

Analysis of the attributes of primary health care using the electronic medical records in the city of Rio de Janeiro

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Abstract *Epidemiology plays a strategic role at this stage of the policy cycle, contributing to goal setting, resource allocation and use of information systems. In 2009, the Municipal Health Secretariat of Rio de Janeiro initiated a reform of the health care model under the main influence the Primary Health Care concept. This study evaluates the trend of selected pay-for-performance indicators that measure the health care process in the city's PHC. This a study on repeated panels, from the administrative and clinical records of electronic medical records in the period from 2012 to 2016. We selected seven indicators that analyzed longitudinal performance within the established goal, among those that represent access, longitudinality, coordination of care - APS attributes, as well as other characteristics of the services, such as care performance and economic efficiency. This study demonstrated that management decentralization to levels closer to the user is potentially successful for the recording of clinical data under an adequate monitoring of indicators, regular clinical audits and feedback to health professionals, along with data and indicators monitoring.*

Key words *Pay-for-performance, Primary Health Care, Process indicators*

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Introduction

Health policy implementation is about drafting legislation, negotiating agreements [and covenants], allocating resources and developing direct programs to achieve its objectives and goals, which in turn involve the personal development of human resources and operational procedures¹. Thus, deployment does not occur automatically. Approximately 30% of designed policies are never implemented and the likelihood of achieving them is directly related to the strategies considered, opportunities and obstacles. In this context, goal setting, resource allocation and use of information systems are facilitated by the use of methods and epidemiological and statistical techniques.

In 2009, the Municipal Health Secretariat of Rio de Janeiro initiated a profound care model reform² under the main influence of “Primary Health Care – PHC”, the concept coined by Starfield³ that is based on four essential attributes, namely, first access contact - use and accessibility, longitudinality, comprehensiveness and coordination, and three derivative attributes, namely, family orientation, community orientation and cultural competence.

Obviously, any health reform has to follow up on its processes and markers to verify the implementation of the policy. Spasoff⁴ says that *“particular attention should be given to information systems in policy assessments, especially in individualized data, noting that information systems are often developed for administrative purposes only, without taking into account their potential uses for planning or appropriate epidemiological investigation.”* This author defined four essential criteria of a good information system for evaluating public policies: (i) unique identification of all individuals in the target population (users and non-users) along with sociodemographic characteristics such as age, gender and registration geographical data, i.e. home address; (ii) identification of the financiers of the cost of provision and of each action/procedure; (iii) all services provided, including the date of service should contain the unique identification number of the provider, user identification, reason for the visit (issue (s)), diagnosis and services provided; (iv) final or intermediate results are measurable (highly desirable but rarely available).

Among these criteria, items (i), (ii) and (iii) can be scaled with the use of electronic records that contain administrative aspects of services and clinical and epidemiological information.

The use of electronic medical records sometimes also makes it possible to evaluate the results, as characteristic mentioned by Spasoff⁴ in item (iv).

The use of electronic medical records for administrative and clinical management: pay-for-performance in the city of Rio de Janeiro

In 2009, the electronic medical records system was implanted with the inauguration of the first Family Clinic in the district of Realengo. This was the first municipal facility to use this technology to assist in the coordination of care. The following year, with the development of the Reform’s axis that addressed the “Management of Information and Communication Technologies in Health (ICTs)”, this technology gained scale in most primary healthcare establishments and was progressively implemented in all units by 2011. In 2012, it was possible to analyze access and performance indicators, considering the municipality and its planning areas, which had different implementation periods in each case. It is worth noting that, according to the requirements defined by the SMS-RJ, medical records are the main tool for clinical management and quarterly pay-for-performance to facilities and professionals of the Family Health Teams.

Of the four companies that started the implantation process in 2009, three were European and experienced in primary healthcare reform in Portugal, and one Brazilian, which developed the integrated modules to meet the requirements of management agreements. All the aggregation of the databases is carried out by the SMS-Rio central management and made available to the planning areas as management panels and by consultation in the Tabnet-DATASUS (“Business Intelligence”) format.

Variables that have never before been individually assessed, such as the vaccines that make up the national immunization schedule of the PNI, the coding of outpatient diseases by the International Classification of Primary Care (ICPC) and ICD-10 are beginning to envisage a new possibility and analyzes at the local level that qualify the care process in the city.

Worth highlighting are actions of health surveillance of users in the first year of life, pregnant women, women of childbearing age, hypertensive patients, diabetics and patients with tuberculosis and leprosy. In this special case, a set of timely clinical actions determine the payment for the clinical performance of team members.

Since 2012, Rio de Janeiro's electronic medical records enable the evaluation of organizational and clinical performance. They are implanted in more than 95% of the Family Health Teams (ESF) compatible with the national e-SUS, which was later proposed by the Ministry of Health as a model for basic facilities.

Recent years have seen a growing interest in pay-for-performance (P4P) – especially in universal systems such as the Unified Health System (SUS). These programs aim at improving quality and promoting increased access to health services. The Portuguese experiences of 2008⁴⁻⁸ and British experience of 2004 and 2010⁹⁻¹⁴ have suggested positive conclusions and indicated some precautions in the application of this strategy, and improvement of the initial results of the contractualized goals was noted. These authors alert to the need to change the agreed indicators every two or three years, to avoid ethical biases with what is called “gaming”, that is, the focus of the health teams in achieving contractualized goals and paying less attention to other non-contractual aspects.

This paper aims to evaluate the trend of pay-for-performance indicators that measure the health care process in the city of Rio de Janeiro.

Materials and Methodology

This is a study of repeated panels¹⁵ in which sectional studies were performed at different instances in the same population, without necessarily repeating the observations on the same individuals represented at the initial time (t1). In this case, t1 = 1st quarter of 2012, and following sectional studies, a new panel was created in each quarter, totaling 17, eventually generating t17 = 1st quarter of 2016.

Individual patient data will be considered in the electronic medical records of primary health care, made available in a cluster by Health Planning Area, in a public domain link¹⁶, which inform the care processes in the various realms of the organization of services. The selected indicators seek to demonstrate the progress in the work process over the years, bearing in mind PHC attributes in the improvement of the results and all the data are public domain and available on the SMS/RJ homepage.

In this paper, seven indicators were chosen from a larger set of indicators that represent access, longitudinality, coordination of care – PHC attributes, as well as other characteristics of ser-

vices such as care performance and economic efficiency. Those who had the best quarterly historical record from 2012 to 2016 were chosen. We chose to select targets for the values agreed in 2016 (the goals of some indicators are revised every two years). Thus, we will analyze: (i) the proportion of consultations by the family doctor; (ii) the proportion of spontaneous vs. scheduled demand; (iii) the rate of service portfolio items implemented; (iv) proportion of diabetics with at least 2 years consultations recorded in the last 12 months; (v) the proportion of hypertensive patients with a blood pressure record in the last 6 months; (vi) the average cost of drugs prescribed per user; (vii) primary health care patients referrals to other levels of the health system (Chart 1).

Results and Discussion

The proportion of consultations by the family doctor himself is one of the main indicators of longitudinality and of access in PHC. It allows the verification of the extent of the family doctor's involvement and monitoring of individuals who reside in the areas covered by the teams. SMS-RJ has established a range of 70-90%, since it is expected that there will obviously be personal interferences, absences from work, participation in external activities and leave period.

In Portugal, the Regional Health Administration and Tagus Valley (ARSLVT) recommends brackets of 65 to 90% (Portugal, 2016). In Brazil, the use of this indicator is a pioneer in the city of Rio de Janeiro, although there is no benchmark of the Ministry of Health or other states. Data show an increasing trend, but always below the upper limit of the targeted 90% (Graphic 1). The lowest point observed in the first quarter of 2013 can be explained by the increased entry and arrival of new medical residents to the health units, generating redeployment of physicians among teams and units.

This is one of the main differences in comprehensive primary care when compared to another limited system. The link with the family doctor and the team allows the resolution of health problems over time, especially the comprehensive view of individuals and their families, keeping the possibility of replacement between teams and ensuring access even when the doctor is not at the facility.

During the analyzed period, the SMS-RJ used methods triangulation to follow the longitudinality implantation process in the family health teams,

Chart 1. Selected pay-for-performance indicators – Municipal Health Secretariat of Rio de Janeiro – 2012 – 2016.

Code	Action	Indicator	Calculation formula	Goal	Remarks
A1	Access/ Longitudinality	Proportion of consultations performed by own family doctor	(N) Nº of medical consultations performed on patients of the team by team doctor _____ X 100 (D) Nº of medical consultations performed on patients of the team at the facility	70 to 90%	
A2	Access	Proportion of spontaneous (*) vs. scheduled demand (doctors, nurses and dentists)	(N) Nº consultations not previously scheduled (spontaneous demand) by doctors, nurses and dentists of the team _____ X 100 (D) Nº total consultations performed (doctors, nurses and dentists) by the team	Minimum 40%	(*) Reception of unplanned demand or referrals from other facilities. Spontaneous demand is a consultation that is carried out on the same day, without previous scheduling. Collective care services, groups or activities other than consultation are excluded.
A5	Access	Rate of service portfolio items implemented	(N) Nº service portfolio actions implemented by family and oral health team _____ X 100 (D) Total service portfolio actions	Minimum 80%	
D2	Care performance	Proportion of diabetics with at least 2 consultations recorded in the last 12 months	(N) Nº diabetics covered by the team with at least consultations recorded in the last 12 months _____ X 100 (D) Total Nº of diabetics registered in the area covered by the team	Minimum 70%	For the calculation of the indicator, consider as denominator (D) only diabetics who had a diagnosis validated by the team doctor. In order to follow-up, show in new column next to (D) the number of diabetics in the team area (by the PHC register (card B) + those validated by the doctor).
D3	Care performance	Percentage of hypertensive patients with a blood pressure record in the last 6 months	(N) Nº of hypertensive patients covered by the team with blood pressure record in the last 6 months _____ X 100 (D) Total Nº of hypertensive patients registered in the area covered by the team	Minimum 70%	

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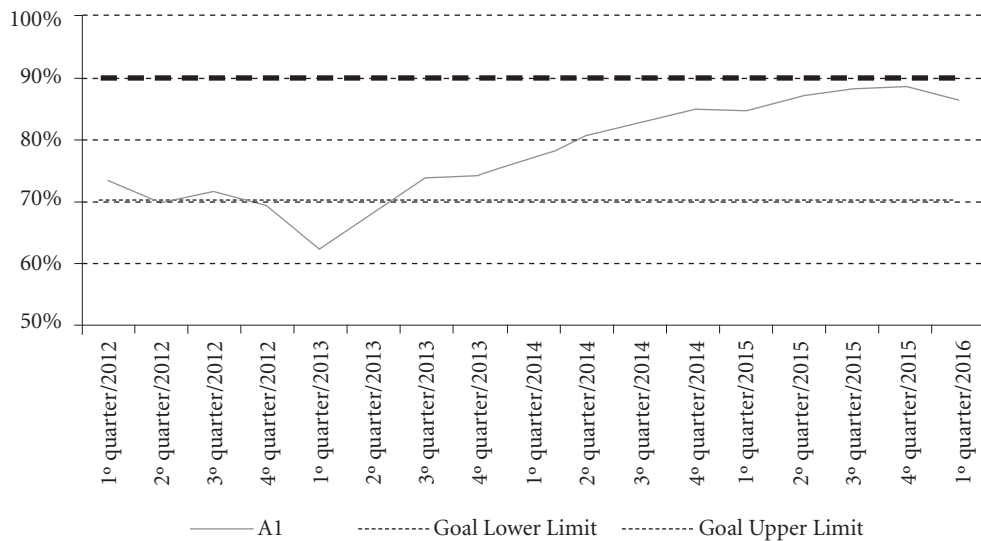
Chart 1. continuation

Code	Action	Indicator	Calculation formula	Goal	Remarks
E1	Efficiency	Average cost of prescription drugs per user	(N) Sum of the amount of prescriptions by the doctor of each team in the last 3 months (REMUME and non-REMUME) <hr/> (D) Nº of total users attended by doctors of each team in the last 3 months (with prescription + without prescription)	Maximum R\$ 51.78	* Consider as denominator (D) all users attended by the doctor of each team (patients in the area and attended out of the area by the doctor) regardless of whether medication was prescribed or not. * Show new column next to (D) with the number of patients attended who had prescribed medication. * Should allow details of patients, the medication prescribed, the cost of the prescription and the amount of prescription drugs delivered to the facility's pharmacy. * All medical records must make available the option of non-REMUME medication prescription.
E2	Coordination – integration of care (PCATool)	Proportion of patients referred vs. number of patients attended	(N) Nº of patients attended by the doctor of each team (patients in the area and out of the area) in the last 3 months referred to some service / specialty <hr/> (D) Total Nº of patients by the doctor of each team (patients in the area and out of the area) in the last 3 months	Maximum 20%	* Consider as denominator (D) all users attended by the doctor of each team (patients in the area and attended out of the area by the doctor) regardless of whether medication was prescribed or not.

Source: SMS/RJ, 2012 to 2016.

correlating with data of the electronic medical records. In the first semester of 2014, the Faculty of Medicine of UFRGS¹⁷ prepared an external evaluation and conducted a survey that assessed this attribute, interviewing responsible for children and adults who used PHC services in Rio de Janeiro, interviewing 6,675 individuals with the tool validated in Brazil named PCAT (Primary Care

Assessment Tool). It showed an average score of 6.1 for users and 7.5 for health professionals (previous study in 2012)¹⁸, with significant differences between the evaluated units but with an average close to that expected by the management baseline. These scores are close to the recommended minimum of 6.6 to have a strong and quality PHC measured in the subject tool.



Graphic 1. Proportion of medical consultations in family health units by the family doctor himself – Municipality of Rio de Janeiro – 2012-2016.

Source: Municipal Health Secretariat of Rio de Janeiro¹⁶.

Proportion of spontaneous vs. scheduled demand

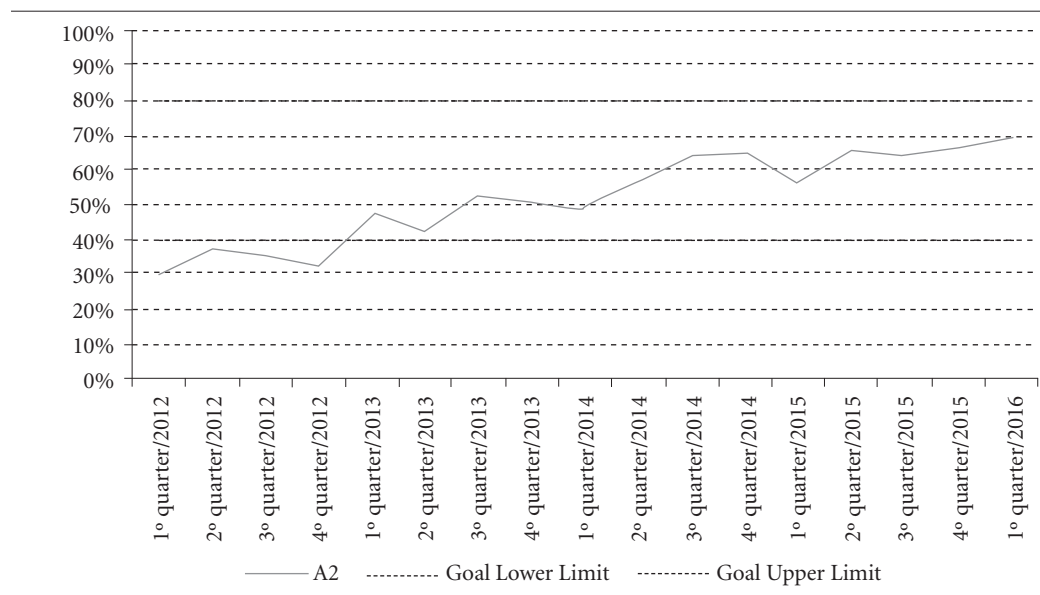
Unplanned access or spontaneous demand to a primary healthcare unit is widely advocated in literature^{19,20}, which has studied the phenomenon as one of the ways of organizing the process of delivering health services. This indicator in the SMS considers that consultation that is carried out on the same day, without previous scheduling.

SMS-RJ stipulated an interval of 40% to 80% for this indicator. Graphic 2 describes the trend of substantial increase in the period represented with proportions within the goal limit from the first quarter of 2013. Obviously, other indicators should be monitored to gauge the appropriateness of care to specific groups and maintain scheduling of consultations, for example, prenatal consultations and, as will be seen later, clinical protocols for scheduling chronic diseases of hypertension and diabetes.

In the access - first contact attribute, PCAT scores were below the mean of the other realms measured in the surveys of 2012 and 2014: 5.2 for family doctors, 4.7 for children users and 4.2 for adults^{17,18}. Much of the explanation for these values being below 6.6 refer to, in the case of chil-

dren users, two items: “C4. When you arrive at the “health service”, you do not have to wait more than 30 minutes for your child to consult with the “doctor” (without taking into account screening or reception), do you?”; “C6. When the “health service” is open, can you get quick advice over the phone if you need to?” In the case of adults, there are four items that scored and affected the mean access/first contact score; “C4. When the “health service” is open, can you get quick advice over the phone if you need it?”; “C5. When the “health service” is closed, is there a phone number that you can call when you get sick?”; “C6. When the “health service” is closed on Saturday and Sunday and you get sick, does anyone in this service provide care to you that same day?”; “C7. When the “health service” is closed and you get sick at night, does anyone in the service provide care to you that same night?”

The current primary healthcare arrangements in most European countries have expanded not only the number of teams but also the ability to cope with the growing range of primary level services, as demonstrated by Wienke et al.²¹. Thus, the city of Rio de Janeiro published its first portfolio of in primary healthcare services in 2010²², performing a strict monitoring



Graphic 2. Proportion of medical consultations by unscheduled demand in relation to total consultations – Municipality of Rio de Janeiro – 2012-2016.

Source: Municipal Health Secretariat of Rio de Janeiro¹⁶.

of expanded and standardized services, initially monitoring the execution per facility and later by family health team.

Data shown inform us that, on average, as of 2014, more than 90% of the service portfolio items were implemented by the teams evaluated (Graphic 3). SMS-RJ devised three strategies to achieve the goal. The first one was through homogeneous investment in the physical structure of facilities. The second one was in the processes of permanent education. The third one was a substantial investment in formal educational processes, especially medical and nursing residency, which began in 2012 and, by 2015, represented the largest programs among the Brazilian capitals as described by Justino et al.²³, as well as ENSP / Fiocruz²⁴ specialization courses in public health and multiprofessional master's degree in primary healthcare.

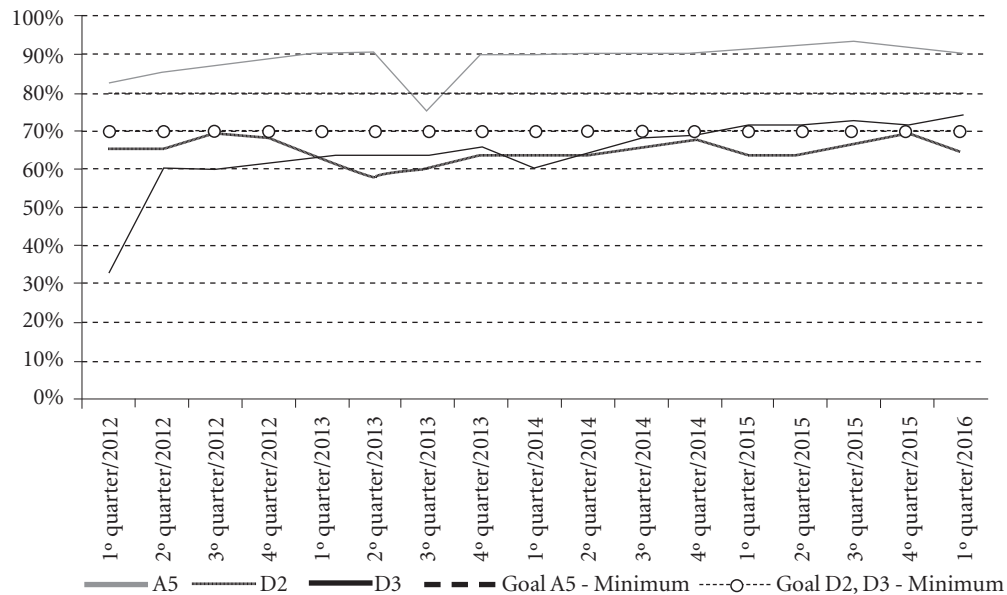
Throughout the period analyzed, except for the third quarter of 2013, in which two areas of the city (north region-Leopoldina and west region-Santa Cruz) contributed with values below 80% and then recovered, the city of Rio de Janeiro has been carrying out dozens of actions and services in each of its family health teams. The greatest hardships in implementing the service portfolio were associated with alcohol dependence treatment and IUD insertion.

Chronic diseases have a special place in primary health care. The most prevalent ones, namely, diabetes and hypertension, stand out as those in which historically, since the initial conception of the then “Family Health Program” in 1994, are measured and monitored by both community health workers regarding the referred morbidities, as well as by doctors and nurses with regard to clinical morbidity. We can verify the development of care coverage in the two chronic diseases mentioned and most prevalent in the Brazilian primary healthcare, which monitoring started with the SIAB manual in 1998²⁵.

The proportion of diabetics with at least two visits recorded in the last 12 months allows us to infer the level of longitudinality of care and prioritization attributed by the teams to this health situation. Data show that the minimum target of 70% is only achieved in the 1st quarter / 2015, (Graphic 3).

The proportion of hypertensive patients with a blood pressure record in the last six months remained between 60 and below 70% throughout 2012 and 2016, and greater investments are still required to improve this basic indicator. In Portugal, this goal is established as an interval between 38 and 80%⁵.

These are goals of the follow-up process of two of the most prevalent chronic primary care



Graphic 3. Proportion of service portfolio items implemented, proportion of diabetics with at least 2 visits recorded in the last 12 months, proportion of hypertensive patients with blood pressure record in the last six months – Municipality of Rio de Janeiro – 2012-2016.

Source: Municipal Health Secretariat of Rio de Janeiro¹⁶.

Captions: A5 = rate of service portfolio items implemented, D2 = proportion of diabetics with at least 2 visits recorded in the last 12 months, D3 = proportion of hypertensive patients with a blood pressure record in the last six months.

diseases in several countries in the world that have already measured the impact on reducing hospitalizations due to sensitive conditions and mortality from cardiovascular diseases, one of the main challenges of RJ's PHC²⁶.

Average cost of prescription drugs per user

In PHC, the municipality of Rio de Janeiro provides its residents with drugs from a list known as “Municipal Drug List” - REMUME, in addition to that supplied by the Ministry of Health, namely the National List of Essential Drugs (RENAME). The medication expense per patient with is a continuous and essential process for the clinical management and classified from the perspective of economic efficiency, generating reduced costs of the system as a whole.

This is one of the most difficult indicators to be measured because it subjects the reliable recording to the correct completion of the electronic medical record by the doctor with the issuing of a prescription. Culturally, this is a challenge to be overcome, with the prospect of knowing the

real costs per patient. A study by Silva et al.²⁷ evidenced the increased diversity of items offered by REMUME for PHC, from 57 in 2008 to 222 in 2014. In addition, it estimated the value of medication prescribed by consultation close to R\$ 10.

We observed an increasing evolution over time, reaching around R\$ 14 per consultation / patient in the first quarter of 2016 (Graphic 4), which means that, in annual values, we would reach R\$ 168.00 (or about 48 euros). There are no Brazilian Ministry of Health references for this indicator. In Greater Lisbon, Portugal, this figure is almost three times higher (about 140 euros in 2015). This country has a universal national health system but does not have a national drug list. Access to these supplies is through co-payment by users in pharmacies registered outside health facilities, except for specific groups such as pregnant women, the elderly and people in vulnerable situations, who receive them free of charge. It should be noted that the Table used to price the REMUME medication items did not change in the period.

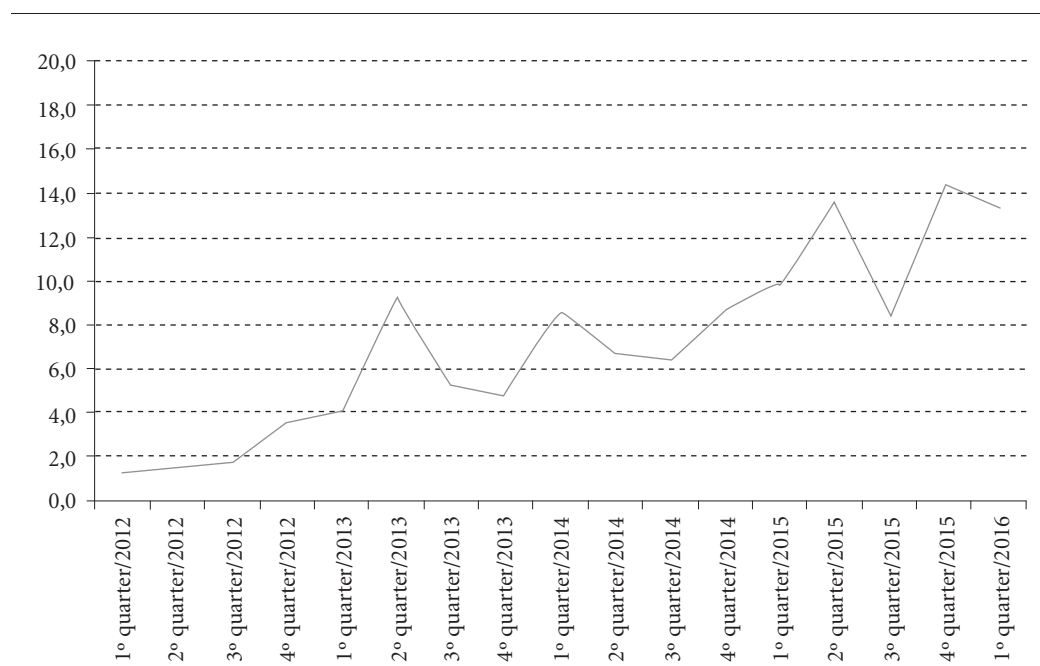
Primary health care patients' referrals to other health system levels

From the perspective of Starfield³, the attribute of coordination - integration of care would include, among other aspects, referrals from patients of this level of complexity to other levels of the health system. The SMS-RJ established as a reference a maximum of 20% of people consulted by family doctors with this type of situation. Further studies are required to define the minimum limits for this indicator, since it may suggest clinical management failure, registration failure or spontaneous search. In the analysis of data (not presented), it is observed that there is a good process of coordination of care in Rio de Janeiro's PHC, since the upper limit of the goal has never been achieved. This result is in agreement with that observed by Harzheim et al.¹⁷ who, when analyzing the city's PHC, found a score of 6.6 for adult users, indicating good quality of care coordination for the set of items surveyed in PCATool Rio-2014. In the external evaluation of these researchers, data of teams with less than three years of existence were compared with those with more than three years. Scores of 7.03 and 7.15 were found for "coordination of care" and "coordination of care - information system",

respectively, indicating that the variable, "team time of existence" discriminates a better quality in this attribute and should be considered in future comparative studies.

Special emphasis should be placed on the reform that defined objective rules for access to care at the levels of care, where access to other specialists is only allowed after evaluation by the family doctor responsible for the patient. This gatekeeper role contributes greatly to user satisfaction from the perspective of Grumbach et al.²⁸ who, in a study in California, observed that most of the 12,707 patients endorsed the importance of identifying primary care physicians in integration and global care, involving them in the decisions about obtaining care from other specialists. Most patients also preferred to start care for new medical problems with their primary healthcare physicians instead of seeking care directly from specialists. These responses indicate that patients perceive a beneficial role for PHC doctors in coordinating their care.

The benefits of good care coordination go beyond individual gain, and the possibility of allocating its resources more equitably between the areas of a given city with greater social vulnerability³ is a concrete gain for health systems.



Graphic 4. Average cost of prescription drugs per user (R\$) Municipality of Rio de Janeiro – 2012-2016.

Final considerations

This paper shows for the first time some indicators of electronic medical records, implanted in Rio de Janeiro's PHC in 2011. Consistent indicators were obtained throughout the evaluated quarters, three years after implementing the Primary Health Care Reform in the city, with an initial overview of the main PHC indicators.

However, this challenge is permanent. With the technological advance, integration with other subsystems such as imaging, laboratory and hospital, for example, becomes necessary, not only for the sake of reducing the cost of examination requests without sound scientific evidence for clinical indication, but also for strengthening the coordination of care, the main realm that marked Rio de Janeiro's Reform in the period.

A huge challenge for municipal governance and clinical management at the local level was addressed in the period 2009-2016, with implementation of PHC in 222 primary care units, 1,217 family health teams in ten planning areas, with the recording and monitoring of the health situation of about four million Rio citizens.

By 2016, electronic medical records were being widely used in day-to-day family health teams, serving as a basis for verifying the implementation of the policy and especially for

correcting directions. Pay-for-performance indicators are reviewed every 2-3 years by SMS-RJ's central team in order to avoid the gaming behavior described in the literature.

Monitoring process indicators are a key step towards ensuring good outcomes. In PHC, it is fundamental to use information systems that allow the association of health indicators (structure, process and results) with the primary healthcare attributes.

The small set of indicators is a limited representation of the primary health care process developed in the period 2009-2016 in the city of Rio de Janeiro, more so if we consider that availability of electronic medical records had consistent data for the entire municipality as of 2012, after starting at the first Family Clinic "Olímpia Esteves" in November 2009. We hope that this study will encourage other researchers and managers to develop research based on data from electronic medical records, considering PHC attributes.

This study demonstrated the relevance of studying elements of the health systems process for the evaluation of PHC outcomes. Management decentralization to levels closer to the user is potentially successful for the recording of clinical data, if adequate monitoring of indicators, regular clinical audits and reports to health professionals with data and indicators monitored are performed.

Conflict of interest

D Soranz participated as manager of the PHC Reform in the period 2009-2016. LF Pinto supported the design and actions of the Reform.

Collaborations

D Soranz participated in paper design and writing. LF Pinto collected data and developed the statistical part, as well as contributing to the analysis of the results. LAB Camacho reviewed the article critically and contributed to data analysis and paper final version.

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Article submitted 14/10/2016

Approved 04/12/2016

Final version submitted 06/12/2016