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Continuity in general practice as a predictor of mortality, acute hospitalization, and use of out-of-hours services: registry-based observational study in Norway

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ABSTRACT

Background Continuity, usually considered a quality aspect of primary care, is under pressure.

Aim To analyse the association between longitudinal continuity with a named regular general practitioner (RGP) and use of out-of-hours (OOH) services, acute hospitalization, and mortality.

Design and setting Registry-based observational study in Norway covering 4 552 978 Norwegians listed with their RGPs.

Method Duration of RGP-patient relationship was used as explanatory variable for the use of OOH services, acute hospitalization, and mortality in 2018. Several patient-related and RGP-related covariates were included in the analyses by individual linking to high-quality national registries. Duration of RGP-patient relationship was categorized as 1, 2–3, 4–5, 6–10, 11–15, and > 15 years. Results are given as adjusted odds ratio (OR) with 95 % confidence interval resulting from multilevel logistic regression analyses.

Results Compared with a one-year RGP-patient relationship the OR for use of OOH services decreased gradually from 0.87 (0.86 – 0.88) after 2 – 3 years duration to 0.70 (0.69 – 0.71) after more than 15 years. OR for acute hospitalization decreased gradually from 0.88 (0.86 – 0.90) after 2 – 3 years duration to 0.72 (0.70 – 0.73) after more than 15 years. OR for dying decreased gradually from 0.92 (0.86 – 0.98) after 2 – 3 years duration to 0.75 (0.70 – 0.80) after an RGP-patient relationship of more than 15 years.

Conclusion Length of RGP-patient relationship is significantly associated with lower use of out-of-hours services, fewer acute hospitalizations, and lower mortality. The associations are dose-dependent and probably causative.

Key words: continuity of care, general practice, family practice, emergency medical services, mortality, Norway

How this fits in

Continuity of care with a general practitioner is generally regarded as an aspect of quality. It is usually measured by visit patterns with different providers over time and is associated with lower mortality rates, fewer hospital admissions, and less use of emergency departments.

This nation-wide study of the Norwegian population shows that longitudinal continuity with a named regular general practitioner is significantly associated with the need for out-of-hours services, acute hospitalizations, and mortality in a dose-dependent way. When longitudinal continuity exceeds 15 years, the probability of these occurrences is reduced by 25 – 30 %.

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INTRODUCTION

Continuity is a core value of primary care. McWhinney described continuity as an implicit contract between a patient and a general practitioner (GP), who then takes personal responsibility for the patient's medical needs.^{1,2} Continuity is not limited by the type of disease and bridges episodes of various illnesses. Greater continuity with a primary care physician has been shown to be associated with lower mortality rates³, fewer hospital admissions,^{4,5} less use of emergency departments,⁶ and less referrals for specialist healthcare.^{7,8} Nevertheless, continuity has been declining during the later years.⁹

There is no uniform agreement about how continuity should be defined, but three aspects are usually described: informational, longitudinal, and interpersonal.¹⁰ Informational continuity means that the doctor has adequate access to all relevant information about the patient. Longitudinal continuity means that it transcends multiple episodes of illness, and interpersonal that there is a trustful relationship between patient and physician. Various methods have been used for measuring continuity. Most of them are based on visit patterns with different providers over time.^{10,11} An example is the Usual Provider of Care (UPC) index which calculates the percentage of all contacts that is with the most frequent provider¹². Most of these studies have been conducted with limited patient samples and rather short observation periods. There is scarce literature on studies with large- or full-scale populations, long follow up, and hard endpoints.

In a limited number of countries, such as the UK, the Netherlands, Denmark or Norway, most inhabitants are listed with a general practice or a named regular general practitioner (RGP) who is responsible for taking care of their medical needs. Such RGP schemes are usually established to increase continuity of care as an assumed aspect of quality, but also to prevent unnecessary spending by introducing the RGP as a gatekeeper. It should, however, be noted that patients also value such personal relationship with their RGP.¹³

The aim of the present study, based on Norwegian registry data, was to analyse, on a national level, the effects of longitudinal RGP continuity associated with use of out-of-hours services, acute hospitalizations, and mortality.

METHOD

The Norwegian Regular General Practitioner Scheme

In Norway, the state is responsible for hospitals, while the primary health care system is the responsibility of the municipalities. In 2018 there were more than 400 municipalities in Norway.

In 2001 a reform called the RGP Scheme, a contractual system based on listing and capitation, was introduced.¹⁴ All inhabitants were invited to choose their own RGP. Those who did not express any preference were assigned to an RGP with available capacity. More than half of the patients

stated that it was most important to keep a GP they already knew. This was especially important for elderly people with poor health.

As it turned out, 87.3 % were assigned to their first choice and the mean list size was 1 175.¹⁴ Only 0.2 % of the inhabitants have decided not to participate in the RGP Scheme.¹⁵ RGPs are gatekeepers, patients cannot self-refer themselves to hospital, an outpatient clinic, or an emergency department. One can change RGP twice a year. When this happens, the medical record will usually be transferred to the new RGP. People residing in nursing homes are still formally registered with their last RGP, even if the medical responsibility is transferred to the attending physician at the nursing home.

Most RGPs work in small group practices of 3 – 6 doctors. However, RGPs also do public medical work in nursing homes, prisons, schools, and maternal and child health centres, and are therefore usually present in their practices three to four days a week. Colleagues usually help each other, seeing patients who cannot or will not wait for their own RGP to be present. Many practices also have interns. Informational continuity is secured since group practices have common electronic patient records.

Out-of-hours (OOH) services are also the responsibility of municipalities. Some municipalities have their own OOH service, others cooperate. In 2018 there were 177 different OOH services in Norway, 75 municipal and 102 intermunicipal cooperatives.¹⁶ OOH services are mainly staffed by RGPs, but other physicians may also participate.

Both RGP practice and OOH services are based on fee for service. As for out-of-pocket expenses, children younger than 16 years pay nothing. Others usually pay 20–30 Euros, depending on the service offered. In addition, doctors always send electronic compensation claims to the Norwegian Health Economics Administration (HELFO). The third component of RGPs income is capitation paid by the municipality, about 50–60 Euros yearly per inhabitant on their list.

Study population and data sources

All Norwegian citizens are given a unique personal identification number (ID-number) at birth. This number is used in various official records and allows for linking such records on an individual level. Foreigners moving to Norway to stay for more than six months are also given an ID-number. Our sample was created by linking information from four nationwide registries by ID-number, allowing us to include several possible confounders in addition to the main variables. The present study is based on data from 2015 to 2018. The following data sources were used:

1. Statistics Norway (SSB)
2. Control and Payment of Reimbursement to Health Service Providers (KUHR)

3. The Norwegian Patient Registry (NPR)
4. The RGP registry

SSB provided demographic data about all inhabitants, such as gender, age, education, centrality, ethnicity, and deaths during 2018. In 2018 the population of Norway was approximately 5.3 million. Highest fulfilled education was categorized as none or elementary, upper secondary, and higher education. Centrality describes a municipality's geographical location in relation to a centre where there are important functions (central functions). It is categorized from 1 (most urban) to 6 (most rural). Ethnicity was categorized in three groups (country of birth):

1. Norway
2. Immigrant from EU, USA, Canada, New Zealand, or Australia
3. Immigrant from rest of Europe, Asia, Africa, or Latin America

The KUHR database is maintained by HELFO and has complete records of all patient contacts with RGPs and OOH services in Norway. For this study we recorded if the person had contacted the OOH services during 2018, defined as having at least one consultation at the OOH clinic or a home visit.

The NPR database contains information about all patient contacts with specialist health care, including hospital admissions. For this study we recorded if the person had been acutely admitted to somatic hospital during 2018. Birth-related admissions were excluded (ICD-10 codes Z37 and Z38).

Morbidity was defined by The Royal College of Surgeons Charlson Score, which is based on 14 groups of ICD-10 codes used in specialist and hospital care (table 1).¹⁷ Any use of the relevant ICD-10 codes during the three preceding years (2015 – 2017), be it outpatient or inpatient, was recorded (also NPR database).

The RGP registry contains information about all RGPs and their listed inhabitants. For this study we recorded the RGP's gender, age, and whether he or she is an approved general practice specialist. We also recorded list size (the number of persons listed with each RGP) and the number of vacant list places for new patients. This is the difference between the maximum number of persons the RGP will accept, and the actual number of persons listed. Finally, we recorded how many years the RGP-patient relationship had lasted: 1 year, 2–3 years, 4–5 years, 6–10 years, 11–15 years, and more than 15 years. These RGP data were recorded at the start of 2018. There were 5 301 036 persons who were assigned to an RGP at this time, but we excluded 748 058 who changed RGP during 2018, leaving 4 552 978 for analysis.

Statistics

We performed three multiple logistic regression analyses with the duration of the RGP-patient relationship as the main explanatory variable. The three dependent variables were use of OOH services (at least one consultation or home visit), hospitalization (at least one acute admission), and death, all in 2018.

The following patient's variables were included as covariates: gender, age (continuous), educational level, country of birth, Charlson score (continuous), centrality, and frequency of RGP visits (continuous). The following RGP's variables were used: gender, age (continuous), general practice specialist or not, list size (continuous), vacant list capacity (continuous). Adjustments were first performed for patient's variables only, thereafter RGP's variables were also added.

Because of the clustered nature of the material (patients clustered by individual RGPs) we analysed the data by multilevel logistic regression.¹⁸ Results are presented as odds ratios (OR) with 95 % confidence intervals. The analyses were carried out by using Stata version 16.

RESULTS

A description of the material according to duration of RGP-patient relationship is given in table 2. Mean age of the 4 708 included RGPs was 47.7 years, 57.8 % were male, and 61.3 % were general practice specialists. Mean list size was 1 113 and mean vacant list capacity was 49.4.

Table 3 shows that there was a consistent and significant trend towards less use of OOH services with increasing duration of the RGP-patient relationship. Compared with a one-year RGP-patient relationship the OR for use of OOH services decreased gradually from 0.87 (0.86 – 0.88) after 2 – 3 years duration to 0.70 (0.69 – 0.71) after more than 15 years. Table 4 shows a similar consistent trend for acute hospital admissions. OR for acute hospitalization decreased gradually from 0.88 (0.86 – 0.90) after 2 – 3 years duration to 0.72 (0.70 – 0.73) after more than 15 years. There was a similar, but somewhat weaker trend for mortality (table 5). OR for dying decreased gradually from 0.92 (0.86 – 0.98) after 2 – 3 years duration to 0.75 (0.70 – 0.80) after an RGP-patient relationship of more than 15 years. Patients' covariates were of larger influence on the results than RGPs' covariates (table 3, table 4, and table 5).

DISCUSSION

Summary

This study provides strong evidence that continuity of care by an RGP is associated with reduced need for out-of-hours services and acute hospitalization and decreased mortality in a dose-dependent way. If the RGP-patient relationship has lasted more than 15 years, the probability of

these occurrences is reduced by 25 – 30 %. This effect was not significantly affected by the personal characteristics of the RGP or their list.

Strengths and limitations

The material is large, nationwide, and more than 4.5 million individuals are included as almost all Norwegians participate in the RGP Scheme.¹⁵ Furthermore, the study covers a long time span with more than 800 000 patients having had the same RGP for more than 15 years. We were able to adjust for many possible confounders by individual linking of high-quality national registries.

We have no information about the use of private health services that operate outside the national health care system. In some of the larger cities there are private outpatient clinics that may serve as an alternative to the public OOH services. Adjusting for the centrality variable may have reduced the importance of this factor. In Norway private hospitals have no role in receiving patients in need of acute admissions.

Although being the most widely used measure of morbidity the Charlson score is far from perfect. One important limitation is that psychiatric conditions are not included in the score. There is a need for a validated morbidity score based on the most important diagnoses occurring in general practice.

Nursing home residents are still formally registered with their RGP although they are cared for by the nursing home's attending physician. This may have diluted the effect of the RGP-patient relationship for this subgroup since nursing home residents will be recorded with an artificially long relationship with their RGP. An opposite bias is also possible for this group since nursing home residents in need of OOH services will not be recorded by HELFO because the nursing home covers all the expenses for their residents. However, nursing home residents constitute a minor group, and we believe this bias is of little importance.

Although the patients are listed with a named RGP of their own choice, it is still possible to see other RGPs. We do not know to what degree this may have happened over the years. Visiting RGPs at other clinics rarely occurs,¹² but if the patient's own RGP is absent the patient may have an encounter with a colleague at the same clinic. The UPC index has been found to be 0.78 in Norway.¹² This is higher than in Israel (0,75), Spain (0,71), England (0.61), Sweden (0.33), or Germany (0.12 – 0.24).^{4 19-22} This is to be expected since the patients have actively chosen their RGP, who on the other hand is legally obliged to provide rapid access.

The investigated associations are complex, and therefore we have adjusted for many possible confounders. Patients' age and morbidity are examples of such confounding variables that may determine use of OOH services, hospitalization, and death. In addition, such variables may have a bearing on the duration of the RGP-patient relationship and thus obscure its effect on the outcome.

Gender, ethnicity, and education level are other variables that may influence health, the use of health services, and mortality. Since there are geographical differences in the use of hospitals and OOH services²³⁻²⁵, we have also adjusted with a rural-urban variable (centrality). It is possible that healthy patients with few visits may have long continuity without the benefit of being well known by their RGP. Therefore, we have included the frequency of visits to the RGP as a patient related adjustment variable.

It is also possible that doctor related factors may influence the outcome. Therefore, we included the RGPs' gender, age, and general practice specialization as adjustment variables. The number of patients listed with the RGP may affect accessibility, and the number of vacant list places may be taken as an indicator of the RGP's popularity and competence. Both these variables were therefore included as adjustment variables.

Comparison with existing literature

In a survey of 133 Norwegian GPs Per Hjortdahl found that it took at least one, and often five years, to create an extensive knowledge base about individual patients.²⁶ In parallel, he found that the duration of the patient-doctor relationship was associated with patient satisfaction, which also could take as much as five years to develop.²⁷ Our study indicates that even much longer relationships may be of additional benefit.

Many previous studies have found an association between continuity of care and lower use of OOH services, emergency departments, and acute admissions. Most of these studies cover a limited time span, and continuity is usually defined by the UPC index or similar measures.^{4-6 22 28-31} We are not aware of any studies comparable to ours, investigating the time span that patients have been formally listed with a named physician.

In the UK patients are usually listed with a general practice, not a named RGP. However, in 2014 an RGP scheme for patients aged 75 and over was tried in 139 practices and evaluated after two years.³² As it turned out, personal continuity did not improve and there was no decrease in acute hospital admissions.

In a survey of 8 068 older Americans, it was found that 55.3 % had a tie to their physician of more than five years, and 35.8 % ten years or more.³³ Longer duration was associated with lower cost and lower risk of hospitalization, but not for use of emergency room. Multivariate analyses, adjusted for sociodemographic and clinical covariates, failed to demonstrate a dose-response relationship between duration of tie and any of the outcomes measured.

Pereira Gray et al. reviewed several studies that reported significantly lower mortality with increasing continuity of care.³ Most of these studies used the UPC index as a measure of continuity. A possible important confounding factor in such studies is increased number of contacts with a specific

physician because of increased morbidity prior to death, described as reverse causality bias. This source of bias is avoided by our longitudinal design, not counting number of contacts. In addition, we recorded morbidity during the three preceding years (2015 – 2017).

One long-term Dutch study followed older adults up to 17 years and found increased mortality among those with low continuity of care.³⁴ However, that study included only 1 712 subjects, and the association was barely statistically significant. Earlier studies of large populations have used aggregated data at practice or primary care trust level. In such studies lower mortality has been found for patients recalling access to their preferred general practitioner.^{35 36}

Implication for healthcare policy and research

When patients can choose their personal RGP, the ground is laid for a lasting relationship. Over the years RGPs may become specialists on their individual patients, rather than on their diseases. This is the essence of personal doctoring, also described by William Osler: “It is much more important to know what sort of a patient has a disease than what sort of a disease a patient has.”³⁷ The World Health Report 2008 also emphasized a stable long-term, personal relationship as a prerequisite for providing patient centred care.³⁸

Longitudinal continuity is not possible without physicians who remain in their practices over time. To promote stability among RGPs should be a priority for health authorities. A recent study from Norway demonstrated that even short breaks in continuity entailed increases in use of OOH services and admissions for ambulatory care sensitive conditions (ACSC).³⁹ More research is needed on what measures may be undertaken to promote stability of RGPs.

The Norwegian RGP Scheme was inspired by similar systems in countries like the United Kingdom, Denmark, and the Netherlands. Although there may be some differences, our results are probably representative for those who have organized primary care in this way. Other countries may be inspired to develop and strengthen general practice in their health care systems. Interpersonal continuity of care should be encouraged.

Declarations

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National Centre for Emergency Primary Health Care, NORCE Norwegian Research Centre AS

Ethical approval

Ethical approval was obtained from the Regional Ethical Committee for Medical and Health Research Ethics, Region West (30.01.2014) (reference number 2013/2344/REK vest) and Norwegian Data Protection Authority (15.09.2014) (reference number 14/0322-9/CGN). The Regional Ethical Committee for Medical and Health Research Ethics, Region West gave permission to use the data without asking the patients for consent. Norwegian Data Protection Authority approved the use of the data for research purposes in this project. The register owners, Statistics Norway and the Norwegian Directorate of Health, approved linkage of registries. The data were pseudoanonymized by third party (Statistics Norway).

Competing interests

The authors declare that they have no competing interests.

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Data from the Norwegian Patient Register has been used in this publication. The interpretation and reporting of these data are the sole responsibility of the authors, and no endorsement by the Norwegian patient register is intended nor should be inferred.

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Table 1: Morbidity was defined by The Royal College of Surgeons Charlson Score, which is based on 14 groups of ICD-10 codes used in specialist and hospital care ¹⁷

Condition	ICD-10 codes
Myocardial infarction	I22-23, I252
Congestive heart failure	I11, I13, I255, I42-43, I50, I517
Peripheral vascular disease	I70-73, I770-I771, K551, K558-559, R02, Z958-959
Cerebrovascular disease	G45-46, I60-69
Dementia	A810, F00-03, F051, G30-31
Chronic pulmonary disease	I26-27, J40-47, J60-67, J684, J701, J703
Rheumatic disease	M05-06, M09, M120, M315, M32-36
Liver disease	B18, I85, I864, I982, K70-71, K721, K729, K76, R162, Z944
Diabetes mellitus	E10-14
Hemiplegia/paraplegia	G114, G81-83
Renal disease	I12-13, N01, N03, N05, N07-08, N171-172, N18-19, N25, Z49, Z940, Z992
Malignancy	C00-26, C30-34, C37-41, C43, C45-58, C60-76, C80-85, C88, C90-97
Metastatic tumours	C77-79
AIDS/HIV	B20-24

Table 2: Description of patients and their RGPs by duration of RGP-patient relationship

	Duration of RGP-patient relationship						Total (n=4 552 978)
	1 year (n=609 577)	2–3 years (n=868 490)	4–5 years (n=647 761)	6–10 years (n=955 974)	11–15 years (n=667 154)	>15 years (n=804 022)	
Patient variables							
Male patients (%)	48.8	50.1	50.8	51.2	52.3	50.7	50.7
Mean age patients (years)	35.1	36.6	38.2	39.8	38.9	56.3	41.1
Higher education (%)	36.2	36.0	35.4	34.6	29.3	31.1	33.5
Norwegian born (%)	78.5	78.6	81.6	84.4	91.2	93.8	84.8
Mean Charlson score (0=min 14=max)	0.15	0.16	0.17	0.17	0.15	0.26	0.18
Mean centrality (1=rural 6=urban)	2.9	2.9	2.7	2.7	2.7	2.7	2.8
Mean number of consultations per year	2.6	2.7	2.8	2.7	2.5	3.1	2.7
RGP variables							
Male RGP (%)	54.4	55.9	56.0	59.8	63.2	72.1	60.5
Mean age RGP (years)	42.3	43.4	45.0	48.2	53.5	59.4	48.8
GP specialist (%)	41.8	45.1	57.9	77.2	86.4	88.1	66.9
Mean list size (number of listed persons)	1 140	1 180	1 215	1 263	1 306	1 340	1 244
Mean vacant list capacity (number of places)	70.1	44.9	26.9	19.8	12.3	8.5	29.1
Patient outcome variables							
Use of OOH services (%)	19.9	18.1	16.5	15.4	15.7	15.2	16.7
Acute hospital admission (%)	6.4	6.1	5.9	5.9	5.6	8.2	6.4
Death (%)	0.7	0.8	0.8	0.8	0.7	1.4	0.9

Table 3: Odds ratio (with 95 % confidence intervals) for having at least one consultation or home visit from OOH services during 2018. Multilevel multiple logistic regression analysis, grouped by RGP

Duration of RGP-patient relationship	Unadjusted		Adjusted for patients' covariates*		Adjusted for patients' and RGPs' covariates**	
	OR	95 % CI	OR	95 % CI	OR	95 % CI
1 year (ref)						
2 – 3 years	0.82	0.82 – 0.83	0.87	0.86 – 0.89	0.87	0.86 – 0.88
4 – 5 years	0.69	0.68 – 0.70	0.80	0.79 – 0.81	0.80	0.78 – 0.81
6 – 10 years	0.61	0.60 – 0.62	0.77	0.76 – 0.78	0.76	0.75 – 0.77
11 – 15 years	0.62	0.61 – 0.62	0.78	0.77 – 0.79	0.77	0.76 – 0.78
> 15 years	0.57	0.56 – 0.58	0.71	0.70 – 0.72	0.70	0.69 – 0.71

*Adjusted for gender, age, educational level, country of birth, Charlson score, centrality, mean number of consultations per year.

**Adjusted for gender, age, educational level, country of birth, Charlson score, centrality, mean number of consultations per year, RGP's gender, RGP's age, general practice specialist, list size, vacant list capacity.

Table 4: Odds ratio (with 95 % confidence intervals) for being acutely admitted to hospital during 2018. Multilevel multiple logistic regression analysis, grouped by RGP

Duration of RGP-patient relationship	Unadjusted		Adjusted for patients' covariates*		Adjusted for patients' and RGP's covariates**	
	OR	95 % CI	OR	95 % CI	OR	95 % CI
1 year (ref)						
2 – 3 years	0.91	0.89 – 0.92	0.89	0.87 – 0.90	0.88	0.86 – 0.90
4 – 5 years	0.89	0.87 – 0.90	0.84	0.82 – 0.86	0.83	0.81 – 0.85
6 – 10 years	0.92	0.90 – 0.93	0.81	0.80 – 0.83	0.80	0.79 – 0.82
11 – 15 years	0.93	0.91 – 0.94	0.81	0.79 – 0.82	0.79	0.77 – 0.81
> 15 years	1.48	1.45 – 1.50	0.74	0.73 – 0.76	0.72	0.70 – 0.73

*Adjusted for gender, age, educational level, country of birth, Charlson score, centrality, mean number of consultations per year.

**Adjusted for gender, age, educational level, country of birth, Charlson score, centrality, mean number of consultations per year, RGP's gender, RGP's age, general practice specialist, list size, vacant list capacity.

Table 5: Odds ratio (with 95 % confidence intervals) for dying during 2018. Multilevel multiple logistic regression analysis, grouped by RGP

Duration of RGP-patient relationship	Unadjusted		Adjusted for patients' covariates*		Adjusted for patients' and RGP's covariates**	
	OR	95 % CI	OR	95 % CI	OR	95 % CI
1 year (ref)						
2 – 3 years	1.12	1.06 – 1.18	0.89	0.83 – 0.94	0.92	0.86 – 0.98
4 – 5 years	1.34	1.26 – 1.42	0.87	0.81 – 0.93	0.90	0.84 – 0.96
6 – 10 years	1.60	1.52 – 1.69	0.83	0.78 – 0.88	0.85	0.80 – 0.91
11 – 15 years	1.66	1.57 – 1.76	0.80	0.74 – 0.85	0.81	0.75 – 0.86
> 15 years	4.03	3.81 – 4.26	0.76	0.72 – 0.81	0.75	0.70 – 0.80

*Adjusted for gender, age, educational level, country of birth, Charlson score, centrality, mean number of consultations per year.

**Adjusted for gender, age, educational level, country of birth, Charlson score, centrality, mean number of consultations per year, RGP's gender, RGP's age, general practice specialist, list size, vacant list capacity

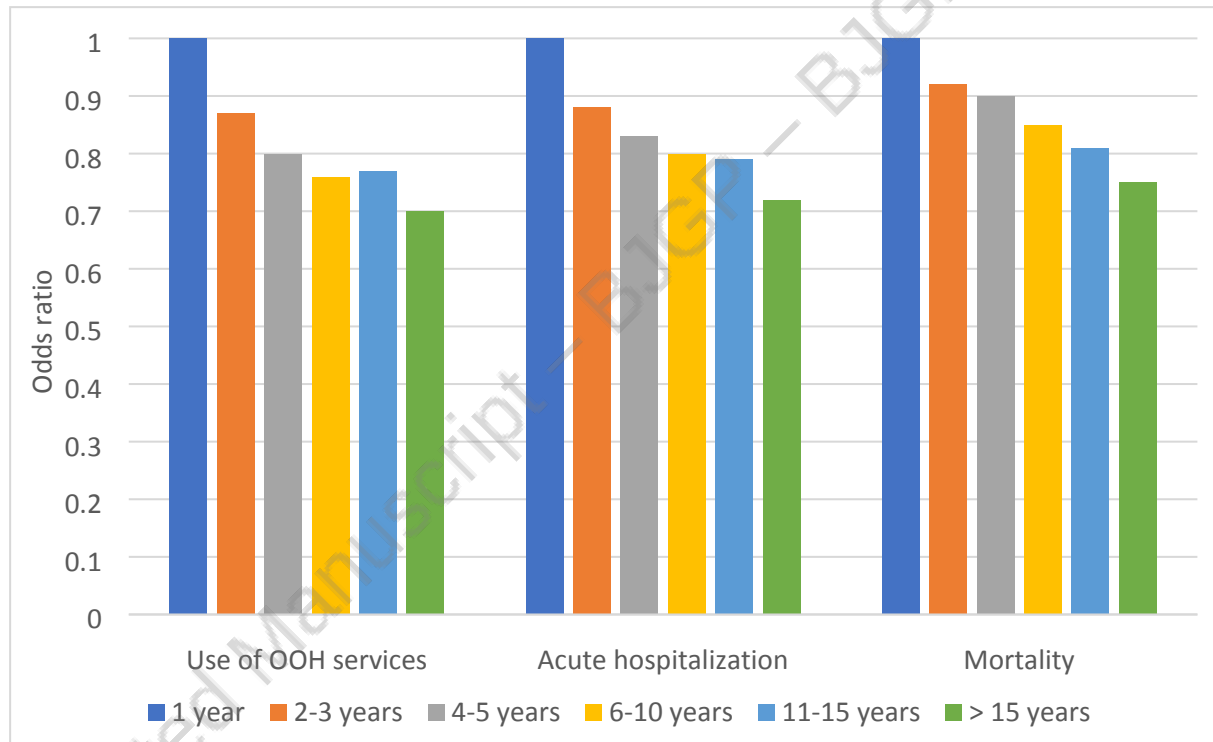


Figure 1: Associations between continuity measured as years with the same regular general practitioner and odds for use of out of hours (OOH) services, acute hospitalization, and mortality during 2018