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RESEARCH

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Adaptation of French general practitioners for the management of nursing home patients during COVID-19 in 2020: a multilevel analysis

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Abstract

Background To describe French general practitioners' (GPs) adaptation strategies to ensure follow-up care of nursing home patients during the first wave of COVID-19 (May 2020) and to identify factors associated with each strategy.

Methods A national cross-sectional study was conducted with online questionnaires in May 2020 among GPs practicing in France (metropolitan and overseas) and usually providing nursing home visits before pandemic. The outcome was defined as the GPs' adaptation strategies for managing nursing home patients and was categorized into four groups: Maintenance of Nursing Home Visits NHV (reference), Stopping NHV, Numeric adaptation (teleconsultations only), Mixed adaptation (NHV and teleconsultations). The probability of adaptation strategies was analyzed by multilevel logistic models in which the GPs represented level 1 and the counties level 2. We applied three random-intercept multilevel logistic models with the county of GP's practice as random effect.

Results This analysis included 2,146 responses by GPs coming from 98 French counties. Overall, 40.4% of GPs maintained NHV, while other strategies were: Stopping visits (24.1%), Numeric adaptation (15.4%), Mixed adaptation (20.1%). Several individual (age, training GP, perceived status of being at high risk of severe COVID, compliance with temporary delegation of the patient's management) and territorial factors (excess mortality rate due to COVID-19, GPs' density, proportion of over-75s, presence of reinforcement measures for nursing home patients) were identified as associated with each strategy.

Conclusions This study highlights a rapid adaptation of general practice to keep supporting nursing home patients. Heterogeneity of adaptation strategies could reflect both the lack of national guidelines and the heterogeneity among GPs' usual practices. Policymakers should take actions at a territorial level (subnational) to strengthen support to nursing home patients considering adaptations to the local context of the pandemic outbreak and perspective of local actors.

†Sylvain Gautier and Julien Le Breton shared last author position. These authors contributed equally to this work.

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Keywords COVID-19, Continuity of patient care, General practice, Nursing homes, Primary care, Patient care management.

Background

During the COVID-19 pandemic, the world faced a very challenging crisis, particularly due to the overwhelming demand on healthcare systems. Elderly individuals, who are highly vulnerable to the virus, faced an increased risk of hospitalization and mortality due to their age and underlying chronic conditions [1]. Age was described as the main risk factor by far for COVID-19-related hospitalization and in-hospital mortality, with a 100-fold increased risk of death among people aged 85 years and older compared to those aged 40–44 years [1]. Residents of nursing homes were especially vulnerable due to their communal living environment [2, 3]. Protecting nursing home residents was prioritized in the management of the pandemic [4].

In France, the first wave of COVID-19 began in January 2020: the first case was officially reported on January 24, 2020. Then, the virus spread rapidly, leading to a surge in infections by March. France had been reported as one of the most severely affected countries in Europe in that time. The French government responded by implementing strict lockdown measures to curb the spread of the virus: this first French lockdown began on March 17, 2020 and officially ended on May 11, 2020 [5]. During this period, strict measures were in place, including the closure of non-essential businesses and restrictions on movement (including visits to nursing homes). As the situation gradually improved, the French government announced a phased reopening plan (between May 11 and June 02, 2020). The mortality among nursing home residents increased by 43% during the first wave of the pandemic [6]. They accounted for 51% of the excess deaths in general population [6]. The total number of COVID-19 cases among residents was 80,100 (13.4%) and deaths attributed to COVID-19 14,700 (2.5%), with an average number of 4 deaths per facility [2]. Nevertheless, the impact of the pandemic across the country was heterogeneous on a territorial level [2].

Primary care plays an essential role for the management of the outbreak in gatekeeping, triaging and managing most of the COVID-19 cases (mild or uncomplicated forms) [7]. The pandemic imposed organisational changes to frontline health workers, in a context of emergency and lack of personal protective equipment or clear guidelines [5, 8, 9]. Simultaneously, a multidisciplinary primary care research network (ACCORD) emerged in France, in order to document the adaptations of the primary care actors to the pandemic, with a special interest in territorial factors associated with the adaptation strategies [9–12]. The suddenness of the pandemic

and the lockdown measures challenged GPs to maintain access and continuity of care for vulnerable patients.

This study focused on the month of May, when the ending of the first French COVID-19 lockdown occurred (May 11, 2020). In that pivotal period, the primary care sector was reinvested by policy makers (it was moved aside at the beginning of the pandemic) [5, 13]. By May 2020, GPs were encouraged by the government to provide nursing home visits with financial incitation (after being told to minimize them at the beginning of the pandemic) [14]. Despite the end of the first lockdown for the general population, French government requested to maintain strict isolation measures in nursing homes for health care workers and public in that period.

Objectives

The main objective was to describe whether and how French GPs developed adaptation strategies for the management of nursing home patients during the first wave of COVID-19. The secondary objective was to identify individual and territorial factors associated with each strategy.

Methods

Study design

This national cross-sectional study was conducted using an anonymous online survey. The self-administered questionnaire was sent from May 07 to May 20, 2020 by email. An invitation to participate to the survey was distributed via national mailing lists of GPs (approximately $N \sim 25,000$ recipients) provided by each study partner (see Supplementary Table 1). Only active GPs (not retired), practicing in France (metropolitan or overseas regions) and willing to participate, were included. Exclusion criteria were GPs with a specific practice of nursing home medical director and GPs not providing nursing home visits before COVID-19.

This study was approved by the Institutional Review Board and Ethics Committee of the National College of Academic GPs (CNGE, IRB number 00010804). All followed procedures were in accordance with the French Data Protection Authority (Commission Nationale de l'Informatique et des Libertés CNIL, number 2218060v0).

Data collection

The questionnaire was divided into 3 sections and 63 questions (see Supplementary Table 2). It explored adaptations related to 7 domains of interest (activity, tests and prescriptions, occupational health, patients with suspected or confirmed COVID-19, nursing home patients,

vulnerable patients, territorial partnerships). It also examined GP's individual characteristics, organizational and territorial characteristics. This long questionnaire was developed for a large national project including several different topics (sub-studies) [11, 12]. This specific study about nursing home patients exploited data from only a few questions of the survey ($n=12$).

Study's outcome: GPs' adaptation strategies

GPs' adaptation strategies to manage nursing home patients during the first wave of the COVID-19 pandemic were based on the answers to two dichotomous questions of interest: "Do you currently [during the pandemic] provide nursing home visits?" and "Do you currently [during the pandemic] provide teleconsultations with your nursing home patients?" Then, it was categorized into four groups with a contingency table: maintenance of Nursing Home Visits (NHV only, no teleconsultations), stopping NHV (no NHV and no teleconsultations), numeric adaptation (teleconsultations only, no NHV) and mixed adaptation (NHV and teleconsultations).

Predictors: factors potentially associated with adaptation strategies

We assessed the potential impact on GPs' adaptation strategies of the following individual factors: age, gender, to be training GP, to be afraid of catching a COVID-19 infection, to be at self-assessed higher risk of a severe form of COVID-19, to belong to Health Territorial and Professional Communities (HTPC), type of practice (alone, monodisciplinary group practice or multidisciplinary practice), to accept temporary delegation of the nursing home patient's management to another physician during the pandemic. Because we hypothesized a nonlinear relationship, GP's age was categorized into <40 years, 40–49 years, \geq 50 years (based on the overall median age). HTPC are meso-level organizations to coordinate health care actors in a defined territory since 2016 [15]. In France, the medical education for general practice involves specific university courses and practice-based training. This clinical training is conducted by general practitioners (GPs) who have been specially trained to supervise medical students and who are affiliated with the local university: they are referred as "training GPs". Trainees may be in the second cycle of their medical studies (5th or 6th year) or the third cycle (7th or 9th year). GPs who are not involved in clinical training will be referred as "non-academic GPs" in the manuscript.

The following territorial-related variables (defined at the county-level) were evaluated for possible effects on GPs' adaptation strategies: excess mortality rate due to COVID-19 [16], GPs' density (per 100,000 inhabitants) [17], proportion of population aged 75 and over [18], presence of reinforcement measures relative to nursing

home patients. In France, a county represents approximately a median of 500,000 inhabitants and 6,000 km². The excess mortality rate due to COVID-19 was defined as the number of observed deaths during a reference period in the COVID-19 pandemic (March 10 to May 08, 2020) compared to the average number of deaths during the same reference period in the 4 years before the pandemic. An excess mortality rate of 1.2 corresponds to a +20% increase in mortality due to COVID-19 in 2020 compared to the average number of deaths over the same period between 2016 and 2019 (reference period). The different thresholds about characteristics of the counties were defined by The National Institute of Statistics and Economic Studies (INSEE) [16–18]. The "reinforcement measures" variable corresponds to the existence of either incentive measures (i.e. half-day grant) or coercive measures (i.e. requisitions) or both to ensure care to nursing homes patients.

Analyses

Description of adaptation strategies

Standard descriptive statistics were performed, first on the overall study population and then by adaptation groups. Quantitative data were expressed as means and standard deviations. Categorical data were expressed as numbers and percentages. Comparisons were done between adaptation groups: Pearson chi-square test was used for categorical data. The statistical significance was set at $P<0.05$.

Modeling the probability of adaptation strategies

"Maintenance of Nursing Home Visits" was designated as the reference strategy in our statistic models.

Assuming that GPs' adaptation strategies were to some extent homogeneous if they were from the same territory, the hierarchical structure of the data had to be taken into account (GPs nested within counties). Therefore, GPs were defined as level 1 (individuals) and counties as level 2 (cluster units). The probability of adaptation strategies was analyzed by random-intercept multilevel logistic models with the territory (county-level) as random effect. Three binomial multilevel modelling were performed (first with stopping NHV versus reference, second with numeric adaptation versus reference, third with mixed adaptation versus reference). First, we used an empty model ("null model"; without explanatory variable) to compute the intra-class correlation coefficients (ICC). Obtained ICC in the null models were all significant, confirming the need for further modeling with multilevel regressions. Then, multivariable analyses were done adjusted for both individual and territorial level factors.

Bivariate analyses were performed and variables with $P<0.2$ were selected for multivariable analyses. Multicollinearity was checked using the Variance Inflation

Factors (VIF). None of the VIF values exceeded 10 and it was therefore considered as non multicollinear. Fixed effects were reported with adjusted odds ratio (aOR) with 95% Wald confidence intervals. A backward selection was performed on all models, with a significance threshold of 0.05, providing final adjusted models. Correlation's coefficients of fixed effects were checked in the final models. The model goodness-of-fit was assessed with Akaike's Information Criterion (AIC), Bayesian Information Criterion (BIC) and log-likelihood.

All analyses were done using R, version 4.0.3.

Results

Study population

Among the 4,699 questionnaires that were filled in, it resulted in a final sample of 2,146 questionnaires (Fig. 1).

Most of the respondents were female (52.7%), with a mean age of 46.9 (± 11.6) years and practicing in mono-disciplinary groups (44.5%). The majority was training GP (71%). Overall, 60.5% of GPs still provided NHV during the first wave of the pandemic and 35.4% provided teleconsultations. All GPs' characteristics are described in Table 1.

The number of responding GPs varied by county (see map in Fig. 2). Details for the percentages of participation by county are available in Supplementary Table 3.

GPs' adaptation strategies

GPs were classified into 4 groups of adaptation strategies: maintenance of NHV (40.4%), stopping NHV (24.1%), numeric adaptation (15.4%) and mixed adaptation (20.1%). Groups were significantly different in terms of territorial characteristics but not in terms of individual characteristics (Table 2).

Variability across counties

GPs' adaptation strategies varied across 98 counties. The null multilevel models showed that inter-counties variances were 6.1%, 5.6% and 4.6% (Supplementary Table 4). After adjustment for GPs' characteristics, the residual ICC were 5.8%, 6.0% et 5.3% (Supplementary Table 4). Thus, the variability observed across counties was not attributable to disparities within their GPs' populations.

Factors associated with GPs' adaptation strategies

Final multivariate analyses with the multilevel modeling are shown in Table 3.

GP characteristics

The probability of belonging to « stopping NHV » group was higher for GPs agreeing to temporarily delegate patient's management (aOR=3.67, $p < 0.001$).

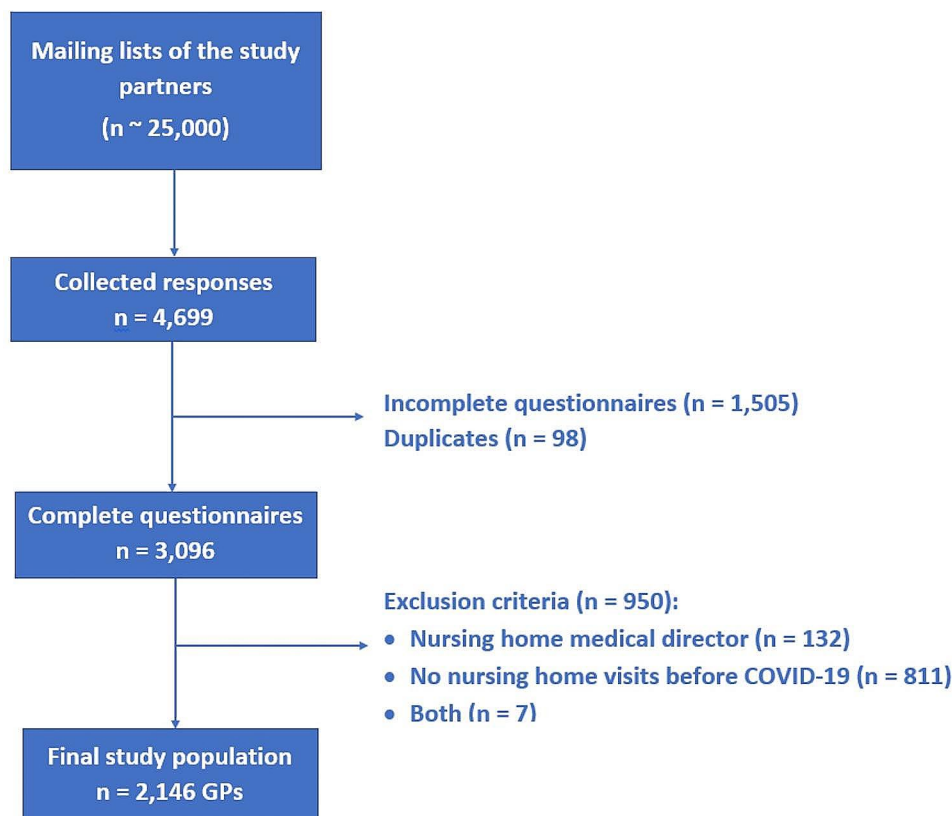


Fig. 1 Flow chart of the study. GPs: General practitioners

Table 1 Individual and territorial characteristics of respondent GPs

Individual characteristics	GPs (n = 2,146)
Age, mean ± SD	46.9 (± 11.6)
Age class (years)	
< 40	764 (35.6%)
40–49	476 (22.2%)
≥ 50	900 (41.9%)
Missing data	6 (0.3%)
Female	1,131 (52.7%)
Type of practice	
Alone	313 (14.6%)
Monodisciplinary group practice	955 (44.5%)
Multidisciplinary practice	878 (40.9%)
Training GP	1,520 (70.8%)
Belonging to Health Territorial and Professional Communities	637 (29.7%)
At self-assessed higher risk of a severe form of COVID-19	303 (14.1%)
Fear of catching a COVID-19 infection	274 (12.8%)
Providing nursing home visits during COVID-19	1,298 (60.5%)
Visits only	868 (40.4%)
Mixed (providing teleconsultations + visits)	430 (20.0%)
Providing teleconsultations during COVID-19	760 (35.4%)
Teleconsultations only	330 (15.4%)
Mixed (providing teleconsultations + visits)	430 (20.0%)
Stopped nursing home visits	518 (24.1%)
Compliance with a temporary delegation of patient's management	1,621 (75.5%)
Territorial characteristics	GPs (n = 2,146)
Reinforcement measures	110 (5.1%)
Excess mortality due to COVID-19 in the county of practice	
< 1.2 (low)	1,344 (62.6%)
≥ 1.2 (high)	715 (33.3%)
Missing data	87 (4.1%)
GPs' density (per 100,000 inhabitants) in the county of practice	
< 124 (low)	261 (12.2%)
124 to < 157 (moderate)	627 (29.2%)
≥ 157 (high)	1,177 (54.8%)
Missing data	81 (3.8%)
Proportion of over-75s in the county of practice	
< 9.6% (low)	1,024 (47.7%)
≥ 9.6% (high)	1,041 (48.5%)
Missing data	81 (3.8%)

SD: Standard Deviation, GP: General Practitioner

The probability of belonging to « numeric adaptation » group was higher for GPs agreeing to temporarily delegate the patient's management (aOR=1.97, $p<0.001$) and at self-assessed higher risk of a severe form of COVID-19 (aOR=1.94, $p<0.001$), and was lower in the oldest age group (50 years or more) (aOR=0.64, $p<0.01$).

The probability of belonging to « mixed adaptation » group was higher for training GP (aOR=1.36, $p=0.04$) and was lower in the two age groups over 40 years (respectively aOR=0.69, $p=0.04$ and aOR=0.66, $p<0.01$).

Territorial characteristics

The probability of belonging to « stopping NHV » group was lower for a county of practice with a high proportion of over-75s inhabitants (aOR=0.65, $p=0.01$) and presence of reinforcement measures (aOR=0.40, $p<0.01$).

The probability of belonging to « numeric adaptation » group was higher for a county with a high GPs' density (aOR=1.82, $p=0.02$).

The probability of belonging to « mixed adaptation » group was higher for a county with a moderate medical density (aOR=1.87, $p<0.01$).

Finally, the higher severity of the local pandemic outbreak (based on excess mortality related to COVID-19)

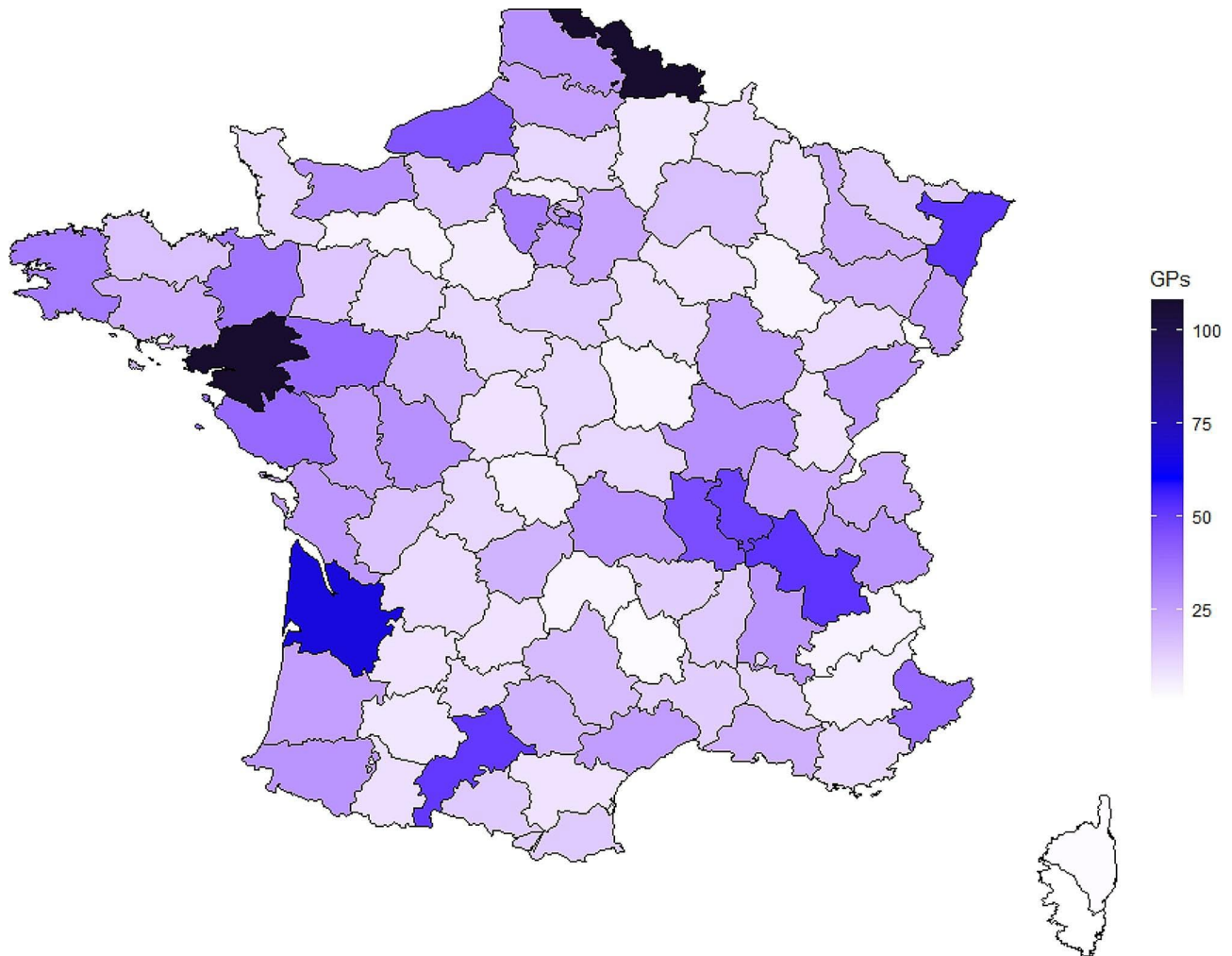


Fig. 2 Number of respondent GPs per French county. The Overseas counties were not represented on the map, since the number of responding GPs was very low (<3/county)

was associated with a lower probability of belonging to another adaptation strategy than the reference group « maintenance of NHV ».

These characteristics explained from 36% (stopping NHV versus reference), 52% (numeric versus reference) and 94% (mixed versus reference) of inter-counties variance (proportional change in variance PCV) in our models (Supplementary Table 4).

Discussion

We found that 60.5% of the surveyed GPs in France maintained NHV and 35.4% provided teleconsultations to ensure follow-up care of nursing home patients at the end of the first COVID-19 lockdown. GPs' adaptation strategies were maintenance of NHV (40.4%), stopping NHV (24.1%), numeric adaptation (15.4%), and mixed adaptation (20.4%). Several factors were identified as associated with each type of adaptation and were layered across 2 levels. The individual factors were age of the GP,

to be a training GP, to be at self-assessed higher risk of a severe form of COVID-19, compliance to temporary delegation of the nursing home patient's management. The territorial factors (county-level) were excess of mortality due to COVID-19, GPs' density, proportion of over 75s inhabitants and presence of reinforcement measures for nursing home care.

This study highlights a rapid and proactive adaptation of general practice to keep supporting frail older patients in nursing homes during the pandemic. This may imply that French GPs were early aware of the potential adverse effects of lockdowns on vulnerable patients, including care delays, disruptions in continuity of care, or increased psychological and social needs, as shown in prior studies [11, 19–25]. GPs mainly used face-to-face consultations for nursing home patients, with teleconsultations being less common. This highlights the importance of physical examination and contacts for frail elderly patients during exceptional health situations from the GPs' perspective,

Table 2 Characteristics of respondent GPs by adaptation group and comparisons between groups

Variables	Group 1 Maintenance of NHV (reference)	Group 2 Stop- ping NHV	Group 3 Numeric adaptation	Group 4 Mixed adaptation	p value
Total number	868 (40.4%)	518 (24.1%)	330 (15.4%)	430 (20.1%)	
Age class					
< 40 years	284 (32.9%)	189 (36.6%)	126 (38.2%)	165 (38.5%)	0.08**
40–49 years	194 (22.4%)	107 (20.7%)	86 (26.1%)	89 (20.7%)	
≥ 50 years	386 (44.7%)	221 (42.7%)	118 (35.8%)	175 (40.8%)	
Female	452 (52.1%)	287 (55.4%)	180 (54.5%)	212 (49.3%)	0.25**
Type of practice					
Alone	133 (15.3%)	80 (15.4%)	44 (13.3%)	56 (13.0%)	0.28**
Monodisciplinary group practice	374 (43.1%)	244 (47.1%)	156 (47.3%)	181 (42.1%)	
Multidisciplinary practice	361 (41.6%)	194 (37.5%)	130 (39.4%)	193 (44.9%)	
Training GP	614 (70.7%)	356 (68.7%)	229 (69.4%)	321 (74.7%)	0.21**
Health Territorial and Professional Communities	249 (28.7%)	144 (27.8%)	106 (32.1%)	138 (32.1%)	0.33**
Fear of catching a COVID-19 infection	105 (12.1%)	64 (12.4%)	47 (14.2%)	58 (13.5%)	0.74**
At self-assessed higher risk of a severe form of COVID-19	111 (12.8%)	67 (12.9%)	59 (17.9%)	66 (15.3%)	0.10**
Compliance with a temporary delegation of patient's management	605 (69.7%)	459 (88.6%)	269 (81.5%)	288 (67.0%)	< 0.001**
Reinforcement measures	54 (6.2%)	14 (2.7%)	13 (3.9%)	29 (6.7%)	< 0.01**
Excess mortality due to COVID-19 in the county of practice					
< 1.2 (low)	490 (58.5%)	333 (67.3%)	222 (70.7%)	299 (72.6%)	< 0.001**
≥ 1.2 (high)	348 (41.5%)	162 (32.7%)	92 (29.3%)	113 (27.4%)	
GPs' density (per 100.000 inhabitants) in the county					
< 124 (low)	126 (15.0%)	73 (14.7%)	27 (8.5%)	35 (8.5%)	0.001**
124 to < 157 (moderate)	249 (29.7%)	140 (28.2%)	91 (28.8%)	147 (35.5%)	
≥ 157 (high)	463 (55.3%)	284 (57.1%)	198 (62.7%)	232 (56.0%)	
Proportion of over-75s in the county of practice					
< 9.6% (low)	413 (49.3%)	274 (55.1%)	162 (51.3%)	175 (42.3%)	< 0.01**
≥ 9.6% (high)	425 (50.7%)	223 (44.9%)	154 (48.7%)	239 (57.7%)	

** Person's chi-square test (χ^2)

NHV: nursing home visits

and suggests that digital tools may not be well-suited for their follow-up. The literature suggested that teleconsultations could be less relevant for sustainability and more difficult to implement for older and/or impaired patients [26]. The stopping NHV rate is relatively high ($n=518$ and 24.1%) and is probably underrated. An association was found between « stopping NHV » and « accepting temporarily delegation of the patient's management » (aOR=3.67, $p<0.001$). It is therefore likely a logic of contractualization with other healthcare professionals. An association was not found in our study with practices in collective and multidisciplinary structures, but it has been found in other studies [9, 11]. One hypothesis is that GPs would have delegated to the nursing home medical directors and/or dedicated care team of each nursing home and/ another GP from a different practice coming regularly in the same nursing homes, with a likely dilution of the GP's sense of responsibility due to the existence of an alternative patient monitoring system. Another hypothesis is that the GPs, particularly those in solo practices, were overwhelmed by the intensity of

the crisis in terms of visit requests and chose to prioritize the follow-up of vulnerable patients isolated at home over those institutionalized (as they still had at least some access to healthcare professionals). Finally, some external factors, such as nursing homes closing their doors to GPs, could have occurred. All of this leads us to think that this is likely a direction for the evolution of tomorrow's medicine, moving towards a less individualistic and isolated approach, and shifting to a more partnership-based model with territorial responsibility.

Regarding the individual factors, we found that training GP were more likely to provide a mixed adaptation: it is well-established in the literature that the practices of training GP differ from non-academic GPs and often provide better clinical performances [27, 28]. It could also be explained by the fact that the National College of Academic GPs (CNGE) incited its members, including training GPs, on 24 March 2020 to maintain the continuity of care for their patients with chronic conditions during the pandemic [29]. Besides, we found that GPs at self-assessed higher risk of a severe form of COVID-19

Table 3 Individual and territorial characteristics associated with GPs' adaptation strategies, from multivariable multilevel models

County of practice as random effect	Stopping NHV vs REF		Numeric vs REF		Mixed vs REF	
	aOR (95% CI)	<i>p</i>	aOR (95% CI)	<i>p</i>	aOR (95% CI)	<i>p</i>
Level 1 (GP)						
Age class						
< 40 years	(ref)		(ref)		(ref)	
40–49 years	0.82 (0.59–1.14)	0.24	0.97 (0.72–1.49)	.86	0.69 (0.49–0.98)	0.04
≥ 50 years	1.02 (0.76–1.37)	0.88	0.64 (0.46–0.89)	< 0.01	0.66 (0.50–0.89)	< 0.01
Training GP						
No	(ref)		(ref)		(ref)	
Yes	0.96 (0.73–1.26)	0.79	1.00 (0.73–1.36)	0.99	1.36 (1.01–1.82)	0.04
At self-assessed higher risk of a severe form of COVID-19						
No	(ref)		(ref)		(ref)	
Yes	0.92 (0.75–1.55)	0.70	1.94 (1.32–2.85)	< 0.001	1.34 (0.94–1.90)	0.11
Compliance with a temporary delegation of patient's management						
No	(ref)		(ref)		(ref)	
Yes	3.67 (2.65–5.09)	< 0.001	1.97 (1.41–2.74)	< 0.001	0.94 (0.72–1.22)	0.64
Level 2 (County of practice)						
Reinforcement measures						
No	(ref)		(ref)		(ref)	
Yes	0.40 (0.21–0.76)	< 0.01	0.61 (0.31–1.20)	0.15	1.33 (0.79–2.22)	0.28
Excess mortality due to COVID-19						
< 1.2 (low)	(ref)		(ref)		(ref)	
≥ 1.2 (high)	0.61 (0.44–0.86)	< 0.01	0.61 (0.43–0.87)	< 0.001	0.56 (0.42–0.75)	< 0.001
GPs' density (per 100,000 inhabitants)						
< 124 (low)	(ref)		(ref)		(ref)	
124 to < 157	0.98 (0.62–1.55)	0.93	1.69 (0.98–2.92)	0.06	1.87 (1.20–2.93)	< 0.01
≥ 157 (high)	0.92 (0.60–1.40)	0.69	1.80 (1.08–3.00)	0.02	1.52 (0.99–2.33)	0.06
Proportion of over-75s						
< 9.6% (low)	(ref)		(ref)		(ref)	
≥ 9.6% (high)	0.65 (0.47–0.91)	0.01	0.78 (0.56–1.10)	0.16	1.07 (0.81–1.41)	0.63

aOR: adjusted Odds Ratio, GP: general practitioner, NHV: nursing home visits

were more likely to provide a numeric adaptation. Teleconsultations were a compromise between maintaining the continuity of care and a lower personal exposure to COVID-19. Finally, GPs with an advanced age (over 50s) were less likely to provide a numeric or a mixed adaptation, suggesting that older GPs could be less inclined to use numeric tools or to change their habit of practices. As depicted in previous studies, older GPs were less using computers in their clinical practices [30] and teleconsultation was more frequently used by younger GPs [31]. It could also mean that experienced doctors have considered that a physical examination and a face-to-face relationship were essential to maintain a good quality of care for older patients. In our study, no association was found between adaptation strategies and multiprofessional practices, even if those were usually described as explanatory factors in literature [9, 11]. It is interesting and somewhat paradoxical that older GPs tended to continue to visit nursing homes more frequently, while those who consider themselves at risk tend to avoid personal presence. One hypothesis is that older GPs may feel

a stronger sense of duty and responsibility toward their long-term patients. They might perceive their professional role as essential, prioritizing patient care over personal risk. Another hypothesis is that, with more years of practice, older GPs might feel more confident in their ability to manage and mitigate the risks associated with COVID-19, both for themselves and their patients.

The higher severity of the local pandemic outbreak was associated with a lower probability of another adaptation strategy (teleconsultations, mixed adaptation and stopping NHV) than the reference group « maintenance of NHV ». This suggests that GPs may have been overwhelmed and unable to adapt due to other priorities. GPs in counties with a higher proportion of elderly patients were less likely to stop visits, likely due to the recognized risk of severe illness in this age group [1]. Reinforcement measures were also associated with a lower probability of stopping NHV. These results highlight the need for policymakers to consider territorial plans (at the subnational level) to strengthen support to nursing home patients. A pragmatic differentiated approach across counties could

improve and help adapt preparedness plans to local context and responses to local needs during health crisis, as already suggested by OECD [32] and by studies conducted at the scale of nursing homes [33].

This study has limitations. First, there may be a selection bias with responses potentially coming from highly motivated GPs who are more likely to provide adaptive strategies. Our sample is also not representative of all French GPs, since participants were younger, worked more often in groups, and were more frequently training GPs compared to national data [34–36] but representing almost all French counties. This selection bias could be explained by the organizations solicited for recruitment, potentially resulting in an underestimation of strategies among older or isolated GPs who may be more likely to stop nursing home visits or less likely to provide adaptive strategies. Second, since it's a self-report survey on a socially desirable topic, it may overestimate the proportion of GPs implementing adaptive strategies. However, using a survey was relevant for a rapid data collection during the first lockdown, minimizing memory bias. Third, the participation rate of GPs (approximately 8,5%) was relatively low. However, this rate is similar as many researches surveying general practitioners [37]. Also, our sample size was large enough, with more than 2000 participating GPs, to represent almost all French counties. Fourth, the category of “maintenance of NHV” as an adaptation strategy may reflect two different realities: GPs who maintained their usual practices despite the pandemic and those who increased their number of visits to nursing homes. This distinction was not available in the data. Fifth, some other potential explaining factors about the adaptation process were not studied: the rate of residents by GP, to have a geriatric training for GPs, the rate of older patients in the GP practices and the rate of home visit patients (other than in nursing homes) by GP. Finally, external local factors could have influenced the strategies of management in nursing homes during COVID-19, independently of the GPs' own decisions. For instance, some nursing homes had closed their doors and did not allow access for external service providers (including GPs) at the beginning of the pandemic. Therefore, their adaptation was imposed by the local context and not directly coming from their own reflections.

Nonetheless, this study provides original insights into continuity of care strategies in nursing homes during the COVID-19 pandemic, a rarely documented topic [38]. Other strategies than GPs' actions were described in the international literature are: partnership with local hospitals sending dedicated nurses [38, 39] or other type of expertized personnel [14], dedicated team in the facility on a voluntary basis [14], medical presence shifts [14], dedicated team coming from a 24 h call center [14], closing doors with no access for external service providers

[40]. It also captures a strategic and relevant turning point, occurring just after the French government's announcement of providing support and reinforcement to nursing home patients in March 2020 (not documented elsewhere).

Future studies should consider the potential dynamic evolution of the adaptation strategies across the pandemic. It could be interesting to evaluate with a longitudinal design the potential influence of lockdowns, peaks of the different waves and releases of guidelines on the adaptation strategies by GPs across the pandemic. For this purpose, the availability of routinely collected primary care data about physicians' practices is needed [6, 9, 10, 41]. Further qualitative studies could gather points of view from older patients in nursing homes who received remote consultations by their regular GP during the pandemic. It could also be interesting to gather difficulties and limitations expressed by GPs on their adaptation strategies.

Conclusions

Our study highlights a rapid and proactive adaptation of general practice to maintain the continuity of care for nursing home patients in context of health emergencies. Crisis preparedness plans should be rethought to prioritize primary care as a key element in mitigation phase at an early stage of the pandemic. Heterogeneity of adaptation strategies could reflect both the lack of national guidelines and the heterogeneity among GPs' usual practices. Adaptation strategies by GPs depend on individual considerations rather than global populational stakes. They also imply a territorial contextualization (adaptations to the local context of the pandemic outbreak and perspective of local actors). Policymakers should take into account these results to design emergency plans at a subnational level. To date, the question of finding the best way to protect vulnerable patient in context of pandemic remains unresolved between limiting contacts (to decrease the risk of potential exposure to the virus) or continuing visits (to ensure quality and continuity of care). The crisis situation with the COVID-19 pandemic has highlighted the instability of the current medical model in nursing homes, which relies on an individual, doctor-dependent logic of home visits. The challenge of tomorrow's medicine for nursing home patients will be to make it evolve and find a more suitable mode of organization for them, a one that will be residents-centred and revolving around them. This structuring should be developed at a territorial level.

Abbreviations

aOR	Adjusted Odds Ratio
GP	General practitioner
HTPC	Health Territorial and Professional Communities
ICC	Intra-class correlation coefficients

NHV Nursing home visits
PCV Proportional change in variance
SD Standard Deviation

Supplementary Information

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Supplementary Material 1
Supplementary Material 2
Supplementary Material 3
Supplementary Material 4

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Footnotes.

Not applicable.

Author contributions

VO did the literature search, conducted all statistical analyses, designed the figures, interpreted data, wrote the first draft of the manuscript. TB, ARR and VR designed the study, aided in interpreting the results, critically revised the manuscript. YB designed the study and critically revised the manuscript. SG and JLB supervised the project, designed the study, designed the analyses, contributed analysis tools, critically revised the manuscript (directed). They both contributed equally to this work. All the authors read and approved the final manuscript.

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding and senior authors on reasonable request.

Declarations

Ethics approval and consent to participate

This study was approved by the Institutional Review Board and Ethics Committee of the National College of Academic GPs (CNGE, IRB number 00010804). The study was conducted in accordance with the Declaration of Helsinki. All followed procedures were in accordance with relevant guidelines and French regulations. The dataset was declared to the French Data Protection Authority (Commission Nationale de l'Informatique et des Libertés CNIL, number 2218060V0). Informed consent to participate was obtained from all subjects involved in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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