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Impact of the abolition of copayments on the GP-centred coordination of care in Bavaria, Germany: analysis of routinely collected claims data

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ABSTRACT

Objectives In 2012, Germany abolished copayment for consultations in ambulatory care. This study investigated the effect of the abolition on general practitioner (GP)-centred coordination of care. We assessed how the proportion of patients with coordinated specialist care changed over time when copayment to all specialist services were removed. Furthermore, we studied how the number of ambulatory emergency cases and apparent 'doctor shopping' changed after the abolition.

Design A retrospective routine data analysis of the Bavarian Association of Statutory Health Insurance Physicians, comparing the years 2011 and 2012 (with copayment), with the period from 2013 to 2016 (without copayment). Therefore, time series analyses covering 24 quarters were performed.

Setting Primary care in Bavaria, Germany.

Participants All statutorily insured patients in Bavaria, aged ≥18 years, with at least one ambulatory specialist contact between 2011 and 2016.

Primary and secondary outcome measures Primary outcome was the percentage of patients with GP-coordinated care (every regular specialist consultation within a quarter was preceded by a GP referral). Secondary outcomes were the number of ambulatory emergency cases and apparent 'doctor shopping'.

Results After the abolition, the proportion of coordinated patients decreased from 49.6% (2011) to 15.5% (2016). Overall, younger patients and those living in areas with lower levels of deprivation showed the lowest proportions of coordination, which further decreased after abolition. Additionally, there were concomitant increases in the number of ambulatory emergency contacts and to a lesser extent in the number of patients with apparent 'doctor shopping'.

Conclusions The abolition of copayment in Germany was associated with a substantial decrease in GP coordination of specialist care. This suggests that the copayment was a partly effective tool to support coordinated care. Future studies are required to investigate how the gatekeeping function of GPs in Germany can best be strengthened while minimising the associated administrative overhead.

Strengths and limitations of this study

► Containing patients from all statutory health insurances, the results have a high generalisability.
► This study uniquely observes a 6-year period immediately before and after the abolition of the German copayment.
► A limitation is that referrals do not represent an active coordination in every case.
► No direct conclusion can be drawn concerning the quality of care.

INTRODUCTION

Medical progress and demographic change are leading to increased demand for health services. Although the beneficial impact of modern medicine on health outcomes is obvious, it is suspected that low coordination of care could harm patients. For example, Fenton *et al* have demonstrated that discretionary care corresponds to higher drug prescription expenditures and mortality.[1] One potential way to increase the effectiveness of the healthcare system could be to strengthen patient coordination, for example, by general practitioners (GPs). A number of studies have shown that strong primary care has the potential to promote better health outcomes, especially for chronic diseases, to reduce mortality, and finally can lower healthcare costs.[2–6] This might be due to the continuity and coordination of care provided by GPs, which also leads to a better and more equitable access to health services and to a reduction of unnecessary examinations.[4 7]

Patient coordination can be achieved in several ways, such as gatekeeping systems, the introduction of copayments, provision of patient information or through discharge management.[8–11] Germany has a relatively weak primary care system with respect to the coordination of care.[7] This is challenging

because GPs and specialists are both working in licensed private practices in ambulatory care. The specialists comprise mainly dermatologists, ear, nose and throat (ENT) specialists, gynaecologists, internists with and without specialisation (eg, cardiology, gastroenterology, pulmonology and oncology), neurologists, ophthalmologists, orthopaedics, psychiatrists, psychotherapists (both physician and non-physician), radiologists, surgeons and urologists. Internists without specialisation are licensed as GPs.

Germany has a very high physician contact rate, with an average of 14.7 practice contacts annually (2016).[12] To strengthen the coordination function of the GP and simultaneously reduce the rate of unnecessary contacts, a copayment was introduced in 2004.[13] In each quarter patients had to pay a €10 fee for the first ambulatory consultation made without referral, payable to the practice directly. Usually, these referrals are performed by GPs, but patients could also consult a specialist for initial contact. Once the first copayment in a quarter had been made, the patient could avoid further payment when consulting other practices if these were made on referral.

In November 2012, the German Federal Parliament ('Bundestag') voted unanimously to remove the copayment effective 1 January 2013, as the influence on the number of physician visits was considered too low in relation to the high bureaucratic efforts.[14] This was reported widely by German news media, both at the time of the decision and at the beginning of 2013.

The aim of the present study was to investigate the effect of abolishing the copayment for ambulatory consultations on the coordination of specialist care in Bavaria, the largest German federal state by area and the second most populous.[15]

METHODS
Study design
The investigation was performed as a retrospective routine data analysis. We conducted an ecological study with time series analyses of anonymous claims data. The data were provided by the Bavarian Association of Statutory Health Insurance Physicians (*Kassenärztliche Vereinigung Bayerns*, KVB) comparing the years 2011 and 2012, under the influence of the copayment, with the period from 2013 to 2016, following the abolition of the copayment. As the KVB data are recorded quarterly, the investigation period is divided into 24 quarters (8 before and 16 after the abolition of copayment), representing 24 successive sections that were each analysed in a cross-sectional way.

Population and sources of data
Situated in the south of Germany, Bavaria is the largest German federal state by area and with 13 million inhabitants the second most populous.[15] The KVB is the statutory organisation responsible for ambulatory physicians in Bavaria and is thus the primary source for such

administrative routine data. The data have been used extensively for health services and medical research.[16–20] They cover all statutorily insured outpatients in the German federal state of Bavaria, which corresponds to approximately 85% of the Bavarian population whereas 15% of patients are privately insured, mostly civil servants and people with an income higher than €56 250 per year (2016). Furthermore, we only included patients aged ≥18 years, as children are mainly coordinated by paediatricians, and patients with residential address in Bavaria. Thus, the study population does not contain the entire Bavarian population.

The patient-level data are submitted by approximately 9000 GPs, 13 000 specialists in outpatient care, and 4000 psychotherapists for the purpose of remuneration. They detail the diagnostic and therapeutic procedures claimed along with the corresponding medical diagnoses, recorded on a quarterly basis using the German modification of the ICD-10 classification (International Classification of Diseases, 10th Revision). Claims comprise an episode-based payment for each patient, which is documented quarterly, including diagnoses and medical procedures, supplemented by additional claims for time-consuming or technical services (eg, chronic disease management, lung function testing or emergency visits). One treatment episode, in the following denoted as a 'case', is defined in the German statutory health system as the consultation of a single practice within a 3-month period (quarter). If a patient consults the same practice for different reasons within the quarterly period, both contacts are merged for administrative purposes to form a single case.

The Bavarian Index of Multiple Deprivation (BIMD) 2010, subdivided into quintiles, was used to account for socioeconomic area deprivation at the district level.[21] This index is based on an established British method for Indices of Multiple Deprivation[22] and combines official sociodemographic, socioeconomic and environmental data, divided into seven domains of deprivation.[21]

Diagnoses were aggregated using the KM87a_2015 grouper.[23] This grouper was developed in the United States and modified for the healthcare system by an official organ of the German Ministry of Health, the Institute for Strategic Assessment of Reimbursement for Medical Services (German: *Institut des Bewertungsausschusses*, InBA), in order to measure morbidity within the German ambulatory system. The grouper specifies 72 aggregated medical condition categories, in order to provide a convenient and cost-based system for the analysis of the complex ICD-10 diagnoses. Specifically, the number of condition categories was used as a proxy for morbidity.

Definition of coordinated care
Similar to previous analyses, a patient was defined as 'coordinated' if every regular specialist consultation within a quarter was conducted on referral from a GP (coordinated patients, CP).[16 17] Patients consulting at least one specialist within a quarter without a referral were classified as uncoordinated (uncoordinated patients, UP).

The referral status is present in the claims submitted by the receiving physician. In addition, following previous studies we defined a regular specialist consultation as one in which a referral from a GP can be expected under a GP-centred system. Therefore, specialists billing for emergency treatment, pregnancy care or routine screening (eg, mammography) were excluded. Similarly, consultations with radiologists, anaesthetists, surgeons, nuclear physicians and dialysis centres were not considered when determining the status of GP coordination, as these often occur on referral from a specialist. These patients were classified as 'not relevant for coordinated care'. Additionally, patients who consulted only a GP within a quarter were classified as 'GP care only'.

Outcomes

Of primary interest was the percentage of patients with GP-coordinated care and specifically, how this changed after the abolition of the copayment. In addition to the quarterly coordination status, we assessed the within-patient consistency of this measure over the course of each year.

As secondary outcome measures, the developments in the number of ambulatory emergency cases and apparent 'doctor shopping' were analysed, again with respect to the abolition of the copayment. Ambulatory emergencies include both out-of-hours services and emergency care not leading to a hospital admission. We included ambulatory emergency visits, as they represent alternative patient pathways that patients can freely choose, but which are not necessarily desirable from a health policy perspective. In this case, the abolition may also have had an effect, as the copayment also has to be for ambulatory emergency services. In keeping with previous studies, apparent 'doctor shopping' was defined as the regular consultation (as defined for coordination of care) of two or more practices from the same specialism within a quarterly period. We focused only on those specialist groups in which more than 2.5% of patients consult multiple physicians in the same quarter.

Statistical analysis

To visualise the potential effect of the abolition of the consultation fee on specialist contacts in 2012, a descriptive analysis of the patient population was conducted in tabular form differentiated by age, sex and morbidity. Time series are presented in graphical form on a quarterly basis. Graphical analysis of specialist utilisation was performed, accounting for area-level deprivation and age. We aggregated the claims data to generate time series for the proportion of coordinated and UP over a 6-year period, of which 2 years were under the influence of the copayment and 4 years were without copayment.

In order to analyse the impact of the abolition of the copayment on ambulatory emergency care, we had to operationalise the consistency in coordination status during the course of a year. Therefore, patients were divided into three subgroups: (1) patients with a GP referral for each specialist visit in each quarter of a specific year ('always coordinated'), (2) patients for whom all specialist contacts occurred without GP referral ('always uncoordinated') and (3) patients whose coordination status was inconsistent over the course of a specific year ('partially coordinated'). A complementary perspective was obtained by stratifying coordination by the number of ambulatory emergency contacts (0, 1, 2 or ≥3 contacts annually).

The effect of the abolition on emergency cases and apparent 'doctor shopping' was quantified by means of interrupted time series regression models without adjustment for autocorrelation.[24] This method facilitates a simple decomposition of the time series into effects for the long-term trend (slope) and abolition of the copayment ('step' at the time of abolition). As emergency cases vary considerably by quarter and depend on the timing of holidays (eg, Easter), we aggregate this outcome by year in the main manuscript to provide a more interpretable measure. A graphical presentation of all quarters can be found in the appendix (online supplementary figure 1).

Data protection

The research project was performed in accordance with the German guideline 'Good Practice for Secondary Data Analysis' (German: *Gute Praxis Sekundärdatenanalyse*).[25] Data were anonymous and an approval was obtained from the data protection officer of the Bavarian Association of Statutory Health Insurance Physicians.

Patient and public involvement

Patients were not involved in setting the research question, in the outcome measures, in the design, or in the implementation of the study. No patients were asked for advise on interpretation or writing up of results. There are no plans to disseminate the results of the research to study participants or the relevant patient community, which is due to the nature of the cohort study using secondary data.

RESULTS

Baseline data of the study population are presented in table 1. In order to reduce the length of this table and highlight long-term trends, we report data from the first quarter of each year (all quarters are presented in online supplementary table 1). At the beginning of the investigation period (quarter 1/2011), 6 235 739 patients in Bavaria had at least one physician contact. Until 2016, this number increased up to 6 856 489 patients.

Coordination of specialist visits

Of all patients with specialist contacts in 1/2011 (3 401 779), 1 685 655 (49.6%) patients were GP-coordinated patients and 1 716 124 (50.4%) uncoordinated (UPs) (table 1). In the first quarter after the abolition of the copayment (quarter 1/2013; 3 510 724 specialist contacts), the number of CPs was 883 894 (25.2%) whereas the

Table 1 Patient characteristics, classified according to coordination status (only the first quarter of respective years)

Quarter	Coordination status	Patients, n (%)	Cases per patient Mean	Age Mean	SD	Sex: female (%)	With chronic illness (%)	With mental illness (%)	Number of medical condition categories Mean
1/2011	Coordinated care	1 685 655 (27.0)	3.8	57.4	17.7	59.2	86.5	43.1	8.9
	Uncoordinated care	1 716 124 (27.5)	3.7	51.4	18.5	59.2	70.1	39.2	7.6
	GP care only	1 649 237 (26.5)	1.1	49.0	19.9	49.3	64.4	25.6	5.4
	Not relevant for coordinated care	1 184 723 (19.0)	2.6	48.2	19.9	71.1	61.9	29.0	6.1
	Total	6 235 739							
1/2012	Coordinated care	1 641 263 (26.2)	3.9	57.8	17.7	59.0	86.7	43.7	8.9
	Uncoordinated care	1 811 769 (28.9)	3.8	51.5	18.5	58.8	70.1	39.6	7.6
	GP care only	1 623 530 (25.9)	1.1	49.1	19.9	49.2	64.2	26.1	5.4
	Not relevant for coordinated care	1 196 061 (19.1)	2.7	48.3	20.0	71.3	62.1	29.5	6.1
	Total	6 272 623							
1/2013	Coordinated care	883 894 (13.5)	3.8	59.6	17.1	55.5	88.1	42.1	9.1
	Uncoordinated care	2 626 830 (40.2)	3.7	52.7	18.5	59.6	73.7	41.6	8.0
	GP care only	1 786 331 (27.3)	1.1	48.9	19.6	48.5	63.2	25.6	5.3
	Not relevant for coordinated care	1 245 184 (19.0)	2.6	48.1	19.8	71.0	61.3	29.5	6.1
	Total	6 542 239							
1/2014	Coordinated care	703 377 (10.5)	3.8	59.6	17.2	53.2	87.8	40.5	9.0
	Uncoordinated care	2 944 931 (44.1)	3.8	53.3	18.6	60.0	76.4	43.1	8.2
	GP care only	1 762 164 (26.4)	1.1	49.6	19.7	48.2	65.8	26.8	5.4
	Not relevant for coordinated care	1 271 288 (19.0)	2.7	48.0	19.9	71.0	62.9	30.2	6.1
	Total	6 681 760							
1/2015	Coordinated care	614 518 (8.9)	3.8	59.4	17.3	52.0	87.5	40.1	9.0
	Uncoordinated care	3 032 169 (44.1)	3.9	53.6	18.6	59.8	77.1	43.3	8.3
	GP care only	1 937 232 (28.1)	1.1	49.2	19.5	47.3	63.9	26.3	5.3
	Not relevant for coordinated care	1 298 528 (18.9)	2.7	48.1	19.9	70.6	62.9	30.0	6.2
	Total	6 882 447							
1/2016	Coordinated care	568 526 (8.3)	3.8	59.3	17.4	51.5	87.5	39.9	9.0
	Uncoordinated care	3 099 360 (45.2)	3.9	53.9	18.6	59.6	77.8	43.6	8.3
	GP care only	1 868 128 (27.2)	1.1	49.4	19.6	47.6	65.8	27.2	5.4
	Not relevant for coordinated care	1 320 475 (19.3)	2.7	48.1	20.0	70.4	63.3	29.9	6.2
	Total	6 856 489							

GP, general practitioners; n, number.

number of UPs was 2 626 830 (74.8%). In 1/2016 (3 667 886 specialist contacts), this decrease continued, with 568 526 (15.5%) CPs and 3 099 360 (84.5%) UPs. The contact rate per patient (defined as cases per patient) increased in the UP group from 3.7 in 2011 to 3.9 in 2016.

Age and gender distribution
Both the CP and UP groups showed a slight increase in the average age, from 57.4 and 51.4 years (quarter 1/2011) to 59.3 and 53.9 years (quarter 1/2016), respectively. Greater differences were observed in gender distribution, with a decreasing proportion of women only in the CP group (quarter 1/2011: 59.2%; quarter 1/2016: 51.5%).

Chronical and mental illness
Additionally, the UP group exhibited an increased proportion of chronic (quarter 1/2011: 70.1%; quarter
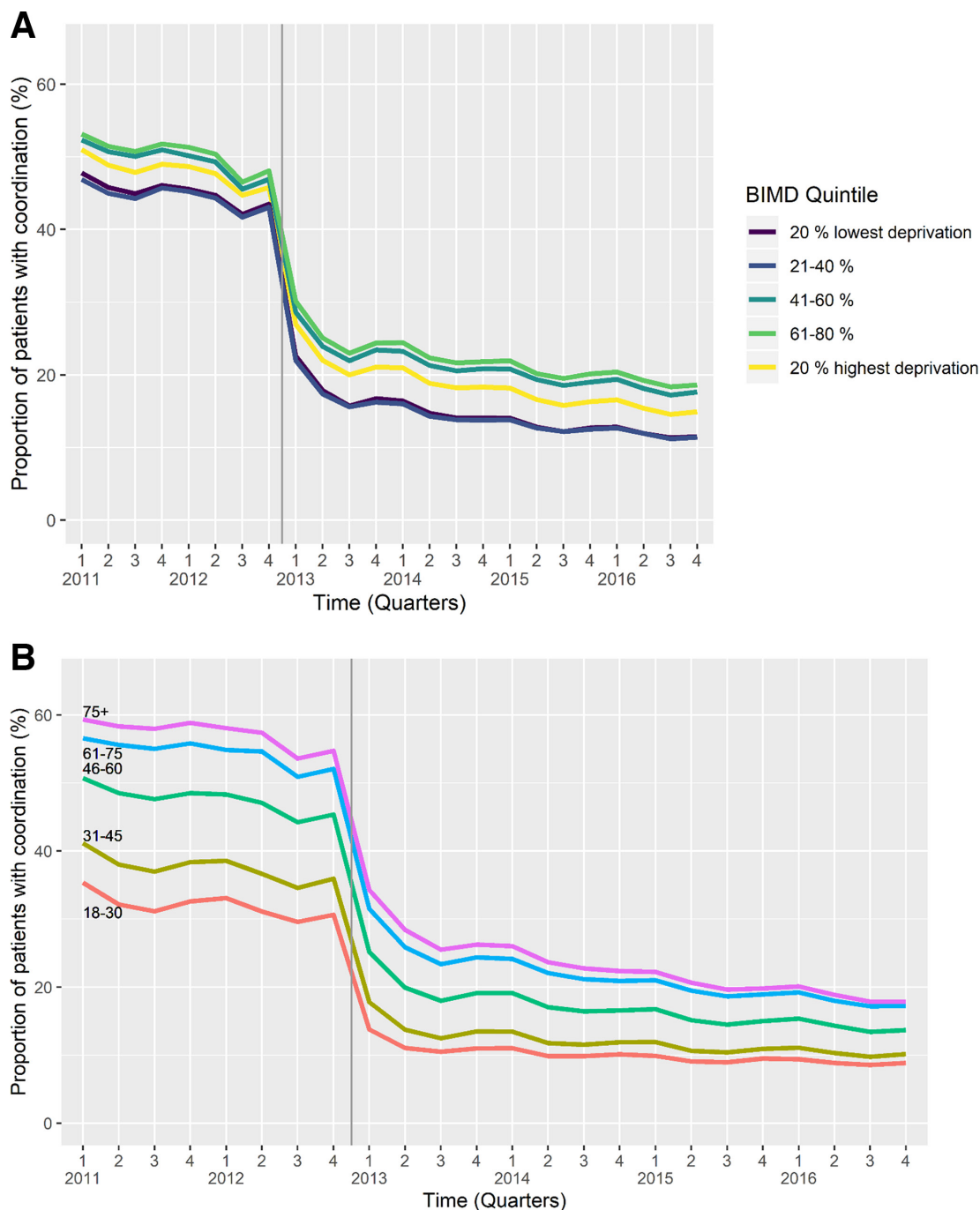
Figure 1 Proportion of patients using general practitioner-coordinated healthcare, stratified by quintiles of the Bavarian Index of Multiple Deprivation (BIMD) 2010 (A) and age (B).

1/2016: 77.8 %) and mental illness (quarter 1/2011: 39.2%; quarter 1/2016: 43.6%). The group 'GP care only' showed a slight increase in the number of patients and a decrease in the proportion of women, whereas other parameters remain stable.

Coordination, deprivation and age

Stratified by quintiles of the BIMD 2010 (figure 1A), the proportion of patients whose specialist contacts were GP coordinated ranged between 47% and 54% under the copayment and decreased sharply for all quintiles to, between 21% and 30%, immediately following its

abolition. Throughout the following observation period, a slow but steady decline is observable. By 2016, the proportion of coordinated care had decreased to below 20% in all BIMD categories. Differences between BIMD categories remained, with lower proportions of coordination in areas with low deprivation ('20% lowest deprivation' and '21%–40%') and higher rates of coordination in areas with higher deprivation ('41%–60%' and '61%–80%'). Stratification by age (figure 1B) revealed a similar trend, with a low CP proportion among the young and a high proportion in older groups. The difference in

the CP proportion between age groups was two times as large before copayment abolition, with a continued slow convergence of the groups until the end of observation in 2016.

Continuity of coordination within a year

Focusing on the continuity of GP coordination over the course of the year, a change in patient behaviour after copayment abolition was observable (figure 2). After 2012, the proportion of patients in the group 'always coordinated' was greatly reduced, as was the group of patients with inconsistent coordination behaviour ('partially coordinated'). Moreover, a correspondingly large increase was evident in the group of patients whose specialist utilisation was 'always uncoordinated'.

Stratification by the number of emergency treatment contacts suggests that the reduced GP coordination was even stronger in categories with more emergency contacts (see also interrupted time series analysis in online supplementary table 2). In the category with three or more emergency treatment episodes, the proportion of 'always coordinated' patients decreased from 30% in 2011 to approximately 7% in 2016.

Emergency treatment

Table 2 shows the development in the number of ambulatory emergency treatment episodes. Under the influence of the copayment in 2011 and 2012, the number amounted to approximately 1.5 million cases. Throughout the observation period, an underlying yearly increase of approximately 3% can be observed. However, immediately after the abolition in 2013, the number of emergency treatments episodes increased by additional 10% to 1.7 million cases (see also interrupted time series analysis in online supplementary table 3 and a graphical presentation of all quarters in online supplementary figure 1).

Apparent doctor shopping

The specialist groups in which at least 2.5% of patients consulted multiple practices were dermatology, gynaecology, ENT, ophthalmology, surgery and orthopaedics. Following the abolition of the copayment, there were no changes observable among gynaecologists, whereas surgeons, ophthalmologists, dermatologists and ENT specialists showed a statistically significant increase in multiple utilisation, which increased by between 0.25% and 0.5%, representing approximately 1500 (surgery) to 4500 (orthopaedics) patients per specialist area per quarter (figure 3A and interrupted time series analysis in online supplementary table 4). Figure 3B shows the development of multiple visits in the selected groups from 2011 to 2016. Here, as well as in the interrupted time series, the greatest increase occurred in orthopaedics group. In 2011, 4% of orthopaedic patients had multiple visits, 4.5% in 2013 and 5% at the beginning of 2016.

DISCUSSION

After the abolition of the copayment, the proportion of CP decreased markedly from 49.6% (2011) to 15.5% (2016). Younger patients and those living in areas with lower levels of deprivation showed the lowest proportions of coordination, irrespective of the copayment. However, even in these 'low-coordinated' groups, the coordination further decreased after abolition. Additionally, there were concomitant increases in the number of ambulatory emergency contacts and to a lesser extent in the number of patients with apparent 'doctor shopping'. The number of patients consulting any physician increased slightly over time.

A previous cross-sectional study by Schneider *et al* showed that ambulatory healthcare costs of CP were on average of €9.65 lower than patients without coordination.[16] A further analysis, which was based on the same data, found that the proportion of CP was significantly higher in rural and deprived areas, for example, due to a lower specialist density in rural areas, as well as among older patients and patients with chronic diseases.[17] The present investigation adds a longitudinal perspective by observing time periods with and without copayment. The previous studies[16 17] showed that the proportion of GP-coordinated patients in the first quarter of 2011 (45.1%) corresponded approximately with those in the present study (49.6%). The differences can be arisen from the improved data quality (eg, a more consistent patient identifier) and minor changes in the definition of a regular treatment episode (eg, exclusion of pregnancy and birth control consultations, as these gynaecologic consultations usually occur without a referral). Consistent with the preceding investigation,[16 17] the present study found higher rates of coordination in areas with higher deprivation, as well as in older patient groups. These general tendencies are observed irrespective of the copayment. Additionally, the decrease of coordination appears to be similar to the overall deprivation categories and age groups.

Due to the unrestricted access to specialist care in Germany, a field of concern is the issue of 'doctor shopping', whereby a patient consults multiple physicians from the same specialist group for a second opinion without medical need. As gatekeeper, a family doctor has the potential to reduce such duplicate examinations. The abolition of the copayment was accompanied by only small increases in doctor shopping, although a substantial increase was observed in orthopaedic practices, with about 4500 additional cases. Therefore, it is possible that the copayment had a coordinating influence on this specialist group. A review by Biernikiewicz *et al* indicated that repeated consultations occur most often in patients with a chronic disease, multiple comorbidities, a drug addiction or the fact that their problem remains unresolved (persistent symptoms despite receiving treatment). It is unclear whether the concentration among orthopaedic physicians is due to drug abuse (eg, repeated prescriptions of pain killers) or due to patient
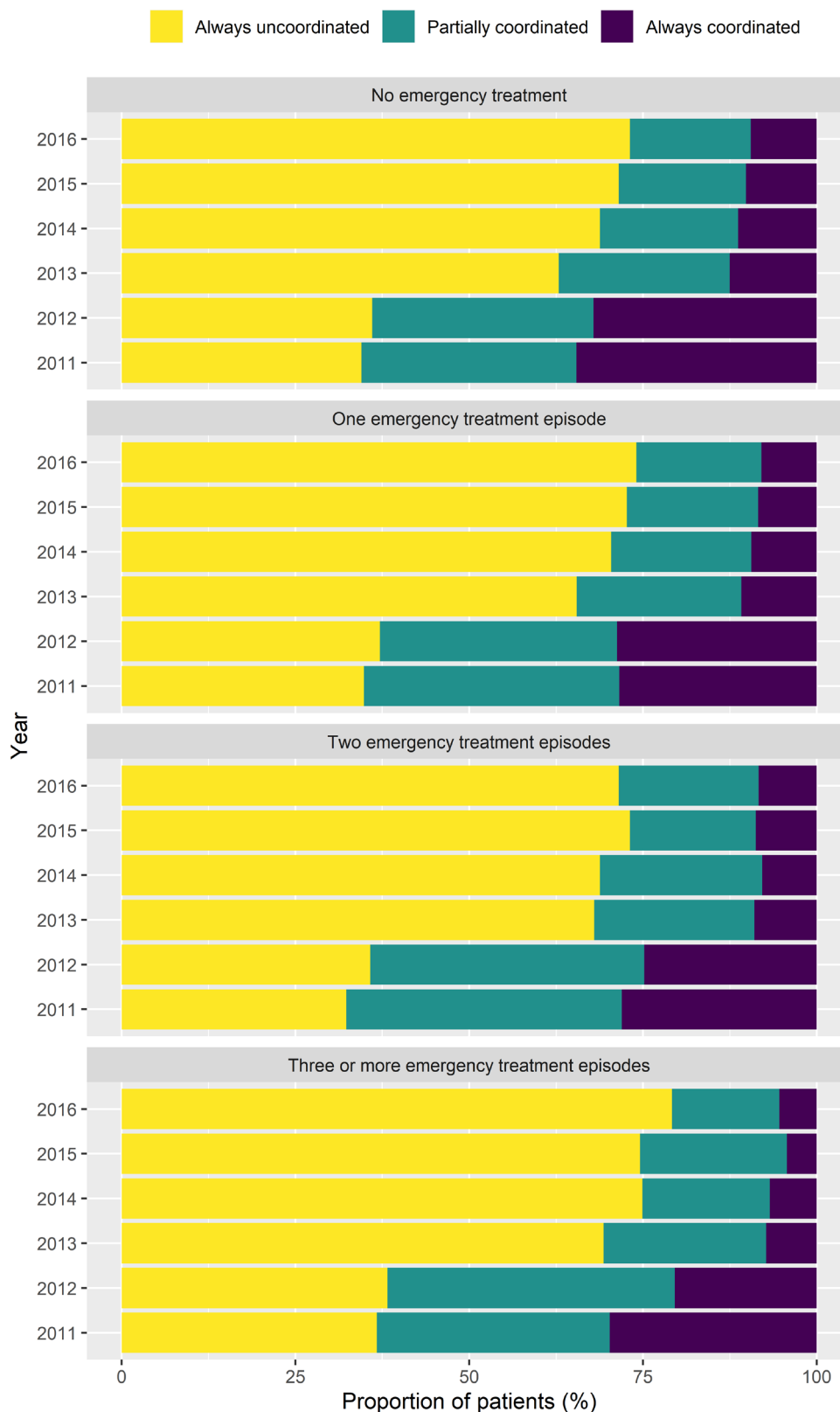
Figure 2 Continuity of coordination within 1 year according to the number of ambulatory emergency visits within 1 year. Yellow bars represent the proportion of patients who consistently contacted a specialist without a GP referral ('always uncoordinated'), blue bars represent patients who had a GP referral for every specialist visit ('always coordinated') and green bars represent patients with a switching coordination status ('partially coordinated'). GP, general practitioners.

Table 2 Development of the number of ambulatory emergency cases in Bavaria, index year (100%) 2012

Year	Emergency episodes (n)	Index 2012 (%)
2011	1 484 119	97
2012	1 527 017	100
2013	1 726 868	113
2014	1 781 266	117
2015	1 817 742	119
2016	1 872 695	123

dissatisfaction with persisting symptoms. Further research is required to investigate the reasons.[26]

Increasing contact rates appear to occur also in ambulatory emergency departments. It was described recently that Germany had experienced steadily increasing contact numbers in ambulatory emergency departments.[27 28] The present study quantified this, finding an annual rate of increase of 3% and a one-off jump of 13% between 2012 and 2013. The abolition of the copayment may have contributed to this increase, as a €10 fee also had to be paid for ambulatory emergency contacts. Scherer *et al* showed that 54.7% of emergency patients estimated the degree of their treatment urgency as low, implying that they did not fall into the category of a medical emergency. As motives, patients stated 'convenience' or the expectation of better care than in the ambulatory sector.[28] Such cases, which are more appropriately treated by a GP, lower the concentration of truly urgent cases in emergency departments. This reduces the effectiveness of care and increases the likelihood of adverse effects, as specialists can no longer concentrate on their core competencies.[29] In this case, the copayment could have been a certain inhibition threshold. David *et al* indicated that the behaviour controlling effect of the
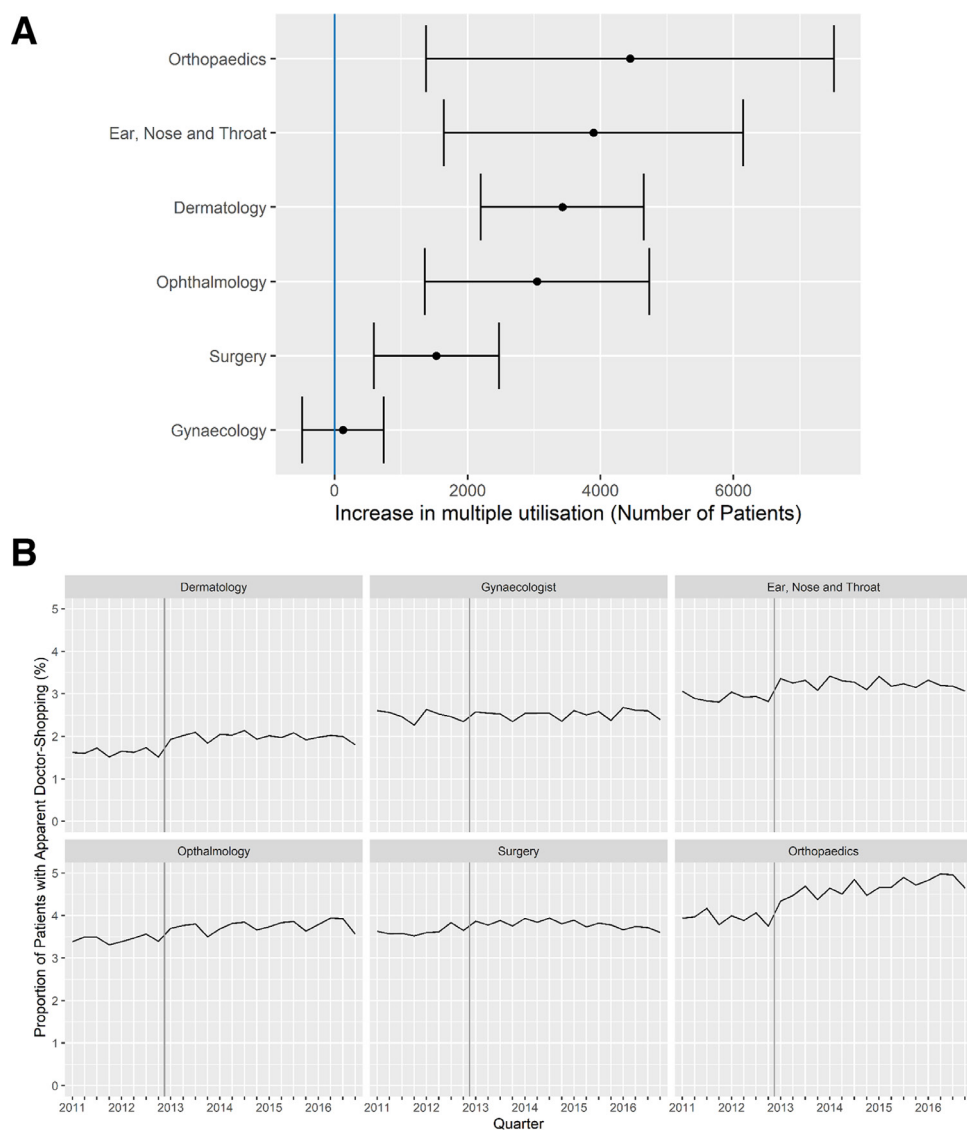

Figure 3 Effect of the abolition of the copayment on multiple specialist contacts of the same discipline as estimated by the interrupted time series regression model, with 95% CI (A) and the proportional development between 2011 and 2016 (quarterly) (B).

copayment might have led to a more appropriate utilisation of emergency department services.[30] Nevertheless, a causal inference between copayment abolition and the rising number of emergency cases is not possible. Concurrent changes in the provision and billing of out-of-hours services, in particular a gradual change to more structured weekday evening services, make it difficult to identify the pure effect of the copayment. National data show similar trends, although out-of-hours services are structured differently in each federal region.[31]

Generally, we found no strong association of the copayment on the total number of specialist contacts. The overall number of physician contacts changed slightly (quarter 1/2011: 6 235 739; quarter 1/2013: 6 542 239; quarter 1/2016: 6 856 489), following a trend observed during the time of the copayment.[12] However, the proportion of uncoordinated specialist contact rates increased remarkably. Similarly, evaluations in Austria[32] and Germany[33–35] showed that the introduction of a copayment had no significant influence on the number of physician contacts, while a systematic review, considering demand effects in different types of healthcare systems, identified reduced GP and specialist use due to copayments in the majority of the studies included.[36] In the context of the German copayment, €10 per quarter is a low barrier to ambulatory care. However, the additive impact of the copayment was an effective incentive for coordinated care, as, for example, a patient who has consulted three practices without referral had to pay €30. Nevertheless, it must be noted that copayments have the potential to be a barrier for persons with low socioeconomic status, especially when the copayment is income-independent. Concerning the German copayment, the evidence is inconsistent. A study by Rückert et al[37] showed that people with a lower socioeconomic status more often delayed or avoided physician visits due to the copayment. Grabka et al[33] and Schreyögg et al[38] did not find any socioeconomic differences. An alternative approach is to implement a mandatory primary care system to strengthen the coordination of care. In the current political discussion, there are considerations to implement GP-centred care models,[6] perhaps in combination with financial incentives for participating patients.[39]

In the light of recent findings of Pereira Gray et al,[40] the general loss of coordinated care represents a matter of concern. They showed that an increased continuity of care, with respect to both GPs and specialists, leads to reductions in mortality. In our analysis, the pronounced decrease in coordinated care among older patient groups after the abolition is of special concern because such patients are particularly vulnerable, for example, due to comorbid chronic diseases. This represents a weakening of the main benefits of strong primary care and consequently of a well-functioning healthcare system. The impact of a strong primary care, especially in the case of chronic diseases, was shown by a recently published study of Basu et al.[5] A higher primary care density was associated with longer life expectancy. Additionally, an increase of 10 primary care physicians per 100 000 inhabitants was associated with a lower mortality rate for cardiovascular and respiratory diseases as well as for cancer. The authors concluded that a solid primary care is the foundation of a well-functioning healthcare system. Despite the difficulties inherent in making causal statements based on the observation of such interdependent systems, the authors were able to conclude that a solid primary care is the foundation of a well-functioning health system.

Strengths and limitations

A major strength of the present study is the analysis of longitudinal claims data, covering 85% of the Bavarian population over 6 years. Including all statutory insured patients in Bavaria, Germany, a higher representativeness and generalisability of the results can be assumed than in studies that, for example, analyse the data of selected health insurance companies. Additionally, to the best of our knowledge, this represents the first published study assessing the impact of the abolition of the copayment, as existing studies were either conducted after its introduction[33–35] or immediately before its abolition.[16 17 38] Although one technical report published in German investigated the change in various time series, it did so without regard to the level of GP coordination or other structural factors, such as regional deprivation.[31] Therefore, the present study is unique in observing a 6-year period immediately before and after the abolition of the copayment.

However, the use of routine data has some limitations, as they were originally collected for billing purposes and not for research. In particular, we were unable to verify the extent to which a referral constituted an active coordination on the part of the GP. For example, referrals to a specialist could also be requested without a prior appointment with the GP.[41] Consequently, the proportion of patients with referrals might overestimate the proportion of patients with active GP-centred coordination. On the other hand, it is conceivable that some patients without administrative referral did in fact experience GP coordination. This could occur if, for example, the patient failed to deliver the referral form to the specialist. Additionally, the mentioned change in out-of-hours services could be partly responsible for the increase in emergency contacts. Further, we are unaware of any other administrative changes. However, we cannot exclude that there have been changes that may have influenced the coordination of care.

Besides healthcare costs, distance to services and waiting time are two additional relevant aspects concerning healthcare use. As these data were not available in the claims data, analyses were not possible. However, waiting times for consultations with specialists are low in Germany if compared with international healthcare systems, due in large part to the high physician density of specialists in ambulatory care.[42 43]

Furthermore, no direct conclusion can be drawn concerning the quality of care. The outcomes 'patient

coordination', 'consistency', 'ambulatory emergency contacts' and 'doctor shopping' might, however, be viewed as surrogate parameters for effective primary care. Additionally, we did not consider outcome quality and had no access to mortality or hospitalisation data. Since the present study is an ecological study, no causal relationships can be drawn, but only indications of possible associations.

CONCLUSION

The present study shows that the abolition of the German copayment in 2012 was followed by an immediate and a substantial decrease in GP-centred coordination of specialist care. The abolition was associated with a change between coordinated vs uncoordinated care, whereas the number of specialist contacts and 'GP only' contacts remained almost stable. Concomitant to these trends, an increase in emergency cases and to a lesser extent in apparent 'doctor shopping' was observable. These findings suggest that the copayment was a partly effective tool for supporting coordinated care. Nevertheless, the German copayment was associated with high bureaucratic efforts. Thus, alternative methods, such as a mandatory primary care system with referrals, might be more reasonable. Future studies are required to investigate how the gatekeeping function of GPs in Germany can best be strengthened while minimising the associated administrative overhead.

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