Home visits made by general practitioners in the canton of Vaud between 2006 and 2015

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Introduction

Population ageing is a major challenge for health systems, as they are confronted with an increase in the number of multimorbid and frail patients. In addition to the somatic challenges in the care of these patients, mental health [1–3] and social issues such as isolation and deprivation become increasingly important. Still, patients wish to remain at home as long as possible [4], which is also in line with current public health strategies, both to limit costs and because of the limited availability of institutional beds. In addition, palliative home care caters to the wishes of most patients when they are approaching end-of-life [5].

General practitioners’ (GPs') home visits are an important component of home care [6]. By home visits we mean visits to a patient’s home by professional personnel for the purpose of diagnosis and/or treatment. Reasons to undertake home visits are diverse, and include routine follow-up, emergency visits [7], palliative care [8, 9] and post-discharge follow-up [10] for patients that are usually unable to travel to the GP practice. GP home visits are highly valued by patients [4], and among the measures that contribute to maintaining elderly patients at home [11].

Indeed, regular home visits have been shown to reduce unnecessary emergency department visits and hospital admissions [12], reduce readmissions [13, 14], and prevent falls [15], functional decline and long-term institutionalisation [16]. GP home visits used to be the main mode of care delivery in Europe before the Second World War, but their number has since decreased progressively in all industrialised countries [17–22]. In Switzerland, most GPs do carry out home visits, but only 43% do so frequently (compared with 6% in the USA and 88% in the Netherlands, for example) [23]. Swiss GPs tend to do fewer home visits than their European counterparts [24, 25], and the mean weekly number of home visits per week has decreased from 7.7 in 1992 to 3.2 in 2012 [26]. In a population survey conducted in the canton of Vaud in Western Switzerland, only 36% of older individuals thought of GP home visits as easily accessible [27].

Various factors have been reported to influence the number of home visits [28]. These include factors at GP level (age, gender, personal preferences, workload), patient level (multimorbidity, age, psychosocial factors) and organisational level (practice location, practice type, financial as-
Hypothesis testing was based on a chi square test for cat-
and explored factors associated with the number of visits.
the patients according to the number of visits per patient
or not they were emergency visits. We then categorised
visits was categorised by day of the week and whether
for the entire 10-year study period. The total number of
We first examined physician and patient characteristics
included. The physicians' variables were age, gender, spe-
ded on the patient's coded identifier, gender and age, the
home visits. For each home visit, information was provid-
ried to a unified payment system (Tarmed). Within this
system, home visits can be identified by a specific tariff
heading corresponding to transportation time. Visits to res-
idential patients are included in these data and cannot be
differentiated from the other visits. In addition, there is a
separate heading for emergency visits, which are defined
as pressing unscheduled visits, or visits that occur out-
side regular consultation time (evenings, nights and week-
ends).
The dataset consisted of billing data from every physician
that was either a general internal medicine specialist (title
corresponding to five years of post-graduate training in
Switzerland) or a practicing physician (title corresponding
to three years of post-graduate training), and who had
billed at least one consultation in the canton of Vaud be-
between 2006 and 2015. Data from paediatricians were not
included. The physicians’ variables were age, gender, spe-
cialty title, postal code, annual number of consultations,
national number of home visits and annual total duration of
home visits. For each home visit, information was provided
on the patient’s coded identifier, gender and age, the
date, the amount and type of medical services billed, and
whether the home visit was an emergency visit (defined as
an unplanned visit that took place immediately after being
requested by the patient or the patient’s “entourage”).
We first examined physician and patient characteristics
for the entire 10-year study period. The total number of
visits was categorised by day of the week and whether
or not they were emergency visits. We then categorised
the patients according to the number of visits per patient
and explored factors associated with the number of visits.
Hypothesis testing was based on a chi square test for cat-
egorical variables and Poisson regression for count vari-
ables.
We looked at the total number of visits, number of visits
per GP and patient characteristics according to year. We
calculated visit rates by dividing the number of visits by
the resident population of the canton of Vaud. We observed
the relative difference between 2006 and 2015 in the cal-
culated indicators.
Finally, we further explored factors associated with the
number of home visits per GP and their evolution over
time, as this parameter showed the most variation. For this,
we fitted a mixed effect negative binomial regression mod-
el of the annual number of home visits per physician, in-
cluding a random intercept for each physician. Year, physi-
cian gender, physician age at baseline (2006) and physician
specialty were the covariates. Linear, quadratic and cubic
time effects were considered. Interactions between time
and all the covariates were tested, and only the significant
ones were kept. GPs who had billed more than 500 visits
in at least one year were excluded in order to have a distri-
bution of the outcome variable close to the chosen regres-
sion model, and because these were considered to be “fre-
quently visitors” whose behaviour was likely to differ from
that of other physicians. The fit of the model was assessed
by comparing observed and predicted values according to
year. In a sensitivity analysis, the model was rerun without
the exclusion of “frequent visitors”.

Results

GP and patient characteristics, entire 2006–2015 peri-
Between 2006 and 2015, 631 physicians out of 688
(91.7%) billed at least one consultation (68.8% men, me-
dian age in 2010 52 years, IQR 42 to 60). Most held a
specialist title either in general internal, general or inter-
nal medicine, while 10.3% (71/688) were medical practi-
cioners. Overall, 87,062 patients received a total of 451,634
visits, which represented 2.5% of all consultations. One
in five home visits (19.9%, 89,966/451,634; table 1) was
billed as emergency visit, and 9.7% (43,915/451,634) took
place over the weekend. More than half of patients (55.6%)
received only a single visit, which was then mostly an
emergency visit (in 71.2% of cases; table 1). The mean age
of visit beneficiaries was 67.1 years (SD 23.2), with 58.7%
of them women. Both age and proportion of women in-
creased with the number of visits (p <0.001, table 1). Vis-
to older patients (65+) represented 84.3% of the total
number of visits (380,469/451,333; age missing for 148
patients = 301 visits), and visits to very old patients (85+)
represented 43.4% (n = 195,727).

Time trends

We analysed the variation over time in the number of
consultations and patient characteristics between 2006 and
2015 in the canton of Vaud (table 2). There was a slight in-
crease in the annual number of both consulting physicians
(+5.7%) and physicians doing home visits (+5.8%), while
the number of consultations per physician remained stable
(−1.9%). However, the mean annual number of home vis-
ts per physician decreased from 125 (SD 165) in 2006 to
75 (SD 136) in 2015, resulting in a 36.9% decline in the absolute number of home visits. While the number of visits per patient remained stable (three per patient on average), the total number of beneficiaries decreased by 41.4% despite the fact that the resident population of the canton increased by 16.5%. The proportion of women among visits beneficiaires remained stable over time, but the proportion of patients aged 65+ increased from 66.7% to 76.5% of all beneficiaries. The relative increase was even more pronounced in the proportion of beneficiaries aged 85+ (+45.5%).

Table 1: Number and proportion of patients, sex/gender, age, total number of home visits and number of emergency home visits, by category of number of visits per patient.

<table>
<thead>
<tr>
<th>Patients</th>
<th>Women</th>
<th>Age in years</th>
<th>Total home visits</th>
<th>Emergency visits</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>Column %</td>
<td>n</td>
<td>Row %</td>
<td>Mean</td>
</tr>
<tr>
<td>A single home visit</td>
<td>48,383</td>
<td>55.6</td>
<td>26,453</td>
<td>54.7</td>
</tr>
<tr>
<td>2 to 10 home visits</td>
<td>28,661</td>
<td>32.9</td>
<td>17,734</td>
<td>61.9</td>
</tr>
<tr>
<td>More than 10 home visits</td>
<td>10,018</td>
<td>11.5</td>
<td>6,947</td>
<td>69.4</td>
</tr>
<tr>
<td>Total</td>
<td>87,062</td>
<td>100.0</td>
<td>51,134</td>
<td>58.7</td>
</tr>
<tr>
<td>p-value</td>
<td>&lt;0.001*</td>
<td>&lt;0.001*</td>
<td>&lt;0.001*</td>
<td></td>
</tr>
</tbody>
</table>

* Chi² test for categorical variables against number of visits category † Likelihood ratio test in simple Poisson model of number of visits per patient

Table 2: Number and characteristics of GP home visits made in the canton of Vaud, Switzerland, by year, and relative difference between 2006 and 2015.

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of physicians who billed at least one consultation</td>
<td>455</td>
<td>447</td>
<td>440</td>
<td>437</td>
<td>454</td>
<td>462</td>
<td>475</td>
<td>487</td>
<td>482</td>
<td>481</td>
<td>462</td>
</tr>
<tr>
<td>Number of physicians who billed at least one home visit, %</td>
<td>397, 87%</td>
<td>402, 90%</td>
<td>384, 87%</td>
<td>387, 89%</td>
<td>390, 86%</td>
<td>400, 87%</td>
<td>422, 89%</td>
<td>432, 89%</td>
<td>425, 88%</td>
<td>420, 87%</td>
<td>406, 88%</td>
</tr>
<tr>
<td>Total annual number of home visits</td>
<td>57,034</td>
<td>56,481</td>
<td>53,980</td>
<td>50,557</td>
<td>46,384</td>
<td>41,248</td>
<td>38,964</td>
<td>35,947</td>
<td>35,068</td>
<td>35,971</td>
<td>45,163</td>
</tr>
<tr>
<td>Mean number of home visits per physician (SD)</td>
<td>125 (165)</td>
<td>126 (162)</td>
<td>123 (156)</td>
<td>116 (142)</td>
<td>102 (137)</td>
<td>89 (133)</td>
<td>82 (127)</td>
<td>74 (108)</td>
<td>73 (129)</td>
<td>75 (136)</td>
<td>98 (142)</td>
</tr>
<tr>
<td>Mean number of consultations per physician (SD)</td>
<td>3,894 (2605)</td>
<td>4,078 (2588)</td>
<td>4,155 (2620)</td>
<td>4,076 (2573)</td>
<td>3,999 (2554)</td>
<td>3,859 (2585)</td>
<td>3,772 (2540)</td>
<td>3,764 (2558)</td>
<td>3,787 (2563)</td>
<td>3,821 (2464)</td>
<td>3,918 (2566)</td>
</tr>
<tr>
<td>Proportion of all consultations which are home visits</td>
<td>3.2%</td>
<td>3.1%</td>
<td>3.0%</td>
<td>2.8%</td>
<td>2.6%</td>
<td>2.3%</td>
<td>2.2%</td>
<td>2.0%</td>
<td>1.9%</td>
<td>2.0%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Number of emergency calls, %</td>
<td>11,221, 19.7%</td>
<td>11,250, 19.9%</td>
<td>11,421, 21.2%</td>
<td>10,476, 20.7%</td>
<td>9,404, 20.3%</td>
<td>7,963, 19.3%</td>
<td>6,882, 17.7%</td>
<td>6,878, 19.1%</td>
<td>7,514, 21.4%</td>
<td>6,960, 19.4%</td>
<td>9,684, 19.8%</td>
</tr>
<tr>
<td>Number of beneficiaries of home visits</td>
<td>19,418</td>
<td>18,798</td>
<td>18,108</td>
<td>17,546</td>
<td>15,965</td>
<td>13,887</td>
<td>12,712</td>
<td>12,094</td>
<td>11,569</td>
<td>11,373</td>
<td>15,147</td>
</tr>
<tr>
<td>Mean number of home visits per patient (SD)</td>
<td>2.94 (4.35)</td>
<td>3.01 (4.44)</td>
<td>2.98 (4.29)</td>
<td>2.88 (3.98)</td>
<td>2.91 (3.91)</td>
<td>2.97 (4.00)</td>
<td>3.01 (3.92)</td>
<td>3.07 (3.92)</td>
<td>2.98 (3.88)</td>
<td>3.17 (4.24)</td>
<td>2.98 (4.11)</td>
</tr>
<tr>
<td>Resident population</td>
<td>658,659</td>
<td>668,581</td>
<td>684,922</td>
<td>697,802</td>
<td>708,177</td>
<td>721,561</td>
<td>729,971</td>
<td>743,317</td>
<td>755,369</td>
<td>767,497</td>
<td>707,877</td>
</tr>
<tr>
<td>Proportion of beneficiaries among total resident population</td>
<td>2.95%</td>
<td>2.81%</td>
<td>2.64%</td>
<td>2.51%</td>
<td>2.25%</td>
<td>1.92%</td>
<td>1.74%</td>
<td>1.63%</td>
<td>1.53%</td>
<td>1.48%</td>
<td>2.14%</td>
</tr>
<tr>
<td>Proportion of women among beneficiaries</td>
<td>68.2%</td>
<td>68.5%</td>
<td>69.7%</td>
<td>68.2%</td>
<td>68.4%</td>
<td>68.3%</td>
<td>67.6%</td>
<td>67.0%</td>
<td>67.8%</td>
<td>68.9%</td>
<td>68.1%</td>
</tr>
<tr>
<td>Proportion of beneficiaries ≥65 years old</td>
<td>66.7%</td>
<td>68.4%</td>
<td>69.9%</td>
<td>69.2%</td>
<td>72.1%</td>
<td>73.8%</td>
<td>75.2%</td>
<td>75.9%</td>
<td>75.2%</td>
<td>76.5%</td>
<td>72.3%</td>
</tr>
<tr>
<td>Proportion of beneficiaries ≥85 years old</td>
<td>27.5%</td>
<td>29.7%</td>
<td>31.2%</td>
<td>30.9%</td>
<td>33.7%</td>
<td>35.2%</td>
<td>37.4%</td>
<td>38.4%</td>
<td>39.3%</td>
<td>40.0%</td>
<td>34.3%</td>
</tr>
</tbody>
</table>

SD = standard deviation
GP characteristics associated with number of visits
The annual number of home visits varied greatly between physicians and fluctuated over time for the same physician (fig. 1). Twenty-seven physicians (3.9% of total) made over 500 visits in one year, and were responsible for 23.7% of all home visits. These physicians were not different from other physicians in terms of specialty title, gender or age, although they did carry out fewer emergency visits (16.5 vs 21.0%, p < 0.001) and the mean age of their patients was slightly lower (77.9 vs. 78.7 years old, p < 0.001). After excluding these “frequent visitors”, we constructed a random effect negative binomial regression model of the annual number of home visits per physician (table 3; fig. 1), which estimated that 69% of the total variability could be explained by the inter-physician variability (ICC). The estimated annual number of home visits per physician decreased over time, with a stabilisation observed during the final years of the study (table 3, fig 1). At baseline (2006), the number of home visits was higher for male and older physicians (p <0.001 and p = 0.006, respectively). General internal specialists carried out more home visits compared with medical practitioners (p = 0.002). The differences according to gender, age class and specialist title decreased over time, as shown by the interaction terms with time in the model that counterbalance the direct effect of the covariates. The parameters of the model did not differ markedly when frequent visitors were included.

Discussion
Main findings
Physicians of the canton of Vaud undertook almost half a million (451,634) home visits between 2006 and 2015. Almost two thirds of all visits were to about 10,000 patients, mostly women and older individuals, representing 1.4% of the resident population. Over 85% of physicians provided home visits throughout the study period. However, the number of visits per physician decreased by 40%, reducing both the absolute number of visits and the proportion of beneficiaries in the population.

Decrease in home visits
This decrease in home visits has been described throughout industrialised countries, including Switzerland [22, 26, 30–32], with the exception of the US, where a recent increase in home visits to Medicare patients has been reported [21]. The mean number of home visits per physician is even lower in our study than in self-reported figures from a sample of Swiss GPs (82 per year vs 3.2 per week in 2012).
Table 3: Mixed effect negative binomial regression model of annual number of home visits per physician. Frequent visitors, defined as physicians who billed more than 500 visits during a single year, were excluded (n = 27).

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>95% confidence interval</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male physician</td>
<td>0.965</td>
<td>0.621–1.310</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Physician’s baseline age &gt;50 years</td>
<td>0.424</td>
<td>0.104–0.744</td>
<td>0.009</td>
</tr>
<tr>
<td>Specialty (practitioner vs general intern specialist)</td>
<td>-0.859</td>
<td>-1.404 – -0.314</td>
<td>0.002</td>
</tr>
<tr>
<td>Year²</td>
<td>-0.017</td>
<td>-0.023 – -0.012</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Year³</td>
<td>0.002</td>
<td>0.001–0.002</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Year² * male</td>
<td>-0.005</td>
<td>-0.007 – -0.003</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Year² * (age &gt;50)</td>
<td>-0.006</td>
<td>-0.008 – -0.004</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Year² * specially</td>
<td>0.005</td>
<td>0.001–0.010</td>
<td>0.018</td>
</tr>
</tbody>
</table>

This could be due to an overestimation in self-reported data compared to actual billing data, but we cannot exclude the possibility that figures in the canton of Vaud are lower than national figures. Indeed, compared with the rest of the country, Western Switzerland has a high density of home care on offer [34], and the number of home care beneficiaries increased by 26% during the study period (source: Statistique Vaud). This relatively high level of home care provision in Vaud (in comparison with other areas of Switzerland) could play a role in the number of home visits. However, collecting data to assess this association was beyond the scope of the current study.

Emergency home visits

In our study, routine visits to elderly patients represented the bulk of all home visits, and emergency care only a small part (20%). This is important, as the public debate around home visits often focusses on the emergency response. Indeed, there are an increasing number of professional medical companies that specialise in the provision of emergency home visits. As of 2015, these do not appear to play an important role in care provision in the canton of Vaud, where most home visits were still undertaken by traditional practice physicians. We identified some “frequent visitors” in our data, corresponding to GPs who had billed at least 500 visits during a single year. However, based on GP and patient characteristics, these did not correspond to either emergency professionals or GPs affiliated with residential homes.

GP characteristics

Physician characteristics such as age and gender were associated with a decrease in the number of home visits. This was supported by the results of the regression model, thereby confirming earlier findings [24, 35]. While the effect of physicians’ age tends to disappear in final years of the study, the ongoing feminisation of family medicine in Switzerland could result in a further decrease in the overall number of home visits. It is also of concern that the resident population is growing three times faster than the number of general practitioners, potentially resulting in increased time pressure on GPs. Indeed, the decrease in home visits was not related to a general decrease in physicians’ activity, as shown by the stable number of consultations per physician in our study. If a GP has to serve a larger fraction of the population, there might be less time available for home visits. Furthermore, this would lead to questions about the ability of the GP to systematically visit chronic patients at home. There may be less burn out among physicians that carry out home visits [36], and it is certainly beneficial in terms of the patient-doctor relation-

ship, but other health professionals such as nurses, especially nurses working in the same practice as the GP, could perform some of these visits. Such models of care exist in North America and Europe [37, 38] and are being developed in Switzerland [39]. Home visits could be among the tasks delegated by GPs in these new models.

Study limitations

There are several limitations to our results. The main limitation is that we cannot differentiate between visits to patients’ private homes and visits to patients in residential homes, but the fact that the mean age of home visit beneficiaries was much lower than the mean age of patients in residential homes (83 years) indicates that this was not a major phenomenon. It was also not possible to differentiate between home visits made in the context of medical duty service and home visits made to a physician’s own patients. More detailed data, including the motive and the context of the visit, will be collected through the Sentinel Surveillance Network in 2019, which should be a useful adjunct to our results. The absence of data from paediatricians and other specialists who may also perform home visits may preclude extrapolation to the paediatric population. In addition, not all physicians are members of the Société Vaudoise de Médecine and some underreporting cannot be excluded, although we estimate that this is a minor phenomenon based on the comparison between the number of physicians in our dataset and national statistics on number of practicing physicians in the ambulatory sector. In addition, we may have underestimated the number of home visits if physicians omitted to bill the transport costs associated with a visit, resulting in the classification of the visit as a normal practice consultation.

Conclusion

In summary, although the vast majority of physicians in the Canton of Vaud continue to visit patients at home, the overall number of home visits is declining. In the rapidly evolving context of an ageing population and the development of home care, the role of physicians and the way they provide care are changing. An in-depth assessment of the reasons for home visits and home care from the perspective of physicians, patients and home care actors, for example using qualitative methods, would be needed in order to characterise potential gaps and inform policy-makers on possible improvements to the system so that it better meets patient needs. In addition, new models of care currently being developed should address the demand for home visits.