-110
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	112-115 133
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up	112-115
		(b) For matched studies, give matching criteria and number of exposed and unexposed	NA
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	120-152
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	App. 1-2
Bias	9	Describe any efforts to address potential sources of bias	162,177
Study size	10	Explain how the study size was arrived at	114-119
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	153-181
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	173-181
		(b) Describe any methods used to examine subgroups and interactions	169
		(c) Explain how missing data were addressed	NA
		(d) If applicable, explain how loss to follow-up was addressed	162
		(e) Describe any sensitivity analyses	NA
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	183
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	183-192
		(b) Indicate number of participants with missing data for each variable of interest	NA
		(c) Summarise follow-up time (eg, average and total amount)	Fig 1, 190
Outcome data	15*	Report numbers of outcome events or summary measures over time	
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	Tbl 2, 4 199-227
		(b) Report category boundaries when continuous variables were categorized	Tbl4
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Tbl3, 259

1	Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and	205
2			sensitivity analyses	
3	<hr/>			
4	Discussion			
5	Key results	18	Summarise key results with reference to study objectives	231-237
6	Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or	273-278
7			imprecision. Discuss both direction and magnitude of any potential bias	
8	<hr/>			
9	Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations,	238-270
10			multiplicity of analyses, results from similar studies, and other relevant evidence	
11	<hr/>			
12	Generalisability	21	Discuss the generalisability (external validity) of the study results	278
13	<hr/>			
14	Other information			
15	Funding	22	Give the source of funding and the role of the funders for the present study and, if	30
16			applicable, for the original study on which the present article is based	
17	<hr/>			

18 *Give information separately for exposed and unexposed groups.

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21 **Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and
22 published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely
23 available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at
24 <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is
25 available at <http://www.strobe-statement.org>.
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