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RESEARCH ARTICLE

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Association between continuity of care in Swedish primary care and emergency services utilisation: a population-based cross-sectional study

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ABSTRACT

Objective: The primary objective of this study was to determine the association between longitudinal continuity of care (CoC) in Swedish primary care (PC) and emergency services (ES) utilisation.

Study design: A cross-sectional analysis of longitudinal population data. *Setting*. PC centres, out-of-hours PC facilities and emergency departments (EDs) in Blekinge County in southern Sweden.

Subjects: People of all ages who lived in Blekinge County and who had made two or more visits per year to a general practitioner (GP) during office hours from 1 January 2012 to 31 December 2014.

Main outcome measure: ES utilisation.

Results: Eight-thousand one-hundred and eighty-five people were included in the study. CoC was quantified using three different indices—Usual Provider of Care index (UPC), Continuity of Care index (CoCI), and Sequential Continuity index (SECON). The CoC that the PC centres could offer their enrolled patients varied significantly between the different centres, ranging from 0.23–0.57 for UPC, 0.12–0.43 for CoCI, and 0.25–0.52 for SECON. Association between the three CoC indices and ES utilisation was computed as an incidence rate ratio which ranged between 0.50 and 0.59.

Conclusion: Longitudinal CoC was shown to have a negative association with ES utilisation. The association was significant and of a magnitude that implies clinical relevance. Computed incidence rate ratios suggest that patients with the lowest CoC had twice as many ES visits compared to patients with the highest CoC.

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Continuity of patient care; primary health care; health care utilisation; emergency department; health care services; Sweden

Introduction

Continuity of care (CoC) has long been thought to be an essential aspect of high-quality primary care (PC) [1]. CoC refers to a long-term relationship between physician and patient—regardless of the presence of any specific disease—and assumes responsibility for coordinating the quality of care including preventive measures [2–4]. Most definitions consist of at least three components: informational, longitudinal, and interpersonal continuity [3,5,6]. Informational continuity refers to the amount of medical and social information about the patient that is readily available to the health care professional. Longitudinal continuity increases the opportunity for a meaningful relationship between patient and provider to develop. Interpersonal continuity means that knowledge, trust, and respect get a chance to develop between the patient and the health provider, which over time allows for better interaction and communication [3,7].

Several different methods of quantifying longitudinal CoC exist and there is no consensus regarding which method gives the most accurate result. In a review article by Jee and Cabana from 2006, 44 studies focusing on longitudinal CoC were reviewed and 32 different ways of quantifying continuity were identified [4]. Additionally, four different aspects of longitudinal CoC have been identified: duration, density, dispersion, and sequence [3,8,9]. Usually one index only describes one or two aspects of longitudinal continuity but when combined, a more complete picture of continuity can be obtained [10–12].

CoC has been reported to be positively associated with health care outcomes in PC settings. In a review by Saultz and Lochner from 2005, 40 studies focusing on CoC and health outcomes were reviewed. A

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significant positive association was found in 35 of these studies and only two studies reported a negative association [13]. Furthermore, studies on the general population, regardless of the presence of particular disease, have shown higher longitudinal CoC to be associated with fewer emergency department (ED) visits [14–16]. Higher CoC has also been shown to be associated with a reduced number of ED visits in specific population groups, such as elderly [14], children under one year [17] and in patients with specific chronic illness such as chronic obstructive pulmonary disease [18,19] and heart failure [19].

PC in Sweden is staffed by general practitioners (GPs) at PC centres during office hours. In addition, out-of-hours (OOH) PC facilities (in Swedish *jourläkarcentraler*) are open evenings and weekends for the purpose of PC emergency services (ES). The OOH PC facilities are staffed by GPs on duty. Swedish PC centres typically house several GPs and practices vary between centres as to whether the enrolled patients are assigned a certain practitioner or not. In contrast to the growing evidence of the importance of CoC in PC, CoC remains hard to obtain in the Swedish PC system. Current legislation states that, if needed, the PC patient should be listed with a health worker (not necessarily a doctor) in order to satisfy any need of reassurance, coordination, and continuity [20]. In a recent report by the Swedish National Audit Office, it is concluded that conditions required in order to live up to these legislative demands are often lacking outside the bigger cities—regions where the care need in general is more pronounced [21].

To our knowledge, the effect of CoC on health care utilisation in Sweden has never previously been assessed. The purpose of this study was to describe the longitudinal CoC and to investigate the association between three different CoC indices and ES utilisation in a Swedish PC setting.

Material and methods

Setting and subjects

The study was designed as a cross-sectional analysis of longitudinal data and the study population comprised people of all ages who lived in Blekinge County in southern Sweden (~150,000 inhabitants) and who had made two or more visits per year to a GP during office hours from 1 January 2012 to 31 December 2014. Thus, six visits to a GP during office hours during the 3-year study period was the minimum number of visits in order for a patient to be included. Data from Blekinge County Council electronic patient medical records were retrieved and analysed. Public PC in Blekinge County is organised into 13 PC centres and two OOH PC facilities. Visits to GPs at private PC centres were not included for practical reasons. Patients who changed their enrolment to a private PC centre were excluded. Team visits where more than one doctor was present were excluded. Some PC centres provide visits to gynecologists, pediatricians or "on call" doctors who provide short 5–10-min consultations for medically less severe but urgent matters—these visits were all excluded.

Covariates

Data include the following variables: PC enrolment, age, gender, number of chronic diagnoses, number of visits to GPs during office hours, and a sequence describing the visits to GPs during office hours (the same or different). Only chronic diagnoses given by GPs and deemed as relevant for this purpose were included. Diagnoses were deemed as relevant from a PC perspective and with regard to their risk of causing an exacerbation or giving rise to other medical complications which would potentially need acute medical attention (Appendix 1). Chronic diagnoses need to be updated within a 2-year interval so as not to fall out of the electronic medical record.

CoC measures

In order to make a comprehensive evaluation, it was desirable to include all four aspects of CoC. Hence a combination of three different previously validated continuity measures was used: Usual Provider of Care index (UPC) describing the density aspect, Continuity of Care Index (CoCI) mainly describing the dispersion aspect, and Sequential Continuity index (SECON) describing the sequence aspect. The study period is three years, thus taking the aspect of duration into consideration. Detailed information about the specific indices can be found elsewhere [8,9]. All three indices vary from zero to one, a higher number corresponding to a higher CoC.

Outcome measure

ES utilisation was used as the outcome measure, including the utilisation of GPs OOH and EDs (both somatic and psychiatric).

Statistical analysis

To analyse differences in health care utilisation and differences in CoC between men and women,

Wilcoxon rank-sum test was used. For the other subgroups (age, number of chronic diagnoses, and number of visits to GPs during office hours) Kruskal–Wallis rank test was used. Differences in CoC between the enrolees of the different PC centres were analysed with Kruskal–Wallis rank test. Due to over-dispersion of the outcome variable the association between CoC and ES utilisation was analysed by negative binominal regression (NBR). Statistical significance was determined at the 0.05 level. Statistical computations were performed using Stata software (version 14, StataCorp LP, College Station, TX).

Results

During the study period, 406,541 visits were made to GPs during office hours, 35,026 visits were made to GPs OOH, and 124,315 visits were made to a doctor at the ED. 8,185 patients made at least two visits to a GP during office hours per year in 2012, 2013, and 2014, and were therefore included in the study. 347 patients changed their enrolment from one public PC centre to another during the study period, and 14 patients made two enrolment changes. Of 34,552 patients who made two or more visits to a GP during office hours in 2012, 2013, or 2014, 1189 died. Hence, the drop-out due to death did not exceed 3.4%.

More women (63%) than men (37%) met the requirements for inclusion. The age distribution was negatively skewed and with a median age of 63 years. The number of chronic diagnoses varied between zero and ten, and the median value was one. The maximum number of visits to GPs during office hours was 78 and the median was ten (Table 1).

Women tended to visit GPs more often than men. In contrast, men had a higher number of ED visits. With increased age, the number of visits to EDs and the number of visits to GPs during office hours increased while the number of visits to GPs OOH decreased. Also, with increased number of chronic diagnoses, the number of visits to GPs during office hours and EDs increased (Table 2).

The distributions of the three continuity indices were all positively skewed. Recorded medians for UPC, CoCI, and SECON were 0.33, 0.18, and 0.33 respectively. Differences in CoC between women and men were small and only significant for SECON. Differences in CoC with increasing number visits to GPs during office hours were marginal. In contrast, increasing age as well as an increasing number of chronic diagnoses was accompanied by a distinct increase in CoC (Table 3).

The CoC that the PC centres could offer their enrolled patients varied significantly between the different centres. In 2012, the difference between the PC centre with the highest median CoC of its enrolled

Table 1. Characteristics of the study population.

Subgroup	Number of participants (% of study population)
Total	8185
Gender	
Male	2993 (37)
Female	5192 (63)
Age (1 January 2012)	
<18 years	589 (7)
18–64 years	3785 (46)
≥65 years	3811 (47)
Number of chronic diagnoses	
0	1965 (24)
1	2406 (29)
2	1875 (23)
≥3	1939 (24)
Number of visits to GPs during office hours	
6–7	1345 (16)
8–9	2049 (25)
10–11	1591 (19)
≥12	3200 (39)

Table 2. Median, 5th and 95th percentile of the number of visits to GPs during office hours, GPs OOH, and ED, divided into subgroups of gender, age, and number of chronic diagnoses.

Subgroup	Median number of visits to GPs during office hours (P_5–P_{95})	Median number of visits to GPs OOH (P_5–P_{95})	Median number of visits to EDs (P_5–P_{95})
Total	10 (6–21)	0 (0–2)	1 (0–8)
Gender	*	*	*
Male	10 (6–19)	0 (0–2)	1 (0–9)
Female	11 (6–22)	0 (0–2)	1 (0–8)
Age	*	*	*
<18 years	9 (6–16)	1 (0–5)	0 (0–4)
18–64 years	10 (6–22)	0 (0–2)	1 (0–7)
≥65 years	10 (6–21)	0 (0–1)	1 (0–9)
Number of chronic diagnoses	*	*	*
0	9 (6–17)	0 (0–3)	1 (0–6)
1	10 (6–19)	0 (0–2)	1 (0–7)
2	11 (7–21)	0 (0–2)	1 (0–8)
≥3	12 (7–26)	0 (0–2)	2 (0–11)

*$p < .05$.

Table 3. Median, 5th and 95th percentile of three different continuity indices (UPC, CoCI and SECON) divided into subgroups of gender, age, number of chronic diagnoses, and number of visits to GPs during office hours.

Subgroup	UPC median (P_5–P_{95})	CoCI median (P_5–P_{95})	SECON median (P_5–P_{95})
Total	0.33 (0.09–0.83)	0.18 (0.03–0.71)	0.33 (0.00–0.80)
Gender			*
Male	0.33 (0.10–0.85)	0.18 (0.03–0.74)	0.33 (0.00–0.80)
Female	0.33 (0.09–0.83)	0.17 (0.03–0.71)	0.33 (0.00–0.79)
Age	*	*	*
<18 years	0.17 (0.00–0.50)	0.07 (0.00–0.29)	0.17 (0.00–0.50)
18–64 years	0.29 (0.08–0.80)	0.14 (0.02–0.67)	0.30 (0.00–0.75)
≥65 years	0.40 (0.13–0.88)	0.23 (0.05–0.78)	0.40 (0.08–0.83)
Number of chronic diagnoses	*	*	*
0	0.23 (0.00–0.75)	0.11 (0.00–0.58)	0.23 (0.00–0.67)
1	0.33 (0.09–0.83)	0.17 (0.03–0.71)	0.33 (0.00–0.80)
2	0.38 (0.11–0.88)	0.20 (0.04–0.78)	0.38 (0.00–0.83)
≥3	0.40 (0.13–0.87)	0.23 (0.05–0.76)	0.40 (0.10–0.83)
Number of visits to GPs during office hours	*	*	*
6–7	0.33 (0.00–0.83)	0.14 (0.00–0.71)	0.33 (0.00–0.83)
8–9	0.29 (0.13–0.86)	0.17 (0.03–0.75)	0.29 (0.00–0.86)
10–11	0.33 (0.10–0.80)	0.18 (0.04–0.65)	0.33 (0.00–0.78)
≥12	0.33 (0.09–0.82)	0.18 (0.04–0.70)	0.36 (0.08–0.75)

*$p < .05$.

Table 4. Factors associated with the number of visits to ES using NBR. Regressions are carried out separately for UPC, COCI, and SECON.

Variables	Regression coefficient	p value (95% confidence interval)
UPC	−0.55	0.00 (−0.67 to −0.43)
Gender	0.18	0.00 (0.13 to 0.24)
Age	−0.00050	0.48 (−0.0019 to 0.00087)
Number of chronic diagnoses	0.099	0.00 (0.078 to 0.12)
Number of visits to GPs during office hours	0.065	0.00 (0.060 to 0.070)
PC centre enrolment 2012	−0.0047	0.22 (−0.012 to 0.0027)
CoCI	−0.60	0.00 (−0.73 to −0.47)
Gender	0.18	0.00 (0.13 to 0.24)
Age	−0.00064	0.35 (−0.0020 to 0.00071)
Number of chronic diagnoses	0.10	0.00 (0.077 to 0.12)
Number of visits to GPs during office hours	0.064	0.00 (0.059 to 0.069)
PC centre enrolment 2012	−0.0046	0.22 (−0.012 to 0.0028)
SECON	−0.70	0.00 (−0.82 to −0.58)
Gender	0.19	0.00 (0.14 to 0.25)
Age	−0.00031	0.65 (−0.0017 to 0.0010)
Number of chronic diagnoses	0.10	0.00 (0.080 to 0.12)
Number of visits to GPs during office hours	0.067	0.00 (0.062 to 0.072)
PC centre enrolment 2012	−0.0036	0.34 (−0.011 to 0.0038)

patients and the centre with the lowest median CoC was 0.23–0.57 for UPC, 0.12–0.43 for CoCI, and 0.25–0.52 for SECON (data not shown).

Association between CoC and ES utilisation was analysed by NBR. For a one unit change in the predictor variable, the regression coefficient shows the difference in the logs of expected counts of the response variable, given the other predictor variables in the model are held constant. Calculated regression coefficients for UPC, CoCI, and SECON were all negative values, determining a negative association between CoC and ES utilisation. Comparing the values of the regression coefficients, the indices for CoC had higher absolute values than the other predictor variables (Table 4). By taking the AntiLog of the regression coefficients produced by the NBR, incidence rate ratios were calculated for each continuity index. Incidence rate ratios for UPC, CoCI, and SECON were recorded to 0.59, 0.56, and 0.50 respectively. The incidence rate ratios were adjusted for age, gender, number of chronic diagnoses, number of visits to GPs during office hours, enrolment, and the number of enrolment changes during the study period.

Discussion

In this study, longitudinal CoC in Swedish PC is shown to have a negative association with ES utilisation. The association is shown to be statistically significant, and computed incidence rate ratios suggest a clinically relevant association. Here, the incidence rate ratios suggest that patients with the lowest CoC had twice as many ES visits compared to patients with the highest CoC. The results of this study are thereby

consistent with previously published data from non-Swedish health care systems [11,13,15,22,23], although comparisons with foreign health care systems should be interpreted with caution since the organisation of health care varies between countries.

Recorded CoC indices in this study were relatively low (median UPC recorded at 0.33) compared to previously recorded values in PC settings in other non-Swedish studies. In Norway mean UPC values have been recorded at 0.78 [24] and in England between 0.50 and 0.68 [25]. A reason for this difference could be a relatively higher number of GPs in Norway and England as compared to Blekinge County. Maintaining high CoC becomes organisationally more challenging as the available workforce decreases. On average in 2014 there were 1970 patients per GP (excluding junior doctors and doctors under training) in Blekinge County. In 2015 the same figure was estimated to 1128 in Norway [26] and in 2012 the number was 1569 in England [27]. The high CoC in Norwegian PC is likely in part also due to a "personal list" system giving every patient the right to choose a personal GP. CoC is not financially incentivised in any of these three health care systems. The absence of local, regional or national policies regarding CoC and a relatively understaffed workforce of GPs in combination with current focus on accessibility in Swedish PC could all be contributing factors to the low CoC recorded in this study.

As shown by annual reports from the Swedish National Board of Health and Welfare, patient flow to Swedish EDs has been steadily increasing since 2010. The increased influx of non-acutely ill patients has been identified as a major contributing factor to this trend [28]. Knowing that patients especially value CoC for health care issues perceived as more severe [29], the low CoC in Swedish PC might be a contributing factor to the increased influx of non-acutely ill patients to EDs. The results of this study provide further evidence in support of this theory.

The current study has several limitations. A potential source of selection bias could be that this study only obtained data from publicly funded PC centres, and patients who changed enrolment to privately funded PC centres during the study period were excluded. Swedish public health insurance does not distinguish between enrolment with public or private PC centres and patients receive the same benefits regardless of their enrolment. Differences between these patient populations are therefore unlikely. Even if the patient populations varied between private and public PC centres, selection bias due to changes in enrolment is unlikely since changes in enrolment are rare. 4.2% of the study population changed enrolment from a public to another public PC centre. There is no reason to believe that such changes are more frequent between public and private PC centres; most likely the percentage is lower since the number of private PC centres in the region is more limited (6 private and 13 public PC centres) [30].

When interpreting the results showing association between CoC and ES utilisation, it is important to note that due to the design of this study, conclusions regarding causality cannot be drawn. Since this study is a cross-sectional analysis, reverse causality bias cannot be excluded. It is likely that lower CoC affects the quality of care in a negative manner, but other possible explanations do exist. For example, for an acutely ill patient to book an appointment at short notice to the GP he or she visited previously is organisationally more challenging than to make an appointment with the first available GP. Another example of this organisational challenge is how a recently discharged patient is planned for a short-notice check-up with the GP. The acute illness can therefore be a factor that affects both CoC and emergency care utilisation. In order to better understand causal relationships, further investigations are needed—something that should be of high priority especially considering the implications for individual patients as well as from a health economics perspective.

In conclusion, this cross-sectional analysis uses three different indices to show that longitudinal CoC in PC in Blekinge County is negatively associated with ES utilisation. The association is statistically significant and of such magnitude that clinical relevance can be assumed. Conclusions regarding causality cannot be made in this study, but viewing the current results in the light of previous international studies, the assumption can be made that CoC plays an important role for the quality of care in Swedish PC. Additional studies are needed to further describe these implications.

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Notes on contributor

Hannes Kohnke is a MD doing his postgraduate training in Blekinge County in southern Sweden to become a general practitioner. With a special interest in continuity of care he is involved in projects regarding the advancement of the quality of care in the region.

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Appendix 1

List of chronic diagnoses as denoted by ICD-10

1) Diabetes Mellitus type 2	
E11	Type 2 diabetes mellitus
2) Dementia	
F00	Alzheimer's dementia
F01	Vascular dementia
G30	Alzheimer's disease
F03	Unspecified dementia
3) Depression and anxiety disorders	
F32	Depressive disorder, single episode
F33	Depressive disorder, recurrent
F34	Chronic affective disorders
F41	Other anxiety disorders
F438A	Other reactions to severe stress
4) Hypertension	
I10	Essential hypertension
I11	Hypertensive heart disease with heart failure
I12	Hypertensive chronic kidney disease
I13	Hypertensive heart and chronic kidney disease
5) Chronic ischemic heart disease	
I25	Atherosclerotic heart disease
6) Heart arrhythmias	
I48	Atrial fibrillation
7) Heart failure	
I50	Heart failure
8) Chronic lung diseases	
J44	Chronic obstructive pulmonary disease (COPD)
J41	Simple chronic bronchitis
J42	Unspecified chronic bronchitis
J43	Unspecified emphysema
J45	Asthma
9) Degenerative joint and back diseases	
M15	Primary degenerative osteoarthritis
M16	Unspecified primary hip osteoarthritis
M17	Unspecified primary knee osteoarthritis
M47	Site unspecified spondylosis
M543	Unspecified sciatica
M544	Low back pain with sciatica
10) Osteoporosis	
M80	Age-related osteoporosis with current pathological fracture
M81	Age-related osteoporosis without current pathological fracture