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Regional differences in the patient population of general practices in northern Germany - results of a mixed methods study

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7 **Regional differences in the patient population of general practices in northern**
8 **Germany - results of a mixed methods study**
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Abstract

Objectives: The aim of our study was to explore patient types in general practitioner (GP) practices and to quantify the regional differences of the frequencies of these patient types in northern Germany.

Design and setting: We conducted a mixed methods study based on focus groups and standardised interviews with GPs. All counties and independent cities within a radius of 120 km around Hamburg were assigned one of three regional categories (urban areas, environs, rural areas). The focus groups were analysed using qualitative content analysis. Relative frequencies of consultations by patient types and differences between the regions were calculated. Logistic regression analyses were used to identify differences among regions.

Participants: Nine focus groups with 65 GPs (67.7% male). From the 280 initially recruited GPs 211 (65.4% male) could be personally interviewed.

Results: Four themes with 27 patient types were derived from the focus groups: patients classified by morbidity, sociodemographic characteristics, special care needs and patient behaviour. We found significantly higher association for the occurrence of five patient characteristics in urban areas than rural areas: patients with migration background and culturally different disease concepts (OR=1.23; 95% CI 1.06-1.42), privately insured patients (OR=1.17; 95% CI 1.05-1.31), educationally disadvantaged patients with low health literacy (OR=1.11; 95% CI 1.04-1.19), patients with psychiatric disorders (OR=1.07; 95% CI 1.02-1.12) and senior citizens living on their own without caregivers (OR=1.05; 95% CI 1.05-1.31). Three patient types were significantly lower associated: minors accompanied by their parents (OR=0.71; 95%CI 0.61-0.83), patients with poor therapy adherence (OR=0.87, 95% CI 0.80-0.95) and patients with dementia (OR=0.90; 95% CI 0.82-0.99).

Conclusions: GPs could compensate the specific needs of their patients with medical training aligned with the requirements of their region. Urban GPs need skills treating patients with psychiatric, social and cultural problems, rural GPs regarding the care for children or incontinent patients.

Trial registration:

The study was registered in ClinicalTrials.gov (NCT02558322; <https://clinicaltrials.gov/ct2/show/NCT02558322>).

Strengths and limitations of this study:

- GPs who participated in the focus groups may differ from non-participants due to their motivation, practice experience and special problems from their regions, eg. undersupply of physicians.
- For the qualitative part of the study, in order to maximize the heterogeneity of focus group participants' experience we ensured to include both male and female GPs, with longer and shorter durations of practice experience, lower and higher age, from smaller and larger practices and different types of practices from all three areas.
- For the quantitative part of the study GP practices were included via a quota sampling.
- The contributions of the GPs in the focus groups and the answers in the interviews might have been influenced by memory gaps, errors or social desirability.
- The GPs were recruited from the regions of northern Germany exclusively. Therefore the sample may possibly not represent the rest of Germany.

Background

The number of general practices per population and the supply of certain services vary greatly between urban and rural areas. Urban areas have a better availability of GPs, while rural areas struggle with the impending shortage of medical personnel and services [1, 2]. As a result, general practitioners (GPs) from rural areas see more patients, have a higher total amount of working hours, a higher workload of home visits and they provide a broader spectrum of services [3–7]. Previously published results from our qualitative analyses indicate that GPs from urban and rural areas perceive their professional role differently. Urban GPs assessed themselves just as a provider of medical services whereas rural GPs described themselves as a medical companion with an intensive doctor-patient-relationship [8].

Doctor-patient-relationship and disease management in primary care are influenced by patient characteristics. According to Fenton et al., higher rates of requests for tests, prescriptions and referrals in family medicine practices were significantly associated with age, greater bother or worry about symptoms, a more extroverted patient personality, greater life satisfaction and a higher probability of at least one prior encounter with the physician that had been visited [9]. Ferroni et al. demonstrated that the management of non-insulin-treated type II diabetes was insufficient in younger patients, immigrants and patients not attending diabetes clinics [10]. Van den Bussche et al. analyzed the overutilization of ambulatory medical care in the elderly German population. They identified two main patient types with regard to overutilization of medical services: One type comprised patients belonging to the oldest age group (42 % \geq 75 years), having many practice contacts (1.4 contacts/week), suffering from severe somatic diseases and multimorbidity and needing long-term care. The other type comprised younger elderly (30 % \geq 75 years) suffering from psychiatric or psychosomatic complaints, being less frequently multimorbid and/or nursing care dependent and contacting a large number of different practices [11]. Another study examined self-care coping strategies in people with diabetes. They found three patient types: proactive managers who independently monitor and adjust blood glucose and the self-care regime, passive followers who adhere to the prescribed self-care regime without self-adjustment and nonconformists who do not follow most of the prescribed self-care regime [12].

Some studies took regional differences of the distribution of patient characteristics or patient types into consideration. Mukhtar et al. analyzed factors associated with consultation rates in general practice in England. Consultation rates increased for females, deprived and older patients and varied by ethnicity. They did not find associations between consultation rates and the location of general practices in rural areas [13]. A study by Carr-Hill et al., which was conducted over 25 years ago, identified higher rates of consultations in association with morbidity-specific and sociodemographic

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3 determinants such as chronic illness, unemployment, living in partnership and living in urban areas
4 [14].
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7 To the best of our knowledge, there are no studies exploring patient types in primary care and
8 considering their regional differences in Germany. Our definition of patient types is the combination
9 of typical characteristics into a characteristic property pattern, which e.g. describes the behaviour,
10 needs or morbidity of a group of patients. Therefore, the aim of our study was to explore 1) patient
11 types in GP practices and 2) to quantify the regional differences of the frequencies of these patient
12 types in GP practices and 2) to quantify the regional differences of the frequencies of these patient
13 types in GP practices and 2) to quantify the regional differences of the frequencies of these patient
14 types in GP practices and 2) to quantify the regional differences of the frequencies of these patient
15 types in northern Germany.
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18 19 20 **Methods**

21 22 **Study design**

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24 The investigation presented here is part of the study “Regional variations in primary medical care of
25 northern Germany - Outpatient Healthcare Research North (*Ambulante Versorgungsforschung Nord -*
26 *AVFN*)”. This study follows a sequential exploratory design [15] consisting of a qualitative and a
27 quantitative part. The qualitative part includes an exploratory qualitative focus groups study with GPs
28 and patients. The quantitative part builds on the qualitative results and comprises a cross-sectional
29 observational study to quantify regional differences in primary health care in northern Germany. The
30 methods of this study had been entered in the study register ClinicalTrials.gov (NCT02558322) before
31 starting the survey and described in the published study protocol [16]. This paper presents the results
32 of the GP focus groups from the qualitative part and of the GP interviews from the quantitative part
33 concerning the description of patient types. The study was approved by the Ethics Commission of the
34 Hamburg Medical Association on 12 August 2013 (file number PV 4535). It was not appropriate or
35 possible to involve patients or the public in the design, or conduct, or reporting, or dissemination plans
36 of our research.
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49 50 **Study regions and regional categories**

51 The study regions and regional categories have been described in previous publications [3, 8, 17]. In
52 brief, three categories were defined for the regional comparison based on the so-called “structural
53 settlement of district types” of the German Federal Institute for Research on Building, Urban Affairs
54 and Spatial Development [18]. The category “urban areas” included independent large cities
55 constituting districts in their own right, the category “environs” urbanised districts and rural districts
56 with signs of agglomeration and the category “rural areas” sparsely populated rural districts.
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3 The areas of the cross-sectional observational study have been described in the study protocol [16].
4 All administrative districts (counties and independent cities) were included in the study where at least
5 20% of the land area was located within a radius of 120 km (ca. 75 miles) linear distance around the
6 study centre (University Medical Center Hamburg-Eppendorf). The chosen administrative districts for
7 the study were derived from the German Federal States of Bremen, Hamburg, Mecklenburg-Western
8 Pomerania, Lower Saxony, Saxony-Anhalt and Schleswig-Holstein. The specific districts and cities are
9 shown in detail in previous publications [3, 16].
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18 **Recruitment**

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20 GPs were eligible for the study if they had been accredited as statutory health insurance physicians in
21 the respective administrative districts. Therefore we used the database of the Department of Primary
22 Medical Care at the University Medical Center Hamburg-Eppendorf as well as the databases of the
23 respective regional associations of statutory health insurance physicians.
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27 For the qualitative focus group study, we contacted GPs from 17 districts and cities (n = 1910). The
28 GPs were invited by mail to participate in the focus groups. GPs from six cities with populations over
29 20,000 in the regional category rural areas were excluded in order to avoid a bias by GPs practicing in
30 larger cities within the rural areas focus groups. For detailed information on the participating districts
31 and cities of the focus groups see Pohontsch et al. 2018 [8].
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36 For the cross-sectional observational study, the GPs were selected by a quota sampling design in order
37 to represent all regionally different healthcare situations in the study. The purpose of this design was
38 to raise the probability of also including underserved regions into the study where usually many GPs
39 were unwilling or unable to participate in a study due to their heavy workload. The goal of the study
40 was to recruit at least 80 GPs per regional category. The sample was stratified into individual
41 administrative districts and the sample size in each district was fixed proportionally to the respective
42 population size. GPs were invited to participate in the study by letter.
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50 **Data collection**

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52 The focus groups took place between May and November 2014 in six different locations to allow
53 participants from different regions to reach the meeting easily. The focus groups were led by at least
54 two experienced moderators out of four (HH, IS, NJP and AS). A semi-structured interview guideline
55 was used and the focus groups lasted approx. 120 minutes. The guideline referred to the main
56 categories: most common reasons for consultations, patient characteristics, regional differences
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3 concerning work of GPs and expectations, needs and treatment requirements. The interview guideline
4 is published elsewhere [17]. The introductory question regarding the patient types was: "Which kind
5 of patients consult you most often?". The focus groups were digitally audio recorded, logged and
6 transcribed verbatim following designated transcription rules by trained research assistants. Field
7 notes were made during the focus groups by the moderators. HH checked all transcripts for accuracy.
8
9 In order to protect participants` identities all names were replaced by numbers and details that would
10 have enabled the identification of individuals were deleted.
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15 The data of the cross-sectional observational study were collected between July 2015 and April 2017.
16 The GPs were visited by staff members of the project and interviewed personally. Participants
17 answered by memory recall and were allowed to check their patient documentation if necessary. The
18 standardised interviews obtained information regarding the GPs personal and professional
19 characteristics (age, gender, workload, post-graduate and advanced medical training, place of
20 residence, data on the practice) and the number of weekly contacts with 27 patient types derived
21 from the focus groups. The interviews included information from home visits and referred to average
22 practice weeks (no overcrowded weeks, no below average weeks, no flu season). The questionnaire
23 is presented in the additional file 1. Furthermore we explored the frequency of 99 different reasons
24 for consultation from 17 areas/ organ systems and 38 different procedures of healthcare services.
25 These analyses are published elsewhere [3].
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37 **Data analysis**

38 The transcripts of the focus groups were analysed using qualitative content analysis [19] following a
39 realistic paradigm [20]. We derived inductive categories from the material. HH, NJP and IS analysed
40 the transcripts, discussed and consented all categories, category descriptions and examples. Data
41 were managed using MAXQDA 11 (Verbi GmbH).
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46 The quantitative data were prepared and analysed using Stata 15.1. Relative frequencies of
47 consultations from patient types and differences between the regions urban areas, environs and rural
48 areas were described and regional differences were analysed using the t-test. The results are
49 presented as the proportion of the respective categories of patient types of all patients consulting the
50 respective practice. Significant regional differences were identified by logistic regression analyses via
51 stepwise backward selection with $p > 0.05$ as exclusion criterion. We calculated two models comparing
52 1) urban areas vs. rural areas and 2) environs vs. rural regions. An alpha level of 5% ($p \leq 0.05$) was
53 defined as statistically significant.
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Patient and public involvement

There was no patient and public involvement in the design, conduct or reporting of our research.

Results

Sample characteristics

We conducted nine focus groups with 65 GPs. Three focus groups were performed in each area: urban areas n=24 GPs, environs n=19, rural areas n=22. 44 GPs were male. Mean age of the GPs was 54.3 years in urban areas, 50.6 in environs and 55.0 in rural areas. Further descriptions of the focus groups participants can be found in table 1.

In our standardized observational study, we were able to include GPs from 91.9% of the selected administrative districts (34 of 37) into the data set. In three districts of the region environs (Delmenhorst, Diepholz and Osterholz) we could not include GPs into our study. From the 280 initially recruited GPs 211 could be personally interviewed. 69 GPs could not participate due to time-related or organisational problems (e.g. absence of practice partners, software problems). The description of the recruitment process, the stratification of groups and a map of the regions can be found in Schäfer et al. 2020 [3].

The characteristics of the interviewed GPs are shown in table 2. 65.4% of the GPs were male, the mean age was 54.5 years. The GPs reported an average of 344 treated patients per month with a slightly lower number of patients in urban areas than in rural areas. The most common practice type in all areas was the individual practice (rural areas: 59.2%, environs: 51.4%, urban areas: 43.9%). GPs working in medical care centers were only found in urban areas.

Patient types identified from the focus groups

We derived 4 themes with 27 categories of patient types from the GP focus groups. The identified patient types are presented in table 3. Quotes from the GPs are shown in italics in the following text.

Patient types classified by morbidity

Theme 1 included patient types classified by morbidity. A frequent category was patients with chronic illness, which was divided into two subtypes. One type is rather well, dutiful, easy to manage and with well-adjusted medication. The other type has a poor compliance and needs a time-consuming treatment.

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3 *"I think the most frequent patient is the stable, chronically ill old patient and the second most often*
4 *the sick old patient with severe complaints."* (Section 190, urban GP group)
5

6 Another category was patients with multimorbidity. These were characterised by the GPs as
7 presenting regularly with new complaints, having polypharmacy, being in need of patient education
8 and constant treatment adaptations. GPs also described a high expenditure of time for the
9 treatment of patients with multimorbidity.
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13 *„So [...] really common is the chronically ill old patient, [who] keeps coming up with new symptoms*
14 *because the joints are damaged, pain occurs again, the medication is not taken properly or is stopped*
15 *because of some side effects, which are often very, how to say, 'wailing' you cannot say, but are very*
16 *plaintive. [...] So that's tiring."* (Section 206, urban GP group)
17

18 Another group of patients that many GPs consider to be common in their practice are patients with
19 psychiatric disorders, e.g. burnout, depression, anxiety or borderline disorders. According to the
20 GPs, mental disorders often occur as a comorbidity of somatic diseases. The treatment of these
21 psychiatric disorders is often stressful because the patients need long and frequent conversations,
22 many of them repeatedly consult the GP with the same symptoms and some patients have no
23 insight into the disease. From the GPs' view another frequently encountered patient group were
24 patients with somatoform disorders. These included e.g. patients with unclear chest, abdominal or
25 whole body pain or patients with irritable bowel syndrome. The treatment of these patients and the
26 clarification of their symptoms is time-consuming. GPs reported that it is difficult to convey to the
27 patient that the complaints are not based on an organic cause. GPs also reported that there are
28 many people with dementia among their older patients. The contact with relatives or caregivers
29 plays a major role in the treatment of these patients. Moreover, some GPs have described patients
30 with substance abuse disorders who are dependent on alcohol, medication such as painkillers or
31 sleeping pills, or illegal drugs as a common patient type. For some GPs caring for this patient group is
32 stressful due to frequent consultations, time consuming, and the need to ward off desires for
33 prescription drugs.
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45 Patient types classified by sociodemographic characteristics

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48 Theme 2 summarized patient types according to sociodemographic characteristics. GPs mentioned
49 that they have patients with social problems due to poverty/low income and educationally
50 disadvantaged patients with low health literacy. These two patient types needed more time-
51 consuming advice and management. From the perspective of the GPs many patients who are
52 affected by poverty struggle with addiction and mental problems and/or a bad health condition. In
53 contrast, GPs reported another category typically for the sociodemographic cluster: privately insured
54 patients. GPs described them as very demanding.
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3 „I saw in [place in Schleswig-Holstein], [...] the community, I think, got three huge containers of dirt
4 out of this [...] house. It was horrible. And then she sued the communit. After that nobody dared to
5 help her again. And unfortunately we see her in the emergency service with a regularity. This is
6 sometimes very appalling and is becoming more frequent, even in areas where you don't think it's
7 possible.” (Section 223, rural GP group)

8
9 „This is more a, actual a claim. Is probably the same as with patients with a lot of money. The private
10 patient assumes that he basically finances the entire practice with his doctor-patient contact or visit.“
11 (Section 252, environs GP group)

12
13 GPs reported that patients with migration background sometimes have very different disease
14 concepts. Some patients, e.g. Turkish-born patients, have a different understanding of the disease
15 than other patients due to their origin or culture. This could lead to difficulties in clarifying
16 symptoms and the assessment of treatment urgency and intensity. GPs needed more time for these
17 patients. The described problems concern the category patients with migration background and
18 communication problems as well.

19
20 „What I find exciting in these groups, what sometimes makes it easier for me e.g. we have quite a lot
21 Polish pickers with us. Polish pain is very much the same as German pain. So i.e. when [a] Pole says
22 'my leg hurts'. Then I know roughly how his leg hurts. I don't know about Turkish pain. This [...] is really
23 a problem. So I know that my Turkish patients get disproportionately more painkillers and more
24 antibiotics from me and I can't get it, although I know it. I can't reduce it because I fail because of the
25 language barrier and the way they describe the pain and I can't get it any other way.“ (Section 312,
26 rural GP group)

27
28 Further patient categories in this theme were minors accompanied by their parents and minors who
29 come alone for consultation. These two groups seemed to be rather less common in the GP
30 practices. Urban GPs reported that children from urban areas were mainly treated by the
31 paediatrician. Rural GPs described that they treated also children particularly when the paediatrician
32 practices were very crowded.

33 Patient types classified by specific care needs

34
35 Theme 3 comprised patients with specific care needs. GPs described patients with other social
36 problems e.g. marital problems, loneliness or workplace bullying. Especially patients suffering from
37 loneliness influenced the GP practice routine. They came without a special reason for consultation
38 and used the waiting areas for social contacts with other people.

39
40 „So, I think it's more of a social problem than a medical problem. That is why they are so often in
41 the clinic. There they meet people. They usually live alone and have some social contact there
42 and can just talk.“ (Section 80, rural GP group)

43
44 Patients regularly needing home visits, patients living in a nursing home or senior citizens living on
45 their own without caregivers had a special treatment effort in common. GPs took responsibility for
46 their older patients, they organized their medical treatment which is related to a higher workload.

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3 „We just have the very few old people in the nursing home. They have no relatives at all. Nobody cares
4 anymore. Yes [...] so that we no longer have any contact persons even in help so.“ (Section 1091,
5 urban GP group)
6

7 „Sometimes the children are far away and there are often very brave old women who really managed
8 it alone for years. Giant garden, huge house and all that. Then it just doesn't work anymore, but they
9 don't want to. Very, very difficult to find a satisfactory solution for everyone, right?“ (Section 244-246,
10 rural GP group)
11

12 Patients who are caregivers themselves were described as a vulnerable group with a need of
13 psychosocial support and a higher risk of developing health problems due to the exhausting care
14 situation.
15

16
17 „So some caring relatives do it very well and you have to treat them too, because they can also get
18 exhausted and there are very nice circumstances and just terrible ones.“ (Section 206, rural GP group)
19

20 This theme also included struggling single parents. According to the GPs this group deserves special
21 attention. Mothers who care for their children alone in addition to a job were overworked, this
22 complicated the treatment and has a negative effect on their health status.
23

24
25 GP A: "As a group of people, I can still think of the group of single mothers [...]."

26 GP B: "Overworked, clearly. Overworked and have problems everywhere. [...] Whatever they do, it will
27 always be [a] problem. "

28 GP A: "Yes, it is very difficult, so because there are quite a lot of them here and I think that their
29 situation is quite understandable." (Section 202 bis 204, urban GP group)
30

31 Patient characteristics classified by patient behaviour

32
33 Theme 4 classified patient types concerning patient's behaviour. Among them are patients who
34 present for consultation bringing along a self-diagnosis obtained via different media. Some of
35 these patients had a clear idea of what they have, what they need and what the GP has to do.
36 These contacts were time consuming, but some of these patients were in a positive way well
37 informed.
38

39
40 „I would differentiate the internet patients again, because I think there are the ones who are really so
41 annoying and are hypochondriacal in some way. But [...] others [...] are [...] uncomfortable for us
42 because they often really know details better than we do, because they deal with certain things that
43 we have already neglected in routine or [things] we are no longer up to date with.“ (Section 160, rural
44 GP group)
45
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47 A frequently described patient group was the patients with poor therapy adherence. The GPs
48 complained that these patients do not follow their recommended lifestyle changes e.g. healthy
49 nutrition, physical education, restrictions in smoking and drinking behaviour or medication
50 intake. Working with these patients was very frustrating for the GPs. The most frequent
51 mentioned patient group was the demanding patients. These patients had high expectations
52 towards their GP. They asked for special services e.g. prolonged sickness certificates,
53 inappropriate medication, physiotherapy or massages.
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3 „The orthopaedic surgeon had no time. He could somehow protect himself and then they end
4 up with us and "I brought something with me what does that mean"? Than you really notice,
5 you somehow got a ball in your goal.“ (Section 207, urban GP group)
6

7 Two patient categories can be summarized as high users: patients who had at least one
8 consultation per week and patients who regularly make excessive demands on GP's time during
9 the consultation. These patients consume a lot resources of the GP and their practice
10 management.
11

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14 „So, there really are patients who are up to twenty times a quarter. [...] Well, they always have
15 a reason. So, [...] if it's medication, medication questions, blood sampling, interpretation of
16 results. Then they come from the specialists in order to interpret their results, because that
17 obviously doesn't take place there. I do not know. Or [because] you want to hear something
18 about it again.“ (Section 77 bis 79, rural GP group)
19

20 „These are the ones that are actually scheduled with a quarter of an hour and that just consume
21 45 minutes regularly and where it is sometimes difficult to slow them down. Often they really
22 have something. Sure, if it's a tumour patient, you can't him ... or if you want to discuss bullying
23 at work for the first time, then you can't get rid of them for a moment. But there are some
24 patients where you know in advance that they basically have nothing and still need three
25 quarters of an hour.“ (Section 139, environs GP group)
26

27 Another category concerning patient's behaviour reported by the GPs were patients who
28 proactively consult additional specialists or different GPs for the same problem. This behaviour
29 could be also called "doctor (s)hopping". Patients change their GPs or other specialists until they
30 get the desired medication or diagnosis.
31

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33
34 „Also the doctor hoppers, who had maybe seven doctors as general practitioners within a year.
35 And say, 'Oh, we've heard so much beautiful from you'. But they say that to everyone, we know
36 that, we all know that.“ (Section 174, rural GP group)
37

38 Theme 4 contained besides these predominantly demanding patients also the regular patients
39 of the practice. GPs reported that they know many of their regular patients well and the
40 treatment of patients with a long doctor-patient-relationship is often very satisfying.
41

42
43 „But there are also many close [patients] who have been with you for years and who actually
44 appreciate the experience of the doctor and thus put themselves in my hand, I would also say. If
45 you've known them for a long time, a lot actually. Where there is a good relationship of trust,
46 where you can also say clear words, but they are not angry afterwards.“ (Section 155, rural GP
47 group)
48

49 **Frequencies and regional differences of patient types**

50
51 The relative frequency of consultation by the 27 categories of patient types in the total sample,
52 urban areas, environs and rural areas is shown in table 4. Percentages relate to all patients seen
53 in the practices and are averaged across all GPs interviewed, in the total sample as well as in
54 the specified regions respectively. The most common patient types were, besides the "regular
55 patients of the practice" (85.2%), "patients with a chronic illness" (57.7%) and – probably largely
56 overlapping with this category – "patients with multimorbidity" (45.9%). In bivariate analyses,
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3 many patient types had a higher frequency in urban areas compared to in rural areas. The
4 biggest differences were found for “patients with psychiatric disorders” (19.2% in urban areas
5 vs. 12.5% in rural areas), “educationally disadvantaged patients with low health literacy” (15.8%
6 vs. 9.1%), and “senior citizens living on their own without caregivers” (16.0% vs. 11.2%). In
7 contrast, “minors accompanied by their parents” was the only patient type significantly higher
8 stated in rural areas (3.1% vs. 6.3%).
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14 The results of the two logistic regression models are shown in the tables 5 and 6. Five patient
15 types were identified by stepwise backward selection to be associated with urban areas in
16 comparison to rural areas. The highest positive association was found for “patients with
17 migration background and culturally different disease concepts” (odds Ratio: 1.23; 95%
18 confidence interval: 1.06-1.42), “privately insured patients” (1.17; 1.05-1.31) and “educationally
19 disadvantaged patients with low health literacy” (1.11; 1.04-1.19). Three patient types were
20 identified with significant negative association between urban areas and rural areas. These
21 included “minors accompanied by their parents” (0.71; 0.61-0.83), “patients with poor therapy
22 adherence” (0.87; 0.80-0.95) and “patients with dementia” (0.90; 0.82-0.99). The logistic
23 regression model concerning the comparison of environs and rural areas revealed two
24 categories with positive association: “Privately insured patients” (1.10; 1.03-1.18), “patient who
25 proactively consult additional specialists for the same problem” (1.06; 1.01-1.12) and one with
26 negative association: “patients who are caregivers” (0.91; 0.83-0.99).
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39 Discussion

40 Main findings

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42 We derived 27 categories of patient types from the GP focus groups. This patient types could be
43 assigned to four themes: morbidity, sociodemographic characteristics, specific care needs and patient
44 behaviour. GPs from urban areas deal with higher frequencies of patients with psychiatric, social and
45 cultural problems. Furthermore, patients with low health literacy, senior citizens living alone and
46 patients who proactively consult additional specialists were represented more often in urban areas.
47 Only minors accompanied by their parents were more common in rural areas. We found significant
48 positive association for the occurrence of five patient types in urban areas than rural areas. Three
49 patient types were significantly negative associated with the occurrence in GP practices in urban areas
50 than rural areas.
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Strengths and limitations

As far as we know this is the first mixed method study exploring patient types in GP practices and quantifying and comparing the frequencies of these patient types seen in urban, environ and rural GP practices in northern Germany. In order to maximize the heterogeneity of focus group participants' experience in the qualitative part of the study, we ensured to include both male and female GPs, with longer and shorter durations of practice experience, lower and higher age, from smaller and larger practices and different types of practices from all three areas. Nevertheless, GPs who participated in the focus groups could differ from non-participants due to their motivation, practice experience and special problems from their regions. This could possibly have biased our identified patient types. However, we could include a large variety and high number of focus group participants in our study. The GPs were exclusively from the regions of northern Germany so that the sample might possibly not represent the rest of Germany. On the other hand GP practices had been included via a quota sampling into the quantitative part of the study. 91.9% of the administrative districts in the survey area could be included and GPs of less favoured areas which are difficult to reach by public transport, were also represented in the study.

The contributions of the GPs in the focus groups and the answers in the interviews might have been influenced by memory gaps, errors or social desirability. The order of the questions of the focus group guideline may influenced the answers of the GPs regarding the patient types. Before we asked which kind of patients consult them most often to initiate a discussion about patient types, we asked the GPs to describe the most common reasons for consultations in their practice, eg, chronic back pain or acute infections of the respiratory tract. This could have led the discussion in a certain direction. Nevertheless, we decided the order of the questions to focus in the patient type part on patient characteristics which describes the behaviour, needs or morbidity of a group of patients and not only the reasons for consultations in general practice. Our focus group discussions were supported by at least two experienced moderators out of four (IS, NJP, HH and AS). The interviewers of the quantitative GP interviews had received substantial training and had been supervised in regular meetings throughout the entire study period to minimize the interviewer bias. Additionally, it should be noted that our study had a mixed methods design which combined the advantages of qualitative and quantitative data.

Comparison with literature and discussion of results

Some studies dealt with the influence of patient characteristics on consultation length or high frequencies in general practice. Characteristics associated with a higher use of consultation frequency

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3 were among other things female sex, higher age, unemployment, poverty, living alone or isolation,
4 but regional differences of the distribution of these patient characteristics were regularly not
5 considered [21–24]. Carr-Hill et al. found higher rates of consultations for patients living in urban areas
6 [14]. Whereas a study of Mukhtar et al. did not find significant association for practice rurality status
7 [13].
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12 A German study about differences in the provision of lifestyle counselling for cardiovascular disease
13 prevention between urban and rural regions reported that rural GPs named more often a lack of
14 adherence by the patients and urban GPs were more often confronted with patients with a migration
15 background, communication problems and culturally different disease concepts as well [25]. We were
16 able to confirm these results in our study.
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21 GPs from urban areas more often deal with language problems and culturally different disease
22 concepts due to higher proportions of patients with migration background in cities [25, 26].
23 Furthermore GPs from urban areas of our study reported higher frequencies of patients with
24 psychiatric disorders. Two reviews about urban-rural differences in depression showed similar results
25 for the most reviewed studies as well. However, studies conducted in China revealed higher
26 prevalence of depression among rural residents [27, 28]. Breslau et al. used a large nationally
27 representative sample from the United States and suggest that the prevalence of mental disorders did
28 not differ between urban and rural areas [29]. Other studies reported a higher prevalence of
29 psychiatric disorders in urban areas [30–33]. Poor mental health is associated with poverty as well as
30 migration [34, 35]. Our previous paper about the regional differences in reasons for consultation and
31 GP's service spectrum showed higher frequencies of social problems and psychosomatic basic care for
32 patients in urban areas [3]. This accumulation of psychosocial patient problems in urban areas
33 represents a big challenge for urban GPs.
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44 The here presented study found a significant negative association between urban areas and rural areas
45 for patients with dementia. Koller et al. reported regional variations between urban and rural patients
46 with dementia concerning the specialist treatment after the incident diagnosis of dementia. While
47 urban patients more often consult neurologists and psychiatrists (NPs) in the year before and after
48 the initial dementia diagnosis, rural patients tend to contact their primary care physicians more often
49 but less NPs [36]. This means a cumulative workload for rural GPs as regards the treatment of patients
50 with dementia.
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55 Our study revealed higher frequencies of minors accompanied by their parents in GP practices in rural
56 areas. Another study from Germany arrived at the same result. 13.5% of family practices from major
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3 cities provided care for infants compared to 26.5% of surgeries in medium-sized towns and 37.5% in
4 small towns or rural areas [37].
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10 11 **Implications for research and clinical practice** 12

13 An analysis of the Zi-practice-panel (ZiPP) from the Central Research Institute of Ambulatory Health
14 Care in Germany (Zi) in 2015 showed a higher income for GPs from rural areas than urban areas in
15 Germany. The main reason was the size of the practices. Rural GPs treated 1,161 patients in the fourth
16 quarter of 2015, while their colleagues in the city treated 1,047 patients. Furthermore, the rural GPs
17 worked 2 hours per week more than the urban GPs [38]. Our study also showed that the GPs from
18 urban areas treated less patients than their colleagues from rural areas. However, they managed
19 higher frequencies of patients with psychiatric, social and culturally problems which can be very
20 complex and time consuming. In addition, urban GPs often just act as a providers of medical services
21 [8] and their patients have a lower commitment [39]. Further research is needed to explore these
22 differences particularly related to the entire German territory.
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30 The identified regional differences should also be included as learning content in the training of
31 medical students and young GPs. Thus, future GPs could compensate the specific needs of their
32 patient clientele with medical training aligned with the requirements of the region. For example, the
33 training for GPs from urban areas should put an emphasis on the treatment of patients with
34 psychiatric, social and cultural problems. Whereas rural GPs need advanced skills regarding the care
35 for children or in compliant patients. Although, in principle, GPs from both areas have to deal with all
36 these challenges, a regionally adjusted training could facilitate a better response to regional
37 challenges in health care.
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Additional files

Additional file 1: Questionnaire on patient types

List of abbreviations

DEGAM: German Association of General Medicine and Family Medicine; GP: General practitioner; NPS: neurologists and psychiatrists; ZiPP: Zi-practice-panel;

Declarations

Ethics approval and consent to participate

The study was approved by the Ethics Commission of the Hamburg Medical Association on 12 August 2013 (file number PV 4535). All study participants gave their written informed consent prior to their participation in the study.

Availability of data and material

The ethics approval does not allowed data sharing.

Authors' information

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Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MS, IS, NJP and HH conceived and designed the study. HHa, NJP and IS facilitated the focus groups and analysed qualitative data. IS analysed the quantitative data. DL, AK and HHa significantly contributed to the study design and/or discussion of the study results. HH and IS drafted the manuscript. All the authors commented on the draft and read and approved the final version of the manuscript.

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Tables

Table 1: Description of participating GPs from the focus groups (n=65)

	Urban areas	Environs	Rural areas
Age (in years):	54.3 ± 7.7	50.6 ± 8.8	55.0 ± 9.7
Sex:			
- female	6	5	10
- male	18	14	12
Number of patients per month :			
- up to 250 patients	42%	5%	9%
- 251 patients and more	58%	95%	91%
Years of practice experience:	17.4 ± 10.0	12.4 ± 9.4	15.4 ± 9.2
Type of medical practice:			
- individual practice	25.0%	52.6%	50.0%
- group practice	54.2%	42.1%	36.4%
- joint practice	20.8%	5.3%	13.6%

Table 2: Description of the interviewed GPs from the cross-sectional observational study (n=211)

	Total	Urban areas	Environs	Rural areas	p (U/R)	p (E/R)
Age (in years):	54.5 ± 8.6 (n=207)	53.5 ± 7.8 (n=66)	54.7 ± 8.6 (n=72)	55.4 ± 9.2 (n=69)	0.190	0.630
Sex:						
- female	34.6%	45.5%	27.0%	32.4%	0.117	0.479
- male	65.4% (n=211)	54.6% (n=66)	73.0% (n=74)	67.6% (n=71)		
<i>Number of patients per month:</i>	344 ± 115 (n=207)	<i>314 ± 101</i> <i>(n=65)</i>	345 ± 96 (n=74)	<i>372 ± 140</i> <i>(n=68)</i>	<i>0.007</i>	0.172
<i>Type of medical practice:</i>						
- <i>individual practice</i>	51.7%	<i>43.9%</i>	51.4%	<i>59.2%</i>	<i>0.004</i>	0.074
- <i>group practice</i>	6.2%	<i>12.1%</i>	6.8%	-		
- <i>joint practice</i>	40.8%	<i>39.4%</i>	41.9%	<i>40.9%</i>		
- <i>medical care centre</i>	1.4% (n=211)	<i>4.6%</i> (n=66)	- (n=74)	- (n=71)		

U/R: comparison "urban areas" vs. "rural areas"; E/R: comparison "environs" vs. "rural areas"
Statistically significant results ($p \leq 0.05$) are shown in bold and italic

Table 3: Identified themes and categories of patients types in GP practices from focus groups**Theme 1: Morbidity**

- Patients with a chronic illness
- Patients with multimorbidity (ie, at least 2 chronic diseases)
- Patients with psychiatric disorders (eg, depression, burnout, anxiety, borderline disorder)
- Patients with somatoform disorders
- Patients with dementia
- Patients with substance abuse disorders

Theme 2: Sociodemographic characteristics

- Educationally disadvantaged patients with low health literacy
- Privately insured patients (ie, patients who are insured outside of Germany's statutory health insurance system)
- Patients with social problems due to poverty/low income
- Minors accompanied by their parents
- Patients with migration background and culturally different disease concepts
- Patients with migration background and communication problems
- Minors who come to consultation on their own

Theme 3: Specific care needs

- Senior citizens living on their own without caregivers
- Patients with other social problems (eg, marital problems, loneliness, workplace bullying)
- Patients regularly needing home visits
- Patients living in a nursing home
- Patients who are caregivers
- Struggling single parents

Theme 4: Patient behaviour

- Regular patients of the practice (as opposed to patients who consulted the GP only once or only if the regular GP practice is closed)
- Patients, who come with self-diagnoses via media (eg, internet, magazines, television)
- Patients with poor therapy adherence (eg, regarding medication, lifestyle changes)
- Demanding patients (eg, patients requesting prolonged sick certificates, inappropriate medication or physiotherapy)
- Patients who regularly make excessive demands on GP's time
- Patients who proactively consult additional specialists for the same problem
- Frequent attenders (ie, at least one consultation per week)
- Patients who proactively consult different GPs because of the same problem

Table 4: Relative frequencies of the consultations by categories of patient types in GP practices divided by region^{MA}

	Total (n=210)	Urban areas (n=65)	Environs (n=74)	Rural areas (n=71)	p (U/R)	p (E/R)
Theme 1: Morbidity						
- Patients with a chronic illness	57.7%	57.2%	57.3%	58.6%	0.662	0.680
- Patients with multimorbidity	45.9%	47.4%	43.3%	47.2%	0.953	0.224
- Patients with psychiatric disorders	14.7%	19.2%	12.8%	12.5%	0.002	0.839
- Patients with somatoform disorders	14.4%	15.6%	14.6%	13.0%	0.175	0.464
- Patients with dementia	6.4%	5.7%	7.1%	6.3%	0.549	0.417
- Patients with substance abuse disorders	5.6%	7.2%	5.2%	4.5%	0.017	0.441
Theme 2: Sociodemographic characteristics						
- Educationally disadvantaged patients with low health literacy	10.9%	15.8%	8.4%	9.1%	0.004	0.666
- Privately insured patients	8.4%	9.3%	9.4%	6.6%	0.074	0.007
- Patients with social problems due to poverty/low income	5.9%	8.7%	4.2%	5.3%	0.020	0.270
- Minors accompanied by their parents	4.8%	3.1%	5.0%	6.3%	<0.001	0.139
- Patients with migration background and culturally different disease concepts	3.9%	6.5%	3.0%	2.5%	<0.001	0.492
- Patients with migration background and communication problems	3.5%	5.6%	2.6%	2.6%	0.002	0.962
- Minors who come to consultation on their own	3.0%	2.7%	3.4%	2.8%	0.928	0.270
Theme 3: Specific care needs						
- Senior citizens living on their own without caregivers	13.2%	16.0%	12.7%	11.2%	0.034	0.401
- Patients with other social problems	9.2%	12.5%	7.4%	8.1%	0.021	0.579
- Patients regularly needing home visits	8.7%	8.4%	8.3%	9.5%	0.370	0.277
- Patients living in a nursing home	8.1%	7.8%	7.9%	8.6%	0.553	0.642
- Patients who are caregivers	4.8%	5.2%	4.2%	5.0%	0.739	0.356
- Struggling single parents	4.3%	4.9%	3.9%	4.2%	0.469	0.719
Theme 4: Patient behaviour						
- Regular patients of the practice	85.2%	83.3%	86.0%	86.1%	0.245	0.969
- Patients, who come with self-diagnoses via media	13.2%	14.1%	13.6%	11.8%	0.308	0.408
- Patients with poor therapy adherence	11.3%	9.2%	12.7%	11.9%	0.135	0.722
- Demanding patients	11.1%	11.0%	11.0%	11.2%	0.926	0.920
- Patients who regularly make excessive demands on GP's time	7.6%	9.5%	7.6%	6.0%	0.086	0.301
- Patients who proactively consult additional specialists for the same problem	6.7%	7.5%	7.8%	4.7%	0.008	0.016
- Frequent attenders	6.0%	5.7%	5.4%	6.8%	0.537	0.434
- Patients who proactively consult different GPs because of the same problem	2.7%	2.8%	3.0%	2.3%	0.435	0.375

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U/R: comparison „urban areas“ vs. „rural areas“; E/R: comparison „environs“ vs. „rural areas“; MA: Multiple answers permitted; Statistically significant results ($p \leq 0.05$) are shown in bold and italic

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Table 5: Association between the frequencies of the consultations of categories of patient types in GP practices and urban areas vs. rural areas: results of a logistic regression

urban areas vs. rural areas	OR	95% CI	p
Minors accompanied by their parents	0.71	0.61 to 0.83	<0.001
Privately insured patients	1.17	1.05 to 1.31	0.005
Patients with poor therapy adherence	0.87	0.80 to 0.95	0.002
Senior citizens living on their own without caregivers	1.05	1.01 to 1.09	0.014
Educationally disadvantaged patients with low health literacy	1.11	1.04 to 1.19	0.001
Patients with psychiatric disorders	1.07	1.02 to 1.12	0.011
Patients with dementia	0.90	0.82 to 0.99	0.036
Patients with migration background and culturally different disease concepts	1.23	1.06 to 1.42	0.007

Table 6: Association between the frequencies of the consultations of categories of patients types in GP practices and environs vs. rural areas: results of a logistic regression

environs vs. rural areas	OR	95% CI	p
Patients who are caregivers	0.91	0.83 to 0.99	0.022
Privately insured patients	1.10	1.03 to 1.18	0.005
Patients who proactively consult additional specialists for the same problem	1.06	1.01 to 1.12	0.024

Additional file 1: Questionnaire on patient types

HA24 How many patients do you see in an average week during your consultation including home visits (no overcrowded weeks, no below average weeks, no flu season)?

patients

HA25 How many patients you see in an average week ... (estimated in absolute numbers, the sum need not be the sum of HA24)

belong to your regular patient base (no representation / emergency patients)

are privately insured patients

have a chronic illness

have multimorbidity (at least two chronic diseases)

have a substance abuse disorder

have a psychiatric disorder (e.g. depression, burnout, anxiety, borderline disorder)

have dementia

have a somatoform disorders (e.g. unclear pain, irritable bowel)

have a culturally different disease concept due to migration background

have communication problems due to migration background

have social problems due to poverty/low income

are patients with other social problems (e.g. marital problems, loneliness, workplace bullying)

are educationally disadvantaged patients with low health literacy

come with self-diagnoses via media (e.g. internet, magazines, television)

are struggling single parents

are children (under the age of 18) accompanied by their parents

are children (under the age of 18) who come to consultation on their own

are senior citizens living in their own without caregivers

are patients who are caregivers

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4 [] [] [] are patients who need regular home visits

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6 [] [] [] are patients living in nursing home

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8 [] [] [] are demanding patients (e.g. patients requesting prolonged sick certificates,
9 inappropriate medication or physiotherapy)

10
11 [] [] [] are patients with poor therapy adherence (eg, regarding medication, lifestyle changes)

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13 [] [] [] are patients who come to the general practitioner at least one consultation per week

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15 [] [] [] are patients who regularly make excessive demands on GP's time

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17 [] [] [] are patients who proactively consult different GPs because of the same problem

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19 [] [] [] are patients who proactively consult additional specialists for the same problem
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Dr. Heike Hansen, Dr. Ingmar Schäfer, Dr. Nadine Janis Pohontsch, Agata Kazek, Hanna Hardt, Dr. Dagmar Lühmann, Prof. Dr. Martin Scherer

Regional differences in the patient population of general practices in northern Germany - results of a mixed methods study

STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology* Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any pre-specified hypotheses	4-5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-6
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	6
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-7
Bias	9	Describe any efforts to address potential sources of bias	6-7
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-7

Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	6-7
		(b) Describe any methods used to examine subgroups and interactions	6-7
		(c) Explain how missing data were addressed	N/A
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	6
		(e) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	s. Schäfer et al. 2020
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8; table 1 and 2
		(b) Indicate number of participants with missing data for each variable of interest	8; table 1 and 2
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	12-13, table 4 and 5
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	12-13
		(b) Report category boundaries when continuous variables were categorized	N/A
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14-15
Generalisability	21	Discuss the generalisability (external validity) of the study results	15-16
Other information			

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	17
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*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.
Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

No	Item	Guide questions/description	Reported on page/ comment
Domain 1: Research team and reflexivity			
Personal Characteristics			
1.	Interviewer/facilitator	Which author/s conducted the interview or focus group	page 6
2.	Credentials	What were the researcher's credentials? <i>E.g. PhD, MD</i>	page 17
3.	Occupation	What was their occupation at the time of the study?	page 17
4.	Gender	Was the researcher male or female?	both sexes were involved
5.	Experience and training	What experience or training did the researcher have?	page 17
Relationship with participants			
6.	Relationship established	Was a relationship established prior to study commencement?	no
7.	Participant knowledge of the interviewer	What did the participants know about the researcher? <i>e.g. personal goals, reasons for doing the research</i>	name, institute, topic of discussion:

No	Item	Guide questions/description	Reported on page/ comment
			regional differences in primary care
8.	Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? <i>e.g. Bias, assumptions, reasons and interests in the research topic</i>	age, profession
Domain 2: study design			
	Theoretical framework		
9.	Methodological orientation and Theory	What methodological orientation was stated to underpin the study? <i>e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis</i>	page 7
	Participant selection		
10.	Sampling	How were participants selected? <i>e.g. purposive, convenience, consecutive, snowball</i>	page 6
11.	Method of approach	How were participants approached? <i>e.g. face-to-face, telephone, mail, email</i>	page 6

No	Item	Guide questions/description	Reported on page/ comment
12.	Sample size	How many participants were in the study?	page 8
13.	Non-participation	How many people refused to participate or dropped out?	Page 6; 1910 GPs were invited. 65 GPs were included in the focus groups. Details s. Pohontsch et al. 2018
Setting			
14.	Setting of data collection	Where was the data collected? e.g. <i>home, clinic, workplace</i>	page 6
15.	Presence of non-participants	Was anyone else present besides the participants and researchers?	page 7
16.	Description of sample	What are the important characteristics of the sample? e.g. <i>demographic data, date</i>	page 8, table 1
Data collection			
17.	Interview guide	Were questions, prompts, guides provided by the author? Were they tested?	Was it pilot pages 6-7
18.	Repeat interviews	Were repeat interviews carried out? If yes, how many?	page 8, 9 focus groups

No	Item	Guide questions/description	Reported on page/ comment
19.	Audio/visual recording	Did the research use audio or visual recording to collect the data?	page 6
20.	Field notes	Were field notes made during and/or after the interview or focus group?	page 7
21.	Duration	What was the duration of the interviews or focus group?	page 6, 120 minutes
22.	Data saturation	Was data saturation discussed?	no
23.	Transcripts returned	Were transcripts returned to participants for comment and/or correction?	no
Domain 3: analysis and findingsz			
Data analysis			
24.	Number of data coders	How many data coders coded the data?	page 7, 3 data coders
25.	Description of the coding tree	Did authors provide a description of the coding tree?	page 23, table 3
26.	Derivation of themes	Were themes identified in advance or derived from the data?	page 7
27.	Software	What software, if applicable, was used to manage the data?	page 7, Maxqda
28.	Participant checking	Did participants provide feedback on the findings?	no

No	Item	Guide questions/description	Reported on page/ comment
Reporting			
29.	Quotations presented	Were participant quotations presented to illustrate the themes / findings? Was each quotation identified? e.g. <i>participant number</i>	pages 8-12
30.	Data and findings consistent	Was there consistency between the data presented and the findings?	yes
31.	Clarity of major themes	Were major themes clearly presented in the findings?	page 8, 4 categories
32.	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	pages 8-12

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Regional differences in the patient population of general practices in northern Germany - results of a mixed methods study

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10 **Regional differences in the patient population of general practices in northern**
11 **Germany - results of a mixed methods study**
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Abstract

Objectives: The aim of our study was to explore patient types in general practitioner (GP) practices and to quantify the regional differences of the frequencies of these patient types in northern Germany.

Design and setting: We conducted a mixed methods study based on focus groups and standardised interviews with GPs. All counties and independent cities within a radius of 120 km around Hamburg were assigned one of three regional categories (urban areas, environs, rural areas). The focus groups were analysed using qualitative content analysis. Relative frequencies of consultations by patient types and differences between the regions were calculated. Logistic regression analyses were used to identify differences among regions.

Participants: Nine focus groups with 65 GPs (67.7% male). From the 280 initially recruited GPs 211 (65.4% male) could be personally interviewed.

Results: Four themes with 27 patient types were derived from the focus groups: patients classified by morbidity, sociodemographic characteristics, special care needs and patient behaviour. Five patient characteristics were significantly more prevalent in urban areas than rural areas: patients with migration background and culturally different disease concepts (OR=1.23; 95% CI 1.06-1.42), privately insured patients (OR=1.17; 95% CI 1.05-1.31), educationally disadvantaged patients with low health literacy (OR=1.11; 95% CI 1.04-1.19), patients with psychiatric disorders (OR=1.07; 95% CI 1.02-1.12) and senior citizens living on their own without caregivers (OR=1.05; 95% CI 1.05-1.31). Three patient types were significantly less prevalent in urban areas: minors accompanied by their parents (OR=0.71; 95% CI 0.61-0.83), patients with poor therapy adherence (OR=0.87, 95% CI 0.80-0.95) and patients with dementia (OR=0.90; 95% CI 0.82-0.99).

Conclusions: GPs could compensate the specific needs of their patients with medical training aligned with the requirements of their region. Urban GPs need skills treating patients with psychiatric, social and cultural problems, rural GPs regarding the care for children or noncompliant patients.

Trial registration:

The study was registered in ClinicalTrials.gov (NCT02558322; <https://clinicaltrials.gov/ct2/show/NCT02558322>).

Strengths and limitations of this study:

- GPs who participated in the focus groups may differ from non-participants due to their motivation, practice experience and special problems from their regions, eg. undersupply of physicians.
- For the qualitative part of the study, in order to maximize the heterogeneity of focus group participants' experience we ensured that both male and female GPs were included, with longer and shorter durations of practice experience, lower and higher age, from smaller and larger practices and different types of practices from all three areas.
- For the quantitative part of the study GP practices were included via a quota sampling.
- The contributions of the GPs in the focus groups and the answers in the interviews might have been influenced by memory gaps, errors or social desirability.
- The GPs were recruited from the regions of northern Germany exclusively. Therefore the sample may possibly not represent the rest of Germany.

Background

The number of general practices per population and the supply of certain services vary greatly between urban and rural areas. Urban areas have a better availability of GPs, while rural areas in Germany struggle with the impending shortage of medical personnel and services [1, 2]. As a result, general practitioners (GPs) from rural areas see more patients, have a higher total amount of working hours, a higher workload of home visits and they provide a broader spectrum of services [3–7]. Previously published results from our qualitative analyses indicate that GPs from urban and rural areas perceive their professional role differently. Urban GPs assessed themselves just as a provider of medical services whereas rural GPs described themselves as a medical companion with an intensive doctor-patient-relationship [8].

Doctor-patient-relationship and disease management in primary care are influenced by patient characteristics. According to Fenton et al., higher rates of requests for tests, prescriptions and referrals in family medicine practices were significantly associated with age, greater bother or worry about symptoms, a more extroverted patient personality, greater life satisfaction and a higher probability of at least one prior encounter with the physician that had been visited [9]. Ferroni et al. demonstrated that the management of non-insulin-treated type II diabetes was insufficient in younger patients, immigrants and patients not attending diabetes clinics [10].

Van den Bussche et al. analyzed the overutilization of ambulatory medical care in the elderly German population. They identified two main patient types with regard to overutilization of medical services: One type comprised patients belonging to the oldest age group (42 % \geq 75 years), having many practice contacts (1.4 contacts/week), suffering from severe somatic diseases and multimorbidity and needing long-term care. The other type comprised younger elderly (30 % \geq 75 years) suffering from psychiatric or psychosomatic complaints, being less frequently multimorbid and/or nursing care dependent and contacting a large number of different practices [11]. Another study examined self-care coping strategies in people with diabetes. They found three patient types: proactive managers who independently monitor and adjust blood glucose and the self-care regime, passive followers who adhere to the prescribed self-care regime without self-adjustment and nonconformists who do not follow most of the prescribed self-care regime [12].

Some studies took regional differences of the distribution of patient characteristics or patient types into consideration. Mukhtar et al. analyzed factors associated with consultation rates in general practice in England. Consultation rates increased for females, deprived and older patients and varied by ethnicity. They did not find associations between consultation rates and the location of general practices in rural areas [13]. A study by Carr-Hill et al., which was conducted over 25 years ago,

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3 identified higher rates of consultations in association with morbidity-specific and sociodemographic
4 determinants such as chronic illness, unemployment, living in partnership and living in urban areas
5 [14].
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9 To the best of our knowledge, there are no studies exploring patient types in primary care and
10 considering their regional differences in Germany. Our definition of patient types is the combination
11 of typical characteristics into patterns of characteristic properties, which e.g. describes the behaviour,
12 needs or morbidity of a group of patients. Therefore, the aim of our study was to explore 1) patient
13 types in GP practices and 2) to quantify the regional differences of the frequencies of these patient
14 types in northern Germany.
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20 21 **Methods**

22 **Study design**

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24 The investigation presented here is part of the study “Regional variations in primary medical care of
25 northern Germany - Outpatient Healthcare Research North (*Ambulante Versorgungsforschung Nord -*
26 *AVFN*)”. This study follows a sequential exploratory design [15] consisting of a qualitative and a
27 quantitative part. The qualitative part includes an exploratory qualitative focus groups study with GPs
28 and patients. The quantitative part builds on the qualitative results and comprises a cross-sectional
29 observational study to quantify regional differences in primary health care in northern Germany. The
30 methods of the quantitative part of the study had been entered in the study register ClinicalTrials.gov
31 (NCT02558322) before starting the survey and described in the published study protocol [16]. This
32 paper presents the results of the GP focus groups from the qualitative part and of the GP interviews
33 from the quantitative part concerning the description of patient types. The study was approved by the
34 Ethics Commission of the Hamburg Medical Association on 12 August 2013 (file number PV 4535).
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47 **Study regions and regional categories**

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49 The study regions and regional categories have been described in previous publications [3, 8, 17]. In
50 brief, three categories were defined for the regional comparison based on the so-called “structural
51 settlement of district types” of the German Federal Institute for Research on Building, Urban Affairs
52 and Spatial Development [18]. The category “urban areas” included independent large cities
53 constituting districts in their own right (over 100,000 inhabitants), the category “environs” urbanised
54 districts (with a density of over 300 inhabitants/km²) and rural districts with signs of urban
55 agglomeration (with a density of over 150 inhabitants/km²) and the category “rural areas” sparsely
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3 populated rural districts (with a density of less than 150 inhabitants/km²).
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5 The areas of the cross-sectional observational study have been described in the study protocol [16].
6 All administrative districts (counties and independent cities) were included in the study where at least
7 20% of the land area was located within a radius of 120 km (ca. 75 miles) linear distance around the
8 study centre (University Medical Center Hamburg-Eppendorf). The chosen administrative districts for
9 the study were derived from the German Federal States of Bremen, Hamburg, Mecklenburg-Western
10 Pomerania, Lower Saxony, Saxony-Anhalt and Schleswig-Holstein. The specific districts and cities are
11 shown in detail in previous publications [3, 16].
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20 **Recruitment**

21 GPs were eligible for the study if they had been accredited as statutory health insurance physicians in
22 the respective administrative districts. Therefore we used the database of the Department of Primary
23 Medical Care at the University Medical Center Hamburg-Eppendorf as well as the databases of the
24 respective regional associations of statutory health insurance physicians.
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29 For the qualitative focus group study, we contacted GPs from 17 districts and cities (n=1910). The GPs
30 were invited by mail to participate in the focus groups. GPs from six cities with populations over 20,000
31 in the regional category rural areas were excluded in order to avoid a bias by GPs practicing in larger
32 cities within the rural areas focus groups. Detailed information on the participating districts and cities
33 of the focus groups can be found elsewhere [8].
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38 For the cross-sectional observational study, the GPs were selected by a quota sampling design in order
39 to represent all regionally different healthcare situations in the study. The purpose of this design was
40 to raise the probability of also including underserved regions into the study where usually many GPs
41 were unwilling or unable to participate in a study due to their heavy workload. The goal of the study
42 was to recruit at least 80 GPs per regional category. The sample was stratified into individual
43 administrative districts and the sample size in each district was fixed proportionally to the respective
44 population size. GPs were invited to participate in the study by letter.
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52 **Data collection**

53 The focus groups took place between May and November 2014 in six different locations to allow
54 participants from different regions to reach the meeting easily. The focus groups were led by at least
55 two experienced moderators out of four (HH, IS, NJP and AS). A semi-structured interview guideline
56 was used and the focus groups lasted approx. 120 minutes. The guideline referred to the main
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3 categories: most common reasons for consultations, patient characteristics, regional differences
4 concerning work of GPs and expectations, needs and treatment requirements. The interview guideline
5 is published elsewhere [17]. The introductory question regarding the patient types was: "Which kind
6 of patients consult you most often?". The focus groups were digitally audio recorded, logged and
7 transcribed verbatim following designated transcription rules by trained research assistants. Field
8 notes were made during the focus groups by the moderators. HH checked all transcripts for accuracy.
9 In order to protect participants` identities all names were replaced by numbers and details that would
10 have enabled the identification of individuals were deleted.

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13 Recruitment of the cross-sectional observational study started in May 2015 and data were collected
14 between July 2015 and April 2017. The GPs were visited by staff members of the project and
15 interviewed personally. Participants answered by memory recall and were allowed to check their
16 patient documentation if necessary. The standardised interviews obtained information regarding the
17 GPs personal and professional characteristics (age, gender, workload, post-graduate and advanced
18 medical training, place of residence, data on the practice) and the number of weekly contacts with 27
19 patient types derived from the focus groups. The interviews included information from home visits
20 and referred to average practice weeks (no overcrowded weeks, no below average weeks, no flu
21 season). The questionnaire is presented in the additional file 1. Furthermore we explored the
22 frequency of 99 different reasons for consultation from 17 areas/ organ systems and 38 different
23 procedures of healthcare services. These analyses are published elsewhere [3].

34 35 36 37 38 **Data analysis**

39
40 The transcripts of the focus groups were analysed using qualitative content analysis [19] following a
41 realistic paradigm [20]. We derived inductive categories from the material. HH, NJP and IS analysed
42 the transcripts, discussed and consented all categories, category descriptions and examples. Data
43 were managed using MAXQDA 11 (Verbi GmbH). We used a parsimonious interpretive approach to
44 language translation of the presented statements of the GPs and stayed as close as possible to a literal
45 translation of the quotations.

46
47 The quantitative data were prepared and analysed using Stata 15.1. Relative frequencies of
48 consultations from patient types and differences between the regions urban areas, environs and rural
49 areas were described and regional differences were analysed using the t-test. The results are
50 presented as the proportion of the respective categories of patient types of all patients consulting the
51 respective practice. As it might be that patient types are correlated, ie, patients systematically belong
52 to more than one type, we also analysed in which patient types the biggest regional difference can be

found. These variables were identified by logistic regression analyses via stepwise backward selection with $p > 0.05$ as exclusion criterion. The full number (n) of identified patient types were introduced as independent variables (x_i) into the backward selection and the regional category (coded 0/1) was used as dependent variable (y). In the following formula, β_i define the estimated coefficients and α the constant:

$$y = \alpha + \sum_{i=1}^n (\beta_i x_i)$$

We calculated two models comparing 1) urban areas vs. rural areas and 2) environs vs. rural regions. An alpha level of 5% ($p \leq 0.05$) was defined as statistically significant.

Patient and public involvement

There was no patient and public involvement in the design, conduct, reporting or dissemination of our research.

Results

Sample characteristics

We conducted nine focus groups with 65 GPs. Three focus groups were performed in each area: urban areas $n=24$ GPs, environs $n=19$, rural areas $n=22$. 44 GPs were male. Mean age of the GPs was 54.3 years in urban areas, 50.6 in environs and 55.0 in rural areas. Further descriptions of the focus groups participants can be found in table 1.

In our standardized observational study, we were able to include GPs from 91.9% of the selected administrative districts (34 of 37) into the data set. In three districts of the region environs (Delmenhorst, Diepholz and Osterholz) we could not include GPs into our study. From the 280 initially recruited GPs 211 could be personally interviewed. 69 GPs could not participate due to time-related or organisational problems (e.g. absence of practice partners, software problems). The description of the recruitment process, the stratification of groups and a map of the regions can be found in Schäfer et al. 2020 [3].

The characteristics of the interviewed GPs are shown in table 2. 65.4% of the GPs were male, the mean age was 54.5 years. The GPs reported an average of 344 treated patients per month with a slightly lower number of patients in urban areas than in rural areas. The most common practice type in all areas was the individual practice (rural areas: 59.2%, environs: 51.4%, urban areas: 43.9%). GPs working in medical care centers were only found in urban areas.

Patient types identified from the focus groups

We derived 4 themes with 27 categories of patient types from the GP focus groups. The identified patient types are presented in table 3. Quotes from the GPs are shown in italics in the following text.

Patient types classified by morbidity

Theme 1 included patient types classified by morbidity. A frequent category was patients with chronic illness, which was divided into two subtypes. One type is rather well, dutiful, easy to manage and with well-adjusted medication. The other type has a poor compliance and needs a time-consuming treatment.

“I think the most frequent patient is the stable, chronically ill old patient and the second most often the sick old patient with severe complaints.” (Section 190, urban GP group)

Another category was patients with multimorbidity. These were characterised by the GPs as presenting regularly with new complaints, having polypharmacy, being in need of patient education and constant treatment adaptations. GPs also described a high expenditure of time for the treatment of patients with multimorbidity.

„So [...] really common is the chronically ill old patient, [who] keeps coming up with new symptoms because the joints are damaged, pain occurs again, the medication is not taken properly or is stopped because of some side effects, which are often very, how to say, 'wailing' you cannot say, but are very plaintive. [...] So that's tiring.” (Section 206, urban GP group)

Another group of patients that many GPs consider to be common in their practice are patients with psychiatric disorders, e.g. burnout, depression, anxiety or borderline disorders. According to the GPs, mental disorders often occur as a comorbidity of somatic diseases. The treatment of these psychiatric disorders is often stressful because the patients need long and frequent conversations, many of them repeatedly consult the GP with the same symptoms and some patients have no insight into the disease. From the GPs' view another frequently encountered patient group were patients with somatoform disorders. These included e.g. patients with unclear chest, abdominal or whole body pain or patients with irritable bowel syndrome. The treatment of these patients and the clarification of their symptoms is time-consuming. GPs reported that it is difficult to convey to the patient that the complaints are not based on an organic cause. GPs also reported that there are many people with dementia among their older patients. The contact with relatives or caregivers plays a major role in the treatment of these patients. Moreover, some GPs have described patients with substance abuse disorders who are dependent on alcohol, medication such as painkillers or sleeping pills, or illegal drugs as a common patient type. For some GPs caring for this patient group is

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3 stressful due to frequent and time consuming consultations. In addition, requests for prescriptions
4 often have to be refused.
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6 7 Patient types classified by sociodemographic characteristics 8

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10 Theme 2 summarized patient types according to sociodemographic characteristics. GPs mentioned
11 that they have patients with social problems due to poverty/low income and educationally
12 disadvantaged patients with low health literacy. These two patient types needed more time-
13 consuming advice and management. From the perspective of the GPs many patients who are
14 affected by poverty struggle with addiction and mental problems and/or poor health conditions. In
15 contrast, GPs reported another category typically for the sociodemographic cluster: privately insured
16 patients. GPs described them as very demanding.
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22 *„I saw in [place in Schleswig-Holstein], [...] the community, I think, got three huge containers of dirt
23 out of this [...] house. It was horrible. And then she sued the communit. After that nobody dared to
24 help her again. And unfortunately we see her in the emergency service with a regularity. This is
25 sometimes very appalling and is becoming more frequent, even in areas where you don't think it's
26 possible.“ (Section 223, rural GP group)*

27
28 *„This is more a, actual a claim. Is probably the same as with patients with a lot of money. The private
29 patient assumes that he basically finances the entire practice with his doctor-patient contact or visit.“
30 (Section 252, environs GP group)*

31
32 GPs reported that patients with migration background sometimes have very different disease
33 concepts. Some patients, e.g. Turkish-born patients, have a different understanding of the disease
34 than other patients due to their origin or culture. This could lead to difficulties in clarifying
35 symptoms and the assessment of treatment urgency and intensity. GPs needed more time for these
36 patients. The described problems concern the category patients with migration background and
37 communication problems as well.
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42 *„What I find exciting in these groups, what sometimes makes it easier for me e.g. we have quite a lot
43 Polish pickers with us. Polish pain is very much the same as German pain. So i.e. when [a] Pole says
44 'my leg hurts'. Then I know roughly how his leg hurts. I don't know about Turkish pain. This [...] is really
45 a problem. So I know that my Turkish patients get disproportionately more painkillers and more
46 antibiotics from me and I can't get it, although I know it. I can't reduce it because I fail because of the
47 language barrier and the way they describe the pain and I can't get it any other way.“ (Section 312,
48 rural GP group)*

49
50 Further patient categories in this theme were minors accompanied by their parents and minors who
51 come alone for consultation. These two groups seemed to be rather less common in the GP
52 practices. Urban GPs reported that children from urban areas were mainly treated by the
53 paediatrician. Rural GPs described that they treated also children particularly when the paediatrician
54 practices were very crowded.
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58 59 Patient types classified by specific care needs 60

Theme 3 comprised patients with specific care needs. GPs described patients with other social problems e.g. marital problems, loneliness or workplace bullying. Especially patients suffering from loneliness influenced the GP practice routine. They came without a special reason for consultation and used the waiting areas for social contacts with other people.

„So, I think it's more of a social problem than a medical problem. That is why they are so often in the clinic. There they meet people. They usually live alone and have some social contact there and can just talk.“ (Section 80, rural GP group)

Patients regularly needing home visits, patients living in a nursing home or senior citizens living on their own without caregivers had in common that they required an additional treatment effort. GPs took responsibility for their older patients and they have to organize their medical treatment which led to a higher workload.

„We just have the very few old people in the nursing home. They have no relatives at all. Nobody cares anymore. Yes [...] so that we no longer have any contact persons even in help so.“ (Section 1091, urban GP group)

„Sometimes the children are far away and there are often very brave old women who really managed it alone for years. Giant garden, huge house and all that. Then it just doesn't work anymore, but they don't want to. Very, very difficult to find a satisfactory solution for everyone, right?“ (Section 244-246, rural GP group)

Patients who are caregivers themselves were described as a vulnerable group with a need of psychosocial support and a higher risk of developing health problems due to the exhausting care situation.

„So some caring relatives do it very well and you have to treat them too, because they can also get exhausted and there are very nice circumstances and just terrible ones.“ (Section 206, rural GP group)

This theme also included struggling single parents. According to the GPs this group deserves special attention. Mothers who care for their children alone in addition to a job were overworked, this complicated the treatment and has a negative effect on their health status.

GP A: "As a group of people, I can still think of the group of single mothers [...]."

GP B: "Overworked, clearly. Overworked and have problems everywhere. [...] Whatever they do, it will always be [a] problem. "

GP A: "Yes, it is very difficult, so because there are quite a lot of them here and I think that their situation is quite understandable." (Section 202 - 204, urban GP group)

Patient characteristics classified by patient behaviour

Theme 4 classified patient types on the basis of common behaviours. Among them are patients who present for consultation bringing along a self-diagnosis obtained via different media. Some of these patients had a clear idea of what they have, what they need and what the GP has to do. These contacts were time consuming, but some of these patients were in a positive way well informed.

„I would differentiate the internet patients again, because I think there are the ones who are really so annoying and are hypochondriacal in some way. But [...] others [...] are [...] uncomfortable for us

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3 *because they often really know details better than we do, because they deal with certain things that*
4 *we have already neglected in routine or [things] we are no longer up to date with.” (Section 160, rural*
5 *GP group)*
6

7 A frequently described patient group was the patients with poor therapy adherence. The GPs
8 complained that these patients do not follow their recommended lifestyle changes e.g. healthy
9 nutrition, physical education, restrictions in smoking and drinking behaviour or medication
10 intake. Working with these patients was very frustrating for the GPs. The most frequent
11 mentioned patient group was the demanding patients. These patients had high expectations
12 towards their GP. They asked for special services e.g. prolonged sickness certificates,
13 inappropriate medication, physiotherapy or massages.
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19 *„The orthopaedic surgeon had no time. He could somehow protect himself and then they end*
20 *up with us and "I brought something with me what does that mean"? Than you really notice,*
21 *you somehow got a ball in your goal.” (Section 207, urban GP group)*
22

23 Two patient categories can be summarized as high users: patients who had at least one
24 consultation per week and patients who regularly make excessive demands on GP’s time during
25 the consultation. These patients consume a lot resources of the GP and their practice
26 management.
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30 *„So, there really are patients who are up to twenty times a quarter. [...] Well, they always have*
31 *a reason. So, [...] if it's medication, medication questions, blood sampling, interpretation of*
32 *results. Then they come from the specialists in order to interpret their results, because that*
33 *obviously doesn't take place there. I do not know. Or [because] you want to hear something*
34 *about it again.” (Section 77 - 79, rural GP group)*
35

36 *„These are the ones that are actually scheduled with a quarter of an hour and that just consume*
37 *45 minutes regularly and where it is sometimes difficult to slow them down. Often they really*
38 *have something. Sure, if it's a tumour patient, you can't him ... or if you want to discuss bullying*
39 *at work for the first time, then you can't get rid of them for a moment. But there are some*
40 *patients where you know in advance that they basically have nothing and still need three*
41 *quarters of an hour.”(Section 139, environs GP group)*
42

43 Another category concerning patient’s behaviour reported by the GPs were patients who
44 proactively consult additional specialists or different GPs for the same problem. This behaviour
45 could be also called “doctor (s)hopping”. Patients change their GPs or other specialists until they
46 get the desired medication or diagnosis.
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49 *„Also the doctor hoppers, who had maybe seven doctors as general practitioners within a year.*
50 *And say, 'Oh, we've heard so much beautiful from you'. But they say that to everyone, we know*
51 *that, we all know that.” (Section 174, rural GP group)*
52

53 Theme 4 contained besides these predominantly demanding patients also the regular patients
54 of the practice. GPs reported that they know many of their regular patients well and the
55 treatment of patients with a long doctor-patient-relationship is often very satisfying.
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58 *„But there are also many close [patients] who have been with you for years and who actually*
59 *appreciate the experience of the doctor and thus put themselves in my hand, I would also say. If*
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3 *you've known them for a long time, a lot actually. Where there is a good relationship of trust,*
4 *where you can also say clear words, but they are not angry afterwards.” (Section 155, rural GP*
5 *group)*
6

7 **Frequencies and regional differences of patient types**

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9 The relative frequency of consultation by the 27 categories of patient types in the total sample,
10 urban areas, environs and rural areas is shown in table 4. Percentages relate to all patients seen
11 in the practices and are averaged across all GPs interviewed, in the total sample as well as in
12 the specified regions respectively. The most common patient types were, besides the “regular
13 patients of the practice” (85.2%), “patients with a chronic illness” (57.7%) and – probably largely
14 overlapping with this category – “patients with multimorbidity” (45.9%). In bivariate analyses,
15 many patient types had a higher frequency in urban areas compared to rural areas. The biggest
16 differences were found for “patients with psychiatric disorders” (19.2% in urban areas vs. 12.5%
17 in rural areas), “educationally disadvantaged patients with low health literacy” (15.8% vs. 9.1%),
18 and “senior citizens living on their own without caregivers” (16.0% vs. 11.2%). In contrast,
19 “minors accompanied by their parents” was the only patient type significantly higher stated in
20 rural areas (3.1% vs. 6.3%).
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23 The results of the two logistic regression models are shown in the tables 5 and 6. Five patient
24 types were identified by the first stepwise backward selection to be more prevalent in urban
25 areas than in rural areas. The highest odds ratios were found for “patients with migration
26 background and culturally different disease concepts” (odds Ratio: 1.23; 95% confidence
27 interval: 1.06-1.42), “privately insured patients” (1.17; 1.05-1.31) and “educationally
28 disadvantaged patients with low health literacy” (1.11; 1.04-1.19). Three patient types were
29 identified to be less prevalent in urban areas than in rural areas. These included “minors
30 accompanied by their parents” (0.71; 0.61-0.83), “patients with poor therapy adherence” (0.87;
31 0.80-0.95) and “patients with dementia” (0.90; 0.82-0.99). The second stepwise backwards
32 selection revealed two categories being more prevalent in environs than in rural areas:
33 “Privately insured patients” (1.10; 1.03-1.18), “patient who proactively consult additional
34 specialists for the same problem” (1.06; 1.01-1.12) and one being less prevalent in environs:
35 “patients who are caregivers” (0.91; 0.83-0.99).
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54 **Discussion**

55 **Main findings**

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3 We derived 27 categories of patient types from the GP focus groups. This patient types could be
4 assigned to four themes: morbidity, sociodemographic characteristics, specific care needs and patient
5 behaviour. GPs from urban areas deal with higher frequencies of patients with psychiatric, social and
6 cultural problems. Furthermore, patients with low health literacy, senior citizens living alone and
7 patients who proactively consult additional specialists were represented more often in urban areas.
8 Only minors accompanied by their parents were more common in rural areas. The biggest difference
9 between urban and rural areas were found in five patient types being more prevalent in urban areas
10 and in three patient types being more prevalent in rural areas.
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20 **Strengths and limitations**

21 As far as we know this is the first mixed method study exploring patient types in GP practices and
22 quantifying and comparing the frequencies of these patient types seen in urban, environ and rural GP
23 practices in northern Germany. In order to maximize the heterogeneity of focus group participants'
24 experience in the qualitative part of the study, we ensured to include both male and female GPs, with
25 longer and shorter durations of practice experience, lower and higher age, from smaller and larger
26 practices and different types of practices from all three areas. Nevertheless, GPs who participated in
27 the focus groups could differ from non-participants due to their motivation, practice experience and
28 special problems from their regions. This could possibly have biased our identified patient types.
29 However, we could include a large variety and high number of focus group participants in our study.
30 The GPs were exclusively from the regions of northern Germany so that the sample might possibly not
31 represent the rest of Germany.
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40 GP practices had been included via a quota sampling into the quantitative part of the study. 91.9% of
41 the administrative districts in the survey area could be included and GPs of less favoured areas which
42 are difficult to reach by public transport, were also represented in the study. We have to contact a
43 high number of 4956 GPs which revealed a comparatively low participation rate of 4.3% interviewed
44 GPs. In Quota sampling the participation rate is not important, however, it may still affect the
45 representativeness of the GP population. Furthermore, we performed a comparison of the data of
46 study participants in the included regions with the statistics of the German national association of
47 statutory health insurance physicians [21]. GPs participating in our study had only been slightly older
48 (urban areas: + 0.9 years; environs: + 0.4 years; rural areas: + 0.6 years) and slightly more often males
49 than the basic study population of the selected districts (urban areas: + 3.6%; rural areas: + 3.6%).
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57 The identification of the patient types took place before the European refugee crisis in Germany
58 arrived. The measurement of the frequencies of the patient types was carried out during this period
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3 (2015-2017). It can be assumed that the refugees have only slowly integrated into the general
4 practices [22]. Therefore, the patient types “patients with migration background and culturally
5 different disease concepts” and “patients with migration background and communication problems”
6 could be nowadays found more frequently in general practices. It could also affect other patient types
7 like “patients with psychiatric problems”, which are frequently found in the refugee population [23].
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12 The contributions of the GPs in the focus groups and the answers in the interviews might have been
13 influenced by memory gaps, errors or social desirability. The order of the questions of the focus group
14 guideline may influenced the answers of the GPs regarding the patient types. Before we asked which
15 kind of patients consult them most often to initiate a discussion about patient types, we asked the
16 GPs to describe the most common reasons for consultations in their practice, eg, chronic back pain or
17 acute infections of the respiratory tract. This could have led the discussion in a certain direction.
18 Nevertheless, we decided the order of the questions to focus in the patient type part on patient
19 characteristics which describes the behaviour, needs or morbidity of a group of patients and not only
20 the reasons for consultations in general practice. Our focus group discussions were supported by at
21 least two experienced moderators out of four (IS, NJP, HH and AS). The interviewers of the quantitative
22 GP interviews had received substantial training and had been supervised in regular meetings
23 throughout the entire study period to minimize the interviewer bias. Additionally, it should be noted
24 that our study had a mixed methods design which combined the advantages of qualitative and
25 quantitative data.
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30 The stepwise variable selection used for identifying significant differences between the regions reacts
31 sensitively to differences in the distribution of the variables and it is not considered a reliable method
32 of variable selection [24]. The results from these analyses therefore describe only one possible, but
33 not necessarily the best solution. Additionally, coefficients resulting from stepwise backward selection
34 analyses tend to be biased upwards in scale and the probability of false positive results is increased
35 [25]. For this reasons, these analyses should be interpreted with care and considered as purely
36 explorative.
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50 **Comparison with literature and discussion of results**

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52 Some studies dealt with the influence of patient characteristics on consultation length or high
53 frequencies in general practice. Characteristics associated with a higher use of consultation frequency
54 were among other things female sex, higher age, unemployment, poverty, living alone or isolation,
55 but regional differences of the distribution of these patient characteristics were regularly not
56 considered [26–29]. Carr-Hill et al. found higher rates of consultations for patients living in urban areas
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3 [14], whereas a study of Mukhtar et al. did not find significant association for practice rurality status
4 [13].
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7 A German study about differences in the provision of lifestyle counselling for cardiovascular disease
8 prevention between urban and rural regions reported that rural GPs named more often a lack of
9 adherence by the patients and urban GPs were more often confronted with patients with a migration
10 background, communication problems and culturally different disease concepts as well [30]. We were
11 able to confirm these results in our study.
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13

14
15 GPs from urban areas more often deal with language problems and culturally different disease
16 concepts due to higher proportions of patients with migration background in cities [30, 31].
17 Furthermore GPs from urban areas of our study reported higher frequencies of patients with
18 psychiatric disorders. Two reviews about urban-rural differences in depression showed similar results
19 for the most reviewed studies as well. However, studies conducted in China revealed higher
20 prevalence of depression among rural residents [32, 33]. Breslau et al. used a large nationally
21 representative sample from the United States and suggest that the prevalence of mental disorders did
22 not differ between urban and rural areas [34]. Other studies reported a higher prevalence of
23 psychiatric disorders in urban areas [35–38]. Poor mental health is associated with poverty as well as
24 migration [39, 40]. Our previous paper about the regional differences in reasons for consultation and
25 GP's service spectrum showed higher frequencies of social problems and psychosomatic basic care for
26 patients in urban areas [3]. This accumulation of psychosocial patient problems in urban areas
27 represents a big challenge for urban GPs.
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38 The here presented study found a significant negative association between urban areas and rural areas
39 for patients with dementia. Koller et al. reported regional variations between urban and rural patients
40 with dementia concerning the specialist treatment after the incident diagnosis of dementia. While
41 urban patients more often consult neurologists and psychiatrists (NPs) in the year before and after
42 the initial dementia diagnosis, rural patients tend to contact their primary care physicians more often
43 but NPs less often [41]. This means a higher workload for rural GPs as regards the treatment of patients
44 with dementia.
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50 Our study revealed higher frequencies of minors accompanied by their parents in GP practices in rural
51 areas. Another study from Germany arrived at the same result. 13.5% of family practices from major
52 cities provided care for infants compared to 26.5% of surgeries in medium-sized towns and 37.5% in
53 small towns or rural areas [42].
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Implications for research and clinical practice

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3 An analysis of the Zi-practice-panel (ZiPP) from the Central Research Institute of Ambulatory Health
4 Care in Germany (Zi) in 2015 showed a higher income for GPs from rural areas than urban areas in
5 Germany. The main reason was the size of the practices. Rural GPs treated 1161 patients in the fourth
6 quarter of 2015, while their colleagues in the city treated 1047 patients. Furthermore, the rural GPs
7 worked 2 hours per week more than the urban GPs [43]. Our study also showed that the GPs from
8 urban areas treated less patients than their colleagues from rural areas. However, they managed
9 higher frequencies of patients with psychiatric, social and culturally problems which can be very
10 complex and time consuming. In addition, urban GPs often just act as a providers of medical services
11 [8] and their patients have a lower commitment [44]. Further research is needed to explore these
12 differences particularly related to the entire German territory.
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20 The identified regional differences should also be included as learning content in the training of
21 medical students and young GPs. In Germany the training of GPs is regulated by the respective
22 regulations on continuing medical education of the federal states [45]. This results in a great variety
23 and legal differences in the federal states. These trainings include the identified problems as
24 psychosomatic primary care, addiction therapy or social medicine but to our knowledge they do not
25 focus on regional differences [46]. The Baden-Württemberg General Practice Competence Center has
26 developed Germany's first competence-based curriculum for general practice training assistants. GPs
27 and the German College of General Practitioners and Family Physicians (DEGAM) were involved [47].
28 This curriculum does not include either the topic regional differences of patient types in general
29 practice. Future revisions of these curricula should consider these regional differences.
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38 Future GPs could compensate the specific needs of their patient clientele with medical training aligned
39 with the requirements of the region. For example, the training for GPs from urban areas should put
40 an emphasis on the treatment of patients with psychiatric, social and cultural problems. Whereas rural
41 GPs need advanced skills regarding the care for children or in compliant patients. Generally, GPs from
42 all regions should be better prepared to address the problems with the worst outcomes, because the
43 differences in the frequencies of topics like psychiatric disorders, poor therapy adherence,
44 hypochondria or drug abuse could also mean that these problems are less talked about or less
45 identified in rural areas. Adjusting the training of GPs accordingly could facilitate a better response to
46 these regional challenges in health care.
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Additional files

Additional file 1: Questionnaire on patient types

List of abbreviations

DEGAM: German Association of General Medicine and Family Medicine; GP: General practitioner; NPS: neurologists and psychiatrists; ZiPP: Zi-practice-panel;

Declarations

Ethics approval and consent to participate

The study was approved by the Ethics Commission of the Hamburg Medical Association on 12 August 2013 (file number PV 4535). All study participants gave their written informed consent prior to their participation in the study.

Availability of data and material

The ethics approval does not allowed data sharing.

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Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MS, IS, NJP and HH conceived and designed the study. HH, NJP and IS facilitated the focus groups and analysed qualitative data. IS analysed the quantitative data. DL, AK and HHa significantly contributed to the study design and/or discussion of the study results. HH and IS drafted the manuscript. All the authors commented on the draft and read and approved the final version of the manuscript.

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Tables

Table 1: Description of participating GPs from the focus groups (n=65)

	Urban areas	Environs	Rural areas
Age (in years):	54.3 ± 7.7	50.6 ± 8.8	55.0 ± 9.7
Sex:			
- female	6	5	10
- male	18	14	12
Number of patients per month :			
- up to 250 patients	42%	5%	9%
- 251 patients and more	58%	95%	91%
Years of practice experience:	17.4 ± 10.0	12.4 ± 9.4	15.4 ± 9.2
Type of medical practice:			
- individual practice	25.0%	52.6%	50.0%
- group practice	54.2%	42.1%	36.4%
- joint practice	20.8%	5.3%	13.6%

Table 2: Description of the interviewed GPs from the cross-sectional observational study (n=211)

	Total	Urban areas	Environs	Rural areas	p (U/R)	p (E/R)
Age (in years):	54.5 ± 8.6 (n=207)	53.5 ± 7.8 (n=66)	54.7 ± 8.6 (n=72)	55.4 ± 9.2 (n=69)	0.190	0.630
Sex:						
- female	34.6%	45.5%	27.0%	32.4%	0.117	0.479
- male	65.4% (n=211)	54.6% (n=66)	73.0% (n=74)	67.6% (n=71)		
<i>Number of patients per month:</i>	344 ± 115 (n=207)	<i>314 ± 101</i> <i>(n=65)</i>	345 ± 96 (n=74)	<i>372 ± 140</i> <i>(n=68)</i>	<i>0.007</i>	0.172
<i>Type of medical practice:</i>						
- <i>individual practice</i>	51.7%	<i>43.9%</i>	51.4%	<i>59.2%</i>	<i>0.004</i>	0.074
- <i>group practice</i>	6.2%	<i>12.1%</i>	6.8%	-		
- <i>joint practice</i>	40.8%	<i>39.4%</i>	41.9%	<i>40.9%</i>		
- <i>medical care centre</i>	1.4% (n=211)	<i>4.6%</i> (n=66)	- (n=74)	- (n=71)		

U/R: comparison "urban areas" vs. "rural areas"; E/R: comparison "environs" vs. "rural areas"
Statistically significant results ($p \leq 0.05$) are shown in bold and italic

Table 3: Identified themes and categories of patients types in GP practices from focus groups**Theme 1: Morbidity**

- Patients with a chronic illness
- Patients with multimorbidity (ie, at least 2 chronic diseases)
- Patients with psychiatric disorders (eg, depression, burnout, anxiety, borderline disorder)
- Patients with somatoform disorders
- Patients with dementia
- Patients with substance abuse disorders

Theme 2: Sociodemographic characteristics

- Educationally disadvantaged patients with low health literacy
- Privately insured patients (ie, patients who are insured outside of Germany's statutory health insurance system)
- Patients with social problems due to poverty/low income
- Minors accompanied by their parents
- Patients with migration background and culturally different disease concepts
- Patients with migration background and communication problems
- Minors who come to consultation on their own

Theme 3: Specific care needs

- Senior citizens living on their own without caregivers
- Patients with other social problems (eg, marital problems, loneliness, workplace bullying)
- Patients regularly needing home visits
- Patients living in a nursing home
- Patients who are caregivers
- Struggling single parents

Theme 4: Patient behaviour

- Regular patients of the practice (as opposed to patients who consulted the GP only once or only if the regular GP practice is closed)
- Patients, who come with self-diagnoses via media (eg, internet, magazines, television)
- Patients with poor therapy adherence (eg, regarding medication, lifestyle changes)
- Demanding patients (eg, patients requesting prolonged sick certificates, inappropriate medication or physiotherapy)
- Patients who regularly make excessive demands on GP's time
- Patients who proactively consult additional specialists for the same problem
- Frequent attenders (ie, at least one consultation per week)
- Patients who proactively consult different GPs because of the same problem

Table 4: Relative frequencies of the consultations by categories of patient types in GP practices divided by region^{MA}

	Total (n=210)	Urban areas (n=65)	Environs (n=74)	Rural areas (n=71)	p (U/R)	p (E/R)
Theme 1: Morbidity						
- Patients with a chronic illness	57.7%	57.2%	57.3%	58.6%	0.662	0.680
- Patients with multimorbidity	45.9%	47.4%	43.3%	47.2%	0.953	0.224
- Patients with psychiatric disorders	14.7%	19.2%	12.8%	12.5%	0.002	0.839
- Patients with somatoform disorders	14.4%	15.6%	14.6%	13.0%	0.175	0.464
- Patients with dementia	6.4%	5.7%	7.1%	6.3%	0.549	0.417
- Patients with substance abuse disorders	5.6%	7.2%	5.2%	4.5%	0.017	0.441
Theme 2: Sociodemographic characteristics						
- Educationally disadvantaged patients with low health literacy	10.9%	15.8%	8.4%	9.1%	0.004	0.666
- Privately insured patients	8.4%	9.3%	9.4%	6.6%	0.074	0.007
- Patients with social problems due to poverty/low income	5.9%	8.7%	4.2%	5.3%	0.020	0.270
- Minors accompanied by their parents	4.8%	3.1%	5.0%	6.3%	<0.001	0.139
- Patients with migration background and culturally different disease concepts	3.9%	6.5%	3.0%	2.5%	<0.001	0.492
- Patients with migration background and communication problems	3.5%	5.6%	2.6%	2.6%	0.002	0.962
- Minors who come to consultation on their own	3.0%	2.7%	3.4%	2.8%	0.928	0.270
Theme 3: Specific care needs						
- Senior citizens living on their own without caregivers	13.2%	16.0%	12.7%	11.2%	0.034	0.401
- Patients with other social problems	9.2%	12.5%	7.4%	8.1%	0.021	0.579
- Patients regularly needing home visits	8.7%	8.4%	8.3%	9.5%	0.370	0.277
- Patients living in a nursing home	8.1%	7.8%	7.9%	8.6%	0.553	0.642
- Patients who are caregivers	4.8%	5.2%	4.2%	5.0%	0.739	0.356
- Struggling single parents	4.3%	4.9%	3.9%	4.2%	0.469	0.719
Theme 4: Patient behaviour						
- Regular patients of the practice	85.2%	83.3%	86.0%	86.1%	0.245	0.969
- Patients, who come with self-diagnoses via media	13.2%	14.1%	13.6%	11.8%	0.308	0.408
- Patients with poor therapy adherence	11.3%	9.2%	12.7%	11.9%	0.135	0.722
- Demanding patients	11.1%	11.0%	11.0%	11.2%	0.926	0.920
- Patients who regularly make excessive demands on GP's time	7.6%	9.5%	7.6%	6.0%	0.086	0.301
- Patients who proactively consult additional specialists for the same problem	6.7%	7.5%	7.8%	4.7%	0.008	0.016
- Frequent attenders	6.0%	5.7%	5.4%	6.8%	0.537	0.434
- Patients who proactively consult different GPs because of the same problem	2.7%	2.8%	3.0%	2.3%	0.435	0.375

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U/R: comparison „urban areas“ vs. „rural areas“; E/R: comparison „environs“ vs. „rural areas“; MA: Multiple answers permitted; Statistically significant results ($p \leq 0.05$) are shown in bold and italic

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Table 5: Association between the frequencies of the consultations of categories of patient types in GP practices and urban areas vs. rural areas: results of a logistic regression

urban areas vs. rural areas	OR	95% CI	p
Minors accompanied by their parents	0.71	0.61 to 0.83	<0.001
Privately insured patients	1.17	1.05 to 1.31	0.005
Patients with poor therapy adherence	0.87	0.80 to 0.95	0.002
Senior citizens living on their own without caregivers	1.05	1.01 to 1.09	0.014
Educationally disadvantaged patients with low health literacy	1.11	1.04 to 1.19	0.001
Patients with psychiatric disorders	1.07	1.02 to 1.12	0.011
Patients with dementia	0.90	0.82 to 0.99	0.036
Patients with migration background and culturally different disease concepts	1.23	1.06 to 1.42	0.007

Table 6: Association between the frequencies of the consultations of categories of patients types in GP practices and environs vs. rural areas: results of a logistic regression

environs vs. rural areas	OR	95% CI	p
Patients who are caregivers	0.91	0.83 to 0.99	0.022
Privately insured patients	1.10	1.03 to 1.18	0.005
Patients who proactively consult additional specialists for the same problem	1.06	1.01 to 1.12	0.024

Additional file 1: Questionnaire on patient types

HA24 How many patients do you see in an average week during your consultation including home visits (no overcrowded weeks, no below average weeks, no flu season)?

patients

HA25 How many patients you see in an average week ... (estimated in absolute numbers, the sum need not be the sum of HA24)

belong to your regular patient base (no representation / emergency patients)

are privately insured patients

have a chronic illness

have multimorbidity (at least two chronic diseases)

have a substance abuse disorder

have a psychiatric disorder (e.g. depression, burnout, anxiety, borderline disorder)

have dementia

have a somatoform disorders (e.g. unclear pain, irritable bowel)

have a culturally different disease concept due to migration background

have communication problems due to migration background

have social problems due to poverty/low income

are patients with other social problems (e.g. marital problems, loneliness, workplace bullying)

are educationally disadvantaged patients with low health literacy

come with self-diagnoses via media (e.g. internet, magazines, television)

are struggling single parents

are children (under the age of 18) accompanied by their parents

are children (under the age of 18) who come to consultation on their own

are senior citizens living in their own without caregivers

are patients who are caregivers

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4 [] [] [] are patients who need regular home visits

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6 [] [] [] are patients living in nursing home

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8 [] [] [] are demanding patients (e.g. patients requesting prolonged sick certificates,
9 inappropriate medication or physiotherapy)

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11 [] [] [] are patients with poor therapy adherence (eg, regarding medication, lifestyle changes)

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13 [] [] [] are patients who come to the general practitioner at least one consultation per week

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15 [] [] [] are patients who regularly make excessive demands on GP's time

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17 [] [] [] are patients who proactively consult different GPs because of the same problem

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Dr. Heike Hansen, Dr. Ingmar Schäfer, Dr. Nadine Janis Pohontsch, Agata Kazek, Hanna Hardt, Dr. Dagmar Lühmann, Prof. Dr. Martin Scherer

Regional differences in the patient population of general practices in northern Germany - results of a mixed methods study

STROBE 2007 (v4) checklist of items to be included in reports of observational studies in epidemiology* Checklist for cohort, case-control, and cross-sectional studies (combined)

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	2
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4
Objectives	3	State specific objectives, including any pre-specified hypotheses	4-5
Methods			
Study design	4	Present key elements of study design early in the paper	5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5-6
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants	6
		(b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case	
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6-7
Bias	9	Describe any efforts to address potential sources of bias	6-7
Study size	10	Explain how the study size was arrived at	6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6-7

Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	6-7
		(b) Describe any methods used to examine subgroups and interactions	6-7
		(c) Explain how missing data were addressed	N/A
		(d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy	6
		(e) Describe any sensitivity analyses	N/A
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	8
		(b) Give reasons for non-participation at each stage	8
		(c) Consider use of a flow diagram	s. Schäfer et al. 2020
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	8; table 1 and 2
		(b) Indicate number of participants with missing data for each variable of interest	8; table 1 and 2
		(c) <i>Cohort study</i> —Summarise follow-up time (eg, average and total amount)	
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time	
		<i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure	
		<i>Cross-sectional study</i> —Report numbers of outcome events or summary measures	12-13, table 4 and 5
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	12-13
		(b) Report category boundaries when continuous variables were categorized	N/A
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	N/A
Discussion			
Key results	18	Summarise key results with reference to study objectives	14
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	14
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	14-15
Generalisability	21	Discuss the generalisability (external validity) of the study results	15-16
Other information			

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Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	17
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*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at www.strobe-statement.org.

For peer review only

Consolidated criteria for reporting qualitative studies (COREQ): 32-item checklist

No	Item	Guide questions/description	Reported on page/ comment
Domain 1: Research team and reflexivity			
Personal Characteristics			
1.	Interviewer/facilitator	Which author/s conducted the interview or focus group	page 6
2.	Credentials	What were the researcher's credentials? <i>E.g. PhD, MD</i>	page 17
3.	Occupation	What was their occupation at the time of the study?	page 17
4.	Gender	Was the researcher male or female?	both sexes were involved
5.	Experience and training	What experience or training did the researcher have?	page 17
Relationship with participants			
6.	Relationship established	Was a relationship established prior to study commencement?	no
7.	Participant knowledge of the interviewer	What did the participants know about the researcher? <i>e.g. personal goals, reasons for doing the research</i>	name, institute, topic of discussion:

No	Item	Guide questions/description	Reported on page/ comment
			regional differences in primary care
8.	Interviewer characteristics	What characteristics were reported about the interviewer/facilitator? <i>e.g. Bias, assumptions, reasons and interests in the research topic</i>	age, profession
Domain 2: study design			
	Theoretical framework		
9.	Methodological orientation and Theory	What methodological orientation was stated to underpin the study? <i>e.g. grounded theory, discourse analysis, ethnography, phenomenology, content analysis</i>	page 7
	Participant selection		
10.	Sampling	How were participants selected? <i>e.g. purposive, convenience, consecutive, snowball</i>	page 6
11.	Method of approach	How were participants approached? <i>e.g. face-to-face, telephone, mail, email</i>	page 6

No	Item	Guide questions/description	Reported on page/ comment
12.	Sample size	How many participants were in the study?	page 8
13.	Non-participation	How many people refused to participate or dropped out? Reasons?	Page 6; 1910 GPs were invited. 65 GPs were included in the focus groups. Details s. Pohontsch et al. 2018
Setting			
14.	Setting of data collection	Where was the data collected? e.g. <i>home, clinic, workplace</i>	page 6
15.	Presence of non-participants	Was anyone else present besides the participants and researchers?	page 7
16.	Description of sample	What are the important characteristics of the sample? e.g. <i>demographic data, date</i>	page 8, table 1
Data collection			
17.	Interview guide	Were questions, prompts, guides provided by the author? Were they tested? Was it pilot?	pages 6-7
18.	Repeat interviews	Were repeat interviews carried out? If yes, how many?	page 8, 9 focus groups

No	Item	Guide questions/description	Reported on page/ comment
19.	Audio/visual recording	Did the research use audio or visual recording to collect the data?	page 6
20.	Field notes	Were field notes made during and/or after the interview or focus group?	page 7
21.	Duration	What was the duration of the interviews or focus group?	page 6, 120 minutes
22.	Data saturation	Was data saturation discussed?	no
23.	Transcripts returned	Were transcripts returned to participants for comment and/or correction?	no
Domain 3: analysis and findingsz			
Data analysis			
24.	Number of data coders	How many data coders coded the data?	page 7, 3 data coders
25.	Description of the coding tree	Did authors provide a description of the coding tree?	page 23, table 3
26.	Derivation of themes	Were themes identified in advance or derived from the data?	page 7
27.	Software	What software, if applicable, was used to manage the data?	page 7, Maxqda
28.	Participant checking	Did participants provide feedback on the findings?	no

No	Item	Guide questions/description	Reported on page/ comment
Reporting			
29.	Quotations presented	Were participant quotations presented to illustrate the themes / findings? Was each quotation identified? e.g. <i>participant number</i>	pages 8-12
30.	Data and findings consistent	Was there consistency between the data presented and the findings?	yes
31.	Clarity of major themes	Were major themes clearly presented in the findings?	page 8, 4 categories
32.	Clarity of minor themes	Is there a description of diverse cases or discussion of minor themes?	pages 8-12