Population and primary health-care team characteristics explain the quality of the service

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Abstract

Objectives: To identify the characteristics of the primary health-care (PHC) team’s structure and of the assigned population affecting service quality dimensions, and to check whether the PHC team’s performance varies when assessing the service quality using crude values or those adjusted by the structural factors that affect it.

Research design: Cross-sectional descriptive study.

Subjects: 213 Catalan PHC teams.

Measurements: Service quality indicators measured in three dimensions: (1) access and physician–patient relationship; (2) team coordination and (3) evidence-based practice. The PHC team structural factors studied are: experience, setting (urban or rural), geographical dispersion, teaching activities and managerial structure. The catchment population characteristics analysed are: age, socio-economic level, mortality, and the proportion of the population that are immigrants.

Results: Access and physician–patient relationship dimension were not affected by the studied structural factors. Team coordination improved in rural teams and in those providing care for older populations. Evidence-based practice was found to be higher in teaching teams, in more experienced teams and in those attending populations with a lower socio-economic level. Adjusted service quality indicator values substantially modify the PHC team quality ranking carried out on the basis of its crude values, especially in the team coordination and evidence-based practice dimensions.

Conclusions: A fair evaluation of PHC team performance must be based on its health-care service quality indicators adjusted for setting, age and socio-economic level of the catchment population and for the team’s experience and teaching activities.

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Keywords: Primary health-care; Performance indicators; Health-care outcomes

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1. Introduction

Although general practice used to be characterised by a partnership between patient and personal doctor working single-handed, the growing complexity of the medical care in recent decades has favoured the emergence of primary health-care teams. Health centres staffed by primary health-care teams appeared in the UK under the NHS in the 1950s, followed by Finland and the Netherlands [1]. A reform of the Spanish primary health-care services aimed at changing the old polyclinics and solo practices into modern primary health-care teams began in 1996 and finished in 2003. Today the reform is fully accomplished and its evaluation shows that the new scheme is more effective than the previous one. Professionals have a greater degree of job satisfaction, users are more satisfied and there has been an improvement in the efficiency of service [2].

Managers and primary health-care professionals need performance indicators to measure the quality of the health-care they offer [3]. These measurements are required for benchmarking the successful strategies of those achieving the highest scores and for introducing corrective measures for those performing poorly. Indicators also evaluate the real impact of health-care organizational changes. Performance indicators are currently of paramount importance for new doctor payment schemes based on professional performance and for funding health-care services paid according target achievements [4]. Accurate measurement of the health-care performance is of great interest, because an erroneous evaluation might lead to an unfair distribution of resources. Comparisons used to be based on the crude values of the performance indicators, despite some studies suggesting that team structure and climate might influence the quality of the service in primary health-care [5]. In order to identify elements for improving the fairness of the assessment of the primary health-care team performance, we analysed the Catalan primary health-care teams.

Catalonia is a region in north-eastern Spain, which has full autonomy in the health-care sector. A National Health Service financed by taxes covers the 7 million citizens of Catalonia. “Catsalut” is a government institution that acts as a public insurer, identifies health needs, purchases services into an internal health services market to public and private providers and evaluates health-care. Although universal cover exists, citizens are also free to purchase additional private services [6]. The “Institut Català de la Salut” (ICS) is the largest public health-care provider in Catalonia, offering primary health-care services to 75% of the population and managing eight hospital centres, mainly teaching hospitals. Primary health-care teams obtain a per capita budget which also has a variable part based on the achievement of health-care quality objectives measured with performance indicators [7]. This incentive is subsequently transferred to the salaries of the professionals themselves since 2003 when ICS launched a performance payment scheme among its public physicians and nurses [8].

The biomedical bibliography and opinions from professionals and patients indicate that multiple factors might affect the quality of the health-care service [9]. A fair comparison of the primary health-care (PHC) teams’ performance must distinguish between the differences attributed to factors that can potentially be modified by the professional activity and those explained purely by non-modifiable structural factors on which professionals cannot act, such as the profile of the assigned population or the structural characteristics of the team.

Many performance indicators are currently used, though few are validated and offer a comprehensive measurement of the PHC team dimensions of the service quality [10]. Through qualitative and quantitative methods [11,12] a model has been constructed using routine information data employed in health service management. Despite professional and patient focus groups identifying four dimensions of the PHC team service quality [11], further confirmatory analysis showed that the three dimensions model was the one that better fitted the structure of the data. A close relationship was found between the accessibility indicators and the professional–patient relationship indicators [12]. The model finally used for measuring the PHC service quality has the following three dimensions: (1) access to the services and professional–patient relationship; (2) coordination within the health-care team; (3) evidence-based practice.

The first objective of the study is to identify the structural factors of the PHC team and the characteristics of its assigned population that influence the service quality. The second objective is to check whether the PHC performance varies when assessing the dimen-
sions of the service quality using crude values or those
adjusted for the structural factors of the team and the
characteristics of the assigned population that affect it.

2. Material and method

A cross-sectional study was designed to analyse
the health-care output from 213 PHC teams that were
integrated into the Institut Català de la Salut in the

2.1. Data sources

Service quality dimensions: the PHC team service
quality dimensions are the following three synthetic
indexes: (1) access to services and professional–patient
relationship; (2) coordination within the health-care
team; (3) evidence-based practice. The variables used
to build those outputs of the family services (Table 1)
team; (3) evidence-based practice. The variables used
relationship; (2) coordination within the health-care
indexes: (1) access to services and professional–patient
quality dimensions are the following three synthetic
2.2. Statistical analysis

The values of the synthetic indexes are calculated
from three linear functions which weight the vari-
ables that incorporate them, and have the property of
being a realization of normals of mean 0 and standard
deviation 1. The weighting of each variable in each
of the three functions is conditional on its range and
is obtained from the estimates through ordinary least
squares of the regression coefficients of the indexes
to observed variables [13]. The resulting functions are:

Accessibility and professional and patient relation-
ship = 0.0716 × service organization + 0.1068 ×
clinical visit duration + 0.1300 × telephone consul-
tation + 0.0382 × physician’s information + 0.0784
× nurse’s information + 0.1728 × attention to user’s
needs + 0.1732 × resolution of user’s problems +
0.0914 × respect accorded to user’s privacy − 0.0424
× time dedicated to the user − 0.0580 × workload +
0.0080 × support from superiors + 0.0148 × support
from colleagues + 0.0033 × work feedback + 0.0069
× proposals listened to and applied.

Team coordination = 0.0087 × service organization
+ 0.0130 × clinical visit duration + 0.0158 ×
telephone consultation − 0.0976 × physician’s infor-
mation + 0.0474 × nurse’s information + 0.0210
× attention to user’s needs + 0.0210 × resolution
of user’s problems + 0.0391 × respect accorded to
user’s privacy − 0.0052 × time dedicated to the user
− 0.0070 × workload + 0.1560 × support from super-
iors + 0.2875 × support from colleagues + 0.2787 ×
work feedback + 0.1341 × proposals listened to and
applied.

Scientific-technical quality = 0.2241 × quality of
prescription standard + 0.1423 × % anti-depressant
medications recommended + 0.1046 × % tranquil-
ilisers recommended + 0.2120 × % anti-hypertension
medication recommended + 0.1734 × % anti-asthma
medications recommended + 0.1738 × % anti-diabetes
medications recommended − 0.1040 × cost of pre-
scriptions standardized by patient age.
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Table 1
Variables constituting each indicator, with the range of values they can take

<table>
<thead>
<tr>
<th>Accessibility relationship of patient and health-care professional</th>
<th>Team coordination</th>
<th>Scientific-technical quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service organization (0–10)</td>
<td>Support from superiors (1–10)</td>
<td>Quality of prescription standard (0–120)</td>
</tr>
<tr>
<td>Clinical visit duration (0–10)</td>
<td>Support from colleagues (1–10)</td>
<td>% Anti-depressant medications recommended (0–100)</td>
</tr>
<tr>
<td>Telephone consultation (0–10)</td>
<td>Work feedback (1–10)</td>
<td>% Tranquilizers recommended (0–100)</td>
</tr>
<tr>
<td>Physician’s information (0–10)</td>
<td>Proposals listened to and applied (1–10)</td>
<td>% Anti-hypertension medication recommended (0–100)</td>
</tr>
<tr>
<td>Nurse’s information (0–10)</td>
<td></td>
<td>% Anti-asthma medications recommended (0–100)</td>
</tr>
<tr>
<td>Attention to user’s needs (0–10)</td>
<td></td>
<td>% Anti-diabetes medications recommended (0–100)</td>
</tr>
<tr>
<td>Resolution of user’s problems (0–10)</td>
<td></td>
<td>Cost of prescriptions standardized by patient age (0–100)</td>
</tr>
<tr>
<td>Respect accorded to user’s privacy (0–10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time dedicated to the user: adult visits/number of team members</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Workload: number of patients assigned/number of team members</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The distribution of values of the synthetic indexes has been described using histograms. The values predicted by the models are interpreted as the values of the indicators that the PHC teams should have in accordance with their structural characteristics. The differences between the values observed in each PHC team and those predicted by the models are called residuals. It is these that finally allow measurement and evaluation of the deviation of grades of the three PHC team synthetic indexes, and will be referred to as deviations of the adjusted indicators. The absolute value of the residual provides the magnitude of the deviations. A negative sign for the residual indicates that the PHC team has not achieved the grade it should have in accordance with its characteristics. A positive sign for the residual indicates that the PHC team has obtained values higher than expected. In summary, the PHC teams operate worse the greater the magnitude of their negative residual, and better the higher their positive residual.

The values observed of the three health-care service quality dimensions and the residual derived from the models, are classified into five categories: PHC teams with values lower than $-2$, values between $-2$ and $-1$, values between $-1$ and $1$, values between $1$ and $2$, and values higher than $2$.

3. Results

The analysis includes a total of 213 PHC teams managed by the ICS. Fig. 1 shows the distribution of the values of the three service quality dimensions corresponding to the PHC teams. The distributions of team coordination and evidence-based practice are slightly asymmetric. The first has a larger range of negative values, and evidence-based practice has a larger range of positive values.

Table 2 shows the description and bivariate analysis of each dimension according to the PHC team structural factors and the characteristics of the catchment population. Descriptive bivariate analysis shows that teams with higher coordination scores are rural, those covering older and affluent populations. Evidence-based practice is better in urban and teaching teams, in those that have been running longer under the reformed model, and in those that provide care for older and deprived populations.

Table 3 shows the effects on the service quality dimensions of the structural factors of the PHC and the characteristics of the assigned populations included in the final statistical models. No significant association with the service quality dimension measuring accessibility and physician–patient relationship has been observed, except the effect of management structure,
Table 2
Relationship between the population and the PHC team structural factors with each dimension of service quality: accessibility, coordination within the team and scientific and technical quality

<table>
<thead>
<tr>
<th>Team structural characteristics</th>
<th>Accessibility–physician/patient relation</th>
<th>Team coordination</th>
<th>Scientific and technical quality</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean* (S.D.)</td>
<td>Test (p-value)</td>
<td>Mean (S.D.)</td>
</tr>
<tr>
<td>Rural/urban PHC team</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>0.010 (0.915)</td>
<td>T = 0.132</td>
<td>0.611 (0.833)</td>
</tr>
<tr>
<td>Urban</td>
<td>−0.007 (0.901)</td>
<td>(0.895)</td>
<td>−0.447 (0.867)</td>
</tr>
<tr>
<td>PHC team territory geographical dispersion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D1 = least dispersion</td>
<td>0.088 (0.938)</td>
<td>F = 0.719</td>
<td>−0.455 (0.788)</td>
</tr>
<tr>
<td>D2</td>
<td>−0.138 (0.729)</td>
<td>(0.610)</td>
<td>−0.202 (0.935)</td>
</tr>
<tr>
<td>D3</td>
<td>−0.108 (0.784)</td>
<td>(0.830)</td>
<td>0.246 (1.087)</td>
</tr>
<tr>
<td>D4</td>
<td>−0.080 (1.061)</td>
<td>(0.833)</td>
<td>0.662 (0.833)</td>
</tr>
<tr>
<td>D5</td>
<td>0.163 (1.107)</td>
<td>(0.982)</td>
<td>0.850 (0.982)</td>
</tr>
<tr>
<td>D6 = greatest dispersion</td>
<td>0.224 (0.809)</td>
<td>(0.765)</td>
<td>0.635 (0.765)</td>
</tr>
<tr>
<td>Teaching</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No teaching</td>
<td>0.017 (0.930)</td>
<td>T = 0.571</td>
<td>0.026 (1.006)</td>
</tr>
<tr>
<td>Teaching</td>
<td>−0.074 (0.791)</td>
<td>(0.569)</td>
<td>−0.115 (0.969)</td>
</tr>
<tr>
<td>Years in reform</td>
<td>R = −0.043 (0.534)</td>
<td></td>
<td>r = 0.151 (0.099)</td>
</tr>
<tr>
<td>Population profile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Population over 65 years</td>
<td>R = −0.104 (0.129)</td>
<td></td>
<td>r = 0.266 ( &lt; 0.001)</td>
</tr>
<tr>
<td>% Immigrants</td>
<td>r = 0.019 (0.785)</td>
<td></td>
<td>r = −0.082 (0.234)</td>
</tr>
<tr>
<td>Socio-economic level</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1 = very high</td>
<td>0.019 (0.901)</td>
<td>F = 0.332</td>
<td>0.691 (0.917)</td>
</tr>
<tr>
<td>S2</td>
<td>0.231 (0.925)</td>
<td>(0.802)</td>
<td>0.348 (0.881)</td>
</tr>
<tr>
<td>S3</td>
<td>−0.082 (0.947)</td>
<td>(0.964)</td>
<td>−0.403 (0.964)</td>
</tr>
<tr>
<td>S4 = very low</td>
<td>0.087 (0.788)</td>
<td>(0.733)</td>
<td>−0.545 (0.733)</td>
</tr>
<tr>
<td>Standard mortality rate</td>
<td>R = −0.082 (0.235)</td>
<td></td>
<td>r = 0.014 (0.840)</td>
</tr>
</tbody>
</table>
and this effect is statistically significant in the other service quality dimension. The values of the dimension measuring team coordination depend on whether the PHC team is rural or urban, and on the proportion of elderly population; rural PHC teams have scores 18.2% higher than urban teams, for each 10% increase in population over 65 years of age, the coordination scores improve by 11%. Scientific and technical quality is associated with the socio-economic level of the assigned population, with the team’s teaching activity, and the experience within the reform; PHC teams with an assigned population with a very low socio-economic level have scores 20.6% higher than with a very high socio-economic level, teaching PHC teams also have values 12.3% higher than those that do not teach, and for every 10 years that the PHC team has been included in the health-care reform there is a 21% improvement.

Fig. 2 shows the distribution of the three dimensions of the PHC team service quality in relation to the crude values and deviation of the adjusted values. For accessibility, there is no great difference between the two measurements. In team coordination, the deviation of the adjusted values tends to decrease the observed values, placing the majority of PHC teams around the mean value. The distribution of evidence-based practice also varies between the observed values and
Table 3
Structural factors of the PHC teams and characteristics of the assigned population that modify the values of two of the health-care service quality dimensions: team coordination and evidence-based practice

<table>
<thead>
<tr>
<th>Team coordination</th>
<th>GMR* point estimates</th>
<th>95% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rural/urban PHC team</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>1.182</td>
<td>(1.097–1.273)</td>
</tr>
<tr>
<td>Urban</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>% Population over 65 years</strong></td>
<td>1.011</td>
<td>(1.002–1.019)</td>
</tr>
</tbody>
</table>

| Scientific and technical quality                                                 |                      |                |
| **Socio-economic level**                                                         |                      |                |
| S4 = very low                                                                     | 1.206                | (1.088–1.337)  |
| S3                                                                               | 1.083                | (0.992–1.182)  |
| S2                                                                               | 0.997                | (0.916–1.085)  |
| S1 = very high                                                                   | 1                    |                |
| **Teaching PHC team**                                                            |                      |                |
| Yes                                                                              | 1.123                | (1.1051–1.200) |
| No                                                                               | 1                    |                |
| **Years in reform**                                                              | 1.021                | (1.015–1.027)  |

GMR*: geometric mean ratio.

4. Discussion

Accessibility and physician–patient relationship, as a dimension of the PHC service quality, were not affected by the structural factors of the PHC teams and its catchment population, though team coordination was higher in rural areas and in PHC teams covering older populations. Evidence-based practice is higher in teaching teams, in teams with longer experience within the reform and in those that provide care for populations of a lower socio-economic level. Studies show that, for these two dimensions, the service quality varies when measured by its crude values or adjusted for the structural factors of the PHC team and catchment population that cannot be modified by professionals. Fair evaluation of the team performance quality must be based on the adjusted values.

Results should be analysed considering the methodological limitations. The service quality indicator, despite its validation [12] has not been used in other populations and consequently has not already proved its external validity. The same limitation can be allocated to the study population that, despite its large size, comes from a single region. The cross-sectional design of the study prevents a causal relationship between the variables being established, and might underestimate some associations. However, the associations identified might reinforce the observations of other authors, in a field with limited evidence. The study identified some of the non-modifiable factors that influence the service quality, but it does not prevent other environmental factors which were not studied affecting the performance.

It is known that in small communities such as those covered by PHC teams, unlike larger communities, the age and socio-economic level of the population are better predictors than mortality for the health-care needs [14,15]. This cross-sectional study also found no relationship between service quality and mortality. Primary health-care services improve health through the implementation of preventive measures and the control and follow-up of chronic diseases. The benefits of primary health services on mortality indicators can only be identified by longitudinal studies.

Accessibility and physician–patient relationship may be related to factors that are not tackled in this article, such as professional personal characteristics and training [16].

Unlike a British study, which had significant methodological limitations due to the low response
rate [17], we do not find that accessibility and physician–patient relationship are worse in socially deprived zones. It is logical to expect a lack of difference in accessibility between rural or urban settings, population age or socio-economic level in Catalonia because a great effort has been made since the achievement of democracy to ensure equity in access to health services, through the reform of primary health-care. The process, which started in the most socially deprived neighbourhoods, was later extended to the rest of the territory [18].

Teams with greater cohesiveness are associated with better clinical outcome and higher patient satisfaction. Communication is a key issue in team cohesion (Grumbach). It has been observed in the study that rural teams and teams attending older populations are better coordinated. It may seem strange that geographically dispersed teams, in which each professional operates in the practice of their village, with obvious communication difficulties, are better coordinated than urban teams where everybody works in the same health centre. The distance probably lessens the risk of interpersonal conflicts due to the constant daily relationship produced when teams share the same premises, and favours a working environment that helps teamwork. Older populations, which tend to be more generous in their evaluations of satisfaction with the service [19], probably also manage to cover their expectations of coordination more easily than young urban people, who are possibly more demanding.

Teaching teams, older teams, and those attending more deprived populations have higher scores in

Fig. 2. Distribution of primary health-care teams in Catalonia in relation to the crude and deviation of the adjusted values of the three dimensions of its health-care outcome; (a) accessibility to the services and professional–patient relationship; (b) coordination within the health-care team; (c) evidence-based practice.
evidence-based practice. There are probably several elements connecting these three factors. Like other authors [17] who have found this connection between teaching and technical quality, we do not believe that teaching improves the adherence to clinical practice guidelines. On the contrary, the association is due to the fact that teaching teams are selected from those who pass an accreditation process rating their scientific and technical quality.

It is important to note that teams with more experience within the reform are still able to continue to offer the best service quality. The result might seem paradoxical, because we know that in the United Kingdom, older professionals offer lower evidence-based practice [20]. In Catalonia it is understandable, because these experienced teams were voluntarily in the vanguard of the primary health-care reform process. Their professional staff have more enthusiasm and motivation than those that incorporated later in a more compulsory fashion. This personal motivation favours their continuing to advance on the learning curve, even though they are older professionals.

We agree with other authors in the observation that evidence-based practice increases in socially deprived populations [16,19]. In our case, we believe that this influence is due to the differences in the use of public and private services. Populations that are socially better-off tend to combine the use of public health-care with additional private health services, while more socially deprived populations have greater loyalty to public health-care. The evidence-based practice dimension is assessed by audits measuring the physician’s adherence to governmental clinical guidelines. Public physicians can better apply these recommendations when they are the only doctors responsible for providing care for the patients.

Catalan PHC teams are financed by a per capita budget and by a variable part related to the achievement of health-care quality objectives, measured with performance indicators [6,8]. Evaluation of primary health-care teams must take these structural factors into account to avoid erroneous measurements of service quality due to the non-modifiable structural factors that affect the results. Crude measurements may result in unfair situations. They may result in the financial situation being worsened for teams with poor results, which are due to factors that are beyond their ability to change. On the other hand, they may wrongly over-finance teams that have good results due to the characteristics of the team or the catchment population. These differences in payment might influence the service provided to citizens and, finally, challenge the equity of the PHC.

The same approach must be considered on the managerial side when establishing PHC team performance objectives. A fair management perspective must avoid universal goals, and establish objectives related to the specific context of each PHC team. Objectives must be related to population and team characteristics. New teams, for instance, cannot be subject to the same requirements as more experienced ones. Experience within the reform must be a variable that modulates the health-care objectives.

On the other hand, while the health-care system allows citizens to have additional private health-care services, it does not seem logical to demand that public physicians who provide care for populations that use both public and private services simultaneously comply with quality standards of the prescriptions in the same way as those attending populations that are more loyal to the public sector.

The results show that the primary health-care services of the ICS offer fairness in the accessibility and physician–patient relationship and team coordination dimensions, since the results of almost all the teams, once adjusted for the environment variables, are satisfactory or excellent. However, there still exists a significant margin of improvement to achieve the homogenisation of indicators in the evidence-based care dimension.

It would be interesting to replicate the study in primary health-care teams of other health-care environments or organizations, to check whether these variables do indeed still determine the final service quality of the PHC teams.

In addition to showing the applicability of the evaluation system to the PHC teams, the study demonstrates the importance of valuing the service quality adjusted for non-modifiable variables related to the structural factors of the team or the assigned population. Both managers and professionals must use adjusted values of the health-care outcome indicators in order to fairly establish health-care quality objectives and to distribute the economical incentives. This policy will also benefit patients, through improvement in the equity of health-care provision.
5. Summary points

- Population mortality has no relation to the primary health-care team service quality.
- Team coordination is higher in rural areas and in those providing care for older populations.
- Evidence-based practice is higher in teaching teams, in more experienced teams and in those attending populations of a lower socio-economic level.
- In Catalonia, the accessibility and physician–patient relationship dimensions do not change in relation to setting, socio-economic level, population age and team experience.

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