



# BMJ Open General practitioners ending their practice and impact on patients' health, healthcare use and mortality: a protocol for national registry cohort studies in Norway, 2008 to 2021

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## ABSTRACT

**Introduction** Continuous general practitioner (GP) and patient relations associate with positive health outcomes. Termination of GP practice is unavoidable, while consequences of final breaks in relations are less explored. We will study how an ended GP relation affects patient's healthcare utilisation and mortality compared with patients with a continuous GP relation.

**Methods and analysis** We link national registries data on individual GP affiliation, sociodemographic characteristics, healthcare use and mortality. From 2008 to 2021, we identify patients whose GP stopped practicing and will compare acute and elective, primary and specialist healthcare use and mortality, with patients whose GP did not stop practicing. We match GP–patient pairs on age and sex (both), immigrant status and education (patients), and number of patients and practice period (GPs). We analyse the outcomes before and after an ended GP–patient relation, using Poisson regression with high-dimensional fixed effects.

**Ethics and dissemination** This study protocol is part of the approved project Improved Decisions with Causal Inference in Health Services Research, 2016/2159/REK Midt (the Regional Committees for Medical and Health Research Ethics) and does not require consent. HUNT Cloud provides secure data storage and computing. We will report using the STROBE guideline for observational case–control studies and publish in peer-reviewed journals, accessible in NTNU Open and present at scientific conferences. To reach a broader audience, we will summarise articles in the project's web page, regular and social media, and disseminate to relevant stakeholders.

## BACKGROUND/NEED FOR RESEARCH

In Norway, healthcare services are largely a public responsibility, where specialised healthcare services are provided by the state and primary care by the municipalities. General practitioners (GPs) are fundamental providers of primary care and are gatekeepers for the specialist services, which overall requires referral.

## STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This study explores changes in outcomes between patients whose general practitioner (GP) did or did not end their practice, a decision assumed unrelated to patient factors.
- ⇒ The study includes the entire Norwegian population and their GPs from 2008 to 2021, linking several mandatory, high-quality, healthcare and demographic registers on a personal level.
- ⇒ The register data contain exact time points for the natural experiment, termination of GP practices and the outcomes, healthcare utilisation and death.
- ⇒ By matching GP–patient pairs in practice period and distinct municipalities, we minimise time-varying confounders and dilution of effects.
- ⇒ As in any observational studies, we cannot rule out residual confounding.

In 2001, Norway initiated the Regular GP Scheme. Under this scheme, every GP has a contract with a municipality that specifies the maximum number of patients that GP can serve, called a 'patient list'. People choose their regular GP, may change GP twice a year and will be assigned to the patient list of their preferred GP in their home municipality, provided the list is not complete. On the contrary, when a GP ends their contract with a municipality, their patient list will be randomly assigned to other GPs with contract and capacity in the same municipality.

The Regular GP Scheme aimed to assure good and equal medical care, anchored the role of gatekeeping and the value of continuity in primary care. The scheme facilitates interpersonal continuity, an ongoing relationship between a patient and one physician, responsible for the patient's overall healthcare.<sup>1</sup> However, most GPs take part in mandatory, out-of-office

public medical tasks, including out-of-hour services, resulting in absence from regular practice. In case patients require medical care when their regular GP is away, informational and 'one medical home' continuity<sup>1</sup> is normally maintained, since most GPs work in group practices sharing electronic journal system, support staff and location and serve each other's patients as required.

In addition to being a core value in primary care, research on GP–patient relation continuity shows associations to positive health outcomes, such as lower mortality<sup>2</sup> and lower specialist healthcare utilisation.<sup>3–6</sup> However, personal continuity is associated with practice and GP characteristics, such as number of GPs,<sup>7</sup> list size<sup>7,8</sup> and perception of continuity,<sup>7</sup> as well as patient's age,<sup>7,8</sup> sex,<sup>7,8</sup> conditions<sup>7,8</sup> and number of contacts.<sup>7</sup> These factors may also affect health outcomes, thus confounding the relationship of GP–patient continuity to health outcomes.

Breaks in continuity is less explored, but impact patient's emotional stress.<sup>9</sup> In Norway, sudden, short-term breaks showed modest changes in healthcare utilisation, with overall less regular GP and increased out-of-hours contacts during the break and a prolonged increase in hospital admissions for ambulatory care sensitive conditions (ACSC) among elderly.<sup>10</sup>

The Regular GP Scheme has been popular, with less than 0.5% of the population opting out.<sup>11</sup> However, the workload for GPs has increased over time, considered partly causing more GPs quitting than recruited. The GP Scheme is currently severely challenged, as one-third of the municipalities do not have any available list capacity and in October 2022, more than 200 000 people lack a regular GP (3.9% of the total population).<sup>12</sup> Patient ombudsman across the country reports patients fearing lack of follow-up<sup>13</sup> and missing a regular GP is shown to threaten basic informational continuity.<sup>14</sup> This amplifies the need for more knowledge on health outcomes related to the definite loss of a regular GP in Norway.

We will add to former studies on GP–patient continuity, using events where original regular GPs end their contract, prompting an ended relation that is not patient-driven, aiming to avoid confounding of continuity. We will use a difference-in-difference design to compare health outcomes and healthcare use among the patients whose GP relation ended to patients with a continuous GP relation. We will further explore these effects for characteristics of the patients, the transition and the municipalities, which may impact the outcomes, such as for patients with assumed complex needs,<sup>15</sup> an abrupt vs gradual ended relation, and between municipalities with varying GP coverage.

## METHODS

### Study period and population

In a planned ending of a GP's contract with a municipality and stopping of GP practice, we assume both GPs and patients may adjust to this, a certain time beforehand. GPs may lower their consultation activity and share the patient lists with another GP. Patients may change

GP before final ending of practice. Therefore, the study period will start some years before the event that a GP ends their practice, based on an investigation of changes in practice and GP–patient continuity over approximately 2 to 4 years prior to ending. Patients will be followed for as long as available registry data permits.

The intervention population is all persons registered as patient list of GPs who stopped practicing, thus being exposed to an ended GP–patient relationship. Some people experienced an ended GP relation several times, and we studied the first episode only.

The non-intervention population is all persons registered as patient list of GPs that did not end their practice, thus exposed to a continuous GP–patient relationship, in the same study period. Some people in the non-intervention population experienced an ended GP relation at another time point, classifying them as intervention population and investigated as such, but not within the same study period that they were identified as part of the non-intervention population.

We matched intervention and non-intervention patients on age, sex, education and immigrant background. Age effects on health vary with chronological age and in matching on age, we facilitate comparing patients with expected similar age effects on health over the study period.

We matched stopping and not stopping GPs on an age span (from 5 years younger to 5 years older if the stopping GP moved, and 10 years younger to equal age if the stopping GP retired), sex and patient list length. The GPs are matched on age and practice period to avoid bias of time trends in medical education and practice, as well as overall societal trends. This also accounts for seasonal variation. We required GPs to not practice in the same municipality, attempting to avoid spillover effects and to facilitate comparison between municipalities.

### Data sources and variables

All citizens in Norway have a personal ID and all authorised medical doctors have a medical ID, which makes it possible to link information from the registers described below.

Statistics Norway (2006–2021) provided information on patients birth year, sex, date for migration or death, as well as patients educational level and immigrant and country background.

The Norwegian GP Register (2006–2021) holds information on patient's GP–affiliation and duration, and the GP's age, sex, specialist status, years of practice, as well as list length, vacant patient places on lists, start and end date, and cause of ended contract. The GP Register also gives information on vacant list contracts and vacant list places in the municipality overall.

The Control and Payment of Health Reimbursement register (KURH, 2006–2021) provides information on patients' ICPC-2 diagnoses, regular and out-of-hour primary healthcare utilisation and identifies the GP consulted.

The Norwegian Patient Register (2008–2021) holds information on patients' ICD-10 diagnoses, specialist healthcare utilisation (elective and acute, outpatient visits and hospital stays, date of admission and discharge).

The Causes of Death Registry (2006–2021) gives information on patients' date and ICD-10 diagnosed cause of death.

### Outcome variables

The main outcomes will be ordinary and out-of-hour primary care visits; elective and acute, outpatient visits and hospitalisation in specialist healthcare; duration of hospital stays, and cause-specific mortality. We will use cause-specific outcomes for particular patient groups, such as hospital stays for ACSC, conditions for which hospitalisation is considered avoidable with proper preventive and early disease management.<sup>16</sup>

### Statistical analysis

We will describe sociodemographic characteristics of patients, GPs and municipalities. We will describe GP–patient continuity for patients by having an appointed, named GP and its duration, as well as cumulative contact with the regular and other GPs. We will describe changes in practice among GPs prior to ending their contract, and for municipalities, describe GP availability at the start of the study period, as well as overall changes during 2006 to 2021.

Between 2009 and 2021, approximately 5000 GPs ended their practice, affecting closer to 5 000 000 list of patients and these pairs will be matched to at least one GP–patient pair not exposed to a break in relation.

In the main analyses, we plan to use Poisson regression with high-dimensional fixed effects in a difference-in-difference design. In general, this design compares changes in outcomes over time between a treated and an untreated group, to estimate the impact of a treatment. The validity of the design requires the counterfactual assumption that if not for the treatment, the outcomes in the treated group would have changed in parallel with the outcomes in the untreated group<sup>17</sup> (chapter 18.1.1).

Here, the treatment is the event that a GP ends their practice. Comparison of changes in outcomes over time between patients affiliated with GPs that ended their practice (treated) to patients whose GPs continued practicing (untreated) estimates the impact of the event of a terminated GP–patient relation on patients' healthcare use and mortality. We match patients and GPs on characteristics expected to impact the outcomes over the study period and we will assess requirements and assumptions for the methods (pre-parallel trends and balance tests based on patient characteristics and prior healthcare use). In sub-studies, we will particularly explore the impact on patients with expected complex healthcare needs based on conditions, social and individual factors. For those with an ended relationship, we will investigate the impact of an abrupt vs gradual ended practice; the

impact of varying GP coverage between municipalities and any time trends over the complete study period.

We will present estimates with 95% CIs, allowing for a nuanced understanding of the precision of our findings.<sup>18</sup>

Register data was updated including information from 2021, in January 2023. Data will be available for analysis in February/March 2023.

### Patient and public involvement statement

This study is part of the project Improved Decisions with Causal Inference in Health Services Research, which collaborates broadly with patient organisations, clinicians in primary and specialist healthcare, and the Central Norway Regional Health Authority, aiming to gain relevant input setting the overall research agenda. The steering group includes patient representatives and meets twice a year, discussing ongoing and planned studies, research questions and outcome measures, interpretation and dissemination of results. The research group further presents ongoing and planned studies in a yearly seminar open to the public.

In this study, expertise from GPs and primary care researchers guided the design of the study and outcome measures, and the steering group has evaluated it of great societal importance (January 2023).

### Ethics and dissemination

The personal data is de-identified to the researchers, and it is not possible to identify individual patients or professionals from the results. Patient consent is not required in this registry study. The Regional Committees for Medical and Health Research Ethics has approved the study, 2016/2159/REK Midt.

We use HUNT Cloud, a scientific infrastructure for data storage and computing, to protect the privacy of data. HUNT Cloud is certified according to international standards for information security (ISO 27001) and quality management (ISO 9001). Four named project employees have access to the data management room including all linked data. Here, data is compiled and prepared for subprojects, such as the one described in this protocol. The prepared data is then transferred to an analysis room, which is available to the main author in addition to the data managers. The data in this project is prepared by KSA and AA.

We will report using the STROBE guideline for observational case–control studies and publish the studies as scientific papers in peer-reviewed journals and disseminate our findings at scientific conferences. Further, the Regular GP Scheme is of broad public interest and the findings are likely to be of interest to administrators and policy makers, as well as clinicians in both primary and specialist healthcare, and other researchers. We aim to present our work to all stakeholders, adapting content and form to the target group.

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**Contributors** KHV was the project manager and drafted the protocol manuscript, while KSA, AA, JHB, FC, BPM, SMN and KP reviewed and revised it critically for important intellectual content and approved the final version for submission. All authors contributed to the research questions and study design. JHB was responsible for data acquisition, and KSA and AA prepared the data for analysis. KHV and AA conducted the statistical analyses. All authors interpreted the results and reviewed, rewrote and approved study articles, while KHV wrote the first drafts. KHV is the guarantor of the protocol.

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**Competing interests** None declared.

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