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Enabling patient-physician continuity in Swedish primary care: the
importance of a named GP

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Abstract

Background: Continuity of care is important for patients with chronic conditions. Assigning patients to a named GP may increase continuity.

Aim: To examine if patients who were registered with a named GP at the onset of their first chronic disease had higher continuity at subsequent visits than patients who were only registered at a practice.

Design and Setting: Registry-based observational study in Region Skåne, Sweden. The study population included 66,063 patients registered at the same practice at least 1 year before the first chronic condition onset in 2009-2015.

Method: We compared patients registered with a named GP with patients only registered at a practice over a four-year follow-up period. The primary outcome was the Usual Provider of Care (UPC) index, for all visits and for visits related to the chronic disease. Secondary outcomes were the number of GP, nurse and out-of-hours visits, ED visits, hospital admissions, and mortality. We used linear regression models, adjusted for patient characteristics (using entropy balancing weights) and for practice-level fixed effects.

Results: Patients with a named GP at onset had 3-4 percentage points higher UPC, but the difference decreased and was not statistically significant after adjusting for patient and practice characteristics. Patients with a named GP made more visits, though not for the chronic condition. There were no statistically significant differences for the other outcomes.

Conclusion: Registration with a GP at onset does not imply higher continuity at visits and is not linked to other relevant outcomes for patients diagnosed with their first chronic condition.

Keywords: Continuity of care, Primary care, Person-centred care

How this fits in

Continuity of care in group practices may be higher if patients are registered at a named GP. This observational study examined continuity for patients after the onset of their first chronic condition. Patients who were registered at a named GP did not have higher continuity than patients without a named GP. Registering patients at a named GP is not guaranteed to improve continuity in group practice.

1 Introduction

Continuity is a central component of primary care [1]. A continuous relationship may improve outcomes by increasing GPs' personal responsibility and knowledge about patients and support the development of mutual trust [2]. Empirical evidence link continuity to increased efficiency [3], reduced hospitalizations and lower mortality [4, 5, 6, 7, 8, 9, 10]. Continuity may be particularly important for high-need patients, such as individuals in advanced ages or with chronic conditions, and is highly valued by such patients [11, 12].

In several countries, primary care has become more fragmented due to a development from the traditional solo-practice organization towards larger, multiprofessional group practices with an increasing number of GPs working part-time and sharing patient lists [9, 13]. Fostering continuity in modern-day primary care requires new ways of working, both at the GP and practice level [14], but research that can support this transition is limited [9]. Registering patients with a named GP has been suggested as a way to build continuity [15]. A previous study found that a mandate to inform patients about their named GP in the English NHS did not increase continuity of care [16]. However, effects on important subgroups such as patients with a chronic condition may have been masked due to the short follow-up.

The present study explores the importance of a named GP for developing continuity in Swedish multiprofessional group practices – primary care centers (PCC). Patients have the right to be registered with a PCC, but registration with a named GP is far from guaranteed [17]. The aim of the study was to examine if patients with a named GP had higher relational continuity following the onset of their first chronic condition, compared to patients with no named GP.

2 Methods

2.1 Setting

The regional healthcare system in Skåne (1.4 million residents) hosts around 150 PCCs, around half of which are privately owned. All PCCs employ GPs, nurses, and physiotherapists, some also employ behavioural therapists [17]. PCCs are mainly reimbursed by capitation, adjusted for morbidity (using the Johns Hopkins Adjusted Clinical Groups (ACG) system) and socio-demographic factors.

All residents are registered at a PCC. The default PCC is the closest one, but patients may freely choose where to register (PCCs cannot close their lists). PCCs may decide whether to register patients at a specific (named) GP. Patients can seek care at any PCC, but normally visit the one they are registered with.

2.2 Data

The regional care registers record all contacts (date, diagnoses, type of professional, practice/clinic identifier) with publicly funded healthcare and registrations with PCCs (start date, end date, PCC identifier, named GP (if any)). The data was linked to patient background data from registers held by Statistics Sweden (SCB) using a personal identifier. The dataset spanned 2005-2019.

Table 1: Follow-up and censoring

	Patient 1	Patient 2
Index date:	2013-02-01	2013-02-01
Last date of follow-up:	2017-01-31	2017-01-31
Censored:	No	Yes
Censoring date:	N/A	2015-01-31
Effective follow-up:	4 years	2 years

Note: The table illustrates the follow-up period over which we compute outcomes for two fictive patients with the same index date, one of whom is censored (e.g., due to death) during the follow-up. Outcomes (number of visits, continuity of care) are counted over the full follow-up period for both patients, but the effective follow-up is shorter for patient 2 because she is only observed for two years after the index date.

2.3 Study population, follow-up and exposure

To focus on chronic conditions that are normally managed by Swedish PCCs, we defined the following set of relevant conditions: Alzheimer's disease, asthma, type 2 diabetes, depression, heart failure, hypertension, ischemic heart disease (IHD) chronic obstructive pulmonary disease (COPD), or anxiety. The study population included 66,063 patients who, *i)* in 2009– 2015, had their first record of any of the above diagnoses (counting from 2005/01/01); *ii)* had no record of any *other* chronic condition during the four years prior to the date of the first diagnosis (index date)(other chronic conditions were defined using the chronic condition indicator in the ACG system); and *iii)* had been registered at the same PCC (with the same GP identifier) for at least 365 days prior to the index date. See the supplementary material for details on the ICD codes and the construction of the sample.

Outcomes were studied over a follow-up period of 4 years after the index date. Patients censored due to death or moving out of the region were not excluded from the analysis, but the effective timeframe used to compute outcomes for them was naturally shorter than 4 years (Table 1).

Patients were defined as exposed if they were registered with a named GP on the index date; the comparison group were only registered at a PCC. The classification into exposed/nonexposed patients was time-invariant; thus, patients were considered exposed in the analysis even if they lost their named GP during follow-up.

2.4 Outcomes

The primary outcome was the Usual Provider of Care (UPC) index – the share of the patient's

GP visits that was made with the most commonly seen GP, i.e., the Usual Provider (UP) [18]:

$$UPC = \frac{\sum_{t=1}^4 visits_t^{UP}}{\sum_{t=1}^4 visits_t}$$

We computed two versions of the UPC: one for all visits, and one for visits with a registered diagnosis related to the chronic condition; both computed over the entire follow-up period, and only for patients with at least three GP visits during the period ($\sum_{t=1}^4 visits_t \geq 3$).

Secondary outcomes included the number of GP visits (all diagnoses, and visits with the chronic condition) or nurse visits, and indicator variables for having visited an out-of-hours (OOH) clinic, a hospital emergency department (ED), or being hospitalized (unplanned) at least once. These outcomes were defined over the entire follow-up period. To study attrition, we examined the proportion of patients who were still registered at a PCC in the region, and the proportion of patients who had died, within 1, 2, 3, or 4 years after the index date.

2.5 Background characteristics

We defined variables describing the pre-diagnosis care utilization (corresponding definitions as for the secondary outcomes) and PCC registrations (duration of spell, date of registration, switches). Background characteristics included age (in years), gender, household disposable income (decile), educational attainment (primary/secondary/tertiary) and indicators for non-Nordic background and recently

having moved from another municipality. Time-variant characteristics were measured on December 31st prior to the index date. See the supplementary file S.1 for definitions.

2.6 Statistical analysis

We used least squares regressions to estimate associations between the outcomes and the indicator for being registered with a named GP. Model 1 was unadjusted. Model 2 accounted for observable patient confounders by weighting. To obtain weights, we used entropy balancing (EB) which is a computationally attractive, data-driven alternative to the manual, trial-and-error based, preprocessing step in ordinary propensity score modelling [19]. The EB algorithm derives weights that make the sample moments (mean, variance, etc.) of the covariates in the comparison group come as close as possible to the moments in the treatment group, while keeping the weights as close as possible to 1 to retain information. Balance is thus ensured by construction. We balanced the groups on the first two moments of the variables that i) measured prior primary care utilization or ii) had modest/large ($\geq .05$) standardized mean differences (SMD) [20] (see Supplementary file 3). Model 3 added PCC fixed effects (FE). By including FEs, the analysis relies only on variation between patients within a given PCC. Thus, the estimated association between the outcome and being registered at a named GP in model 3 does not reflect differences in practice characteristics such as size or location, which may be correlated with the propensity to register patients at a named GP. In all models, standard errors were clustered at the PCC on the index date.

As sensitivity analyses, we *i)* included (linear) control variables instead of weighing and *ii)* included some balanced, but theoretically motivated, covariates (prior ED/OOH visits and hospitalizations) and a covariate that was unbalanced but correlated with the included primary care utilization variables (the number of GPs seen). We also estimated the UPC model with a shorter follow-up of two years.

The analysis was performed using Stata v.18.1. EBWs were obtained using the *ebalance* package.

3 Results

3.1 Descriptive statistics

3.1.1 Background characteristics

Table 2 shows descriptive statistics for the background characteristics used to obtain entropy weights. Patients with a named GP were older, had lower educational attainment but higher household income, and were less likely to be non-Nordic immigrants or to have recently moved between municipalities. They registered at a PCC in the region earlier (in chronological time and relative to the index date). A higher proportion had switched PCCs or GPs during the pre-period. They were less likely to have depression and more likely to have hypertension or ischemic heart disease (IHD) as their first chronic condition (SMD < .05 for the other conditions). The named GP group had higher primary care and ED utilization 3-4 years before the index date, but their primary care utilization was lower in the two years prior to the index date. Most differences were small (see Supplementary file 4 for the SMDs of the full set of background characteristics). The three largest differences were observed for the start of registration date (SMD=-.776), the index spell duration (.388) and the indicator for having moved (.176).

After weighting, the means and variances were highly balanced by construction (Part B. of Table 2). Notably though, the skewness was also balanced for most variables.

Table 2: Sample moments by group

Variable	<u>Named GP} (N=23,762)</u>			<u>No named GP (N=42,301)</u>					
	Mean	Variance	Skewness	Mean	Variance	Skewness	Mean	Variance	Skewness
Age	47.4	4422	26	44.2	5468	24.1	47.4	4424	26.1
Education	0.889	0.605	0.194	0.939	0.65	0.111	0.889	0.605	.194
Disp. inc. (decile)	5.64	8.17	-0.0662	5.36	8.86	0.0283	5.64	8.17	.0604
Born Sweden/Nordic	0.883	0.103	-2.39	0.849	0.128	-1.94	0.883	0.103	2.39
Mover	0.0615	0.0577	3.65	0.111	0.0985	2.48	0.0615	0.0577	3.65
Start date (reg.)	17835	858335	0.0377	18432	323954	0.117	17835	858361	.07
Duration (reg.)	1298	611174	1.31	1038	288864	0.958	1298	611158	1.4
Registered t-2	0.866	0.116	-2.15	0.817	0.15	-1.64	0.866	0.116	2.15
Registered t-3	0.72	0.201	-0.983	0.679	0.218	-0.765	0.72	0.201	.983
Switched PCC (2-4 yrs pre)	0.622	0.235	-0.505	0.481	0.25	0.0744	0.622	0.235	.504
Switched GP (2-4 yrs pre)	0.703	0.209	-0.89	0.543	0.248	-0.173	0.703	0.209	.89
First diag. depr.	0.338	0.224	0.683	0.373	0.234	0.523	0.338	0.224	.683
First diag. hypertension	0.318	0.217	0.783	0.28	0.202	0.978	0.318	0.217	.783
First diag. IHD	0.0529	0.0501	3.99	0.0419	0.0402	4.57	0.0529	0.0501	4
Index year	2012	4.42	0.0325	2013	2.59	-0.333	2012	4.42	.0972
Any GP visit (3-4 yrs pre)	0.522	0.25	-0.0861	0.495	0.25	0.0201	0.521	0.25	.086
No. GP visits (3-4 yrs pre)	1.33	3.9	2.87	1.23	3.56	2.68	1.33	3.9	2.91
No. nurse visits (3-4 yrs pre)	1.3	11.5	7.82	1.29	10.9	7.05	1.3	11.5	8.91

Any ED visit (3-4 yrs pre)	0.131	0.114	2.19	0.114	0.101	2.44	0.131	0.114	2.19
Any GP visit (1-2 yrs pre)	0.867	0.115	-2.16	0.884	0.102	-2.4	0.867	0.115	2.16
No. GP visits (1-2 yrs pre)	2.76	7.21	2.31	2.83	7.11	2.16	2.76	7.21	2.36
No. nurse visits (1-2 yrs pre)	2.18	18.2	6.44	2.67	27.2	4.11	2.18	18.2	4.79

Note: The table shows the first three sample moments -- the mean, the variance, and the skewness -- for the background characteristics which were used to obtain entropy weights. For the comparison group with no named GP, part A. shows the moments as observed in the data, and part B. shows the moments after using the entropy weights. The start date and duration variables refer to the PCC registration that was ongoing at the index date. The dummy variables for being registered in t-2 and t-3 refer to the second and third year prior to the index date (by definition, everyone was registered the year prior to the index date). The dummy variables for having switched PCC or GP indicate whether such a switch occurred during the 2-4 years prior to the index date. The prior care use variables at the bottom of the table are calculated over the 3-4 and 1-2 years prior to the index date, respectively.

3.1.2 Outcome variables

The descriptive statistics in Table 3 show that patients with a named GP had slightly higher UPC in the post period, both for all diagnoses (.484 vs. .457) and for the chronic condition (.675 vs. .638). Only 17,044 (28,591) of the 23,762 (42,301) patients with (without) a named GP made at least 3 GP visits during the follow-up; similarly, relatively few had ≥ 3 visits with a diagnosis related to the first condition (6,412 (11,108) patients with (without) a named GP).

The group with a named GP had slightly higher care utilization, except that a smaller proportion visited an OOH clinic. More than 90% were still registered at a PCC in the region 4 years after the index date. The proportion was slightly higher in the named GP group, which nevertheless also had higher mortality. Notably, for the subsample of patients with at least three GP visits in the follow-up period (i.e., the subsample used to study the UPC), the overall level of attrition was lower; 95% of patients were uncensored throughout the four-year follow-up, 97% were observed for three years, 98.5% for two years and 99.5% at least one year.

Table 3: Summary statistics for main outcome variables by group

	Named GP			No named GP		
	Obs	mean	SD	Obs	mean	SD
<i>Continuity</i>						
UPC	17044	.484	.236	28591	.457	.217
UPC 1st	6412	.675	.255	11108	.638	.248
<i>Care utilization</i>						
No. GP visits	23762	5.95	5.29	42301	5.32	5.04
No. GP visits 1st	23762	1.83	2.52	42301	1.73	2.49
No. nurse visits	23762	5.18	8.41	42301	5.01	8.89
Any OOH visit	23762	.175	.38	42301	.19	.392
Any ED visits	23762	.354	.478	42301	.348	.476
Any unplanned hospitalization	23762	.233	.423	42301	.226	.418
<i>Attrition</i>						
Still registered t+1	23762	.974	.16	42301	.968	.177
Still registered t+2	23762	.956	.204	42301	.944	.23
Still registered t+3	23762	.94	.237	42301	.924	.265
Still registered t+4	23762	.925	.263	42301	.907	.291
Death (1 yr)	23762	.0152	.122	42301	.0134	.115
Death (2 yrs)	23762	.0241	.153	42301	.0208	.143
Death (3 yrs)	23762	.0335	.18	42301	.0289	.167
Death (4 yrs)	20703	.0454	.208	35511	.0396	.195

Note: The table shows the mean (or proportion, for binary variables) and standard deviation (SD) of the outcome variables for the sample used in each model (Obs). The sample generally includes the whole study population, with the following exceptions: 1) For the two continuity variables (Usual Provider of Care index), the sample includes individuals with at least three GP visits during follow-up; for visits with any diagnosis (UPC) and for visits related to the new chronic condition (UPC 1st). 2) For the variable indicating mortality in t+4, the sample excludes patients diagnosed in 2015, due to lack of data deaths in the final follow-up year for that cohort.

3.2 Regression estimates

3.2.1 Continuity

Table 4 shows the estimates of continuity (UPC). The difference between the groups was only statistically significant in the unadjusted Model 1. The difference was reduced by the EBWs (Model 2) and, in particular, after accounting for PCC FEs (Model 3). In Model 3, the

magnitude of the difference was close to zero for all visits and around 2 percentage points for visits related to the new chronic condition (for reference, the UPC for the first condition is around 67%, Table 3). In the sensitivity analyses, the UPC estimates were similar; the UPC for the first diagnosis was statistically significant (5% level) when using a control strategy instead of weighing, but not when accounting for the number of GPs seen (Supplementary file 5).

Table 4: Continuity of care

	Any diagnosis			Chronic diagnosis		
	(1)	(2)	(3)	(4)	(5)	(6)
Named GP	0.0276* (0.0139)	0.0264 (0.0169)	-0.000322 (0.00756)	0.0379* (0.0177)	0.0330 (0.0299)	0.0185 (0.0135)
N	45635	45635	45635	17520	17520	17520
EBW	No	Yes	Yes	No	Yes	Yes
PCC FE	No	No	Yes	No	No	Yes

Note: The table shows the estimated association between having a named GP and continuity of care for three model specifications. Model 1 (columns 1 and 4) shows the unadjusted difference in means. Model 2 (columns 2 and 5) applies entropy balancing weights. Model 3 (columns 3 and 6) applies entropy balancing weights (EBW) and includes practice fixed effects (PCC FE). Continuity is measured by the usual provider of care (UPC) index for patients with at least 3 GP visits during follow-up. Standard errors clustered by PCC. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

3.2.2 Secondary outcomes

Table 5 shows the estimates for the secondary outcomes relating to care utilization. Panel A shows that patients with a named GP made .36 more visits than the comparison group

adjusting for patient and PCC characteristics (col. 3), but the difference was close to zero and statistically insignificant for the subset of visits with the new chronic diagnosis (col. 6). There were no other significant differences after adjusting for patient and PCC characteristics (Model 3).

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Table 5: Secondary outcomes (utilization)

	(1)	(2)	(3)	(4)	(5)	(6)
A:	No. GP visits (Any diagnosis)			No. GP visits (Chronic diagnosis)		
Named GP	0.628*** (0.130)	0.411** (0.143)	0.364*** (0.0915)	0.104 (0.0590)	0.0642 (0.0759)	-0.0112 (0.0562)
B:	No. nurse visits			Any OOH visit		
Named GP	0.164 (0.198)	-0.326 (0.271)	0.104 (0.183)	-0.0147 (0.0109)	0.00944 (0.0129)	0.00605 (0.00599)
C:	Any ED visit			Any hospitalization		
Named GP	0.00630 (0.0143)	0.0438* (0.0215)	0.0128 (0.00854)	0.00708 (0.00555)	-0.0106 (0.0108)	0.00149 (0.00704)
N	66063	66063	66063	66063	66063	66063
EBW	No	Yes	Yes	No	Yes	Yes
PCC FE	No	No	Yes	No	No	Yes

Note: The table shows the estimated associations between having a named GP and the secondary outcomes. Model 1 (columns 1 and 4) shows the unadjusted difference in means. Model 2 (columns 2 and 5) applies entropy balancing weights. Model 3 (columns 3 and 6) applies entropy balancing weights (EBW) and includes practice fixed effects (PCC FE). OOH = out-of-hours clinic. ED = Emergency Department. Standard errors clustered by PCC. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

There was no differential attrition in terms of mortality after adjusting for patient and PCC characteristics, but patients with a named GP were more likely to remain registered at a PCC in the region after 2 years (Figure 1). Notably, the sensitivity analysis using a shorter follow-up did not indicate that patients with a named GP had higher UPC within 2 years; i.e., during the period when the two groups were still equally likely to remain in the region. Furthermore, there was no statistically significant differential attrition, neither in terms of

death or discontinued registration in the region, for the subsample with at least three GP visits during the entire follow-up period, i.e., the sample used in the analysis of the UPC.

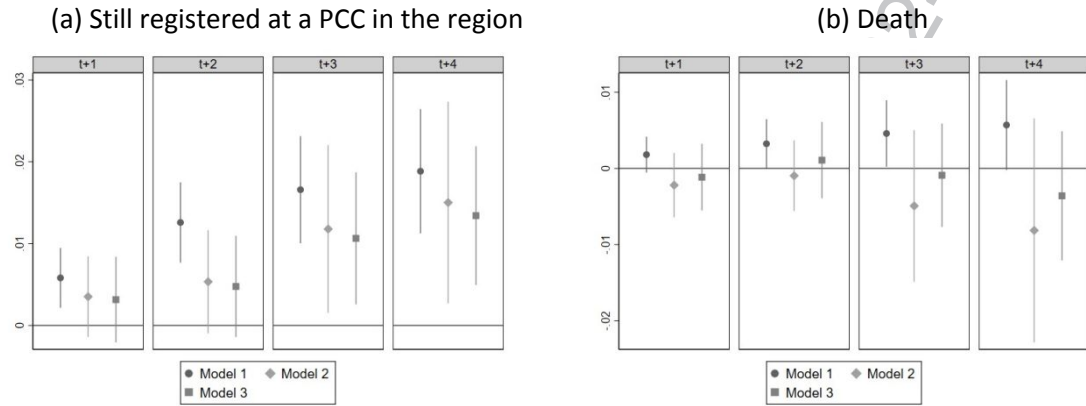


Figure 1: Differential attrition

Note: The figure shows estimates from Model 1-3 contrasting patient with and without a named GP 1-4 years after the index date. Patients with an index date in 2015 lack data on mortality for t+4; otherwise, all models include the full study population.

4 Discussion

4.1 Summary

We explored if patients who were registered with a named GP at the onset of their first chronic condition had higher continuity at subsequent GP visits than patients without a named GP. Patients with a named GP had higher continuity of care, but the relationship vanished once we adjusted for patient and practice characteristics associated with the probability of having a named GP.

4.2 Strengths and limitations

The key contribution of the study was to examine how continuity can be fostered for patients experiencing the onset of their first chronic disease. We were able to study the importance of a named GP thanks to the setting with group practices and variation in the prevalence of registration at a named GP. A strength was the access to detailed and longitudinal register data on all residents in the region, including practice registrations and diagnoses. We could identify patients who were registered with a named GP long before the chronic disease onset, who were unlikely to have been assigned a named GP due to previous health issues. The remaining imbalances in the study population were accounted for by the weighting and a within-practice approach. A limitation was that we did not study a mandated policy; practices and/or patients could influence the choice of registering patients at named GPs. Yet, even in this most-likely scenario, the association was very weak. Possibly, the results reflect that PCCs who do not register patients on GPs have other routines to ensure relational continuity. The results are unlikely to indicate that the scope for increasing continuity was exhausted, as patients only saw their usual provider on around half–two thirds of all occasions. Another limitation was that we could not examine

if the UPC was the named GP, due to different GP identifiers in the PCC enrollment register and the care utilization data.

However, making such a link was not crucial for the empirical analysis as specified. A third limitation is that we could not explore the role of nurse continuity, which may be relevant for some of the studied diagnoses.

4.3 Comparison with existing literature

Two evaluations of a Named GP reform in the English NHS found no causal effect on the number of GP visits [21] or continuity at visits [16]. These studies had shorter follow-up periods (up to 2 years) than the present study. Furthermore, as most patients in the UK were already assigned to a named GP, the main change implied by the studied reform was that all patients, irrespective of their care need, were informed about who they were registered with [16]. Our study focused on patients in a situation in which the presence of a named GP may be more likely to affect downstream care decisions: the time after the onset of a chronic disease. Yet, we found little to suggest that having a named GP helps build continuity.

Previous studies on Finnish survey data shows that patients reporting that they have a named GP are more satisfied with their care [22] and have greater access to care [23]. With self-reported data, these analyses cannot separate the role of having a named GP from the role of continuity at visits, as patients may answer the survey based on their experience of both. Our study was able to isolate registration from continuity of care.

A Norwegian study reported a negative relationship between the duration of the patient-GP relationship and the risk of adverse events and out-of-hours visits [10]. The association cannot be interpreted as a causal effect of the duration, as the decision to stay

registered with the same GP is endogenous. This methodological insight is underlined by our results, which indicate that registration *per se* does not have a large impact on continuity of care or other outcomes.

4.4 Implications for research and/or practice

In our study setting, registration on a GP was not mandated by the healthcare authority. The reasons why some patients were registered on a GP was therefore that i) it was the routine in their primary care practice, ii) it was requested by patient (and accepted by the GP), or iii) a GP or other staff thought that the patient needed special attention, perhaps due to frailty. Our models indicate that all these explanations may be relevant, and that the relationship between registration and continuity at visits is weak after accounting for these factors. This indicates that a mandated policy to register patients on named GPs is neither sufficient nor necessary to realise continuity in modern day primary care. To further establish causality, future research on the development of continuity after chronic disease onset should employ quasi-experimental approaches.

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