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The Chronic Care Model: Congruency and predictors among primary care patients with osteoarthritis

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ABSTRACT

OBJECTIVE

The Chronic Care Model (CCM) and the 5A-approach have achieved widespread acceptance and reflect the core elements of patient-centred care in chronic diseases, including osteoarthritis (OA). The aim was to assess to what extent current care for patients with osteoarthritis accords with the CCM in Germany. Furthermore we aimed at revealing possible predictors to assess whether certain patients are more likely to receive care complying with the CCM than others.

METHODS

Cross-sectional observational study, addressing 1250 patients from 75 primary care practices in Germany. 1021 (81.7%) of the administered 1250 questionnaires were returned. The Patient Assessment of Chronic Illness Care (PACIC-5A) was used to assess accordance to the CCM and the 5A-approach. Impact of OA was assessed by means of the Arthritis Impact Measurement Scale (AIMS2-SF); the Patient Health Questionnaire (PHQ-9) was used to assess depression symptoms. Two stepwise multiple linear regression models with the PACIC sum score and the 5A score as dependents were performed to reveal predictors of a high accordance to the CCM and to the 5A-approach, respectively.

RESULTS

With a mean of 2.79 in men (SD 0.83) and 2.67 in women (SD 0.89; p for difference=0.89), the PACIC sum score was notable lower than in previous studies conducted in HMO settings in the US. The PACIC score was associated with a higher educational level (beta= 0.421; p=0.008) and younger age (beta=-0.319; p=0.016); the 5A score was predicted by educational level (beta=0.344; p=0.002), age (beta=- 0.386; p=0.004) and the PHQ-9 score (beta=- 0.288; p=0.005).

CONCLUSIONS

Younger and better educated patients achieve higher scores on the PACIC score, indicating that their care accords to a higher degree with the CCM. Whether this reflects differences in physician behaviour toward different patient groups or rather different demands of these patient groups can not be concluded from the presented data. Further research is needed to confirm our results and assess possible implications for implementing the Chronic Care Model in primary care.

OBJECTIVE

Chronic diseases like diabetes, hypertension, arthritis and asthma are expected to increase tremendously in the upcoming years (1). They are associated with high economical costs but also with a high burden on individuals' quality of life. Multiple interventional studies have been conducted to increase quality of life of patients with various chronic diseases. Based on the evidence of these interventions, Wagner et al. have developed the Chronic Care Model (CCM) as a conceptual framework (2-4). Current care for the chronically ill is often event-driven despite solid evidence that a structured, planned and proactive approach to chronic diseases helps to reduce the burden of many chronic diseases (5). The CCM contains 6 key dimensions of care: Organization of health care, clinical information systems, delivery system design, decision support, self-management support, and community resources. A recent review of the literature reiterates that successful improvement strategies concerning chronic diseases are consistent with the concept and components of the CCM (6). The CCM has achieved widespread acceptance, and recently an intense discussion has started among German physicians if and how the CCM or its components can be implemented in health care (7;8). On the annual meeting of the German Association of Family Medicine (DEGAM) in the year 2006, a statement has been launched reflecting the intention to implement the CCM or at least some elements thereof in primary care. Nevertheless, no data are available to date showing to what extent current primary care for the chronically ill is congruent to the CCM. To assess the congruency of provided health care to the CCM, Glasgow et al. developed the "Patient Assessment of Chronic Illness care" (PACIC) (9). It is organized according to the key elements of the CCM and assesses the behaviour of professionals and practice teams from a patient's perspective. The PACIC contains 20 items assessing 5 scale constructs: patient activation, delivery system design/decision support, goal

setting/tailoring, problem solving/contextual, follow-up/coordination. “Patient activation” assesses to what extent the patient was motivated and supported by the physician to initiate changes, “decision support” assesses if the patient was supported e.g. by booklets and how satisfied he was with the organization of his care. “Tailoring” assesses to what extent general instructions and suggestions were adapted to his personal situation. “Problem solving” addresses how the physician dealt with problems which interfered with achieving predefined goals. Finally, “follow-up” addresses how frequently and consequently the whole process was followed-up. Recently, a German version of the PACIC 5A has been validated in a sample of osteoarthritis patients (10). Its psychometric properties have been reported in detail elsewhere (10): Cronbach’s alpha ranged from 0.78 to 0.90, the test-retest validity, estimated by the intra cluster correlation coefficient (ICC) was at least 0.77.

The “5A” model represents an evidence-based approach to induce a behavioural change (11). Originally developed for smoking cessation, it represents the recommended counselling approach for behavioural changes according to the recommendations of the US Preventive Services Task Force (USPSTF). The key elements are assessment of present behaviour (Assess), patient counselling (Advise), collaborative agreement with the patient about realistic goals (Agree), assisting the patient during his lifestyle changes (Assist), and frequent follow-ups (Arrange) (12). Glasgow et al. expanded the PACIC by including 6 items assessing to what extent physicians’ counselling reflects the 5A-approach. They validated the PACIC-5A in a sample of diabetes patients (12).

The aim of this study was to assess the congruency between care in general practice in Germany and the CCM as well as between General practitioners’ (GPs) counselling style and the 5A-approach. Since we assumed that care and counselling

may differ according to sociodemographic or disease-related characteristics, we aimed at revealing possible predictors of the PACIC-5A score.

METHODS

Recruitment of patients and data collection

The PraxArt-project, performed by the University Hospital Heidelberg and financed by the German Ministry for Education and Research (BMBF), intends to improve quality of life of patients suffering from osteoarthritis (13). 1021 OA patients from 75 primary care practices in Germany are currently enrolled in this project. The 75 practices are located across the federal state of Baden-Württemberg and are a representative sample of German primary care practices: e.g. most of them are single-handed. The anonymous questionnaires are linked within the project via a code-list to the medical file of the practices. Thus, detailed data about sociodemographic variables, duration of OA as well as information about comorbidities, medication, and health services utilization were available and considered in the analyses. Since GPs prepared a list of all addressed patients, these data were available for respondents as well as non-respondents. Inclusion criteria were age over 18 years, meeting the criteria of OA to the hip or knee according to the American College of Rheumatology (ACR) (14;15), and sufficient German language skills for understanding and answering the questionnaire. In all 75 practices GPs consecutively asked patients enrolled in the PraxArt-project to answer the PACIC-5A. After giving their written informed consent, they received the questionnaire and a return envelope to the university. Patients were informed that their GP had no possibility to get knowledge about their answers and were asked to complete the questionnaire on their own. Inclusion of patients did not start unless

there was a written and unrestricted positive vote of the ethics committee of the University of Heidelberg which was received in March 2005.

Depression was measured using the depression module of the German version of the Patient Health Questionnaire (PHQ-9) (16;17). The PHQ-9 is a completely self-administered questionnaire that enables screening for depression and assessment of depression severity. The PHQ-9 score ranges from 0 to 27, where higher scores indicate a worse health status. The impact of OA on patients' health was assessed by the AIMS2-SF, which provides a comprehensive assessment of patients' health status including the dimensions physical limitation, symptom (reflecting perceived pain), social (reflecting social contacts), affect (reflecting mood), and work (reflecting the ability to work). It has recently been validated in German using a sample of OA patients and proved to be comparable to the original version regarding reliability and validity (18;19). The AIMS2-SF dimensions score between 0 and 10, with 0 representing the best and 10 representing the worst health status. Based on clinical relevance in primary care, the following comorbid conditions were collected from the medical record: high blood pressure (defined as > 140/90 mm Hg), diabetes, chronic heart failure, coronary vessel disease (CVD), elevated cholesterol level (total cholesterol > 200 mg/dl), ulcer or stomach disease, asthma/chronic obstructive pulmonary disease (COPD), renal insufficiency, (prior) cancer and (prior) stroke. Educational level was assessed on five (nearly equidistant) stages: (1) no school degree, (2) basic degree (<=7 years of education), (3) <=10 years of education, (4) college degree, (5) university degree.

Statistical analysis

Data were transferred into the SPSS program (version 14.0) after questionnaires were scanned. Scores were calculated according to the scoring instructions for the

PACIC-5A questionnaire, resulting in values between 1 and 5 for each scale. Higher scores represent higher congruency to the CCM. Descriptive analysis included mean and standard deviation. The intracluster correlation coefficients (ICCs) for each PACIC-5A scale were calculated to estimate the variation within the clusters and to choose the appropriate regression model (20). After calculating bivariate correlations, stepwise regression analyses were performed to reveal predictors of a high PACIC sum score and a high 5A score.

RESULTS

1021 (81.7%) of the administered 1250 questionnaires were returned. An analysis of the non-respondents revealed no significant differences with respect to sociodemographic data, OA duration and comorbidities in comparison to patients who returned the questionnaires. Table 1 displays characteristics of the study sample. Women were overrepresented (66.0% of respondents), an effect most likely related to the prevalence of OA being nearly twice as high among women as among men. Mean duration of osteoarthritis was 14.9 (SD 14.3) years.

Table 1. Characteristics of the study sample separated by gender (n=1021)

	Gender			
	Male (347/34.0%)		Female (674/66.0%)	
	mean	SD	Mean	SD
Age	65.16	14.75	66.64	15.33
Body Mass Index (BMI; kg/m^2)	28.39	4.26	28.12	5.16
Educational Level (1-5)	2.61	1.11	2.38	0.83
Duration of OA (years)	14.80	16.18	13.13	11.09
Married/Living in partnership	278	80.1 (%)	376	55.8 (%)
Quality of life (AIMS2-SF dimensions)				
Lower body	2.39	1.71	2.98	2.08
Upper body	1.38	2.33	1.54	2.22
Symptom	4.49	2.17	5.12	2.18
Affect	2.60	1.28	3.10	1.36
Work (126 women / 89 men)	3.08	2.67	2.34	2.23
PHQ-9 score	15.33	4.76	15.95	4.63
Comorbidities	Total	%	Total	%
High blood pressure	181	52.1	384	56.9
Elevated cholesterol	124	35.7	245	36.3
Diabetes	57	16.4	120	17.8
CVD	62	17.8	70	10.3
Asthma/COPD	34	9.8	64	9.5

Table 2 shows the descriptive statistics of the individual scales of the PACIC-5A scores separated for gender. The average overall score of the PACIC was 2.79 (SD

0.83) in men and 2.67 (0.89) in women. There was adequate variability in the overall scale and all subscales as indicated by the standard deviation. Significant differences between men and women occurred in the “problem solving” scale of the PACIC and the “agree” scale of the 5A.

Table 2. Score distribution of the PACIC-5A

	Gender						
PACIC-Scale	Male			Female			p*
	Mean	SD	95% CI	mean	SD	95 % CI	
Activation	3.51	1.10	3.31-3.52	3.39	1.14	3.22-3.48	0.302
Delivery	3.34	0.84	3.20-3.46	3.33	0.92	3.18-3.38	0.851
Tailoring	2.41	0.88	2.26-2.54	2.31	0.95	2.17-2.40	0.294
Follow-up	2.39	1.02	2.16-2.52	2.29	1.02	2.15-2.41	0.370
Problem solving	2.94	1.15	2.71-3.13	2.62	1.21	2.44-2.81	0.009
PACIC sum score	2.79	0.83	2.64-2.93	2.67	0.89	2.53-2.76	0.185
5A Scale							
Assess	2.86	1.12	2.67-3.02	2.77	1.11	2.61-2.88	0.427
Agree	3.31	1.03	3.09-3.42	3.09	1.06	2.95-3.19	0.050
Advise	2.74	0.83	2.60-2.86	2.74	0.94	2.58-2.88	0.938
Assist	2.42	0.92	2.24-2.57	2.25	0.99	2.12-2.37	0.089
Arrange	2.17	0.98	1.92-2.28	2.10	1.01	1.97-2.22	0.492
sum score	2.79	0.84	2.64-2.93	2.65	0.89	2.53-2.73	0.131

* t-test

Correlations of the PACIC sum score and the 5A score to patient characteristics, PHQ-9 and AIMS2-SF scores are displayed in table 3. Notable correlations were found for age, educational level and the PHQ-9 score. Interestingly, the correlations for the AIMS2-SF scales were all statistically significant but, with the exception of the affect scale, quite low. All factors achieving significance were entered in the regression model.

Table 3. Correlations of patients variables with the PACIC and 5A sum score

		PACIC sum score	5A sum score
Gender**		0.099	0.109
Age (years)*		-0.322	-0.349
Educational level**		0.401	0.3.78
Marital status*		0.028	-0.099
Disease duration (years)**		0.184	0.178
BMI (kg/m²)**		0.213	0.199
No. of comorbidities**		0.145	0.177
PHQ-9 sum score**		-0.347	-0.421
AIMS2-SF Scales	Lower body**	0.128	0.139
	Upper body**	0.188	0.201
	Affect**	0.292	0.277
	Social**	0.144	0.156
	Work**	0.201	0.173

Level of statistical significance: *p<0.05; **p<0.01; (Spearman rho)

To decide which regression model would be appropriate we first calculated the ICCs of the PACIC-5A to estimate the variation between the different practices. Interestingly, the ICC was below 0.01, consequently, we decided to choose a linear regression model without considering the cluster effect. Table 4 displays the results of the regression analysis with the PACIC sum score as dependent variable. As can

be seen, only two factors remained in the final model which explained 29.5 % of the variation in the PACIC sum score. The educational level was the strongest predictor with a beta of 0.421 ($p<0.008$), reflecting that a higher educational level predicted higher scores on the PACIC score. The relationship to age was inversely: higher age predicted lower PACIC sum scores, reflected in a beta of -0.319 ($p=0.016$). The PHQ-9 score was eliminated in the last step of the regression model while slightly surpassing the demanded significance level (beta=0.107; $p=0.057$)

Table 4. Predictors of the PACIC-score assessed by stepwise regression

Dependent: PACIC sum score Unadjusted $R^2 = 0.302$ Adjusted $R^2= 0.295$ $F= 21.233$; $p<0.0001$	beta	SE	T	p
Educational level	0.421	0.118	3.620	0.008
Age	-0.319	0.121	2.022	0.016

Interestingly, the regression model revealed similar predictors for the 5A sum score as for the PACIC score: age as a negative predictor of high 5A scores and educational level as a positive predictor (Table 5). Additionally, the PHQ-9 score remained as significant predictor in the final model. Higher PHQ-9 scores were associated with lower 5A scores.

Table 5. Predictors of the 5A score assessed by stepwise regression

Dependent: 5A sum score Unadjusted R^2 = 0.312 Adjusted R^2= 0.302 F= 21.455; p<0.0001	beta	SE	T	p
Age	- 0.386	0.145	3.450	0.004
Educational level	0.344	0.129	1.988	0.002
PHQ-9 score	- 0.288	0.243	1.874	0.005

DISCUSSION

The CCM has been promoted as a template of care for the chronically ill, aiming at substantially improving quality of life (4;21). Our study showed that certain patients rated those aspects of their care more favourably which were consistent with the CCM. Being younger, better educated and less depressed increased the chance to achieve higher scores on the PACIC-5A. Assuming that the PACIC-5A reflects the accordance of physicians' behaviour with the CCM, these patients are more likely to receive care that contains the core elements of chronic care as activation, support, goal setting, assistance and a frequent follow-up.

Tsai et al. showed in their meta-analysis that interventions containing at least one CCM element could improve clinical outcomes as well as patient-relevant outcomes (22). They included 112 studies, assessing diabetes, asthma, chronic heart failure, and depression. Furthermore, a number of studies are available to date, that focused on implementing at least a few elements of the CCM. The results emphasize that the

CCM is not only a theoretical framework that improves process parameters as well as patient-relevant outcomes, in a recently published study, Vargas et al could also show that the CCM approach can reduce risk factors for a heart disease in diabetes patients (23). Regarding chronic obstructive pulmonary disease, Adams et al. reported in a recent review that patients who received interventions with two or more CCM components had lower rates of hospitalizations and emergency/unscheduled visits and a shorter length of stay in a hospital compared with control groups (24). It has to be considered, though, that most of these data were retrieved in hospital settings or HMOs and can not easily be transferred to primary care settings. So far, only one study is available, showing that CCM elements can be implemented in small independent practices and result in improved care for diabetics (25).

Our paper has three main findings. First of all, the comparison of the scores of our study sample with previously collected data suggests that current care for patients with OA only poorly reflects the key elements of the CCM. Glasgow et al., for instance, found notably higher values among diabetes patients as we did: Their reported means in the “tailoring/goal-setting” scale (3.1 in men and 3.0 in women), in the “follow-up” scale (2.9 in men and 3.0 in women), and the “problem-solving” scale (3.4 for both gender) do not even fall within the 95% CIs of our outcomes (12). The same result applies to the sum score (3.2 in men and 3.2 in women). The results regarding the 5A-approach are quite similar, with notably lower scores regarding all scales of the 5A part of the PACIC-5A.

In our opinion, there are several reasons that account for the significantly lower scores in our study: First of all, Glasgow collected his data in a HMO and not, as we did, in a primary care setting with a large number of single handed practices. Furthermore, and related to the first reason, care according to the CCM is proactive, focused on activating, involving and accompanying the patient. This kind of care

frequently requires the involvement of qualified practice nurses or physicians' assistants. But these medical professions are currently not available in Germany (26). Another important reason may be the observed disease itself. It could be assumed that physicians' engagement in diseases as diabetes, heart insufficiency or depression is higher than in OA, which is regarded as less threatening to patients' health or at least associated with a lower burden of disease (27).

The second important finding is that the PACIC as well as the 5A scores are not correlated with severity of OA. None of the AIMS2-SF scales, reflecting different aspects of quality of life of OA patients, was significantly correlated with the PACIC or the 5A scales and none of them remained in the regression model. This suggests that GPs counselling efforts are not dominated by the disease itself.

The most important finding is related to the predictors of high PACIC and 5A scores. The finding that younger, better educated patients with lower PHQ-9 scores are more likely to achieve high scores on the PACIC-5A could reflect differences in physician behaviour towards different patient groups as well as the fact that these patients are more actively seeking care that complies with the CCM. Still, this association can not be concluded from our data and remains speculative. Nevertheless, this information is valuable since it may suggest that in implementing the CCM or its elements, it will be of great importance to assure that all patient groups are able to benefit to the same extent from this advance in chronic illness care. It is well known that most chronic diseases as diabetes and high blood pressure are associated with social status (28;29); a recent German health survey confirmed the association of chronic conditions and social status once more (30). It is quite obvious that these patients would benefit the most from advanced approaches like the CCM. Our data suggest that efforts in implementing CCM elements should consider to assure that these patients will eventually benefit from the CCM as well as other patients.

Since Glasgow et al. could not reveal significant differences in the PACIC scores regarding gender, ethnicity, income and comorbidities, it will also be of great importance to consider the setting in which the data were collected (9;12): Their patients were enrolled in an HMO, ours in a primary care setting.

Strengths and weaknesses

There are some weaknesses of our study which should be acknowledged: First of all, the assumed linkage between different PACIC scores and differences in received care has not empirically been proved. But preliminary data from a nationwide research project using the PACIC-5A in evaluating diabetes disease management programs confirm this assumption. Secondly, the data were derived from a cross-sectional observational study within a sample of OA patients and it remains unclear whether the findings can be transferred to other diseases and patient groups. Furthermore, the social situation of participants could not be assessed properly since it is still problematic in Germany to ask for the annual income. Since uninsurance is no problem in Germany and the health care system can be freely accessed by everyone, this weakness may be limited. The strength of this study is its reasonably large and representative sample of primary care practices and patients. In contrast to previous studies, which assessed the congruency to the CCM by a health professionals' perspective (by means of the Assessment of Chronic Illness Care (ACIC) (31)), we assessed it from a patients perspective.

Conclusion

Without a doubt, the framework of the CCM represents an important step towards an improved care for the chronically ill. Our findings suggest that currently, this structured approach is only rarely implemented in the care for patients with OA in a primary care setting. The finding that younger and better educated patients are more likely to receive care which complies with the CCM suggests that the implementation

of CCM or CCM elements in primary care will be challenging to assure that all patients benefit equally. Further research is needed to confirm our results and assess possible implications for implementing the Chronic Care Model in primary care.

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COMPETING INTERESTS

All authors declare that there is no conflict of interest.

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