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Relationship between psychosocial problems and satisfaction with GP communication in primary care patients: A structural equation model based on the cross-sectional GPCare-1 patient study

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Abstract

Objectives

This study examined the relationship between primary care patients´ psychosocial problems, other patient characteristics that are associated with satisfaction with overall care, and satisfaction with GP communication.

Design

A cross-sectional survey was conducted. Patients filled an anonymous 2-page questionnaire on various socio-demographic, medical characteristics, and their satisfaction with GP communication. Structural equation modelling evaluated associations of various patient characteristics including psychosocial problems with GP communication.

Setting

General practices in Germany.

Participants

A total of 813 patients from 12 GP practices participated. The survey was conducted in summer 2020 during a Covid-19 lockdown.

Results

The prevalence of psychosocial problems was 30%. The three most frequent problems were excessive stress at work (19%), financial problems/debts (9%), and loneliness (8%). Most patients agreed that their GP takes their problems seriously (71%), feeling comfortable talking about sensitive things (66%), having enough space in communication (62%), and being asked by their GP about personal strains (53%). Perceived social support, health status, a preference to get GP´s help for one's problems and age predicted lower satisfaction with GP communication, while the number of psychosocial problems, gender, years with physician, chronic stress, and

depression had no influence. According to the Bentler Comparative Fit Index [1], the pooled structural equation model had a 97.6 % better fit than the corresponding model without covariate effects.

Conclusions

GPs should be aware of the high prevalence of patients´ psychosocial problems and actively address patients´ social support and self-management preferences which influence patients' satisfaction with GP communication.

Trial registration

The GPCare-1 study was registered in the German Clinical Trials Register (DRKS00022330).

Keywords

physician-patient-communication, social determinants of health, psychosocial problems, general practice, primary care

Strength and Limitations of this study

- The study examines the prevalence of psychosocial problems and satisfaction with GP communication in primary care patients from a patient rather than a provider's perspective
- The study recruited a large sample of German primary care patients (n = 813) from different socioeconomic backgrounds, stratified by region
- Structural equation modelling was used to estimate a multiple parameter model that predicted patient satisfaction with GP communication

- The patient sample is not representative but in some characteristics similar to national comparative values
- The study used a cross-sectional design so no causal relationships can be determined.

Background

Psychosocial aspects of life influence morbidity and mortality [2]. For example, lower socioeconomic status and lower income are related to shorter life expectancy and poorer quality of life [3–5]. Also, chronic stress, social isolation, and financial problems are associated with a higher prevalence of adverse outcomes related to cardiovascular diseases [6, 7] cerebrovascular diseases, hypertension [8–10] and cancer [11–13]. It has further been shown that considering patients' contextual factors, such as financial or transportation problems, can play an important role in improving patient outcomes and decreasing health care costs [14, 60-61]. Aiming to improve health outcomes for these populations, general practitioners can play an important role due to their personal relationship to patients from various backgrounds with the potential to address psychosocial problems. However, contextual factors are not always identified and addressed in primary care.

While collaborative structures of physicians and social workers are being implemented in a few countries like Great Britain and Ireland [15], studies from other settings report that patients´ psychosocial needs are often not identified [16] and not addressed by GPs [17–19]. In line with this, general practitioners reported lower prevalence rates of patients' psychosocial problems such as financial difficulties, personal stress, or unemployment, than their patients [20]. A study from the Danish primary care setting showed that GPs typically address biological and psychological issues, but feel uncomfortable to address patients' social needs due to a lack of training and knowledge of resources [21]. A study from Norway shows that only 17% of the consultations were influenced by the GPs' knowledge of their patients' social problems [22].

Adequate GP communication is the basis to address psychosocial problems in consultations and is shown to be the strongest driver of patient satisfaction with primary care [23]. However, factors influencing satisfaction with GP communication, and especially the association between psychosocial problems and satisfaction with GP communication have not been studied widely. Several studies examined patient-related factors that influence satisfaction with GP care. For example, lower age [24, 25], poorer self-reported mental health [26, 27], lower physical health status [25, 26, 28, 29], and lower perceived social support [26, 30] were associated with less patient satisfaction with care. Yet, it has not been systematically investigated how these factors influence patients' satisfaction with GP communication.

A study by Gulbrandsen and colleagues [20] highlights the importance of communication in primary care, showing that patients disclosed less than half of their reported problems to their GP. Using data from more than 800 patients from the German GPCare-1 patient survey, this study addresses the relationship between patients´ psychosocial problems, other patient characteristics associated with satisfaction with overall care, and the satisfaction with GP communication.

Methods

The General Practice Care-1 study (GPCare-1) is a cross-sectional study conducted by the Institute of Family Medicine and General Practice, University of Bonn, Germany. It examined the following three aspects:

1) the prevalence of psychosocial problems in adult GP patients from practices of our teaching practice research network,

2) patients´ satisfaction with GP communication, and

3) the associations between psychosocial problems, patient-reported characteristics and patients´ satisfaction with GP communication.

Design, Settings and Patients

Practice recruitment

The study was conducted in 12 primary care teaching practices, which are affiliated with the Institute of General Practice and Family Medicine, University of Bonn and University Hospital Bonn. Practices were selected based on different socio-demographic regional characteristics (e.g., age structure, population density, proportion of migrants) to ensure a coverage of differing population groups. The survey was conducted between June and August 2020 which happened to be during the second Covid-19 lockdown in Germany. As practices were too busy during the Covid-19-pandemic, the response rate was calculated based on average data of patients per practice from a public German data base [31] and a documented 40% reduction in patient volume in GP practices [32]. The calculated response rate was 24.1%.

Participants´ recruitment

All adult patients who visited one of the practices during the survey period and were able to fill in a questionnaire in the waiting room were eligible. Reception clerks offered the study material which comprised an information letter and a two-page questionnaire in different languages (German, English, Arabic, Turkish). It took about ten minutes to fill in the questionnaire. Completed questionnaires were dropped into a locked "post box" in the practice using a sealed envelope. Patients were informed about the anonymity of the survey, their voluntary participation, and the aim of the study both verbally and in writing. By participating, patients declared their consent.

Measures

The GPCare-1 questionnaire comprised a total of 48 questions. It integrated existing questions from standardized surveys as well as self-developed items. Questions addressing patients´ sociodemographic characteristics, health and psychosocial characteristics were mainly derived from the DEGS1 questionnaire used by the Robert-Koch-Institute for the national health monitoring system [35]. Additional four questions addressed patients´ experiences in communicating with their GP. The questionnaire was piloted with 40 individuals from the German general population with minor adjustments thereafter. The following aspects were included:

- *Socio-demographic characteristics*: age, gender (male/female/divers).
- *Education:* current profession, work sector, highest educational level (low = did not complete any education/ secondary school up to 9th grade/ secondary school up to 10th grade, middle=high school (A-levels)/vocational school; high=university degree), current occupational status, and monthly household net income.
- *Living Conditions*: relationship status, informal caregiving, migration background, household size
- *Social support* was measured with the OSLO-Scale [33]. It categorizes participants´ perceived availability of social support into low, medium and high.
- *Health-related factors (physical)*: time with the GP as a patient, general health status, specific health problems (e.g., diabetes, high blood pressure), self-management style (preference to solve problems on one's own).
- *Depressive symptoms* were measured with the PHQ-2 of the Patient-Health-Questionnaire (PHQ) [34]. The PHQ-2 is a brief screening instrument to assess the severity of depressive symptoms. It consists of two items that ask about depressive

symptoms over a period of the last 14 days. Answer possibilities range from 0 (never) to 3 (almost every day) with a maximum of 6 points.

- Chronic stress (last three months) was measured with the 12-Item-screening tool TICS-SSCS [35, 36]. A sum score was calculated and classified into 3 categories: low (0-11), middle (12-22) and high (22-28).
- *Psychosocial problems:* Patients were asked whether they were currently affected by any of the following problems: excessive stress at work, loss of job / unemployment, feeling of loneliness, taking care of a relative or (family) friend (Informal caregiving), financial problems / debts that are difficult to negotiate, death of a partner, physical attacks, psychologically hurting actions or threats, sexual harassment and assaults.
- *Satisfaction with GP communication:* Four items addressed physician-patient-communication with previous GP contacts based on existing instruments. Participants were asked for their agreement to various statements using a 5-point Likert scale (strongly disagree to strongly agree). A sum score was calculated with higher scores indicating more satisfaction with GP communication. The following instruments were considered in the development of these items: the Medical Interview Satisfaction Scale (MISS) [37] the Patient Request Form [38], the Patient-Doctor Relationship Questionnaire (PDRQ-9) [39] and the Patient Reaction Assessment Instruments (PRAD) [40].

Data analysis

The patient sample was described using descriptive statistics and frequencies. Per patient, the number and kind of problems currently burdening was summed (0, 1-2, 3-4, 5+). Differences in prevalence were investigated using Chi-square test. Missing

rates are displayed in brackets behind the respective item. All percentages are displayed as valid percent.

Associations between communication and satisfaction as well as their dependencies were jointly estimated by a structural equation model (SEM). The latent continuous endogenous variable satisfaction with GP communication represents one dimension of patient satisfaction with quality of care, including perceived consideration for the patient [41] and emotional support [38]. Communication quality is a sub-dimension of the interpersonal qualities of a general practitioner [42]. The SEM consists of a structural component that is represented on the left side of the latent variable in Figure 3 and a measurement model displayed on the right side of the latent variable. Outgoing arrows represent independent variables and ingoing arrows dependent variables. All variables used in the structural equation model were assumed to be observations from a continuous scale. That includes the summary variables derived from multiple items, such as the sum of PHQ items, sum of SCSS items and the number of impairments.

The structural component part can be interpreted analogously to a linear regression framework [58]. All observed items on the left side (age, gender, social support, time with the GP, depression score, chronic stress, number of current psychosocial problems, health status and communication preference) correspond to independent covariates and the latent variable satisfaction with GP communication is the dependent response variable. The latent variable is assumed to be continuous and normal distributed conditional on the items. Each path represents the effect of the specific item on the latent variable. Due to continuous scale of observed variables, each coefficient represents the linear effect of the covariate on satisfaction with GP communication if the covariate would be increased by one unit given all other covariates stay constant.

In the measurement model part, the observed items (communication 1-4) are responses that are explained by the latent variable satisfaction with GP communication analogue to factor analysis [59]. The coefficient of personal strains was restricted to one due to identifiability constraints. Each path represents factor loadings that can be interpreted as regression coefficients between covariate satisfaction with GP communication and each item. Values near one are an indication of good correspondence between the construct satisfaction with GP communication and measured items (e. g. comfortableness, problem perception).

In the model, the latent variable depends on the observed items age, gender, social support, time with the GP, depression score, chronic stress, number of current psychosocial problems, health status and communication preference. Satisfaction was measured by observed items communication 1-4.

Missing values were imputed by multiple imputation by chained equations [43] with 25 iterations and repetitions. Continuous covariates (e. g. age, Oslo score) were imputed by predictive mean matching, nominal covariates (e. g. gender) were imputed by multinomial regression [44] and ordinal covariates (e. g. health status) were imputed by proportional odds models [45]. For each multiple imputed data set, a structural equation model was estimated [46]. All items were assumed to be ordinal representations of continuous scales. Norman [47] points out that many previous studies show the robustness of Likert scales to parametric assumption violations and in case of five point Likert scales, a simulation study showed that t-test and Mann-Whitney-Wilcoxon Tests had similar power [48]. According to recommendations of Kline [46] we report several pooled structural equation model goodness of fit statistics. IBM Statistical Package for Social Sciences (SPSS, Version 25.0) for Windows was used [49] for the first part of the analyses. The structural equation modelling was

conducted with statistical software R Version 4.2.2 [50]. The SEM was estimated using default settings in R-package lavaan Version 0.6-15 [57] by Maximum Likelihood method. Variances of the latent variable and their measurement variables were not fixed and estimated from the data. The model consists of 17 parameters (structural part 10 parameters, measurement part 3 parameters and variance estimation 4 parameters). The sample size to estimated parameters ratio is 47.71 which is more than double than the recommended minimum ratio of 20 in Kline [40]. In this work, p-values below 0.05 were considered significant.

Patient and public involvement

General practitioners were involved in the planning and design of the study design and the questionnaires. Forty persons from the general public were involved in pretesting the questionnaires. Patients were involved as participants in the conduct of the study. The findings will be presented to and discussed with general practitioners and patients from our practice and research network.

Results

Sample description: socio-demographic and health characteristics

The GPCare-1 data set included 813 adult GP patients. Characteristics are displayed in Table 1. The mean age was 52 years (range 18-91 years). The sample included about 59% females. 25% of the participants had a migration background. More than 60% of the participants were with their GP for more than 5 years (65%). The majority of participants reported middle or high social support (middle: 52%, high: 28%), while 21% of the participants reported low social support. Almost one third of the patients

indicated excessive stress (19%), and 42% reported a bad general health. The most frequent health problems of the participants were back and/or joint complaints (55%), high blood pressure (36%), and sleeping disorders (31%).

Table 1: Sample description, N=813. Missing values are described after each variable [N].

	N	%
Gender [13]		
female	474	59.3
male	337	41.4%
diverse	2	0.3
Age, *mean, SD* [13]	51.61	18.7
Age groups [13]		
18-39	243	30.4
40-59	266	33.3
60-69	130	16.3
70-79	103	12.9
80+	58	7.2
Chosen questionnaire language [0]		
German	761	93.6
Other	52	6.4
Migration background [36]	194	25.0
Education [23]		
Low	247	31.3
Middle	336	42.5
High	190	24.1
Other	17	2.2
Social support [48]		
Low	157	20.5
Middle	398	52.0
High	210	27.5
General health status (subjective) [20]		
Moderate, bad, very bad	333	42.0
Excellent, very good, good	460	58.0
Health Problems [38]		
Back / joint complains	428	55.2
High blood pressure	282	36.4
Sleeping disorders	240	31
Migraine	90	11.6
Coronary artery disease (CAD)	82	10.6
Chronic obstructive pulmonary disease (COPD)	64	8.3
Depressive symptoms (PHQ 2), mean, SD [97]	1.75	1.62
Chronic stress (SSCS), *mean, SD* [125]	17.01	10.4

Low	223	27.4
Medium	260	32.0
High	205	25.2
Years with GP [26]		
< 3 year	150	18.9
3-5 years	122	15.5
>5 years	515	65.4
Number of current psychosocial problems per Patient, categorized [34]		
None	535	68.7
1-2	199	25.5
3-4	36	4.6
5+	9	1.2
Satisfaction with GP Communication, mean, SD	15.19	4.19

Seventy percent of the patients did not report any psychosocial problems, while about a fourth (25%) reported 1 to 2 problems, 4% three to four problems, and about 1% had five or more challenges. The most reported psychosocial problems by GP patients were stress at work (19%), feeling of loneliness (9%), and financial difficulties (7%). Figure 1 displays the self-reported psychosocial problems in GP practices and self-management preferences of those patients who reported at least one current psychosocial problem.

Physician-patient communication

More than half of the patients agreed or agreed strongly to each of the four communication statements. In detail, 71% agreed that “the doctor takes my problems seriously”, 66% reported to being “made feeling comfortable when talking about sensitive things”, 62% were “given enough space to describe personal strains”, and 53% are “asked about stress caused by personal strains”. For details, see Figure 2.

Modelling satisfaction with GP communication

The structural equation model was estimated as described in the section Data analysis. The Chi-Square statistic value was 65.549 and the fit differs from a model without covariates (p-value < 10^{-3}). According to the Bentler Comparative Fit Index [1] the pooled structural equation model has a 97.6 % better fit than the corresponding model without covariate effects. Steiger-Lind Root Mean Square Error of Approximation [51] had a value of 0.039 with confidence interval [0.027, 0.052]. The fit is good, because it is lower than the threshold 0.05 suggested by Browne [52]. This interpretation is in line with the value of the standardized root mean square residual (srmr=0.019) that is below the threshold of 0.1. The estimated structural equation model parameters are shown in Figure 3. The variables social support, health status and self-management preference, and age predicted the latent variable satisfaction, suggesting that lower age, less social support, worse health status and less preference to solve problems on their own was associated with lower satisfaction with GP communication.

Discussion

The present study examined the prevalence of psychosocial problems in GP practices, patients' satisfaction with GP communication, and the relationship between psychosocial problems, other patient-related variables, and patients' satisfaction with GP communication. About every third primary care patient reported at least one current psychosocial problem, with the most common being stress at work (19%), loneliness (9%), and financial problems (8%). Generally, patients were satisfied with GP communication, and most patients did not explicitly prefer help from their GP to solve their problems. Higher social support, preference to solve one's problem without GP help, higher age, and better health status but not the number of psychosocial problems

predicted more satisfaction with physician-patient-communication. To the authors' knowledge, this is the first study that examined psychosocial problems and patient-physician-communication in a large primary care patient sample in Germany. GPs should be aware of the presence of current social support and patients' self-management preference as important factors associated with patients' satisfaction with GP communication.

The study assessed the prevalence of psychosocial problems in German primary care patients from a patient perspective. Selected GP practices in different regions were selected in order to reach a variety of patients from different social backgrounds. The nature of psychosocial problems reported by GP patients in this study are in line with those reported by German GPs [18]. The reported prevalence rates were similar to those reported in a study of GP patients in Norway, e.g., stressful working conditions (25%) or loneliness (7%) [19].The reported psychosocial problems seem to be more prevalent than reported by GPs, who indicated that psychosocial problems play a role in their consultations at least three times per week [18]. This finding, in turn, is in line with Bikson et al. [53] and Gulbrandson et al. [19] who found that the prevalence of psychosocial problems in GP practices was higher when assessed through patients compared to GPs. Furthermore, the prevalence of some self-reported psychosocial problems in GP patients found in this study seem higher than in the German general population. For example, only 11% of the German population reported chronic stress in the DEGS study [35], which is lower than the percentage of patients who reported currently being burdened by stress at work in this study. The prevalence of loneliness in this study was similar (with 9%) to the one reported in the city of Leipzig, where 12% of the population reported being lonely in 2011 [54].

Structural equation modelling was used to examine the relationship between psychosocial problems, social support, self-management preferences, patients' background factors and patients' satisfaction with GP communication. The method of analysis allowed to include multiple parameters associated with patient satisfaction into the same statistical model. Previous studies have examined the relationship between some of the variables and satisfaction with GP communication separately but have not included them in one statistical model. Furthermore, the study included parameters, such as health status and perceived social support, that were found to be associated with general patient satisfaction with care [24, 26, 28] but have not been examined with regards to patient satisfaction to GP communication. As general satisfaction of patients is related to satisfaction with the quality of doctor-patient-communication [55], the relationships are not surprising. It needs to be kept in mind that the relationship between psychosocial problems, the encounter, and satisfaction are complex and interpretation should be made with caution. A recent study by Gulbrandson and colleagues showed, for example, that the numbers of encounters, gender of the doctor and patients' affect influences the evaluation of the encounter [56].

There are several limitations to the study. Firstly, the study used a cross-sectional design so no causal relationships can be determined. Secondly, the data collection took place during the Covid-19 pandemic. Strict hygiene concepts, precautionary measures, and infrastructural adaptation may have influenced participants' participation in the study. Thirdly, due to the Covid-19 lockdown, it was not possible to assess the total number of patients that frequented the GP practices. We therefore had to calculate the participants' response rate from public databases. Fourthly, the income was not reported by many patients (missing for n = 197) and could therefore not be included in the model. Some other variables, such as chronic stress (n = 125) and

satisfaction (n = 65) had also a relatively high number of missing values, indicating that participants did not always fill in the questionnaires thoroughly. It is possible that participants did not feel comfortable to fill in certain information, such as household income, or that they did not provide the correct information with regards to age and gender, for example. As the data collection was anonymous, we had no way of controlling this. Hence, the interpretation of the findings must be done with caution. Fifthly, we could not check for double responses by participants who visited the facility several times within the data collection period, as the participation was anonymous. However, double responses are unlikely, as patients did usually not come in more than once during the length of the sampling period in the Covid-19 pandemic. Finally, the sample is not representative of the German general population, particularly with regards to gender (the sample has a higher percentage of women than the General German population) and age (the sample is older than the General German population). This is not surprising in a sample of primary care patients as younger and healthier people go to the doctor less frequently. However, the higher prevalence for psychosocial problems may be (partly) attributed to the differences in age and / or gender. Hence, the effect may be overestimated due to the bias in the sample. We still believe that the study is making a valuable contribution, as the authors are not aware of a better dataset on German primary care patients.

The findings have several implications for GP practice: Firstly, the study highlights the number of patients with psychosocial problems in primary care and that GPs may still underestimate the presence of problems in their patients. A routine screening could make sure that psychosocial problems are detected and may be considered during the consultation. Secondly, the study shows that not all patients with psychosocial problems would like support from their GP. Therefore, GPs should be aware of

patients' current social support and self-management preferences. Asking patients whether they currently have someone to support them may be crucial in supporting those in need. Finally, patients were generally satisfied with their GP's communication, indicating that physician-patient-communication works well in most cases.

More research is needed to better understand the prevalence of psychosocial problems in primary care. For example, it would be helpful to assess the prevalence of psychosocial problems from a GP's and patient's perspective in a representative sample. Furthermore, qualitative research is necessary to identify how physicians would like to be supported with psychosocial problems.

Figure 1: GPCare-1 study: Percentage of patients who indicated current psychosocial problems (multiple select answer format) and percentage of those who have current social problems that would rather like support by their GP (disagree / rather disagree to wanting to solve problems without GP).

Figure 2: GPCare-1 study: patients´ satisfaction with GP communication (in %)

Figure 3. Structural equation model with endogenous continuous latent variable satisfaction, which depends on the observed items on the left and was measured by the variables on the right.

Availability of data and materials

The data set of the GPcare-1 study will be shared on reasonable request to the Institute of General Practice and Family Medicine of the University of Bonn, Germany.

Competing interests

The authors declare that they have no competing interests.

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Author Contributions

JS and BW developed the study question and its design. JS, TW, and BW developed the statistical approach and analyzed the data. JS and BW interpreted the data and results. MO, BG, NI, CH, FB, JP-W conceptualized the GPCare-1 questionnaire, recruited GPs, collected data, and added substantial inputs by critically reviewing and revising the draft manuscripts for improvement. All authors read and approved the final manuscript.

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Ethical approval

The Ethics´ Committee of the Medical Faculty of the University of Bonn as well as the Data Protection Officer of University Hospital Bonn approved the study (No. BO 215/20). The study was registered in the German Clinical Trials Registry (DRKS) (DRKS00022330). Patients were informed verbally and in writing about the voluntariness of participation, the study procedure, and anonymity. The return of the anonymous questionnaire constituted the patient's consent to the use of the data in the study. Based on this, written informed consent was not required.

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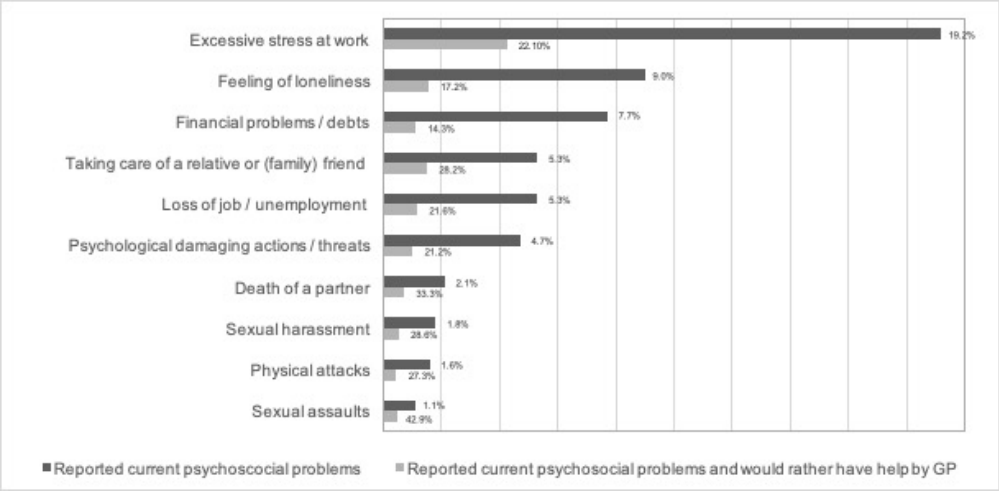
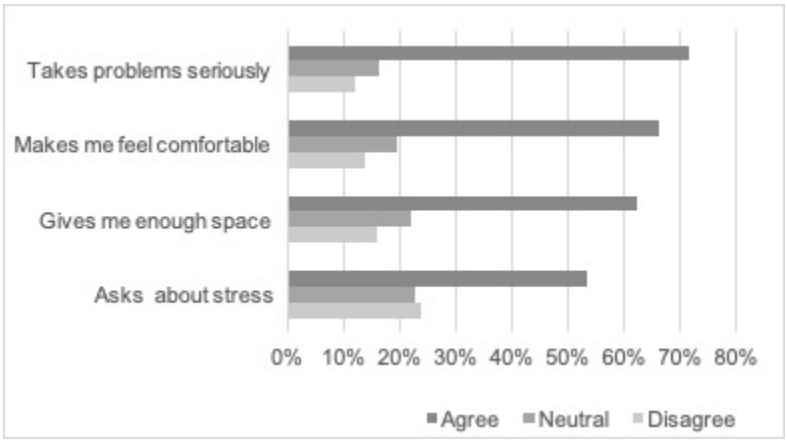


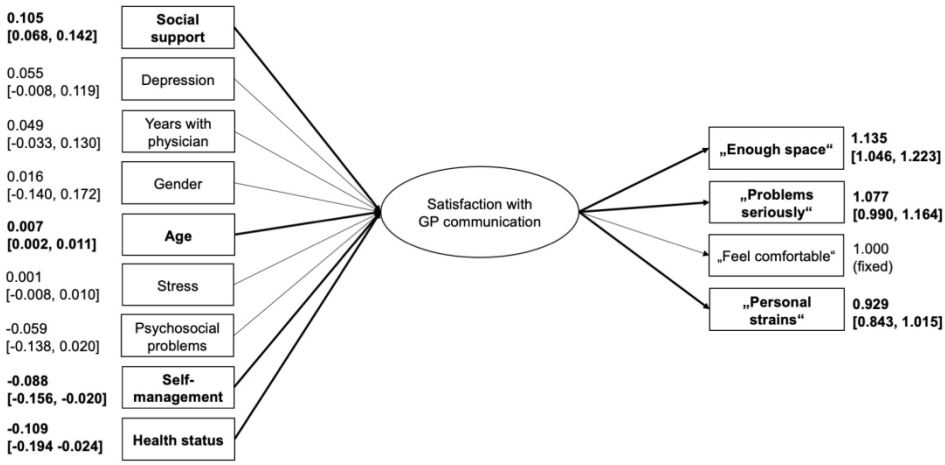
GPCare-1 study: Percentage of patients who indicated current psychosocial problems (multiple select answer format) and percentage of those who have current social problems that would rather like support by their GP (disagree / rather disagree to wanting to solve problems without GP).

214x105mm (72 x 72 DPI)



GPCare-1 study: patients´ satisfaction with GP communication (in %).

137x76mm (72 x 72 DPI)



Structural equation model with endogenous continuous latent variable satisfaction, which depends on the observed items on the left and was measured by the variables on the right.

661x372mm (72 x 72 DPI)

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Relationship between psychosocial problems and satisfaction with GP communication in German primary care practices: A structural equation model based on the cross-sectional GPCare-1 patient study

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Relationship between psychosocial problems and satisfaction with GP communication in German primary care practices: A structural equation model based on the cross-sectional GPCare-1 patient study

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Abstract

Objectives

This study examined the relationship between primary care patients´ psychosocial problems, other patient characteristics that are associated with satisfaction with overall care, and satisfaction with GP communication.

Design

A cross-sectional survey was conducted. Patients filled an anonymous 2-page questionnaire on various socio-demographic, medical characteristics, and their satisfaction with GP communication. Structural equation modelling evaluated associations of various patient characteristics including psychosocial problems with GP communication.

Setting

General practices in Germany.

Participants

A total of 813 patients from 12 GP practices participated. The survey was conducted in summer 2020 during a Covid-19 lockdown.

Results

The estimated response rate was 24,1%. The prevalence of psychosocial problems in the sample was 30%. The three most frequent problems were excessive stress at work (19%), financial problems/debts (9%), and loneliness (8%). Most patients agreed that their GP takes their problems seriously (71%), feeling comfortable talking about sensitive things (66%), having enough space in communication (62%), and being asked by their GP about personal strains (53%). Higher social support, preference to solve one's problem without GP help, higher age, and better health status predicted more satisfaction with physician-patient-communication, while the number of

psychosocial problems, gender, years with physician, chronic stress, and depression had no influence. According to the Bentler Comparative Fit Index [1], the pooled structural equation model had a 97.6 % better fit than the corresponding model without covariate effects.

Higher social support, preference to solve one's problem without GP help, higher age, and better health status but not the number of psychosocial problems predicted more satisfaction with physician-patient-communication.

Conclusions

GPs should be aware of the high occurrence of patients´ psychosocial problems and actively address patients´ social support and self-management preferences which influence patients' satisfaction with GP communication.

Trial registration

The GPCare-1 study was registered in the German Clinical Trials Register (DRKS00022330).

Keywords

physician-patient-communication, social determinants of health, psychosocial problems, general practice, primary care

Strength and Limitations of this study

- The study examines the prevalence of psychosocial problems and satisfaction with GP communication in primary care patients from a patient rather than a provider's perspective

- The study recruited a large sample of German primary care patients (n = 813) from different socioeconomic backgrounds, stratified by region
- Structural equation modelling was used to estimate a multiple parameter model that predicted patient satisfaction with GP communication
- The patient's' response rate could only be estimated; the estimated response rate is low (24.1%)
- The patient sample is not representative, but in some characteristics similar to national comparative values

Background

Psychosocial aspects of life influence morbidity and mortality [1]. For example, lower socioeconomic status and lower income are related to shorter life expectancy and poorer quality of life [2–4]. Also, chronic stress, social isolation, and financial problems are associated with a higher prevalence of adverse outcomes related to cardiovascular diseases [5, 6] cerebrovascular diseases, hypertension [7–9] and cancer [10–12]. It has further been shown that considering patients' contextual factors, such as financial or transportation problems, can play an important role in improving patient outcomes and decreasing health care costs [13-15]. Aiming to improve health outcomes for these populations, general practitioners can play an important role due to their personal relationship to patients from various backgrounds with the potential to address psychosocial problems [15]. However, contextual factors are not always identified and addressed in primary care.

While collaborative structures of physicians and social workers are being implemented in a few countries like Great Britain and Ireland [16], studies from other settings report that patients´ psychosocial needs are often not identified [17] and not addressed by GPs [18–20]. In line with this, general practitioners reported lower prevalence rates of patients' psychosocial problems such as financial difficulties, personal stress, or unemployment, than their patients [21]. A study from the Danish primary care setting showed that GPs typically address biological and psychological issues, but feel uncomfortable to address patients' social needs due to a lack of training and knowledge of resources [22]. A study from Norway shows that only 17% of the consultations were influenced by the GPs' knowledge of their patients' social problems [23].

Adequate GP communication is the basis to address psychosocial problems in consultations and is shown to be the strongest driver of patient satisfaction with primary care [24]. However, factors influencing satisfaction with GP communication, and especially the association between psychosocial problems and satisfaction with GP communication have not been studied widely. Several studies examined patient-related factors that influence satisfaction with GP care. For example, lower age [25, 26], poorer self-reported mental health [27, 28], lower physical health status [26, 27, 29, 30], and lower perceived social support [27, 31] were associated with less patient satisfaction with care. Yet, it has not been systematically investigated how these factors influence patients' satisfaction with GP communication.

A study by Gulbrandsen and colleagues [21] highlights the importance of communication in primary care, showing that patients disclosed less than half of their reported problems to their GP. Using data from more than 800 patients from the German GPCare-1 patient survey, this study addresses the relationship between patients´ psychosocial problems, other patient characteristics associated with satisfaction with overall care, and the satisfaction with GP communication.

Methods

The General Practice Care-1 study (GPCare-1) is a cross-sectional study conducted by the Institute of Family Medicine and General Practice, University of Bonn, Germany. It examined the following three aspects:

1) the prevalence of psychosocial problems in adult GP patients from practices of our teaching practice research network,

2) patients´ satisfaction with GP communication, and

3) the associations between psychosocial problems, patient-reported characteristics and patients´ satisfaction with GP communication.

Design, Settings and Patients

Practice recruitment

The study was conducted in 12 primary care teaching practices, which are affiliated with the Institute of General Practice and Family Medicine, University of Bonn and University Hospital Bonn. Practices were selected based on different socio-demographic regional characteristics (e.g., age structure, population density, proportion of migrants) to ensure a coverage of differing population groups. The survey was conducted between June and August 2020 which happened to be during the second Covid-19 lockdown in Germany. As practices were too busy during the Covid-19-pandemic, the response rate was calculated based on average data of patients per practice from a public German data base [32] and a documented 40% reduction in patient volume in GP practices [33]. The calculated response rate was 24.1. The targeted sample size was 1000 patients. The goal could not be reached due to slower recruitment in primary care practices during the Covid-19 pandemic and its' lockdowns.

Participants´ recruitment

All adult patients who visited one of the practices during the survey period and were able to fill in a questionnaire in the waiting room were eligible. Reception clerks offered the study material which comprised an information letter and a two-page questionnaire in different languages (German, English, Arabic, Turkish). It took about ten minutes to fill in the questionnaire. Completed questionnaires were dropped into a locked "post box" in the practice using a sealed envelope. Patients were informed about the

anonymity of the survey, their voluntary participation, and the aim of the study both verbally and in writing. By participating, patients declared their consent.

Measures

The GPCare-1 questionnaire comprised a total of 48 questions. It integrated existing questions from standardized surveys as well as self-developed items. Questions addressing patients´ sociodemographic characteristics, health and psychosocial characteristics were mainly derived from the DEGS1 questionnaire used by the Robert-Koch-Institute for the national health monitoring system [34]. Additional four questions addressed patients´ experiences in communicating with their GP. The questionnaire was piloted with 40 individuals from the German general population with minor adjustments thereafter. The following aspects were included:

- *Socio-demographic characteristics*: age, gender (male/female/divers).
- *Education:* current profession, work sector, highest educational level (low = did not complete any education/ secondary school up to 9th grade/ secondary school up to 10th grade, middle=high school (A-levels)/vocational school; high=university degree), current occupational status, and monthly household net income.
- *Living Conditions*: relationship status, informal caregiving, migration background, household size
- *Social support* was measured with the OSLO-Scale [35]. It categorizes participants´ perceived availability of social support into low, medium and high.
- *Health-related factors (physical)*: time with the GP as a patient, general health status, specific health problems (e.g., diabetes, high blood pressure), self-management style (preference to solve problems on one's own).

- *Depressive symptoms* were measured with the PHQ-2 of the Patient-Health-Questionnaire (PHQ) [36]. The PHQ-2 is a brief screening instrument to assess the severity of depressive symptoms. It consists of two items that ask about depressive symptoms over a period of the last 14 days. Answer possibilities range from 0 (never) to 3 (almost every day) with a maximum of 6 points.
- Chronic stress (last three months) was measured with the 12-Item-screening tool TICS-SSCS [37]. A sum score was calculated and classified into 3 categories: low (0-11), middle (12-22) and high (22-28).
- *Psychosocial problems:* Patients were asked whether they were currently affected by any of the following problems: excessive stress at work, loss of job / unemployment, feeling of loneliness, taking care of a relative or (family) friend (Informal caregiving), financial problems / debts that are difficult to negotiate, death of a partner, physical attacks, psychologically hurting actions or threats, sexual harassment and assaults.
- *Satisfaction with GP communication:* Four items addressed physician-patient-communication with previous GP contacts based on existing instruments. Participants were asked for their agreement to various statements using a 5-point Likert scale (strongly disagree to strongly agree). A sum score was calculated with higher scores indicating more satisfaction with GP communication. The following instruments were considered in the development of these items: the Medical Interview Satisfaction Scale (MISS) [38] the Patient Request Form [39], the Patient-Doctor Relationship Questionnaire (PDRQ-9) [40] and the Patient Reaction Assessment Instruments (PRAD) [41].

Data analysis

The patient sample was described using descriptive statistics and frequencies. Per patient, the number and kind of problems currently burdening was summed (0, 1-2, 3-4, 5+). Differences in prevalence were investigated using Chi-square test. Missing rates are displayed in brackets behind the respective item. All percentages are displayed as valid percent.

Associations between communication and satisfaction as well as their dependencies were jointly estimated by a structural equation model (SEM). The latent continuous endogenous variable satisfaction with GP communication represents one dimension of patient satisfaction with quality of care, including perceived consideration for the patient [42] and emotional support [39]. Communication quality is a sub-dimension of the interpersonal qualities of a general practitioner [43]. The SEM consists of a structural component that is represented on the left side of the latent variable in Figure 1 and a measurement model displayed on the right side of the latent variable. Outgoing arrows represent independent variables and ingoing arrows dependent variables. All variables used in the structural equation model were assumed to be observations from a continuous scale. That includes the summary variables derived from multiple items, such as the sum of PHQ items, sum of SCSS items and the number of impairments.

The structural component part can be interpreted analogously to a linear regression framework [44]. All observed items on the left side (age, gender, social support, time with the GP, depression score, chronic stress, number of current psychosocial problems, health status and communication preference) correspond to independent covariates and the latent variable satisfaction with GP communication is the dependent response variable. The latent variable is assumed to be continuous and normal distributed conditional on the items. Each path represents the effect of the specific item on the latent variable. Due to continuous scale of observed variables, each coefficient

represents the linear effect of the covariate on satisfaction with GP communication if the covariate would be increased by one unit given all other covariates stay constant. In the measurement model part, the observed items (communication 1-4) are responses that are explained by the latent variable satisfaction with GP communication analogue to factor analysis [45]. The coefficient of personal strains was restricted to one due to identifiability constraints. Each path represents factor loadings that can be interpreted as regression coefficients between covariate satisfaction with GP communication and each item. Values near one are an indication of good correspondence between the construct satisfaction with GP communication and measured items (e. g. comfortableness, problem perception).

In the model, the latent variable depends on the observed items age, gender, social support, time with the GP, depression score, chronic stress, number of current psychosocial problems, health status and communication preference. Satisfaction was measured by observed items communication 1-4.

Missing values were imputed by multiple imputation by chained equations [46] with 25 iterations and repetitions. Continuous covariates (e. g. age, Oslo score) were imputed by predictive mean matching, nominal covariates (e. g. gender) were imputed by multinomial regression [47] and ordinal covariates (e. g. health status) were imputed by proportional odds models [48]. For each multiple imputed data set, a structural equation model was estimated [49]. All items were assumed to be ordinal representations of continuous scales. Norman [50] points out that many previous studies show the robustness of Likert scales to parametric assumption violations and that parametric tests can be applied for Likert scales. According to recommendations of Kline [49] we report several pooled structural equation model goodness of fit statistics. Among those is the Chi-Square test statistic of the structural equation model,

which is an omnibus test with null hypothesis that all coefficients are zero. The Bentler Comparative Fit Index [51] compares the model with the previous null hypothesis model and calculates the relative difference. Steiger-Lind Root Mean Square Error of Approximation [52] and the standardized root mean square residual both compare the estimated values of the structural equation model with the observed data. In the former values below 0.05 and for the latter measure values below 0.08 indicate a good model fit [53]. We further conducted several sensitivity analyses (cluster analysis, complete case analysis). The cluster information did not systematically improve the fit of the structural equation model to the data. The complete case analysis did not indicate systematic differences between the complete case structural equation model and the multiple imputed version. Results of both analyses can be found in the supplemental material.

IBM Statistical Package for Social Sciences (SPSS, Version 25.0) for Windows was used [54] for the first part of the analyses. The structural equation modelling was conducted with statistical software R Version 4.2.2 [55]. The SEM was estimated using default settings in R-package lavaan Version 0.6-15 [56] by Maximum Likelihood method. Variances of the latent variable and their measurement variables were not fixed and estimated from the data. The model consists of 17 parameters (structural part 10 parameters, measurement part 3 parameters and variance estimation 4 parameters). The sample size to estimated parameters ratio is 47.71 which is more than double than the recommended minimum ratio of 20 in Kline [49]. In this work, p-values below 0.05 were considered significant.

Patient and public involvement

General practitioners were involved in the planning and design of the study design and the questionnaires. Forty persons from the general public were involved in pretesting the questionnaires. Patients were involved as participants in the conduct of the study. The findings will be presented to and discussed with general practitioners and patients from our practice and research network.

Results

Sample description: socio-demographic and health characteristics

The GPCare-1 data set included 813 adult GP patients. Characteristics are displayed in Table 1. The mean age was 52 years (range 18-91 years). The sample included about 59% females. 25% of the participants had a migration background. More than 60% of the participants were with their GP for more than 5 years (65%). The majority of participants reported middle or high social support (middle: 52%, high: 28%), while 21% of the participants reported low social support. Almost one third of the patients indicated excessive stress (19%), and 42% reported a bad general health. The most frequent health problems of the participants were back and/or joint complaints (55%), high blood pressure (36%), and sleeping disorders (31%).

Table 1: Sample description, N=813.

	N	%
Gender [13*]		
female	474	59.3
male	337	41.4
diverse	2	0.3
Age, *mean, SD* [13*]	51.61	18.7
Age groups [13*]		
18-39	243	30.4
40-59	266	33.3
60-69	130	16.3
70-79	103	12.9

80+	58	7.2
Chosen questionnaire language [0*]		
German	761	93.6
Other	52	6.4
Migration background [36*]	194	25.0
Education [23*]		
Low	247	31.3
Middle	336	42.5
High	190	24.1
Other	17	2.2
Social support [48*]		
Low	157	20.5
Middle	398	52.0
High	210	27.5
General health status (subjective) [20*]		
Moderate, bad, very bad	333	42.0
Excellent, very good, good	460	58.0
Health Problems [38*]		
Back / joint complains	428	55.2
High blood pressure	282	36.4
Sleeping disorders	240	31
Migraine	90	11.6
Coronary artery disease (CAD)	82	10.6
Chronic obstructive pulmonary disease (COPD)	64	8.3
Depressive symptoms (PHQ 2), mean, SD [97*]	1.75	1.62
Chronic stress (SSCS), *mean, SD* [125*]	17.01	10.4
Low	223	27.4
Medium	260	32.0
High	205	25.2
Years with GP [26*]		
< 3 year	150	18.9
3-5 years	122	15.5
>5 years	515	65.4
Number of current psychosocial problems per Patient, categorized [34*]		
None	535	68.7
1-2	199	25.5
3-4	36	4.6
5+	9	1.2
Satisfaction with GP Communication, mean, SD	15.19	4.19

Note. **Missing values are described after each variable [N].*

Seventy percent of the patients did not report any psychosocial problems, while about a fourth (25%) reported 1 to 2 problems, 4% three to four problems, and about 1% had

five or more challenges. The most reported psychosocial problems by GP patients were stress at work (19%), feeling of loneliness (9%), and financial difficulties (7%). Table 2 displays how many of the patients reported psychosocial problems in GP practices and self-management preferences of those patients who reported at least one current psychosocial problem.

Table 2. GPCare-1 study: Percentage of patients who indicated current psychosocial problems (multiple select answer format) and percentage of those who have current social problems that would rather like support by their GP (disagree / rather disagree to wanting to solve problems without GP).

Type of psychosocial problem	Reported current psychosocial problems (in %)	Of those reported current problems would like help (in %)
Excessive stress at work	19.2	22.1
Feeling of loneliness	9.0	17.2
Financial problems /debts	7.3	14.3
Taking care of a relative or (family) friend	5.3	28.2
Loss of job / unemployment	5.3	21.6
Psychological damaging actions / threats	4.2	21.2
Death of a partner	2.1	33.3
Sexual harassment	1.8	28.8
Physical attacks	1..6	27.3
Sexual assaults	1.1	42.9

Physician-patient communication

More than half of the patients agreed or agreed strongly to each of the four communication statements. In detail, 71% agreed that “the doctor takes my problems seriously”, 66% reported to being “made feeling comfortable when talking about sensitive things”, 62% were “given enough space to describe personal strains”, and 53% are “asked about stress caused by personal strains”. For details, see Figure 2.

Modelling satisfaction with GP communication

The structural equation model was estimated as described in the section Data analysis. The estimated structural equation model parameters are shown in Figure 1. The variables social support, health status and self-management preference, and age predicted the latent variable satisfaction, suggesting that higher age, more social support, better health status and the preference to not solve problems on their own was associated with higher satisfaction with GP communication.

Discussion

The present study examined psychosocial problems in GP practices, patients’ satisfaction with GP communication, and the relationship between psychosocial problems, other patient-related variables, and patients’ satisfaction with GP communication. About every third primary care patient reported at least one current psychosocial problem, with the most common being stress at work (19%), loneliness (9%), and financial problems (8%). Generally, patients were satisfied with GP communication, and most patients did not explicitly prefer help from their GP to solve their problems. Higher social support, preference to solve one’s problem without GP help, higher age, and better health status but not the number of psychosocial problems predicted more satisfaction with physician-patient-communication. To the authors’

knowledge, this is the first study that examined psychosocial problems and patient-physician-communication in a large primary care patient sample in Germany. GPs should be aware of the presence of current social support and patients' self-management preference as important factors associated with patients' satisfaction with GP communication.

The study assessed the prevalence of psychosocial problems in German primary care patients from a patient perspective. Selected GP practices in different regions were selected in order to reach a variety of patients from different social backgrounds. The nature of psychosocial problems reported by GP patients in this study are in line with those reported by German GPs [19]. The reported prevalence rates in this sample were similar to those reported in a study of GP patients in Norway, e.g., stressful working conditions (25%) or loneliness (7%) [20].The reported psychosocial problems seem to be more prevalent than reported by GPs, who indicated that psychosocial problems play a role in their consultations at least three times per week [19]. This finding, in turn, is in line with Bikson et al. [57] and Gulbrandsen et al. [20] who found that the prevalence of psychosocial problems in GP practices was higher when assessed through patients compared to GPs. Furthermore, the prevalence of some self-reported psychosocial problems in GP patients found in this study seem higher than in the German general population. For example, only 11% of the German population reported chronic stress in the DEGS study [34], which is lower than the percentage of patients who reported currently being burdened by stress at work in this study. The prevalence of loneliness in this study was similar (with 9%) to the one reported in the city of Leipzig, where 12% of the population reported being lonely in 2011 [58].

Structural equation modelling was used to examine the relationship between psychosocial problems, social support, self-management preferences, patients'

background factors and patients' satisfaction with GP communication. The method of analysis allowed to include multiple parameters associated with patient satisfaction into the same statistical model. Previous studies have examined the relationship between some of the variables and satisfaction with GP communication separately but have not included them in one statistical model. Furthermore, the study included parameters, such as health status and perceived social support, that were found to be associated with general patient satisfaction with care [25, 27, 29] but have not been examined with regards to patient satisfaction to GP communication. As general satisfaction of patients is related to satisfaction with the quality of doctor-patient-communication [59], the relationships are not surprising. It needs to be kept in mind that the relationship between psychosocial problems, the encounter, and satisfaction are complex and interpretation should be made with caution. A recent study by Gulbrandsen and colleagues showed, for example, that patient evaluations in a hospital setting are dynamic, and that different variables play a role in first and later visits [60].

There are several limitations to the study. Firstly, the study used a cross-sectional design so no causal relationships can be determined. Secondly, the data collection took place during the Covid-19 pandemic. Strict hygiene concepts, precautionary measures, and infrastructural adaptation may have influenced participants' participation in the study. Thirdly, due to the Covid-19 lockdown, it was not possible to assess the total number of patients that frequented the GP practices. We therefore had to calculate the participants' response rate from public databases. Fourthly, the income was not reported by many patients (missing for n = 197) and could therefore not be included in the model. Some other variables, such as chronic stress (n = 125) and satisfaction (n = 65) had also a relatively high number of missing values, indicating that participants did not always fill in the questionnaires thoroughly. It is possible that

participants did not feel comfortable to fill in certain information, such as household income, or that they did not provide the correct information with regards to age and gender, for example. As the data collection was anonymous, we had no way of controlling this. Hence, the interpretation of the findings must be done with caution. Fifthly, we could not check for double responses by participants who visited the facility several times within the data collection period, as the participation was anonymous. However, double responses are unlikely, as patients did usually not come in more than once during the length of the sampling period in the Covid-19 pandemic. Sixthly, the assumption of this analysis was that the variables were missing at random. This implies that the missing mechanism may depend on other variables observed values, which is more realistic than the missing completely at random assumption. There seems to be no evidence, that the missing mechanism could depend on non-available information besides the observed values. Finally, the sample is not representative of the German general population, particularly with regards to gender (the sample has a higher percentage of women than the General German population) and age (the sample is older than the General German population). This is not surprising in a sample of primary care patients as younger and healthier people go to the doctor less frequently. However, the higher occurance of psychosocial problems may be (partly) attributed to the differences in age and / or gender. Hence, the effect may be overestimated due to the bias in the sample. We still believe that the study is making a valuable contribution, as the authors are not aware of a better dataset on German primary care patients.

The findings have several implications for GP practice: Firstly, the study highlights the number of patients with psychosocial problems in primary care and that GPs may still underestimate the presence of problems in their patients. A routine screening could make sure that psychosocial problems are detected and may be considered during the

consultation. Secondly, the study shows that not all patients with psychosocial problems would like support from their GP. Therefore, GPs should be aware of patients' current social support and self-management preferences. Asking patients whether they currently have someone to support them may be crucial in supporting those in need. Finally, patients were generally satisfied with their GP's communication, indicating that physician-patient-communication works well in most cases.

More research is needed to better understand the prevalence of psychosocial problems in primary care. For example, it would be helpful to assess the prevalence of psychosocial problems from a GP's and patient's perspective in a representative sample. Furthermore, qualitative research is necessary to identify how physicians would like to be supported with psychosocial problems.

Figure 1: Structural equation model with endogenous continuous latent variable satisfaction, which depends on the observed items on the left and was measured by the variables on the right.

Figure 2: GPCare-1 study: patients´ satisfaction with GP communication (in %)

Availability of data and materials

The data set of the GPcare-1 study will be shared on reasonable request to the Institute of General Practice and Family Medicine of the University of Bonn, Germany.

Competing interests

The authors declare that they have no competing interests.

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Author Contributions

JS and BW developed the study question and its design. JS, TW, and BW developed the statistical approach and analyzed the data. JS, TW and BW interpreted the data and results. LO, MO, BG, NI, CH, FB, JP-W conceptualized the GPCare-1 questionnaire, recruited GPs, collected data, and added substantial inputs by critically reviewing and revising the draft manuscripts for improvement. All authors read and approved the final manuscript. BW is responsible for the overall content as guarantor.

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Ethical approval

The Ethics´ Committee of the Medical Faculty of the University of Bonn as well as the Data Protection Officer of University Hospital Bonn approved the study (No. BO 215/20). The study was registered in the German Clinical Trials Registry (DRKS) (DRKS00022330). Patients were informed verbally and in writing about the voluntariness of participation, the study procedure, and anonymity. The return of the anonymous questionnaire constituted the patient's consent to the use of the data in the study. Based on this, written informed consent was not required.

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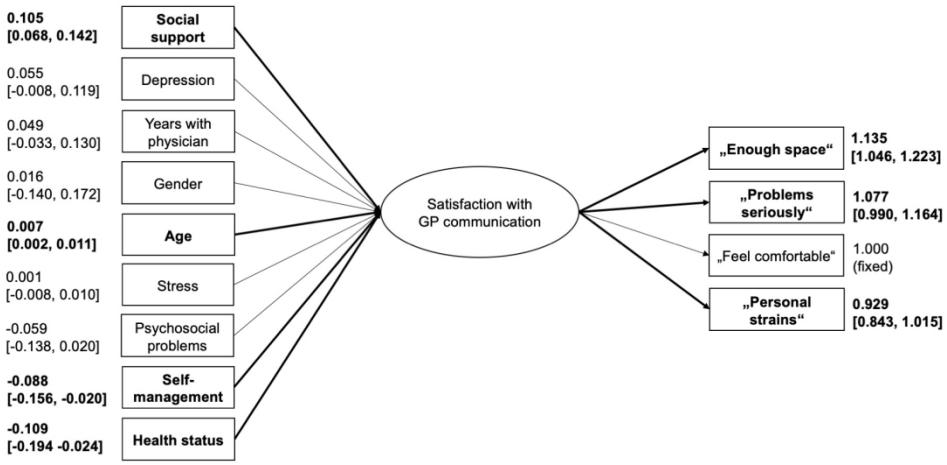
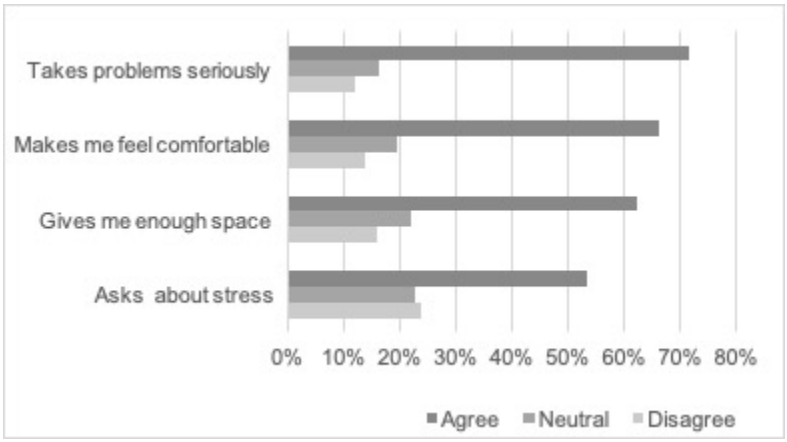


Structural equation model with endogenous continuous latent variable satisfaction, which depends on the observed items on the left and was measured by the variables on the right.

661x372mm (72 x 72 DPI)



GPCare-1 study: patients´ satisfaction with GP communication (in %).

137x76mm (72 x 72 DPI)

Supplemental material

Cluster analysis

Methods. To combine clustering with multiple imputation, we applied a clustering to our data following the approach by Lee et al. [1]. In particular, k-medoids clustering [2] was used. Medoids are a more robust version than k-means and these are easier to interpret, because medoids correspond to observed data points. Mixed measurements variables (for example ratio scale age and ordinal questions related to communication) were considered by using Gower distance matrix [3]. For each multiple imputed data, set cluster sizes from 2 to 28 were evaluated and the best cluster size was chosen according to the highest average silhouette width [4].

Results. The cluster analysis identified seven final clusters, with their medoid values and the distribution of observed variables. Table 1 presents an overview of the main variables used in our analyses across the seven identified clusters.
The mean average silhouette width over the multiple imputed data sets was 0.20337, which falls below the threshold of 0.25. This indicates that the identified clusters provide only weak support for unobserved subgroup heterogeneity in the data to validate the relevance of the cluster assignments, a pooled likelihood ratio test [5] was conducted. This test compared the original structural equation model with an extended version that included the final clusters as a covariate. The resulting p-value of 0.285 suggests that incorporating the cluster information did not systematically improve model fit.

Variable / Cluster	1	2	3	4	5	6	7
Personal strains (1 < 2 < 3 < 4 < 5)	3	5	3	3	4	4	4
Enough space (1 < 2 < 3 < 4 < 5)	3	5	3	3	4	4	5
Feel comfortable (1 < 2 < 3 < 4 < 5)	3	5	4	3	4	4	5
Problems seriously (1 < 2 < 3 < 4 < 5)	4	5	4	3	4	5	5
Self-Management (1 < 2 < 3 < 4 < 5)	3	3	4	4	4	3	3
Age (years)	48	48	56	53	47	58	44
Gender (0 = female, 1= male)	0	0	1	1	0	1	0
Social support (sum score)	9	10	11	11	12	9	11
Years with physician	4	4	4	4	4	4	4
Depressive symptoms (sum score)	2	1	1	1	2	2	2
Chronic stress (sum score)	21	12	16	12	20	13	19
Psychosocial problems (sum score)	0	0	0	0	0	0	0
Health status (1 < 2 < 3 < 4 < 5)	3	3	4	3	3	3	3

Table 1: Cluster medoids after multiple imputation. Likertscale items with five categories correspond to values „do not agree at all“ (1), „tend to disagree“ (2), „agree partly“ (3), „tend to agree“ (4) and „fully agree“ (5).

Discussion. These findings suggest that the identified clusters do not provide substantial discriminatory power regarding the underlying data structure. This may be

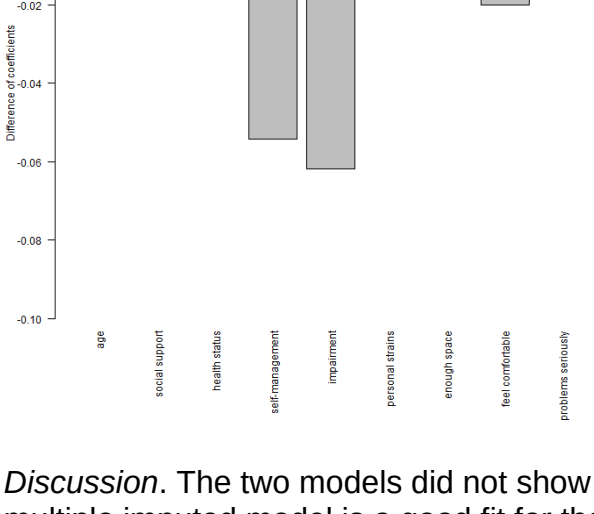
explained by high similarity among subgroups, suggesting that GP practices may have had a similar variety of patients. As the findings indicate that the clusters do not significantly improve the analyses performed without clustering, they were not considered in our analyses.

Complete case analysis

Methods. A complete case analysis was conducted. The complete case data consisted of 67.32 % of all GP in the original data. It was tested whether the coefficients of the observed model were equal to the coefficients observed in the imputed model. Then, the differences between each model`s regression coefficients of social support, self-management, age, health status and impairment were compared with a two-group Z-test. This approach took both the standard deviations of the complete case and the multiple imputed structural equation model into account.

Results. Both models were found to share the same covariates with p-values smaller then 0.05 with the only exception impairment. The measurement model coefficients of variables “enough space” (p-value 0.9615), “feel comfortable” (p-value 0.7599) and “Problems seriously” (p-value 0.7799), social support (p-value 0.6172), self-management (p-value 0.2804), age (p-value 0.7350), health status (p-value 0.7813) and impairment (p-value 0.2840) were not systematically different between the two models. Figure 3 shows the results of the complete case analysis. The findings indicate that there is no indication of systematic differences between the complete case structural equation model and the multiple imputed version.

Figure 3. Complete case analysis



Discussion. The two models did not show different p-values, indicating that the multiple imputed model is a good fit for the data and that imputation of missing values did not change the model. Only one variable was significant in the complete case model and not in the multiple imputed model (impairment). However, the estimates of the multiple imputed model include more information. Therefore, we think the effect of

impairment in the complete case model could be the result of the smaller sample size and should be interpreted with caution.

Literature

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