

HEALTH SERVICES

Influence of commercial information on prescription quantity in primary care

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Background: In the last few years we have witnessed many publicly-financed health services reaching a crisis point. Thus, drug expenditure is nowadays one of the main concerns of health managers, and its containment one of the first goals of health authorities in western countries. The objective of this study is to identify the effect of the perceived quality stated in commercial information, its uses, and how physicians perceive the influence it has on prescription amounts. **Methods:** A cross-sectional study of 405 primary care physicians was conducted in Galicia (north-west Spain). The independent variables physician's education and speciality, physician's perception of the quality of available drug information sources, type of practice, and number of patients were collected, through a postal questionnaire. Environmental characteristics of the practice were obtained from secondary sources. Multiple regression models were constructed using as dependent variables two indicators of prescription volume. **Results:** The response rate was 75.2%. Prescription amounts was found to be associated with perceived credibility of information provided by medical visitors, regulated physician training, and environmental characteristics of the practice (primary care team practice, urban environment). **Conclusions:** The study results suggest that in order to decrease prescription amounts it is necessary to limit the role of pharmaceutical companies in physician training, improve physician education and training, and emphasize more objective sources of information.

Keywords: cross-sectional study, multiple regression, prescription quantity, primary care

In the last few years we have witnessed many publicly-financed health services reaching a crisis point. It is likely that a wider health coverage and the cost of new diagnosis and treatment techniques, as well as an ageing population, are responsible for this situation. Thus, drug expenditure is nowadays one of the main concerns of health managers, and its containment one of the first goals of health authorities in western countries.^{1–4} Therefore, identifying prescribing-associated factors is of paramount interest from health, as much as social and economic, standpoints.

The influence of various factors on prescribing amounts has been considered in many studies.^{5–8} The physician's age, training, environment and health-care demand have been quoted as explanatory factors for prescription-amount variables. Although the issue of information provided by the industry has also been mentioned as a relevant conditioning of prescribing patterns, the effect that commercial information exerts on the amounts prescribed has not often been subjected to study.

The object of this study was to identify the effect of the perceived quality of commercial information, its uses,

and how physicians perceive the influence it has on prescription amounts.

METHODS

Design, population and sample

A cross-sectional study of the population under primary care physicians in Galicia, north-west Spain (N=1,500) was designed. The study's analysis unit is the physician. A stratified random sample of 405 primary care physicians was selected. The sampling frame was divided into four geographical areas, and in each one of those four areas a proportional to population random sample was selected. Physicians who had worked less than six months during 1993, were excluded.

Setting

Galicia has 2.8 million inhabitants, greatly spread out over the territory. Two million of the total population live in small villages. The territory is divided into 313 municipalities.

The primary care system (PCS) functions under two structures: the traditional model, based on the work of the single-handed physician; and the reformed model, which is more in accordance with the guidelines set forth in Alma-Ata.^{9,10} The latter revolves around the structure of the Health Centre, integrating the roles of doctors, nurses, social workers, and other health personnel. More than 70% of all prescriptions are generated through the PCS, and over 90% of all prescriptions are processed

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through PCS, since PCS physicians also process prescriptions from specialists. Medications are dispensed in the pharmacy by pharmacists, who, according to legislation, are allowed to substitute brand drugs if they are not available.

Health care for the population is free of charge and universal. Economically inactive persons (children, students, disabled, etc.) have access to the system through the identification card of the person they are dependent on. There are two types of identification cards: for actively working persons and for retirees. Actively working persons and their dependents pay 40% of drug charges, whereas retirees and their dependents receive all drugs free.

Physicians, both with and without speciality, work in the PCS. Specialists, once they have finished University training, are trained in a regulated programme for a minimum of three years, in one of the centres of the National Health Service. Among physicians with a speciality, there are physicians with training in Family and Community Medicine, and physicians with training in other specialities.

Data collection procedures

The main independent variables were collected through a self-administered mail questionnaire. The questionnaire was validated in accordance with patient and expert validity criteria. Reliability was assessed on the basis of internal consistency between questions and of reproducibility. Furthermore, a pilot test was run on 15 professionals unassociated with the study population.

This was mailed to the sample physicians with a letter describing the objectives of the study and the importance of their participation, and a pre-paid addressed envelope for returning the questionnaire. The first questionnaire was mailed out in October, 1992. It was re-sent to non-respondents a maximum of four times. We excluded from the study those physicians for whom the postal service returned the questionnaire.

The questionnaire was designed to be short and easy to complete, these factors have been shown to influence response rates.¹¹ The questionnaire form presented 60 items in one single page. The first part collected personal and education data, such as age, sex, year of graduation, specialty, and pharmacology training. In the second part, physicians were asked about different drug information sources (advertisements, sales representatives, and medical journals and conferences). They were asked specifically about the quality of these sources and the degree of influence they perceived that each of them had on their selection of prescription drugs. In the last part physicians were asked about the characteristics of their practice: type of practice, number of identification cards, number of patients seen per day, and the service accessibility for the patients. All of these variables are thought to modify prescribing behaviour. Other variables that may modify prescribing behaviour such as unemployment rate and population distribution were obtained from secondary sources.¹²

Dependent variables for 1993 were obtained from the database of the accounting archives of the National Health Service, which includes all prescriptions served in all the pharmacies in Galicia. These databases are prepared by the Professional Pharmacists Colleges and they are very detailed, because they are used so that the National Health Service can pay the pharmacists.

Definition of variables and instrumentation

■ Independent variables

Physicians were asked whether they had a graduate speciality, and whether this was in Family and Community Medicine. Both variables are dichotomous (1=yes; 0=no). Physicians were also queried about which health care model they followed in their practice. The model followed was classified and coded as: 0=traditional model; 1=reform model.

The perceived quality of information about drugs obtained from visiting sales representatives (SR), medical journals, and conferences, and the influence of this information on drug selection was measured using a four-point Likert-like scale ranging through 'none', 'low', 'medium' and 'high'. The utilisation of this information was measured with a dichotomous variable (1=yes; 0=no). Using a four-point Likert-like scale, physicians' opinions about the quality and influence of the formulary for Primary Health Care in 1992 were measured as an information source on drug choice.

A number of social and service variables were included to adjust for their expected influence on the quality and quantity of drug prescription. These were: the number of patients' ID cards; the service demand, measured as number of patients seen per hour; the service accessibility, measured as the median travelling time the patient requires to reach the health centre; and the proximity of the patient's residence to the hospital, measured again as the median travelling time the patient requires to reach the closest hospital.

In addition, two socio-economic variables were measured: the percentage of residents born in a particular municipality (an indicator of a rural setting, since higher percentages are found among rural municipalities), and unemployment rate. These variables were collected for each municipality, and are therefore ecological in their nature.

■ Dependent variables

Two variables were defined for measuring prescription amounts: i) units prescribed by physician, standardized by number of identification cards, rate of retiree identification cards, and time worked; and ii) expenditure by physician, this was also standardized by number of identification cards, rate of identification cards, and time worked. In order to avoid seasonal differences in prescription, the months worked by each physician were estimated by the prescription distribution of the whole sample in the twelve months of the year. The equivalence between working subjects and retirees was estimated from the total prescription distribution of the sample according to working subjects and retirees.

■ Statistical methods

In the variables gathered through the questionnaire, a proportion of data are missing. Several studies have shown that conditional-mean imputation or complete-subject analysis can be biased under reasonable circumstances, and that multiple imputation is recommended in these cases.¹³ The multiple imputation was carried out with SOLAS¹⁴ package software.

A univariable and bivariable descriptive analysis was carried out. A multiple regression model was devised for each dependent variable. Maximum models were created, and the variables that had no effect on the dependent variable and had no confounder effect in relation to the remaining independent variables were removed. Once the variables making up the model had been defined, the possible effect modifications among variables were evaluated. The conditions of application of the multiple regression models were analysed using the Kolmogorov–Smirnov test applied to distribution of residuals.

RESULTS

Among the 405 physicians in the sample, 94 were excluded (by mistakes in the database, retired physicians or

addresses that have been changed). Of the 311 remaining physicians, 234 replied (75.2% response rate).

Table 1 shows the characteristics of the main independent variables included in the models. The median for prescribed units by physician was 14277.3 (95% CI: 13296.9; 15257.7); thus there was a significant difference between what was prescribed to working card holders 4480.1 (95% CI: 4140.1; 4820.1) and to retirees 9789.2 (95% CI: 9092.5; 10478.2). The mean expenditure by physician reached 111468.7 (95% CI: 103789.8; 119388.3) euros, and the expenditure for working card holders was significantly lower than that of the retirees group; 34196.6 (95% CI: 30597.0; 37796.3) for working card holders against 77392.4 (95% CI: 71992.9; 82791.9) for retirees. Table 2 presents the bivariate and multivariate analysis for the expenditure variable. In the multivariate analysis, quality of SR information, and utilization of SR information are associated with higher expenditure. On the contrary, working in the reform model, the number of active patients' cards, the number of retirees patients' cards, and the rate of residents born in the municipality are associated with lower expenditure.

Table 3 shows the bivariate and multivariate analysis for the prescribed-units variable. In the multivariate analysis,

Table 1 Description of subjects studied for the main independent variables

Variable		95% CI
Mean years with degree	14.7	(13.6 ; 15.8)
Proportion of males (%)	71.0	(66.9 ; 77.0)
Proportion of speciality obtained through residency in NHS (%)	12.1	(8.1 ; 16.6)
Proportion of family and community medicine specialist (%)	23.2	(17.6 ; 28.5)
Proportion of physicians in reform model (%)	40.2	(33.8 ; 46.5)
Median number of patient's cards per physician	1116	(1041.3 ; 1190.4)
Proportion of retirees' ID cards per physician (%)	44.0	(41.6 ; 46.7)

NHS: National Health Service

Table 2 The influence of physician's education, perceived quality of drug information, and medical care setting on the standardized expenditure per physician

	Bivariate analysis			Multivariate analysis		
	Coef	95% CI	p-value	Coef ^a	95% CI ^a	p-value
Number of years with medical degree	21.3	(-517.65 ; 559.9)	0.077	304.7	(-201.3 ; 810.8)	0.237
Speciality obtained through residency in NHS ^b	-1983.25	(-33547.9 ; -6117.0)	0.005	-11597.6	(-24986.8 ; 1791.4)	0.089
Quality of visiting sales representatives' information ^c	7943.4	(2124.1 ; 13763.8)	0.008	5578.6	(-107.1 ; 11264.4)	0.054
Utilization of visiting sales representatives' information ^b	12123.1	(2396.7 ; 21849.5)	0.015	9967.6	(-724.1 ; 19211.2)	0.035
Sales representatives, number per week	-309.9	(-1318.1 ; 698.3)	0.545	21.9	(-880.7 ; 924.5)	0.962
Reform model ^b	-12557.9	(-21794.5 ; -3321.3)	0.008	-16285.6	(-25680.4 ; -6890.7)	0.001
Number of active patients' cards	-29.8	(-39.0 ; -20.5)	<0.001	-34.4	(-43.4 ; -25.5)	0.001
Number of retirees patients' cards	-16.2	(-36.1 ; 3.8)	0.112	-33.4	(-52.0 ; -14.9)	0.001
Rate of residents born in municipality	40.0	(-285.1 ; 365.0)	0.809	-475.6	(-793.8 ; -157.3)	0.004

Coef: Regression coefficients; CI: confidence intervals; p-value: statistical significance

NHS: National Health Service

Kolmogorov–Smirnov p=0.105, N(3.4E-11; 34321)

a: Adjusted for the other independent variables included in this table.

b: Yes=1; No=0

c: Measurements on Likert-like scale (0=none, ... 4=high).

the utilization of the visiting marketers information is associated with higher amounts. On the contrary, working in the reform model, the number of active patients' cards, the number of retirees patients' cards, and the rate of residents born in the municipality are associated with reduced amounts.

DISCUSSION

The results of this study show that giving greater weight to the information provided by SRs is related to a larger number of prescriptions and to greater expenditure, adjusted by the number and type of cards. On the other hand, physicians specializing in Family and Community Medicine and integrated in a reformed model are associated with the lowest prescription rates.

The pharmaceutical industry is probably the main provider of information to physicians in Spain.¹⁵ In fact, it is estimated that most physicians allocate more hours to receiving SRs than to attending updating courses.^{16,17} Moreover, according to various authors, commercial information makes up for the lack of training in health services,¹⁵ and this is higher in the developing countries where the industry influence is greater.^{18,19} Nevertheless, in all probability the SRs influence cannot only be explained through the information they provide.²⁰ This must be supplemented with the *need-satisfaction* model,²⁰⁻²⁴ which focuses on the physician's need to harmonize with his/her environment. According to several authors,¹⁵ the primary care physician's detachment within the health system, especially in the traditional primary care model, is exploited by pharmaceutical companies to create personal links with the physicians. On the one hand, this would have repercussions on a more positive perception of the quality of the information provided by SRs, and on the other hand on the physician's prescribing behaviour. These results are

consistent with Shawn's study,²⁵ which has also shown that there is a significant relation between the credibility attributed to SRs and prescription costs.

In this study the number of SRs received has shown no relation to prescription amounts. Such result would indicate that SR influence does not depend so much on the exerted pressure as on the credibility offered to the physician. On the contrary, other authors actually point out a direct relation between the number of SRs and the request for inclusion into drug formularies,²⁶ although the fact that these models are not controlled by the credibility assigned to SRs may confound the results.

Other variables, such as medical training, the organizational model in which the physician operates, and the characteristics of the assisted population were taken into account in the models to control their possible confounding effects as well as to evaluate their effect on the dependent variables. In a bivariate analysis, physicians specialized via hospital residency have been seen associated with lower prescribing. These results coincide with several studies carried out in Spain,^{27,28} which relate in-hospital training to lower prescribing. In relation to the organizational model, and coinciding with other authors' findings, the study results show a relationship between the reform model working and lower prescribing.²⁹ This lower prescription rate is probably related to a better follow-up of patients due to the multidisciplinary approach of the reform model, made up of doctors, nurses, clinical pharmacologists, social workers and psychologists. The greater motivation implied in teamwork, as well as the subsequent lower influence of commercial information, can also be related to lower prescribing rates.³⁰ Other authors³¹ have pointed out different concepts of medical activity amongst physicians working on their own against those working in teams. Thus, it remains to be seen whether physicians' prescribing patterns are

Table 3 The influence of physician's education, perceived quality of drug information, and medical care setting on standardized units prescribed by physician

	Bivariate analysis			Multivariate analysis		
	Coef	95% CI	p-value	Coef ^a	95% CI ^a	p-value
Number of years with medical degree	0.0968	(-0.28 ; 0.474)	0.613	0.332	(-0.021 ; 0.684)	0.065
Speciality obtained though residency in NHS ^b	-14.3	(-23.9 ; -4.8)	0.004	-7.633	(-16.953 ; -1.687)	0.108
Quality of visiting sales representatives' information ^c	5.5	(1.4 ; 9.5)	0.009	3.634	(-0.324 ; 7.591)	0.072
Utilization of visiting sales representatives' information ^b	7.8	(1.0 ; 14.7)	0.024	6.505	(0.070 ; 12.94)	0.048
Visiting sales representatives, number per week	-0.224	(-0.929 ; 0.481)	0.531	-0.0010	(-0.629 ; 0.627)	0.998
Reform model ^b	-9.771	(-16.206 ; -3.336)	0.003	-12.90	(-19.44 ; -6.36)	<0.001
Number of actives patients' cards	-0.020	(-0.027 ; -0.013)	<0.001	-0.011	(-0.030 ; -0.017)	<0.001
Number of retirees patients' cards	-0.0150	(-0.029 ; -0.001)	0.034	-0.173	(-0.041 ; 0.015)	<0.001
Rate of residents born rate in municipality	0.068	(-0.159 ; 0.296)	0.553	-0.308	(-0.530 ; -0.087)	0.007

Coef: Regression coefficients; CI: confidence intervals; p-value: statistical significance

NHS: National Health Service

Kolmorov-Smirnov p=0.065, N(-1.4E-12; 6583)

a: Adjusted for the other independent variables included in this table.

b: Yes=1; No=0

c: Measurements on Likert-like scale (0=none, ...,4=high).

conditioned by the health service structure, or whether physicians' different training backgrounds are a key factor in their integration to primary care teams.³¹

Whether measured in units or in costs, prescribed amounts reduce as the number of cards increases. Thus, doctors with a higher contingency proportionally generate lower expenditures. It has been pointed out that large quotas could be associated with lower prescription rates, due to the greater control that the physician tends to have on expenditure.³² Other authors associate a greater number of patients per physician to lower accessibility (longer waiting time, etc.), and therefore to lower consumption and expense.³³ Nevertheless other authors understand that the shorter time available to the physician may lead to prescriptions replacing diagnosis.³⁴ Moreover, the percentage variable of inhabitants born in a municipality (rurally indicator), measured at municipality level has been considered in that study. Rurally seems associated with lower prescription rates in our study. This effect could possibly be explained by economic conditioning. At any rate, this possible *ecological fallacy* induces cautious interpretation of this kind of variable.

The results of this study suggest that one of the possible measures to be adopted to lower prescription expenditure would be to regularize medical visits. Thus the pharmaceuticals industry training by SRs should be replaced by training programme provided by the health service, particularly face-to-face, which has been shown to be one of the most effective training methods for rationalizing drug prescription.³⁵ On the other hand, these results highlight the need to apply primary care reforms in accordance with Alma-Ata.^{9,10}

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