



The impact of physician exits in primary care: A study of practice handovers

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ABSTRACT

Recent studies on physician exits suggest that general practitioners (GPs) have an important impact on health care utilization and costs, but the transmission channels - interpersonal discontinuities of care, practice style differences and deterioration in access - are usually not clear. Our objective is to estimate the short-run and long-run impacts of switches in GPs on patients' health care utilization and costs, while all other factors of the health care setting remain the same. To do this, we collect data on handovers of primary care practices in Switzerland, occurring between 2007 and 2015. We link this data to rich insurance claims to construct a panel dataset of roughly 240,000 patients. Employing a difference-in-difference type framework, we find transitory increases in overall visits and costs, which are likely caused by the entering GP's initial re-assessment of patients' health care needs. Additionally, we find long-term increases in specialist health care utilization and ambulatory costs. The latter finding can be explained by changes in practice styles between the exiting GP and her successor, who is typically much younger and more likely to be female. In contrast to the literature on practice closures, we do not find evidence on reduced overall utilization rates. An important lesson for health policy is thus to preserve patients' access to care in the case of GP exits.

1. Introduction

Primary care is a cornerstone of the healthcare system, as it is often the first source of care. General practitioners (GPs) not only act as providers of primary care, they also issue referrals and coordinate care across various providers, which helps to curb care fragmentation [1–3]. Moreover, through continuous doctor-patient relationships, GPs accumulate valuable knowledge on patients' health status and health behaviors over time [4]. Therefore, interpersonal continuity of care is often considered to be a key factor in primary care, although the bulk of the evidence only provides descriptive associations [5–13]. At the same time, research has also shown that GP practice styles vary considerably, which may strongly influence patients' health care utilization and the associated costs [14,15].

Although the importance of primary care with regard to coordination, utilization rates and patient outcomes is widely acknowledged, isolating the causal impact of primary care is a challenging task. An emerging strand of literature seeks to provide causal evidence by studying the effects of physician exits, which occur due to retirement or relocation. The idea is that physician exits induce an exogenous change

in primary care provision that is typically independent of patient behavior [16–21]. Besides these empirical considerations, physician exits are an important and timely issue from the perspective of health policy and planning. In many OECD countries, the physician workforce has been aging considerably, implying that the number of physician retirements will increase in the forthcoming years [22]. At the same time, population aging raises the demand for primary care services, which will further exacerbate the potential shortages of trained GPs.

On the patient level, physician exits have different implications in the short and long run. First, physician exits disrupt an often long-standing patient-provider relationship. This allows researchers to study the short-run effects of an interpersonal discontinuity of care. Second, once patients rematch to a new GP, they are exposed to a new practice style that persists in the long run. A very recent strand of the literature exploits the exogeneity of physician exits to estimate the causal impact of discontinuities of care on various measures of patient utilization and outcomes. Several studies report a shift from primary to specialist care and increases in costs, especially in settings where patients may have a hard time finding a new GP (e.g., when the exiting GP closes his solo practice) [16–20]. In contrast, one study finds only minor effects on

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primary care utilization [21]. A possible reason for the disparate result is that the latter analyses a setting where seamless access to a new GP is maintained, thus highlighting the importance of having continuous access to care. Several studies additionally suggest that a change in GP may ameliorate the quality of care, such as the detection of previously unnoticed chronic conditions [20,21].

While these studies all provide credible causal estimates of physician exits, it remains often unclear which transmission channels are at play. For example, when studying practice closures, the effects on utilization can arise from the interpersonal discontinuity, practice style differences and/or a deterioration in local access to care [16]. Moreover, most of the previous work does not explicitly differentiate between short-run and long-run effects. However, this distinction is crucial when assessing the relative importance of each channel: Short-run effects are driven by the disruption in the doctor-patient relationship and practice styles, whereas persistent effects are likely to be due to differences in practice styles and access-related issues (the latter only applies to closures). Another limitation of the existing literature is that studies for the United States mostly focus on a specific subgroup of the population (patients enrolled in Medicare or Medicaid), thereby limiting the generalizability of the results [17–20].

The objective of this study is to examine both the short-run and long-run effects of an exogenous switch in GPs on patients' health care utilization and the associated costs. To do this, we focus on practice handovers, a situation in which a retiring GP sells his practice to a successor. First, this setting allows us to study how patients are affected in the short run when they transfer to a new provider. Second, we analyze whether and how physician practice styles affect patients' utilization, costs and outcomes by estimating long-run effects. The setting of practice handovers is appealing because apart from the change in physicians, all other factors such as access to primary care, travel distance, non-physician staff, health insurance contracts etc. remain unchanged. Therefore, studying handovers allows us to isolate the role of the GP in absence of changes in access that occur when practices are closed down. Understanding the consequences of GP exits is important from the perspective of health policy and planning across many countries. The findings of this study should therefore prove relevant for those health care systems beyond Switzerland which face similar challenges with respect to an aging physician workforce and demographic changes.

2. Materials and methods

2.1. Institutional setting

In Switzerland, 90% of residents report to have a regular source of primary care, which is usually a private GP practice [23]. Swiss GPs are typically self-employed, and work in solo or shared practices [24]. The patient is responsible to enroll with a GP and to transfer to a new GP if required. Depending on the mandatory health insurance plan, patients either enjoy direct access to all licensed physicians including specialists (standard plan) or they must visit their regular GP first (managed care plan; preferred provider (PPO), health maintenance organization (HMO), and telemedicine). The costs for primary care are covered by mandatory health insurance, although patients bear some of the costs through deductibles and co-payments. We refer to previous work for a thorough overview of the institutional setting [16].

2.2. Sources of data

We use detailed data from mandatory health insurance claims provided by a large Swiss health insurer. The data covers the period 2005 to 2018 and includes only individuals who were continuously insured for a period of at least six years. For each individual, we observe basic demographics, the region of residence and health plan characteristics. Claim records include information on the provider, the number of visits, costs, and information on individual services. The data are aggregated to

a matched patient-provider-year panel dataset containing annual health care utilization and costs. Information on the occurrence of handovers of GP practices in Switzerland was gathered in a primary data collection, building on previous work [16]. We first analyzed existing provider-level register data to match exiting GPs with entering GPs. In a second step, we conducted extensive field research, to identify practice handovers among other possible events (see Appendix A for more information). In total, we identified 652 exiting GPs who handed over their practice to a successor between 2007 and 2015 ("treated" GPs). Most exits are due to retirements given the age structure of the treated GPs (see Figure B.3.I in Appendix B). We assign 3236 GP practices to the control group, which consists of those practices that were active during the entire observation period. This ensures that the control group does not contain any GPs who interrupted or stopped their activity.

2.3. Study design

2.3.1. Treatment and control group

Patients are included in the main sample if they live in Switzerland, are at least 18 years old at the beginning of the observation period and still alive at the end of the observation period, i.e., if they are observed for the entire period 2005 - 2018. For the construction of treatment and control group we closely follow the procedure in previous work [16]. We define the "treated" group as those patients who experience a change in their regular GP caused by a practice handover. Since patients' regular GP must be determined empirically, we match patients to GPs based on the observed distribution of doctor visits. First, we consider all patients who visited any exiting GP at least once in the two years preceding the event. Second, we assign patients to the treatment group only if the majority (i.e., at least 50%) of their primary care visits were made to the exiting GP. The control group should consist of patients who do not experience any exit of their regular GP, but who are otherwise similar. For this reason, we first assign a hypothetical event year to each control GP ("pseudo handover"). To do this, we generate random draws from the distribution of event years (i.e., years when the handovers took place) in the treatment group. Second, we assign patients to the control group based on the same sampling procedure used for the treated group. This ensures that the data are well balanced in terms of calendar year. Our main sample consists of 241,429 patients, whereof 43,767 experience a practice handover (treated group) and 197,662 do not (control group).

2.3.2. Empirical strategy

Our setting consists of a difference-in-differences (DiD) framework in which we compare health care utilization between the treated and the control group before and after a practice handover takes place. Since the initial year of treatment varies across individuals, our framework is referred to as a staggered adoption design. For this design, the recent econometric literature shows that standard fixed-effects models pooling all treatment cohorts do not recover meaningful estimates of causal effects [25–29]. Simply speaking, the main reason is that early-treated cohorts contaminate the counterfactual time trend of the later-treated cohorts. To avoid this problem, we apply a type of the "stacked" DiD estimator [30–32]. First, we estimate a fixed-effects model separately for each cohort, where a cohort contains all treated patients with the same initial year of treatment and all control patients with the same initial year of pseudo treatment. In a second step, we aggregate the cohort-specific treatment effects to obtain a single estimate for each relative time period. We refer to Appendix A.3 for a more detailed motivation and explanation of the estimation procedure.

The central identifying assumption in the DiD design is that trends in the dependent variable between the treated and control group would have been parallel in the absence of the treatment. To increase the credibility of this assumption and to ensure balance between groups, we enhance the fixed-effects regression with balancing weights [33]. If treatment effects are, for instance, heterogeneous across age groups or regions, balancing weights help to avoid bias by rendering the two

groups comparable in terms of these characteristics. We estimate these weights separately for each cohort using the entropy balancing method (see Appendix A.3) [34].

2.4. Variables

The claims data allows us to construct a range of dependent variables on the patient-year level. First, we use the number of ambulatory visits made to GP practices, specialists and outpatient departments of hospitals as well as the total number of specialist and ambulatory providers visited. For health-related outcomes, we generate an indicator for having any hospitalization and the number of days spent in inpatient care. We also consider several measures of health care costs: overall costs, ambulatory costs, costs per visit, prescription drug costs and laboratory costs. Furthermore, we focus on a variety of services that are often considered to be potentially of low value in primary care: spine imaging, lipid measurements for elderly patients, MRI of the knee, prostate specific antigen (PSA) tests, and vitamin D tests [35–40]. Finally, we look at four frequent chronic conditions: reflux disease, high cholesterol and hypertension, depression and anxiety, and type 2 diabetes. Since data on diagnoses is absent, chronic conditions are proxied by pharmaceutical cost groups (PCGs).

For the estimation of balancing weights, we include a rich set of covariates: age, gender, nationality, language of correspondence, region of residence (NUTS-2 level), local physician density, deductible level (high, medium, low), health plan (standard plan, preferred provider, HMO, telemedicine), accident coverage, indicators for 24 pharmaceutical cost groups (PCGs) and a measure of continuity of care with the regular GP in the pre-treatment period. Moreover, we include lagged dependent variables taken from several pre-treatment periods. To keep the specification concise, we use two-year averages for up to four years prior to the event. A detailed description of all variables can be found in Appendix A.

3. Results

3.1. Descriptive statistics

Descriptive statistics for the treated and control groups of patients from the year prior to the (pseudo-) handover are shown in Table 1. The statistics for the control group are weighted using the balancing weights. Utilization patterns show that more than half of all ambulatory visits are made to GPs. About 12% of patients are hospitalized at least once. Total annual costs in mandatory health insurance are roughly CHF 4000 per patient, of which almost half are generated in an ambulatory setting. Demographics suggest that our sample of patients is on average somewhat older, more likely to be female and more likely to be German-speaking compared to the overall adult population of Switzerland [16]. Comparing the means across the two groups, we note that the balancing weights ensure that average characteristics are nearly identical. This is also reflected in the standardized difference, which is indeed very small for all of the covariates (rightmost column). The standardized difference is an adequate measure to assess the degree of imbalances in the covariates across treatment groups because it does not depend on the sample size [41]. For the sake of brevity, Table 1 only contains a small selection of the available PCGs, the full list is found in Table B.2.I in Appendix B. For completeness, descriptive statistics without using balancing weights can be found in Table B.2.II in Appendix B.

Fig. 1 displays average characteristics of patients' main GP over time and across groups. If patients visit several GPs in a given year, the main GP is the one to whom most visits are attributed. The figure illustrates that the transition from a retiring to a new GP in the treated group is associated with a sharp and persistent change in physician demographics. The average physician age decreases from roughly 64 years in $t = -1$ to 49 years in $t = 1$. In contrast, the main GP's average age

Table 1
Descriptive statistics, pre-treatment period.

	Treated		Controls		Std. Diff.
	Mean	SD	Mean	SD	
<i>Ambulatory utilization</i>					
Total visits	9.36	9.64	9.35	10.1	-0.001
GP visits	5.21	5.74	5.22	6.15	0.002
Specialist visits	2.69	4.76	2.68	4.98	-0.003
Hospital outpatient visits	1.46	3.48	1.45	3.48	-0.004
Number of providers	1.30	2.32	1.29	2.34	-0.003
Number of specialist providers	1.12	1.32	1.12	1.33	-0.002
Usual provider continuity index	0.93	0.12	0.93	0.12	0.002
<i>Inpatient utilization</i>					
Hospitalization	12.2%		12.1%		-0.004
Number of inpatient days	1.82	9.45	1.85	9.95	0.003
<i>Costs (in CHF)</i>					
Total costs	3962	7651	3948	7660	-0.002
Ambulatory costs	1817	2684	1808	2669	-0.003
Costs per visit	127	153	127	143	-0.006
Prescription drug costs	1061	4087	1054	3857	-0.002
Laboratory costs	103	204	100	205	-0.011
<i>Demographics</i>					
Age	56.4	14.8	56.4	15.0	-0.004
Female	54.3%		54.3%		0.001
Swiss nationality	84.1%		84.1%		0.000
German language	79.0%		78.9%		-0.001
<i>Health plan</i>					
Medium deductible	22.4%	22.5%		0.003	
High deductible	19.3%	19.1%		-0.004	
Preferred provider plan	29.8%	29.4%		-0.010	
HMO plan	4.2%	4.0%		-0.007	
Telemedicine plan	0.9%	0.9%		0.000	
<i>Regional information</i>					
Lake Geneva	11.9%		11.9%		0.001
Central Switzerland	28.4%		28.2%		-0.004
Espace Mittelland	19.1%		19.4%		0.008
Northwestern Switzerland	11.8%		11.6%		-0.008
Eastern Switzerland	14.6%		14.6%		-0.001
Ticino	1.8%		1.8%		0.001
Local physician density	0.76	0.33	0.76	1.15	0.000
<i>PCGs (selection)</i>					
Reflux diseases	13.7%	13.6%		-0.003	
Type 2 diabetes	5.9%	5.9%		0.000	
high cholesterol and hypertension	10.6%	10.6%		-0.002	
Depression and anxiety	9.7%	9.7%		0.001	
Number of GP practices	652	3236			
Number of patients	43,767	197,662			
Number of observations	603,806	2718,039			

Notes: The numbers are measured in annual terms based on the calendar year prior to the (pseudo-) handover. The control group is weighted using entropy balancing weights. The standardized difference is the difference in sample means divided by the square root of the average of the two sample variances. Abbreviations: GP, general practitioner, HMO, health maintenance organization, PCG, pharmaceutical cost group, SD, standard deviation, Std. Diff., standardized difference.

gradually and smoothly increases over time in the control group. As younger GPs are more likely to be female, it is not surprising that we observe a sharp increase in the share of female physicians following the handover [42]. Around 25% of the main GPs in the post-treatment period are women, compared to only 5% of the exiting GPs before the handover. Taken together, Fig. 1 demonstrates that the transfer to a new regular GP is accompanied with a substantial change in average physician demographics and thus, in turn, with changes in physician practice styles that are associated with these demographics.

3.2. Difference-in-differences estimates

Conceptually, we might expect two different effects from a switch in

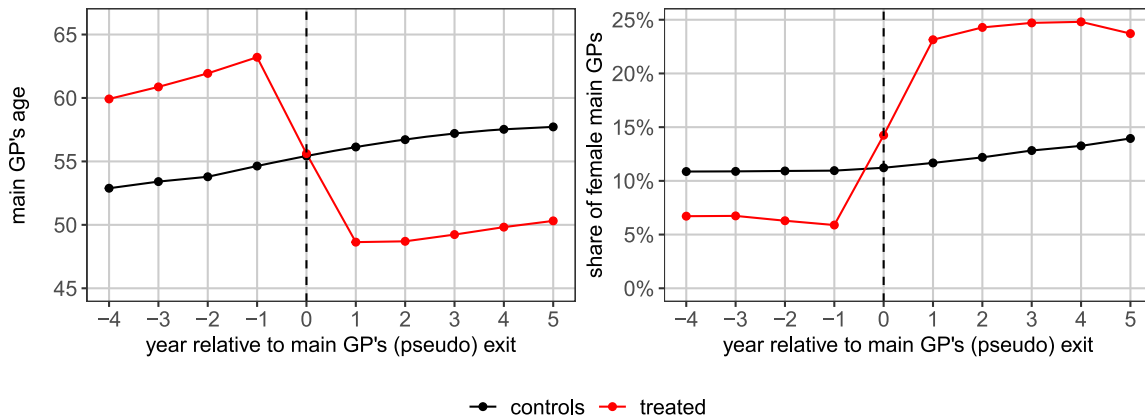


Fig. 1. GP characteristics over time

Notes: This figure shows weighted averages of main GP characteristics by treatment group over time. Weights are estimated by entropy balancing. The main GP is assigned to patients annually based on observed GP visits. If a patient has no GP visits in a given year, the last known value is carried forward. Patients with missing information on main GP characteristics are excluded (treated = 11%, controls = 12%). (To view the color figure, the reader is referred to the web version of this article.)

the regular GP on patients' utilization and costs. First, in the short run, the disruption in the continuity of care may trigger a change in health care utilization due to the initial re-assessment of a patient's health care needs. In doing so, the new GP may initiate additional diagnostic measures, for example, by referring patients to specialists or hospitals or by conducting blood tests. Indeed, two recent studies find that the new

physician might diagnose conditions that had gone unnoticed by his predecessor [20,21]. Second, the handover from a retiring to a new GP potentially entails a change in practice styles. This may also affect utilization and costs.

In the longer run, the effects of the interpersonal discontinuity of care are expected to vanish, once the new GP has learned about his

Table 2
Effects on utilization, hospitalization, costs and prevalence chronic condition.

	Short-run ($t = 1$)		Baseline	Long-run ($t = 5$)		
	ATT	SE		ATT	SE	Baseline
A. Utilization						
Total visits	2.6%**	(0.009)	9.78	-0.7%	(0.010)	10.28
GP visits	0.5%	(0.013)	5.01	-3.7%*	(0.017)	4.94
Specialist visits	5.4%**	(0.012)	3.08	3.7%**	(0.014)	3.35
Hospital outpatient visits	4.1%**	(0.016)	1.68	1.6%	(0.019)	1.93
Number of providers	7.2%**	(0.013)	1.48	2.2%	(0.015)	1.61
Number of specialist providers	6.3%**	(0.008)	1.27	5.4%**	(0.010)	1.39
B. Hospitalization						
Hospitalization	1.8%	(0.020)	0.13	0.0%	(0.020)	0.14
Number of inpatient days	0.2%	(0.035)	1.95	1.6%	(0.038)	2.33
C. Costs						
Total costs	3.3%**	(0.011)	4629	2.1%	(0.012)	5693
Ambulatory costs	6.2%**	(0.011)	2142	3.0%*	(0.012)	2461
Costs per visit	2.7%**	(0.009)	138.1	3.2%**	(0.011)	151.6
Prescription drug costs	2.7%	(0.014)	1207	2.8%	(0.019)	1423
Laboratory costs	18.5%**	(0.029)	234.6	8.1%**	(0.025)	250.3
D. Costs potentially low-value care						
Spine imaging costs ^a	6.8%	(0.057)	22.99	11.7%*	(0.058)	25.41
Lipid measurement costs ^b	36.8%**	(0.077)	4.27	26.3%**	(0.084)	3.78
Knee MRI costs ^a	-8.7%	(0.093)	5.19	11.5%	(0.102)	5.62
PSA test costs	12.5%**	(0.048)	2.63	7.2%	(0.049)	2.74
Vitamin D test costs	33.3%**	(0.083)	12.81	12.5%*	(0.057)	15.37
E. Prevalence of chronic conditions (PCGs)						
Reflux disease	4.1%**	(0.010)	0.17	2.9%*	(0.014)	0.21
High cholesterol and hypertension	10.0%**	(0.014)	0.13	10.3%**	(0.020)	0.15
Depression and anxiety	-2.4%*	(0.011)	0.10	-4.6%**	(0.017)	0.11
Type 2 diabetes	4.7%**	(0.012)	0.07	3.6%*	(0.016)	0.09

Notes: This table shows weighted short-run and long-run estimates of causal effects of practice handovers on outcomes in relative terms, that is, the aggregated coefficients of the interaction between the treatment group and time period $t = 1$ and $t = 5$. The model includes patient fixed effects and time effects. Data is measured in annual terms. Standard errors are clustered at the physician level. Estimates of panel D. and laboratory costs are based on cohorts 2012–2015, due to limited data availability for earlier cohorts. Long-run estimates for these outcomes correspond to those in time period $t = 3$. Abbreviations: ATT, average treatment effect on the treated, GP, general practitioner, MRI, magnetic resonance imaging, PCG, pharmaceutical cost group, PSA, prostate specific antigen, SE, standard error.

* $p < 0.05$.

** $p < 0.01$.

^a treatment due to illness.

^b patient age ≥ 75 .

patients' health status and health behaviors. In contrast, the effects of practice styles are arguably persistent over time. In addition, new health care needs detected at the initial re-assessment may require more health care services in the long run, for example in the case of chronic conditions.

To investigate the importance of these channels, we report short-run effects calculated in the first year after the handover ($t = 1$) as well as long-run effects calculated in the fifth year after the handover ($t = 5$). Since practice style effects are relevant in the short run and long run, a reasonable approximation of the short-run effect of disruption is to consider the difference between the short-run effect and the long-run effect. We explain this in more detail in Appendix A.4.

Table 2 reports the estimated causal effects, the treatment effect on the treated (ATT), of practice handovers on a wide range of dependent variables. Since the dependent variables are measured on different scales, we focus on the relative effect which is computed by dividing the absolute effect by the average counterfactual mean in the treated group. To assess the validity of the estimation strategy, Fig. 2 shows that there are no discernible pre-trends in the estimated effects for a selected number of utilization and cost measures. Similar plots for all other outcomes reported in Table 2 are depicted in Figures B.1.I - B.1.III in

Appendix B.1.

A series of robustness checks in Appendix B.4 shows that long-run effect estimates are not sensitive to different choices of the relative time period t , or to binning the endpoints [43]. We additionally show unweighted results (Tables B.4.I) and results including patients that eventually die (Table B.4.II).

3.2.1. Utilization and costs

Panel A in Table 2 shows the average effects of a practice handover on patients' utilization patterns. In the short run, a practice handover leads to a transitory increase in total visits of 2.6%, essentially no change in GP visits, and significantly more specialist and hospital outpatient visits. Furthermore, we observe a short-term increase in the number of providers which is partly driven by the switch to a new GP and a rise in the number of specialist providers. Considering the long-run effects, we see that the effect on total visits, hospital outpatient visits and the number of providers is only transitory, as the effects are smaller and insignificant in the long run. A different pattern emerges when comparing GP visits to specialist visits. While the number of GP visits significantly decreases in the long run (-3.7%), the positive effects on specialist visits and the number of specialist providers amount to 3.7%

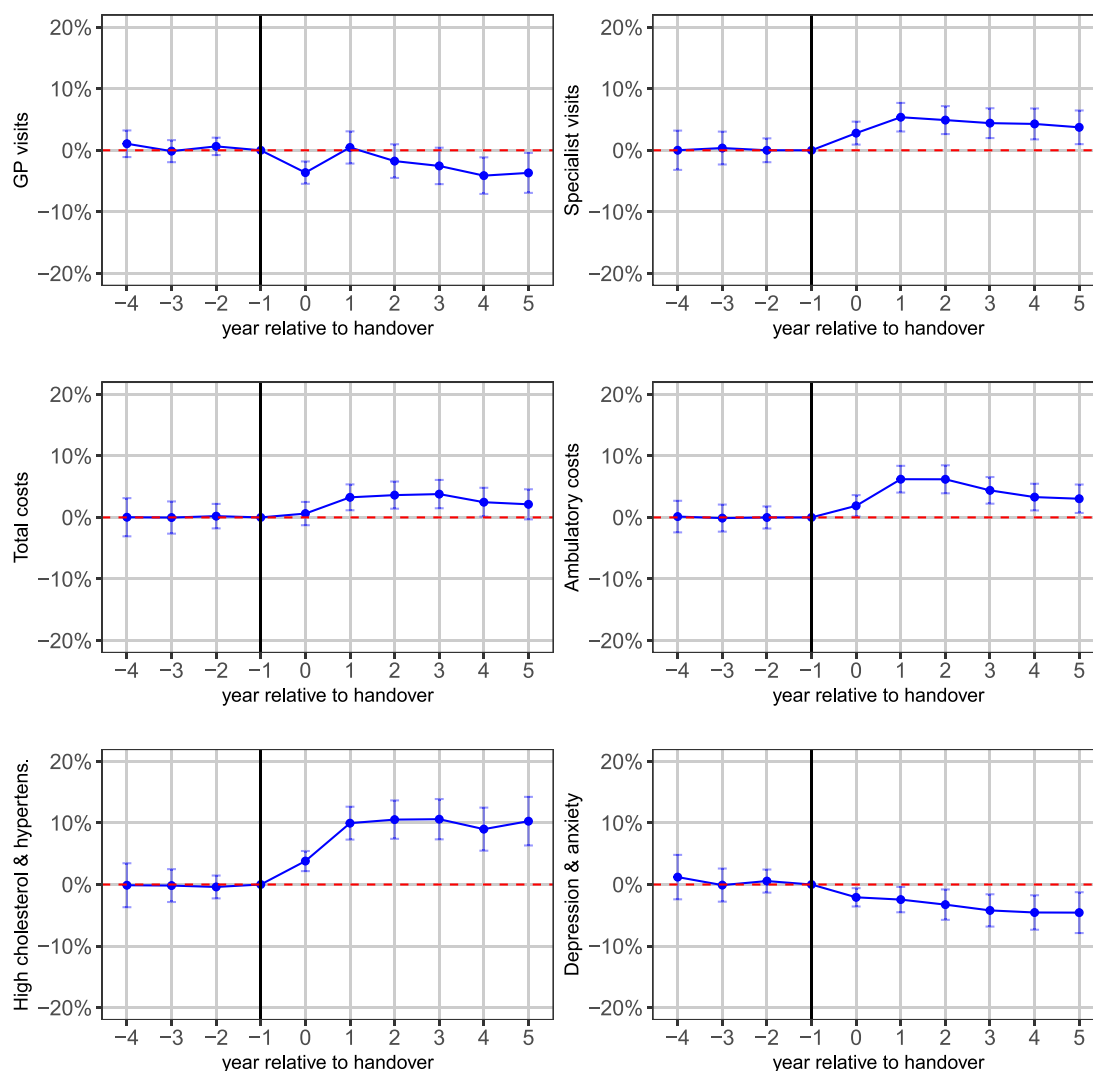


Fig. 2. Relative effects on selected outcomes

Notes: Dots correspond to the average relative effect at a given relative time period, measured in years. Vertical lines represent 95%-Confidence intervals of the relative effect. These plots are the result of estimating the dynamic model. The effect for the year just before the handover ($t = -1$) is set equal to zero. (To view the color figure, the reader is referred to the web version of this article.)

and 5.4%, respectively. These findings indicate that there is a persistent shift from primary to specialist care following the handover.

We do not find any evidence for adverse health effects as measured by the hospitalization rate and the number of days spent in hospitals. The estimated impacts are small in magnitude and statistically insignificant (see Panel B of Table 2).

Panel C of Table 2 presents the causal short-run and long-run effects on various cost categories. In the short run, we observe an increase in overall costs of 3.3%, mainly driven by higher ambulatory costs. The reason for this is twofold: First, there is an increase in doctor visits, and second, visits become more expensive on average (2.7%). Possible reasons for the persistently higher costs per visit are that consultation time increases and/or more expensive treatments are administered. The latter may be associated with specialist visits, which generally entail more costly health care services. We also note that the largest effect (in relative terms) concerns laboratory costs, amounting to 18.5% in the short run.

The transitory short-run effects on the number of visits and total costs suggest that entering GPs initially use more resources because they conduct a re-assessment of their patients' medical needs, for example, by having longer consultations or running more diagnostic tests such as blood tests. After five years, some effects still persist, however. In particular, we observe a shift from primary to secondary care, more expensive visits and higher laboratory costs. Most likely, these long-run effects are associated with differences in physician practice styles between exiting and entering GPs. In light of Fig. 1, this explanation is plausible because entering GPs, on average, are less experienced, younger and are more often female compared to their retiring counterparts.

3.2.2. Potentially low-value care

Given the evidence discussed above, an obvious follow-up question is whether the rise in costs and utilization is in fact beneficial for patients' health or whether it merely represents an increase in resource use. We tackle this question by focusing on a selected number of specific services that are often considered to be potentially of low value in a primary care setting [35]. These include spine imaging (excluding accidents), lipid measurements with elderly patients, MRI of the knee (excluding accidents), PSA tests and vitamin D tests [36–40]. The corresponding results are depicted in Panel D of Table 2. We find large and significant increases in costs for lipid measurements (36.8%), PSA tests (12.5%) and vitamin D tests (33.3%) in the short run. The effects tend to partially fade out in the long run. Overall, our results provide some suggestive evidence for an increased use of potentially low-value care, but absent data on health outcomes, it is difficult to draw strong conclusions.

3.2.3. Chronic conditions and prescription drug use (PCGs)

In a next step, we analyze whether practice handovers affect the prevalence of four common chronic conditions as proxied by PCGs. The results are shown in Panel E of Table 2. The most pronounced and persistent effect can be observed for high cholesterol and hypertension, where the prevalence persistently increases by around 10%. The prevalence of the PCGs for reflux disease and type 2 diabetes also increase, albeit to a lesser extent. In contrast, the prevalence of the PCG for depression and anxiety significantly decreases both in the short and long run. As the prevalence of chronic conditions is measured by prescription drug use, we consider two potential explanations. First, as new GPs re-assess patients' health status after taking over the cases, they may diagnose chronic conditions that had previously gone unnoticed, and consequently, start administering new pharmaceutical treatments. This effect can persist over time because they are long-run treatments. Second, the findings may also reflect differences in practice styles with regard to prescription drug use. The new GPs may be more or less inclined to prescribe certain drugs compared to their predecessors. For example, entering GPs may be more hesitant to prescribe antidepressants or tranquilizers, and in contrast, may prefer alternative treatments

(such as psychotherapist counseling in this case). These changes are most likely associated with a re-assessment of patients' health status and, in addition, may be linked to physicians' preferences towards drug-related treatments.

3.3. Heterogeneity analysis

In a next step, we investigate whether the estimated effects are heterogeneous across different GP characteristics. Since practice styles are generally associated with physician demographics, studying heterogeneous effects are informative with respect to practice style variation. Indeed, previous studies report that practice styles differ considerably with respect to physician age and gender [44–46]. It is therefore interesting to examine whether the effects depend on age and gender of the entering GP. To categorize by physician age, we split the treated group at the median age of the entering GP (46 years) in $t = 1$. To categorize by physician gender, we simply split the treated group according to their main GP's gender in $t = 1$.

Figure B.5.I in the appendix, shows the results for selected utilization measures across different GP characteristics. Consistent with previous studies, switching to a female GP leads to higher laboratory costs compared to a male GP, which suggests that female doctors run more diagnostic tests such as blood tests [45,46]. Female doctors have somewhat longer (but fewer) consultations, as indicated by higher costs per visit. They also refer patients more frequently to specialists compared to their male colleagues. Overall, there is some evidence for gender-specific practice styles among GPs that is in line with other existing studies [45,46]. Comparing entering GPs by age, the estimates indicate that younger GPs have fewer consultations with their patients than older GPs, which may explain the smaller effect on total health care costs. For the other utilization measures considered, the effect heterogeneity across GPs' age seems less pronounced. It is worth noting that handovers lead to significantly more specialist visits and a larger number of specialist providers visited in all subgroups. Overall, these results are consistent with findings from previous studies which report variation in practice styles due to differences in physician demographics [45–47].

4. Discussion

Our results show that a practice handover leads to a transitory rise in the total number of visits and total health care costs. Comparing short-run and long-run effects provides some information as to whether the interpersonal discontinuity of care affects outcomes. We note that the effects on total number of visits, hospital outpatient visits, number of providers, total health care costs, ambulatory costs and laboratory costs are substantially larger in the short-run than in the long-run. This suggests that there exists some transitory effect of practice handovers on these outcomes. A plausible explanation is that new GPs initially have a higher resource use because they re-assess patients' health status when taking over the cases. In contrast to the literature on interpersonal continuity of care [8,11,13], we do not find any evidence that discontinuities of care lead to adverse health effects, to the extent that this can be measured by hospitalizations and the number of days spent in inpatient care. Since our empirical design allows for causal conclusions under plausible assumptions, disruptions in the doctor-patient relationship may not be as important for patient health as this literature suggests given that access to care is preserved.

Certain effects also persist in the long run. For example, we document a significant and persistent increase in specialist health care utilization, ambulatory costs, laboratory costs and costs per visit. One plausible explanation is related to physician practice styles, which have a persistent impact on the delivery of health care [48,49]. This notion is supported by the fact that patients affected by a handover experience a substantial change in average physician demographics, i.e., the entering GP is more likely to be female and on average much younger than their

predecessor. Recent studies indeed report that female GPs tend to have fewer but longer visits, solve more problems in one consultation and are more likely to refer patients to specialists [45]. Female GPs are also found to perform more laboratory tests, but prescribe fewer drugs compared to their male counterparts [46]. This implies more expensive GP visits as well as more specialist visits, which is consistent with our results. Another explanation for higher utilization and costs in the long run is that newly detected chronic conditions have a persistent impact on patients' utilization and costs.

Besides utilization and costs, we also document that a practice handover leads to changes in the prevalence of certain chronic conditions measured by PCGs. In the case of reflux disease, type 2 diabetes, high cholesterol and hypertension, the increase could be a consequence of a re-assessment of patients' health status. Entering GPs administer drug treatments for chronic conditions that were untreated or undetected by their predecessors. Indeed, these results are consistent with findings for practice closures in Denmark and GP exits in the US [20,21]. Another explanation is that entering GPs may have different practice styles with respect to diagnostic intensity [48,49], and/or prescription drug use. In the case of depression and anxiety, entering GPs may deprescribe certain medication and place more emphasis on psychotherapist counseling instead. This presumption is supported by a recent study reporting a positive association between years of practical experience and over-prescription of antidepressants [50].

A limitation of our study is that the claims data does not contain any information on diagnoses, e.g. ICD-10 codes. While PCGs are informative on the prevalence of certain chronic conditions, they also reflect physicians' prescribing behavior to some extent. Data on diagnoses could shed some light on the question as to whether the increase in health care utilization is due to newly detected chronic conditions, which warrants more health care and higher costs, or due to inefficiencies in the delivery of health care. Another limitation is that claims data contain only limited and indirect information on patient health. Our results suggest that changing GP does not lead to more hospitalizations, but patient health could also be affected in different ways that we fail to capture with our data. As a last limitation, we are unable to identify the uncontaminated effect of practice styles and the discontinuity of care, even though we distinguish between short- and long-run effects. While short-run effects are a combination of the initial disruption effect and practice styles, long-run effects are likely a combination of practice styles and the long-run consequences of the initial re-assessment.

5. Conclusions

Our findings provide important insights with regard to previous work that focuses on closures of GP practices. Practice closures simultaneously affect access to care, continuity of care and physician practice styles such that it is hard to assess the relative importance of each of these channels. A recent study finds that practice closures lead to a decrease in overall doctor visits and a sharp drop in GP visits, which are particularly pronounced in areas with low physician density [16]. In contrast, in the present study, access to care remains unchanged and we do not observe any significant negative effects on overall health care utilization. We therefore conclude that deteriorating access to a primary care provider is the main explanation of the drop in utilization observed after practice closures. Moreover, previous studies show that practice closures lead to shifts towards more specialist care and hospital outpatient care [16,17]. We also find these types of substitution effects in the case of practice handovers where access to care does not change. This suggests that physician practice styles at least partially explain the observed shifts towards specialists and hospitals in the case of closures. From a policy perspective, our findings carry certain lessons in the face of the increasing number of retiring GPs in the forthcoming years. First, while practice closures have adverse effects on health care utilization, especially in peripheral areas, practice handovers do not affect overall

utilization rates. In other words, smooth transitions from an existing GP to a new GP help to ensure continuous access to primary care, which is crucial from the patient perspective. One problem is that patients lack easily accessible information as to which practices take on new patients. Registering with a new practice can therefore be time consuming. One policy recommendation could be to actively assist patients in transferring to a new GP when their previous GP retires. At the very least, patients should be provided with lists of available GPs in their resident area who take on new patients. Second, our findings suggest that transitioning to a new GP induces more services and costs, potentially due to an initial re-assessment of the patient's health status. One policy tool aimed at reducing re-assessment costs is the introduction of individual electronic patient records (EPRs), which contain all relevant medical information across providers. Switzerland introduced an EPR system in 2021, but its dissemination has been limited so far. More widespread use of EPRs could foster digitization of medical records in ambulatory practices and thereby contribute to lower re-assessment costs. Third, the change in practice style raises the question whether policies should respond to the shift from GP to specialist care. However, it is not clear from our results to what extent a higher referral rate to specialists affects the quality of care.

Declaration of Competing Interest

None.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.healthpol.2023.104867](https://doi.org/10.1016/j.healthpol.2023.104867).

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