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Family practitioners' remuneration and patterns of care – does social class matter?

Summary

The objective of the study is to examine whether medical care patterns and/or outcomes for patients under a prepaid system differ from those under fee-for-service according to social class. An effect of this kind was suggested by the investigators reporting on the RAND Health Insurance Experiment (RAND HIE). We performed a cross-sectional study in family practice in Germany (fee-for-service) and the UK (predominantly capitation i.e. prospective payment). 778 attending patients aged 18 and above were included. Indicators of care, relating mainly to cardiovascular prevention, were collected by patient interview and questionnaire, doctor's questionnaire, analysis of records, and blood pressure (BP) measurement. Multiple linear and logistic regression models with these indicators as dependent variables were calculated to examine possible interactions between social class and system of payment. Social class as a main effect was related to diastolic BP, BP measurement frequency, and the number of non-pharmacological interventions to lower BP. The data on the process and the outcome of primary care from British and German family practice do not show any significant interaction between system of family practitioners' remuneration and patients' social class. We were unable to reproduce the effect postulated by the RAND HIE investigators.

Morbidity and mortality have repeatedly been shown to be positively related to lower social class^{1,2} poverty³ and deprivation⁴. Thus an increased need for health care among persons who belong to lower social classes can be assumed. However, the higher need does not necessarily translate into increased utilization of health services. Rather the opposite effect, the

“inverse care law”, has been shown to operate⁵, i.e. those who are least in need of medical services make the most use of them, and vice versa.

Presumably the inverse care law does not always apply. Under what circumstances it does operate, or to what extent, might well depend on the organisational and social context in which health care is pro-

vided. The system for payment of care providers is an important structural aspect of the quality of care. It can be expected to influence many aspects of curative and preventive services and also, although indirectly, help-seeking behaviour.

The most elaborate study so far to examine the effects of different systems of remuneration has been the RAND Health Insurance Experiment⁶. This randomized controlled trial compared a fee-for-service (FFS) system and prepaid remuneration (Health Maintenance Organisation, HMO). Overall outcomes of care were similar in both groups. However, the investigators observed an interaction between payment system and social class: those who were poor and ill at randomization fared worse under the HMO scheme. The high income, initially ill group under HMO had improved general health ratings and cholesterol levels compared to those under FFS.

With systems of prospective remuneration becoming more widespread internationally^{7,8}, we thought that this question should be reexamined within the European context.

We performed a study comparing progress and outcome measures of primary care in Germany and the

UK, where there are different systems of remuneration. Whereas in Germany family practitioners are paid on a fee-for-service basis, capitation (i.e. a fixed sum per patient registered with the practice) is the predominant way of payment in the UK. Both systems have undergone many modifications recently, but they still differ markedly. We used cardiovascular prevention as an indicator. Primary results with regard to quality of care have been published elsewhere^{9,10}. Here we report on a secondary analysis specifically addressing possible interactions between doctor's remuneration and social class.

Methods

Fifteen Family Practice units in Germany and the UK, matched for rural-urban location, were included in a cross-sectional study. With truly random samples response rates to research projects can be expected to differ considerably between the two countries¹⁰. In both countries we therefore chose a sample consisting of practices with established links to academic general practice units. 778 consecutive patients aged 18 or more attending for consultation gave oral consent and were interviewed about sociodemographic data, medication, previous blood pressure (BP) checks and diagnosis, risk factor concepts, and remembered interventions against smoking. Blood pressure was measured in a standardized way. Patients' records were analyzed for previously recorded BP readings, medication, biochemical tests, and previous visits. Actions taken by practitioners on the day of data collection were not taken into account. Data were collected in 1992/1993. 92% of the patients approached participated in the survey. For further methodological details see Donner-Banzhoff¹⁰.

Social class was defined according to education achieved. Four categories (see appendix) reflected similar levels in the British and the German educational systems. However, as frequencies at the higher levels were low, we collapsed the three higher strata and obtained a dichotomous measure (high education vs. low education). Given the heterogeneity that could be expected from an international comparison, we decided to use multivariate analyses to adjust simultaneously for potential confounders. Several variables related to either the process or the outcome of quality/patterns of care were examined this way (see Tables 2 and 3). For continuous dependent variables we used linear regression analyses, for binary variables logistic regression supported by the software package SAS^{11,12}. As independent variables we entered age, gender, country, social class, deprivation (patient belonging to practice with >10% unemployed among attenders no/yes), geographical location (urban vs. rural), time since last practice contact (this variable was omitted when it was analysed as dependent); for modelling of "time since last BP-measurement" and "time since last total cholesterol (TChol) measurement" we also included "known hypertension no/yes" as an independent variable. The analyses of the "number of non-pharmacological interventions against hypertension" and "last generation antihypertensive agent" were applicable only to patients known as hypertensive. To obtain stable estimates from this much smaller group we reduced the set of independent variables to age, gender, social class, country, and time since last visit.

The question to be answered by this analysis was whether the interaction term "country × class" would increase that part of the variance of the dependent variable that could be explained by the

model. In linear as well as logistic regression models we therefore examined statistically the gain in variance explained due to the addition of the interaction term. All the other predictor variables mentioned above were consistently kept in the model.

In linear regression, coefficients of determination (R^2) were calculated without and with the interaction term. To determine whether the differences in R^2 's were significantly different from zero we used an incremental F-test¹³.

For logistic regression we proceeded similarly. Here the deviance ($-2 \text{ Log Likelihood Ratio}$) allows some assessment of model fit. It also allows calculation of the explanatory power of a variable added to a model¹⁴.

To provide some descriptive analysis, we report p-values for the interaction term as computed in individual analyses. However, the significance level adjusted for multiple testing, given $\alpha=0.05$, is at 0.0045 according to the Bonferroni Method¹⁵.

Results

Sociodemographic characteristics

Some basic characteristics of the two samples are shown in Table 1. The mean age of the German sample was considerably higher than that of the British one. UK patients were socially more diverse; the proportion of those with university education as well as of those unemployed was higher than among German practice attenders. That there were far more patients with a gynaecological reason for a visit in the UK can be explained by the structures of primary care, which differ the two countries. In the UK, family practitioners provide care in this area, whereas in Germany women usually attend gynaecologists' practices.

	Germany	UK	p-Value
Age in years: mean (standard deviation)	51.8 (16.5)	45.7 (18.1)	p<0.001 ^a
Gender: female %	59.4	60.7	p=0.71 ^b
Social class: highest educational achievement %	3.1	14.2	p<0.001 ^b
Unemployed %	2.9	11.7	p<0.001 ^b
Gynaecological reason for visit %	1.3	12.7	p<0.001 ^b

Two-sided tests for differences between Germany and the UK: ^a t-Test, ^b χ^2 -Test, n = 778.

Table 1. Demographic features.

Quality of care

Interaction between payment and social class

Tables 2 and 3 show the results of multivariate analyses of variables that are related to the quality of care under the two systems of primary care. The incremental explanatory power that results from adding the interaction term country (i.e. payment system) \times social class (i.e. education) is shown and tested for departure from zero.

In linear regression analyses of continuous outcomes (Table 2) the

interaction term makes the largest contribution to the model explaining the variable “time since last BP measurement” (see two columns on the right, Table 2). Diastolic BP and the “number of non-pharmacological interventions” in patients known as hypertensive follow closely. One should note that the overall explained variation (R²) is small, especially in the latter two models.

Among logistic regression analyses (Table 3), it is the model with the dependent variable “hypertension control” that gains most in explanatory power by the interaction

term being added (see two columns on the right, Table 3).

Although there is some tendency for interactions between “country (i.e. payment system) \times social class (i.e. education)” to show, in none of the analyses performed does this make a contribution that exceeds the significance levels corrected for multiple testing. We are therefore not able to reject the null hypothesis that there is no interaction between system of payment and social class.

Main effects

Based on multiple regression/logistic analyses without interaction terms, “social class” made a significant contribution (p<0.05) to the following variables: “diastolic BP” (lower BP with high social class), “time since last BP measurement” (shorter with higher class) and “number of non-pharmacological interventions” (more with high social class). The term “country” contributed in the following analyses: “known hypertension” (more in Germany), “time since last visit” (less in Germany), “time since last visit to other MD” (less in Germany), “time since last TChol mea-

Dependent variable ^a	Source of dependent variable ^b	R ² without interaction term	R ² with interaction term	n	Incremental F	p-Value ^c
Systolic blood pressure	M	0.2944	0.2945	660	0.06	0.8
Diastolic blood pressure	M	0.082	0.089	657	5.21	0.023
Time since last BP measurement	R	0.2229	0.236	641	6.2	0.013
Time since last visit	R	0.054	0.057	659	1.75	0.19
Time since last visit to other MD	P	0.0865	0.088	654	1.12	0.29
Time since last TChol ^d measurement	R	0.373	0.376	640	3.31	0.07
No. of nonpharmacological interventions ^e	P	0.059	0.067	146	1.17	0.28

^a Independent variables: age, gender, country, social class, deprivation, geographical location, time since last visit, known hypertension, where appropriate. For details see methods section.

^b Sources of dependent variables: M = measurement by researcher, R = retrieved from record, P = patient questionnaire or direct questioning.

^c Significance level ($\alpha = 0.05$) after correction: 0.0045.

^d “Total cholesterol level”.

^e Patients known as hypertensive only.

Table 2. Multiple linear regression analyses – seven models.

Dependent variable ^a	Source of dependent variable ^b	n	Difference [-2Log L without interaction term] minus [-2 Log L with interaction term]	p-Value ^c
Known hypertension	P and R	660	2.137	0.14
Hypertension control ^d	M	660	4.216	0.04
Intervention against smoking ^e	P	333	0.199	0.66
Last generation BP lowering agent ^f	P/R	141	0.17	0.68

^a Independent variables: age, gender, country, social class, deprivation, geographical location, time since last visit, known hypertension, where appropriate. For details see methods section.

^b Sources of dependent variables: M = measurement by researcher, R = retrieved from record, P = patient questionnaire or direct questioning.

^c Significance level ($\alpha = 0.05$) after correction: 0.0045.

^d Uncontrolled (i.e. systolic BP > 165 mmHg or diastolic BP > 105 mmHg) vs. controlled.

^e Current and ex-smokers only.

^f Patients known as hypertensive only.

Table 3. Multiple logistic regression analyses – four models.

surement” (less in Germany), “time since last BP measurement” (less in Germany). Details can be obtained from the first author.

Discussion

The data on process and intermediate outcome of cardiovascular preventive care in British and German family practices fail to show significant interactions between the system of remuneration of the FPs and patients' social class. Some limitations should be mentioned. Although most of the indicators we studied have clear quality implications, some have not. For instance, the use of last generation BP lowering agents (i.e. Ca-antagonists and ACE-inhibitors) has repeatedly been questioned^{16,17}. However, for the focus of this analysis, the respective prescribing patterns are still of interest, even if the available evidence is insufficient to make definite statements about the quality provided. One should also keep in mind that cardiovascular prevention, however important, is only part of the whole spectrum of care that is provided in the primary care sector.

There is a difference in mean age between the British and the German patients. As the age distributions of both samples correspond well to that of truly representative surveys in both countries^{18,19}, selection bias is unlikely to account for the difference. Part of this difference is explained by the lack of gynaecological patients, who are on average younger than others, on the German side. There are also data suggesting that patterns of attendance might differ between countries²⁰. Morbidity differentials may play a role, too (as suggested by mortality differentials for several chronic conditions²¹).

The lower academic background among the German attenders is presumably related to a tendency of those with private insurance to attend community specialists. The high proportion of unemployed among British patients may be related to this factor as well as to differences in economic and social development between the two countries.

Despite the fact that practices taking part in the study were not chosen randomly (for reasons given in the Methods section), the demographic composition of the sample is similar to representative

surveys of practice attenders in both countries^{18,19}. This may alleviate concerns with regard to the external validity of our results.

Theoretically our analysis could have missed the postulated interaction effect due to limited power (type-II-error). However, the absolute differences between proportions of explained variance with and without the interaction term are consistently small. In addition, the models explain only a relatively small part of the overall variance of dependent variables. We therefore conclude that in our sample no interaction effect is in operation that would be relevant either from a clinical or a public health perspective.

Secondary or post-hoc analyses like ours should generally be judged carefully. Especially the risk of type-I-error can be increased by this type of data analysis. In this paper, however, we have rejected the alternative hypothesis.

International comparisons of health services are potentially subject to confounding by many factors, and only some can be accounted for in data collection and analysis. In particular, social class and related experiences may differ between countries in many ways that

are difficult to capture by the comparatively crude measures that are available (e.g. education). However, as opposed to experimental designs, which are always limited in time and scope, comparative observational studies allow direct examination of long-established systems of care in the real world.

The conclusion of the RAND-HIE investigators mentioned in the introduction has been challenged²². Although Ware et al.⁶ reported a higher rate of beddays and more serious symptoms in those of lower income who were in ill health at enrollment, this interaction was not significant for the other 37 health indicators analysed²³. This result might therefore have arisen by chance alone. As Wagner and Bledsoe²² point out, these findings were related to an

improvement in health status in the free FFS group (as opposed to those subjects in the pay FFS plans).

The parallel between European health care systems, that are predominantly public, and the US system has to be drawn cautiously. Although HMOs and the primary care system in the UK have prepayment in common, there are considerable structural differences between the Group Health Cooperative of Pudget Sound (that was studied in the RAND Health Insurance Experiment) and British general practice where doctors contract individually with the National Health Service. Despite these caveats our analysis can make a useful contribution to the debate about the possible disadvantage of patients of lower socioeconomic status under prospective systems of care.

Although we conclude that there is no differential effect of the kind described above, social problems themselves remain a challenge for any system of medical care. Increased morbidity among the disadvantaged as well as their problems of access to care must be taken into account as part of continuous quality assurance efforts. For curative, but even more so for preventive measures, a well developed and accessible primary care system can offer a chance to provide high quality care to patients with lower socioeconomic status at reasonable cost. This may become even more important in the future, as evidence is accumulating that the gaps in social conditions as well as health status between different socioeconomic groups are increasing^{2,24–26}.

Zusammenfassung

Ärztliche Vergütung und Versorgungsqualität – spielt soziale Schichtzugehörigkeit eine Rolle?

Ziel der Studie ist es zu untersuchen, ob die soziale Schichtzugehörigkeit von Patienten die Effekte verschiedener Vergütungssysteme auf Art bzw. Ergebnis der Versorgung modifiziert. Ein solcher Zusammenhang war nach Auswertung des RAND Health Insurance Experiment (RAND HIE) berichtet worden. Wir führten eine Querschnitts-Untersuchung in deutschen (Einzelleistungsvergütung für Ärzte) und britischen (Pauschale) Allgemeinpraxen durch (n = 778 Patienten, Mindestalter 18 Jahre). Versorgungsindikatoren, hauptsächlich aus dem Bereich kardiovaskulärer Prävention, wurden durch Patienteninterview und -fragebogen, Arztfragebogen, Auswertung der Praxisunterlagen und Blutdruckmessung erhoben. Modelle multipler linearer und logistische Regression wurden mit diesen Indikatoren als Zielvariablen berechnet, um mögliche Interaktionen von Vergütungssystem und sozialer Schichtzugehörigkeit zu prüfen. Soziale Schichtzugehörigkeit war als Haupteffekt mit diastolischem Blutdruck, Blutdruckmesshäufigkeit und der Zahl nicht-medikamentöser Interventionen zur Blutdruck-Senkung assoziiert. Daten zur Versorgung durch britische und deutsche Allgemeinpraxen zeigen keine signifikante Interaktion von System ärztlicher Vergütung und sozialer Schichtzugehörigkeit. Der durch das RAND HIE postulierte Effekt konnte nicht reproduziert werden.

Résumé**Rémunération des médecins généralistes et caractéristiques des soins médicaux: Le niveau social a-t-il une influence?**

L'objectif de l'étude est d'évaluer si les caractéristiques des soins médicaux et/ou leur résultats, selon qu'ils soient donnés dans un système de prise en charge systématique préalable ou de paiement à l'acte, différent en fonction du niveau social des patients. Certains auteurs ont suggéré ce type d'influence au sujet de l'expérience d'assurance maladie RAND (RAND HIE). Nous avons réalisé une étude transversale chez des médecins généralistes en Allemagne (paiement à l'acte) et au Royaume Uni (prise en charge préalable dans un système de liste administrative des sujets). 778 patients de plus de 18 ans ont été inclus. L'interrogatoire des patients, les questionnaires remplis d'une part par le patient d'autre part par le médecin, la revue des dossiers cliniques, et la prise de la tension artérielle (TA) ont fourni les informations sur les indicateurs de soins, liés principalement à la prévention des affections cardiovasculaires. Les interactions potentielles entre le niveau social et le système de paiement ont été étudiées par des modèles de régression soit linéaire soit logistique avec ces indicateurs comme variables dépendantes. Le niveau social, comme facteur principal, était lié à la TA diastolique, à la répétition de la prise de la TA, et au nombre des mesures autres que le traitement médicamenteux destinées à baisser la TA. Cette étude n'a pas montré une interaction significative entre le niveau social des patients et le système de rémunération des médecins. Nous n'avons pas pu confirmé les hypothèses suggérées par les investigateurs de l'étude RAND HIE.

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Approximate years of education	Germany	No. (Col%)	UK	No. (Col%)
<8	No secondary education completed or "Hauptschulabschluss"	261 (68.0)	no O-levels	211 (55.7)
10	"Realschule", "mittlere Reife", Meisterausbildg. etc.	98 (25.2)	O-levels (GCSE), College	97 (25.6)
12/13	Abitur	13 (3.4)	A-levels	17 (4.5)
15+	(Fach)-hochschulabschluss	12 (3.1)	Polytechnic or University degree	54 (14.2)

Variable dichotomized as shown by thick line (low vs. high).

Appendix. Definition of social class according to education attained.