The pharmacist in the Brazilian Primary Health Care: a comparative analysis between 2014 and 2017

O farmacêutico na Atenção Primária à Saúde no Brasil: análise comparativa 2014-2017

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ABSTRACT The pharmacist play a vital role in PHC. However, studies addressing how pharmacists influence the health care network are still scarce. We aim to verify to what extent the inclusion of pharmacists in PHC Units (UBS) in the country is associated with the expanded structural aspects of pharmacies and drug availability in Brazil. This cross-sectional, retrospective, and analytical study employed secondary data from cycles 2 (2014) and 3 (2017) of the external evaluation of the Improvement of Access and Quality of Primary Care Program (PMAQ-AB) and the National Register of Health Facilities (CNES) databases. The results showed an essential centralization in drug dispensing over PMAQ-AB cycles 2 and 3. In contrast, we identified an improvement in the structural aspects of the UBS pharmaceutical services and an increase in the mean drug availability and the total UBS with drug availability ≥ 80%. Such advances were even more significant in the presence of registered pharmacists at the UBS. We conclude by stating that the presence of pharmacists in the PHC of the Unified Health System (SUS) enhances drug availability and provides better structural conditions for PHC pharmacy services.

KEYWORDS Primary Health Care. Pharmaceutical services. Health evaluation. Practice patterns, pharmacists'.

RESUMO *O farmacêutico tem importante papel nas unidades de saúde da Atenção Primária à Saúde (APS). No entanto, ainda são escassos no Brasil estudos que abordem a influência do farmacêutico na rede assistencial de saúde. O artigo tem como objetivo verificar em que medida a inserção dos farmacêuticos nas Unidades Básicas de Saúde (UBS) do País está associada à ampliação de aspectos estruturais das farmácias e à disponibilidade de medicamentos. Trata-se de estudo transversal, retrospectivo e analítico, que utilizou dados secundários do 2º (2014) e 3º (2017) ciclos da avaliação externa do Programa de Melhoria de Acesso e da Qualidade da Atenção Básica (PMAQ-AB) e do Cadastro Nacional de Estabelecimentos de Saúde (CNES). Os resultados mostraram importante centralização na dispensação de medicamentos ao longo do 2º e 3ºs ciclos PMAQ-AB. Em contrapartida, identificou-se melhora nos aspectos estruturais nas farmácias das UBS e incremento tanto na disponibilidade média de medicamentos como no total de UBS com disponibilidade de medicamentos ≥80%. Tais avanços foram ainda maiores na existência de farmacêutico cadastrado na UBS. Evidenciou-se a relevância do farmacêutico na APS no Sistema Único de Saúde, uma vez que sua presença potencializa tanto a disponibilidade de medicamentos como também propicia melhores condições estruturais dos serviços de farmácia da APS.*

PALAVRAS-CHAVE *Atenção Primária à Saúde. Assistência farmacêutica. Avaliação em saúde. Padrões de prática dos farmacêuticos.*

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Introduction

Primary Health Care (PHC) is the user's main gateway to the Unified Health System (SUS)[1]. It plays a vital role as a care coordinator and organizer of actions and services available in the health care network[2].

PHC has had the Family Health Strategy (ESF) since 1994, initially a Program, as the primary method for its expansion, qualification, and consolidation[3,4]. The Family Health Support Centers (NASF) were established to support the incorporation of the ESF into the network and the territorialization and regionalization process. The NASFs started, among other initiatives, to include pharmacists among professionals who can compose such a team[5] to expand care comprehensiveness.

Pharmacists play a vital role in management and care in PHC. Regarding management, they can organize Pharmaceutical Care (PC) actions, promote the rational use of medicines, ensure the availability, quality, and conservation of medicines, and conduct stock control. In care, this activity is related to overseeing drug therapy, evaluating the prescription, advising the patient and his family, and disseminating information about medicines and health[6]. However, pharmacists' actions are still drug-centered and not user-oriented[7].

Brazilian legislation determines the obligation of pharmacists to be technically responsible in all health establishments (pharmacies and drugstores) where drugs are dispensed[8], with a few exceptions applicable to particular situations, for example, dispensaries and mobile units[9]. However, a study by Carvalho et al.[10] points out that the workforce operating in drug dispensing units in SUS primary care services was predominantly staffed with nursing technicians or assistants, followed by pharmacists.

Given the critical role of pharmacists in PHC and the low availability of studies[11] that identify how many pharmacies in PHC Units (UBS) have pharmacists in Brazil and how these professionals influence PC actions, it is relevant to analyze the distribution of these professionals in the country. In other words, we should verify whether the decentralized services in PC have been following PHC territorialization to ensure comprehensiveness, a fundamental principle of the SUS.

This study aims to verify from national secondary databases to what extent the inclusion of pharmacists in Brazilian UBS is associated with the expanded structural aspects of pharmacies and drug availability.

Material and methods

This cross-sectional, retrospective, and analytical study used secondary data from the second (2014) and third (2017) cycles of the external evaluation of the National Program for Improving Access and Quality of Primary Care (PMAQ-AB) and registration of professionals in the database of the National Registry of Health Establishments (CNES).

The variables used were selected according to the equivalence between the questions in Modules I or Electronic in the second and third cycles of the PMAQ-AB, given that both questions and answer options were changed from one cycle to another. For compatibility, detailed in Peixoto, Campos, and Luiza[12], other pre-existing questions were used in the same module (I) or between modules (I and Electronic). Municipality characterization data (Municipal Human Development Index – MHDI and population data) were obtained from the Brazilian Institute of Geography and Statistics (IBGE)[13].

The variable exposure, presence, or absence of the pharmacist registered at the UBS was adopted according to the professional's registration data at the CNES (December/2014 and December/2017) due to the low response rate of this variable

in the PMAQ-AB (approximately 30%). Validation was performed between CNES and PMAQ-AB (second cycle – pharmacist dispenses) about the presence of the pharmacist, where we found 80% agreement[12].

The characteristics of the municipalities and UBS (population size and MHDI) were the explanatory (stratification) variables. The following analysis variables were considered:

1) PC-related aspects: dispensing of medicines in general at the UBS and, if applicable, dispensing psychotropic drugs; the health unit's structural and ambiance characteristics (shown in *box 1*);

2) Drug availability: a) mean percentage of available drugs (continuous variable) and b) drug availability ≥80% and total drug availability in the pharmacological group (32 drugs divided into nine groups) in sufficient quantity (binary variables). The selection of variables related to drug availability was based on the logical model developed by Mendes et al.[4].

The following methodological criteria were used for these variables:

a) The availability of medicines was only analyzed for UBS that reported dispensing medicines at the unit;

b) The drug was considered available when sufficient quantity in the unit was indicated; that is, according to the procedure defined by the PMAQ-AB, the drug was considered available when at least one unit was available in the UBS, identified by the field researcher's direct observation;

c) As for psychotropics, availability was evaluated only for municipalities with no centralized dispensing of these drugs and when at least one drug from this group was available in sufficient quantity;

i. The term centralization will be used throughout the paper as a synonym for concentrating health actions and services. In particular, when referring to PHC pharmacy services. The opposite is true when we refer to the decentralization of services.

d) The drugs included in this analysis were those available in both cycles, without the issue being submitted to a draw in the second cycle. A previous definition by specialists[4] of essential drugs included in the Basic Component of Pharmaceutical Care (CBAF) in the National List of Essential Medicines (RENAME) and distributed into nine pharmacological groups was also considered;

e) Mean availability was calculated considering that this value would be equal to 100% when the 32 drugs selected in this study were available in the unit in sufficient quantity;

f) From the variable ('e') above, the cut-off point of 80% was drawn, where UBS with the availability of <80% of drugs in sufficient quantity and ≥80%[14] were grouped;

g) Availability by pharmacological group was considered total when all drugs in the group were available in sufficient quantity.

Box 1. Equivalent variables selected in the 2nd and 3rd cycles of the PMAQ-AB, 2014 and 2017

Subdimension	Variable description	Variable Code 2nd Cycle (2014)	Variable Code 3rd Cycle (2017)
General Identification	Federative Unit	UF	ESTADO
	Municipality's IBGE code	IBGE	IBGE
	Municipality's name	CIDADE	MUNICIPIO
	National Register of Health Establishments	CNES	CNES_FINAL
PHC Unit Professionals	No. of Pharmaceutical Professionals in the Unit	I.3.5.6	I.3.2.6
Health unit opening hours (2nd Cycle)/Medicines part of the Basic Pharmacy (3rd Cycle)	Dispensing medications in the unit	I.8.6.6	I.15.1
Structural characteristics and ambience of the health unit	Medication dispensing area	I.10.1.8	I.6.2.1
	Fractionation area	I.10.1.9	I.6.2.2
	Pharmacotherapeutic follow-up room	I.10.1.10	I.6.2.3
	Medication storage room	I.10.1.11	I.6.2.4
	Adequate storage and packaging of medicines (clean place without mold, cool and airy, the boxes are on shelves away from the wall and floor)	I.10.1.12	I.6.2.6
	Computer in the pharmacy (2nd Cycle) / No. of operating computers in the Pharmacy (3rd Cycle)	I.10.1.13	I.6.2.7
Equipment and materials	Refrigerator for pharmacy (2nd Cycle) / No. of exclusive operating refrigerators for medicines in the pharmacy (3rd Cycle)	I.12.12	I.8.22
Medicines part of the Basic Pharmacy (2nd Cycle) / Pharmaceutical Care (Electronic Module 3rd Cycle)	The dispensing of medicines in the municipality is decentralized? (2nd Cycle - Response by eSF)	I.18.1	8.1
	The dispensing of medicines in the municipality is: Centralized/Decentralized (3rd Cycle - Electronic Module - Response by municipality)		
Medicines part of the Basic Pharmacy	Which professional dispenses the medicines in the unit? The pharmacist	I.18.2.1	No equivalent
Medicines part of the Basic Pharmacy (2nd Cycle) / Pharmaceutical Care (Electronic Module 3rd Cycle)	Is the dispensing of controlled medicines decentralized? (2nd Cycle – Response by eSF) Is the dispensing of controlled medicines centralized? (3rd Cycle - Electronic Module - Response by municipality)	I.21.7	8.4
Medicines part of the Basic Pharmacy	**Antianemic drugs / vitamins / multivitamins / mineral salts (In sufficient quantity)**		
	Oral rehydration salts	I.18.3/1	I.15.2
	Ferrous sulphate	I.18.13/1	I.15.4.1
	Folic acid	I.18.14/1	I.15.4.2
	Anti-asthmatic drugs (In sufficient quantity)		
	Salbutamol sulfate	I.18.19/1	I.15.5.1
	Beclomethasone dipropionate	I.18.21/1	I.15.5.3
	Hormonal contraceptive drugs/sex hormones (In sufficient quantity)		
	Norethisterone Enanthate + Estradiol Valerate	I.18.26/1	I.15.6.1
	Ethinylestradiol + Levonorgestrel	I.18.27/1	I.15.6.2
	Medroxyprogesterone Acetate	I.18.29/1	I.15.6.4

Box 1. (cont.)

Subdimension	Variable description	Variable Code 2nd Cycle (2014)	Variable Code 3rd Cycle (2017)
	Antihypertensive drugs (In sufficient quantity)		
	Captopril	I.19.1/1	I.15.7.1
	Enalapril maleate	I.19.2/1	I.15.7.2
	Atenolol	I.19.4/1	I.15.7.4
	Hydrochlorothiazide	I.19.8/1	I.15.7.8
	Cardiological drugs (In sufficient quantity)		
	Propranolol hydrochloride	I.19.3/1	I.15.7.3
	Simvastatin	I.19.11/1	I.15.7.11
	Antidiabetic drugs (In sufficient quantity)		
	Glibenclamide	I.19.20/1	I.15.8.1
	Metformin Hydrochloride	I.19.21/1	I.15.8.2
	NPH insulin	I.19.22/1	I.15.8.3
	Regular insulin	I.19.23/1	I.15.8.4
	Antibiotic and antifungal medicines (In sufficient quantity)		
	Amoxicillin	I.20.1/1	I.15.9.1
	Ciprofloxacin hydrochloride	I.20.2/1	I.15.9.2
	Benzathine benzylpenicillin	I.20.3/1	I.15.9.3
	Erythromycin stearate	I.20.11/1	I.15.9.11
	Gentamicin sulfate	I.20.12/1	I.15.9.12
	Sulfadiazine tablet	I.20.14/1	I.15.9.14
	Fluconazole	I.20.15/1	I.15.9.15
	Miconazole nitrate	I.20.17/1	I.15.9.17
	Nystatin	I.20.19/1	I.15.9.19
	Azithromycin	I.20.20/1	I.15.9.20
	Analgesic/antipyretic drugs (In sufficient quantity)	I.20.21/1	I.15.9.21
	Ibuprofen		
	Paracetamol	I.20.23/1	I.15.10.2
	Paracetamol	I.20.24/1	I.15.10.3
	Anticonvulsant / antidepressant / antipsychotic / anxiolytic and hypnosedative drugs (In sufficient quantity)		
	Diazepam	I.21.10/1	I.15.19.4

Source: Own elaboration.

Uni, bi, and multivariate tests were performed at a 5% significance level using the SPSS V.22.0 program. Student t-test was applied for the mean difference of continuous variables (e.g., drug availability) and the Chi-square test and odds ratios (crude OR) for categorical variables (e.g., infrastructure – with refrigerator Yes/No) for both cycles (2014/2017) and pharmacist presence per the CNES (Yes/No), with a significance level of 5%.

Multivariate logistic regression was also

performed with the outcome of the presence of pharmacists (Yes/No), evaluating the adjusted odds ratios (ORadj) regarding the structural aspects of care and availability of medicines by pharmacological group > 80%.

The study was exempted from ethical review by the Research Ethics Committee as this is public domain secondary data.

Results

Approximately 62.0% of the 38,812 UBS in Brazil registered in the first cycle of the PMAQ-AB (2012) adhered to the second cycle (2014) and 78.2% to the third cycle (2017). Regarding PC-related aspects, the proportion of UBS with medication dispensing fell from 78.1% to 66.8% in the second and third cycles. The downward trend in the third cycle against the second cycle was also observed for UBS with dispensing of psychotropic drugs and for the storage and proper packaging of drugs, respectively 16.1% and 67.6% in the second cycle and 13.1% and 56.9% in the third cycle. In contrast, improvement was observed for a UBS with a refrigerator for pharmacy and a UBS with a storage room for medicines, respectively 24.0% and 42.8% in the second cycle and 32.3% and 50.8 % in the third cycle. The indicator 'Does the pharmacist dispense medications at the unit?' was found only in the second cycle, hindering comparison. As for the presence of the pharmacist at the UBS, according to CNES data, the same proportion was found between the two cycles (*table 1*).

Table 1. Characterization of PHC Units (UBS) investigated in the 2nd and 3rd Cycles of the National Program for Improving Access and Quality of Primary Care (PMAQ-AB), 2014 and 2017

	PMAQ 2 (2014)		PMAQ 3 (2017)	
Variables	**N**	**%**	**N**	**%**
General characteristics				
UBS visited (proportion against the 38,812 who joined PMAQ1)	24,055	62.0	30,346	78.2
Aspects related to pharmaceutical care				
UBS that dispensed medication *1	18,776	78.1	20,286	66.8
UBS that dispensed psychotropics *1	3,882	16.1	3,976	13.1
Medication dispensing area *	15,737	65.4	15,497	51.1
Fractionation area *	3,131	13.0	4,952	16.3
Drug therapy follow-up room *	2,063	8.6	3,221	10.6
Is there a computer in the pharmacy? *	5,227	21.7	8,291	27.3
Does the pharmacist dispense medication in the unit? *	3,565	19.9	-	-
Are there pharmacists at the UBS (CNES)?	3,467	14.4	4,475	14.7
Are medicines stored and packaged properly (clean place without mold, cool and ventilated, boxes are on shelves away from the wall and floor)? *	14,814	67.6	17,281	56.9
UBS with refrigerator for the pharmacy *2	6,001	24.0	9,806	32.3
UBS with storage room for medicines *2	10,303	42.8	15,412	50.8

Source: Own elaboration.

*The sample subset of the UBS that dispensed medication was considered for these variables.

1Corresponding to the 'available drugs' category of the logical model proposed by Mendes et al. (2014)[4].

2Corresponding to the category 'Infrastructure for storage and dispensing of medicines' of the logical model. Mendes et al. (2014)[4].

The mean MHDI was stable among the different population strata, with a mean of 0.7 in the country. However, the UBS indicator/10,000 inhabitants, with a mean of 2.0, showed significant variation by population size, decreasing linearly from 4.8 for municipalities with up to 10,000 inhabitants to 0.6 for municipalities with more than 500,000 inhabitants (*table 2*).

In both cycles, the percentage of UBS that dispensed medications varied positively with size, from 68.8% to 90.1% in 2014; and from 61.3% to 84.7% in 2017, from the smallest to the largest. Still, regarding drug dispensing, specifically for psychotropics, the highest rates in the second cycle were found at both size extremes (up to 10,000 inhabitants – 33.7%; and greater than 500,000 inhabitants – 38.2%).

In the third cycle, we observed a significant decline in the percentage of UBS with psychotropic drugs in municipalities with up to 10,000 inhabitants (from 33.7% to 6.3%) and a growth in those with more than 500,000 inhabitants (from 38.2% to 57.2%), assuming the same profile of internal distribution among the population sizes identified in the dispensing of other types of medication (linear gradient) (*table 2*).

Table 2. Characterization of the PHC Units (UBS) investigated in the 2nd and 3rd cycles of the National Program for Improving Access and Quality of Primary Care (PMAQ), by population strata of the municipality. Brazil, 2014 and 2017

Populational strata (inhabitants)	Up to 10 thousand	10 – 20 thousand	20 – 50 thousand	50 – 100 thousand	100 – 500 thousand	+500 thousand	General
Total municipalities	2,493	1,400	1,042	325	245	38	5,543
Total de inhabitants*	12,838,821	19,738,829	31,353,194	22,384,297	48,788,676	58,572,721	193,676,537
UBS	6,120	7,719	9,759	5,116	6,505	3,593	38,812
UBS /10.000 inhabitants	4.8	3.9	3.1	2.3	1.3	0.6	2.0
Mean HDI (2010)	0.7	0.6	0.7	0.7	0.7	0.8	0.7
PMAQ 2 (adhering units)							
Adhering UBS	3,547	4,705	6,180	3,195	4,074	2,354	24,055
Dispensing UBS (N)	2,441	3,307	4,794	2,664	3,449	2121	18,776
Dispensing UBS (%)	68.8%	70.3%	77.6%	83.4%	84.7%	90.1%	78.1%
Dispensing UBS / 10.000 inhabitants	1.9	1.7	1.5	1.2	0.7	0.4	1.0
Dispensing UBS psychotropics (N)	1,195	596	455	254	483	899	3,882
Dispensing UBS psychotropics (%)	33.7%	12.7%	7.4%	7.9%	11.9%	38.2%	16.1%
UBS with availability of medicines ≥80% (N)	784	569	647	405	693	774	3,868
UBS with availability of medicines ≥80% (%)	32.1%	17.2%	13.5%	15.2%	20.1%	36.5%	20.6%
% UBS with pharmacists (CNES)	32.4%	10.6%	6.6%	7.7%	12.2%	28.4%	14.4%
PMAQ 3 (adhering units)							
Adhering UBS	4,152	5,840	7595	3,978	4,804	2,570	2,8939
Dispensing UBS (N)	2,544	3,709	5,260	2,928	3,669	2,176	20,286
Dispensing UBS (%)	61.3%	63.5%	69.3%	73.6%	76.4%	84.7%	70.1%
Dispensing UBS / 10.000 inhabitants	2.0	1.9	1.7	1.3	0.8	0.4	1.0
Dispensing UBS psychotropics (N)	263	492	522	265	964	1470	3,976
Dispensing UBS psychotropics (%)	6.3%	8.4%	6.9%	6.7%	20.1%	57.2%	13.7%
UBS with availability of medicines ≥80% (N)	1,096	983	1,226	717	1,090	883	6,005
UBS with availability of medicines ≥80% (%)	43.1%	26.5%	23.3%	24.5%	29.7%	40.6%	29.6%
% UBS with pharmacists (CNES)	31.7%	10.4%	6.8%	7.2%	14.1%	32.2%	14.7%

Source: Own elaboration.

*Population estimates released by the IBGE for 2014 and 2017.

The proportion of UBS with drug availability ≥ 80% was also higher in the two extremes of population size (≤ 10,000 and > 500,000 inhabitants) in both cycles. Around 10% increase was observed in the proportion of units with drug availability > 80% (ranging from approximately 20.6% to 29.6%) between cycles. The total availability of critical drugs increased by 9.2% between the two cycles (from 60.0% to 69.2%). The total availability of psychotropics decreased from 84.5% (2014) to 49.9% (2017) (*table 2*).

Regarding the presence of pharmacists at the UBS, no significant variation was identified between the years, with a Brazilian mean of 14.4% in 2014 and 14.7% in 2017. When observing such distribution among population strata, a low percentage of UBS (about 7%) with pharmacists is identified in the central strata (20,000-100,000 inhabitants), which increases (ranging from 28.4 to 32.2%) as they approach the two extremes (up to 10,000 and more than 500,000 inhabitants), in both cycles.

When stratifying the total availability of drugs by pharmacological group and population size (*table 3*), anti-infectives were identified as the drugs with the lowest availability, both in the second and third cycles (2.6 and 2.9%, respectively). This availability was even lower in 2014 in the UBS of municipalities with 50,000 to 100,000 inhabitants (1.4%). In the second cycle, the highest availability was observed for psychotropics (84.5%), followed by analgesics/antipyretics (66.6%) and antianemics (61.5%). Analgesics and antipyretics (81.7%), followed by antianemics (74.2%) and cardiological (62.3%), had the highest availability (*table 3*) in the third cycle.

Table 3. Total availability of drugs by pharmacological group and mean availability of drugs stratified by populational strata of municipality, Brazil, 2014 and 2017

Total availability by pharmacological group	Populational strata (thousands of inhabitants)						Total (adherents)	Presence of pharmacist at the UBS	OR (95% CI)
	Up to 10	10 – 20	20 – 50	50 – 100	100 – 500	+ 500			
PMAQ 2nd Cycle - 2014 (N=18.776)									
Pharmacological group	**% UBS with full availability (in sufficient quantity)**								
Antianemics/vitamins/minerals*	62.3	62.2	58.7	58.7	64.6	64.0	61.5	70.5	1.6
Antiasthmatics	23.9	20.0	19.7	24.0	28.8	45.1	25.5	42.4	2.6
Contraceptives/sex hormones	37.5	30.4	30.3	37.7	44.9	61.9	38.5	55.7	2.3
Antihypertensives	47.8	41.1	39.2	40.0	42.6	40.4	41.5	54.7	1.9
Antidiabetics	43.4	26.3	21.0	24.2	33.4	49.5	30.8	54.6	3.4
Anti-infectives	3.9	3.2	2.2	1.4	1.6	4.3	2.6	5.7	3.0
Analgesics / antipyretics	65.2	63.9	64.0	65.3	72.1	71.0	66.6	74.6	1.6
Cardiological drugs	50.8	46.0	48.1	48.0	54.7	48.2	49.3	59.9	1.7
Psychotropics (N=3.882)	92.0	84.7	78.5	79.1	83.2	79.5	84.5	88.6	1.7
Mean percentage availability of key drugs (PMAQ 2)	60.5	57.3	56.6	59.3	63.3	66.5	60.0	69.7	-

Table 3. (cont.)

Total availability by pharmacological group	Populational strata (thousands of inhabitants)						Total (adherents)	Presence of pharmacist at the UBS	OR (95% CI)
	Up to 10	10 – 20	20 – 50	50 – 100	100 – 500	+ 500			
PMAQ 3rd Cycle - 2017 (N=20.286)									
Pharmacological group	% UBS with full availability (in sufficient quantity)								
Antianemics/vitamins/minerals	75.7	73.1	74.3	75.1	73.1	74.5	74.2	79.7	1.5
Antiasthmatics	18.8	14.1	14.0	16.5	25.3	51.7	21.1	40.8	3.4
Contraceptives/sex hormones	64.3	59.2	60.8	63.6	63.3	59.5	61.6	65.2	1.2
Antihypertensives	65.1	60.6	62.2	61.4	57.2	58.1	60.8	67.1	1.4
Antidiabetics	58.4	39.9	35.9	37.7	43.7	61.0	43.8	61.9	2.4
Anti-infectives	4.0	3.2	2.5	2.8	1.7	3.9	2.9	5.5	2.5
Analgesics / antipyretics	84.3	81.6	81.3	83.0	79.5	81.8	81.7	87.2	1.6
Cardiological drugs	64.5	59.5	62.5	62.6	61.7	64.7	62.3	69.8	1.5
Psychotropics (N=3.976)	63.9	49.0	41.6	52.1	39.6	57.0	49.9	73.7	4.5
Mean percentage availability of key drugs (PMAQ3)	73.6	67.7	67.2	68.1	69.2	72.9	69.2	77.9	-

Source: Own elaboration.

*p-value > 0.05 Chi-square test. For all other drug groups p-value < 0.05.

Regarding drugs for the treatment of Noncommunicable Diseases and Disorders (DANT), antihypertensive, antidiabetic, and cardiological drugs showed a significantly higher availability between cycles (ranging from 41.5%, 30.8%, and 49.3% to 60.8%, 43.8%, and 62.3%, respectively) (*table 3*).

We identified a substantial variation in the availability of antiasthmatics, contraceptives, and antidiabetics in the second cycle, by population size, repeated in the third cycle, except for contraceptives, which become equally distributed among different population sizes (*table 3*).

It is interesting to observe that, in both cycles, both for the general mean and all pharmacological groups, availability was higher with the presence of a registered pharmacist in the unit. The mean availability of crucial medicines ranged from 60.0% to 69.2% between the second and third cycles, reaching 69.7% and 77.9%, respectively, with the presence of a registered pharmacist at the UBS. In the second cycle, the difference reached almost 24% for antidiabetics (30.8%, the general mean, and 54.6%, the mean with the presence of a registered pharmacist – OR: 3.4), about 17% in the contraceptive and antiasthmatic group (from 38.5% and 25.5%, it reached 55.7% and 42.4% in the presence of the registered pharmacist, respectively – OR: 2.3 and OR: 2.6). In the third cycle, the psychotropic medication group stands out, reaching 73.7% with the presence of a registered pharmacist at the UBS (about 24% higher than the general group mean; OR: 4.5). Additionally, in 2017, the antidiabetic and antiasthmatic groups stand out – they hiked from 43.8% and 21.1% to 61.9% and 40.8% (OR: 2.4 and 3.4, respectively) with the presence of a registered pharmacist at the UBS (*table 3 and table 4*).

Table 4. Association between the presence of pharmacists and structural aspects of UBS adherence to PMAQ 2 and 3 and availability of medicines. Brazil, 2014 and 2017

	PMAQ-AB 2nd CYCLe - 2014				PMAQ-AB 3rd CYCLE- 2017			
	N UBS with pharmacists	Presence of pharmacist registered at UBS - CNES			N UBS with pharmacists	Presence of pharmacist registered at UBS - CNES		
Indicators		N (%)	OR[1] (95% CI)	ORadj[2] (95% CI)		N (%)	OR[1] (95% CI)	ORadj[2] (95% CI)
Drug dispensing area	2986	2767 (92.7%)	3.04 (2.63-3.51)	1.23 (1.09-1.38)	3548	3268 (92.1%)	4.59 (4.04-5.21)	2.02 (1.73-2.35)
Fractionation area	2986	590 (19.8%)	1.35 (1.22-1.49)	1.06** (0.94-1.19)	3548	887 (25.0%)	1.08** (0.99-1.17)	1.40 (1.26-1.55)
Drug therapy follow-up room	2986	528 (17.7%)	2.19 (1.96-2.44)	1.27 (1.12-1.44)	3548	960 (27.1%)	2.46 (2.25-2.68)	1.64 (1.47-1.82)
UBS with storage room for medicines	2986	2070 (69.3%)	2.26 (2.08-2.46)	1.15 (1.05-1.26)	3548	2983 (84.1%)	2.03 (1.84-2.23)	1.29 (1.15-1.45)
Are medicines safely stored and packaged*?	2958	2501 (84.6%)	1.76 (1.58-1.96)	1.09** (0.98-1.21)	3469	3220 (92.8%)	1.61 (1.40-1.84)	1.11** (0.95-1.30)
Is there a computer in the pharmacy?	2986	2024 (67.8%)	8.49 (7.79-9.26)	4.07 (3.69-4.49)	3469	2883 (83.1%)	9.32 (8.48-10.25)	5.03 (4.55-5.57)
UBS with refrigerator for the pharmacy	2986	2003 (67.1%)	6.61 (6.07-7.19)	2.60 (2.36-2.87)	3548	2744 (77.3%)	6.17 (5.67-6.72)	2.71 (2.46-2.98)
% UBS with availability > 80%	2986	1377 (46.1%)	4.57 (4.20-4.98)	1.79 (1.62-1.97)	3548	1942 (54.7%)	3.79 (3.51-4.08)	1.86 (1.71-2.03)

Source: Own elaboration.

* Clean place without the presence of mold, cool and airy, the boxes are on shelves away from the wall and floor.

[1] Crude Odds Ratio.

[2] Odds Ratio adjusted by logistic regression.

**p-value > 0.05.

Considering those with a registered pharmacist, 92.7% of the units in the second cycle had a medication dispensing area – with no significant variation in the third cycle (92.1%). Regarding the units that had medicines stored and conditioned properly and a storage room for medicines, we observed an increase from 84.6% to 92.8% and from 69.3% to 84.1%, respectively, between cycles.

The likelihood ($p \geq 0.05$) of medication availability being > 80% was 4.57 times in 2014 when there was a pharmacist at the units (ORadj=1.79) and 3.79 in 2017 (ORadj=1.86). A similar effect was observed for the other indicators, where the presence of pharmacists was associated, for example, with the existence of a computer (OR^{adj}= 4.07, in 2014; OR^{adj}=5.03, in 2017) and a refrigerator in the pharmacy (ORadj=2.60 – in 2014; ORadj=2.71 – in 2017) (*table 4*). However, the association between the presence of pharmacists at the UBS and the adequate storage and packaging of medicines in the two cycles was not statistically significant (α=0.05) when the multivariate logistic regression was performed.

Discussion

In general terms, we noted a trend towards centralizing drug dispensing throughout the second and third cycles, especially psychotropics. On the other hand, we observed an improvement in the structural profile of UBS pharmacy services and an increase both in the mean availability of

medicines and the total of UBS, with the availability of medicines ≥80%. These advances were even more significant in the presence of registered pharmacists at the UBS.

The centralized drug dispensing observed in the third cycle was even more pronounced than in previous cycles, both in the second cycle, addressed in this work, and the first cycle, in which 24.7% of the UBS were not dispensing drugs[4], which brings a substantial potential impact on users if it is not accompanied by strategies that guarantee geographic accessibility and PC interaction with other PHC health actions. The patient's access to comprehensive care as recommended by PHC[15] will be impaired without such care.

Several factors can lead to concentrating drug dispensing in one or more specific health units or even in an isolated location (own building). Regulatory aspects and the low perception of managers regarding the role of pharmacists in the proper drug management and the user care process can be significant limiting factors to realizing the decentralization of pharmacy and drug dispensing services.

On the other hand, we should consider that, in some contexts, centralization may indeed be linked to the adequacy of the service and rational management of medicines and supplies (and of the PC itself), with an improved physical structure for storage, drug dispensing[4], and assurance of drug availability and qualified professionals. This is the case, for example, of the Rede Farmácia de Minas (RFM) Program, where the concentration of dispensing was applied, achieving organizational advantages[16].

The RFM Program was implemented in 2008 in the public pharmacy network in Minas Gerais. Besides centralizing the offer, it focused on concentrating investments to structure the units, training pharmaceutical professionals, streamlining its computerized PA management, securing continuous and regular drug supply, and promoting rational use[16,17].

Furthermore, Leite et al.[15] identified a better structural profile, with more significant physical space, extended service hours, and greater availability of professionals, when exclusively for the service in isolated pharmacy models.

Regarding the supply of psychotropic drugs (subject to special control), this centralization was even more pronounced than other drugs. It is worth mentioning the fact that the number of UBS with psychotropics dispensed follows the presence of a registered pharmacist at the unit, according to the population size, which is possibly due to the current regulatory requirements that, besides those regarding the physical area segregated for the storage of these drugs, determine that such items can only be dispensed in units with a pharmacist in charge. Thus, centralization could be related to the pressure for the pharmacist's presence exerted by the Pharmacy Councils to comply with current regulations.

However, drugs subject to special control were identified in units that did not have a pharmacist, which raises an alert, since this legal requirement aims, among other things, to contain the indiscriminate and abusive use of drugs with a high risk of dependence. It is noteworthy that this aspect could be related to the presence of such drugs in emergency carts, which, even so, is insufficient to justify the discrepancy in the behavior of this indicator among the units studied.

The difficult access to medicines from the user's perspective was pointed out in a diagnosis conducted by the Regional Council of Pharmacy of Rio de Janeiro (CRF-RJ) and the Municipal Health Secretariats of Rio de Janeiro (Municipal Councils of Health Secretariats of Rio de Janeiro – COSEMS-RJ), due to the centralization of its dispensation because of CRF-RJ fines. On the other hand, from the perspective of municipal management, the difficulty/impediment of new recruitments is evidenced due to the

limit imposed by the Fiscal Responsibility Law, thus restricting the possibility of expanding the number of pharmacists in the municipalities[18].

It is worth noting that the pharmacist plays an important role within the PHC in technical-management activities to secure regular supply, adequate packaging, and availability of essential medicines, and clinical activities, focused on the patient, family members, and integration with the multidisciplinary team, to promote the appropriate use of medication, medication adherence, and the prevention of drug-related problems[19-22]. In this sense, Lima et al.[23] pointed out that professionals who dispense drugs were 1.82 times more likely to guide how to use medications in units with a full-time pharmacist.

Nevertheless, we observed a reduced percentage of pharmacists working in PHC in 2014 and 2017 and an unequal distribution by population stratum. Similar results were also found by Carvalho et al.[10] when evaluating the workforce in drug dispensing units by region of the country.

In an analysis of the PC in the 30 years of the SUS, Bermudez et al.[24] highlighted that, even with all the efforts made over the last three decades, there are still critical situations in the scope of PC's human resources, such as the concentration of pharmacists in the capitals and inadequate structures of pharmacy services and lack of adequate staff.

Our findings converged with the previous studies[4,25] and showed deficiencies in structural aspects, especially infrastructure, which is a highly troubling fact that directly reflects on the proper storage and, thus, the assurance of the quality, safety, and efficacy of the medicines dispensed. We should highlight that, for example, human insulins, essential drugs in the management of type 1 and type 2 diabetes (insulin-dependent), and that must be available in PHC, are thermolabile and require refrigeration to maintain their pharmaceutical properties[25].

While generally unsatisfactory, the structural aspects were considerably better in units with registered pharmacists, reinforcing the importance of their work in pharmacy services (ORadj ranging from 1.06 to 4.07).

Regarding the mean drug availability, the result found in the second cycle (60%) was similar to that observed in the first cycle (58.5%)[4] and the National Survey on Access, Use and Promotion of Rational Use of Medicines in Brazil (PNAUM) (62.5%)[26]. On the other hand, the third cycle improved significantly against the previous cycles (69.2%), albeit lower than the findings of countries such as Nicaragua (73.7%) and Honduras (79.2%)[27] and the recommended by the WHO in PHC (≥80%)[28].

Although the increase of almost ten percentage points (p.p.) (from 20.6 to 29.6%) in the total of UBS with drug availability ≥ 80% should be highlighted, Brazil still must advance in strategies to achieve this goal. Once again, pharmacists' positive influence is highlighted since, with these professionals, the number of UBS with drug availability ≥80% hiked from 20.6% to 46.1% in 2014 and from 29.6% to 54.7% in 2017.

The improvements found in the drug groups for DANT and the results of the low availability of anti-infectives are aligned with the data in the PNAUM[29]. According to the research, higher proportions of drugs for chronic conditions, such as hypertension and diabetes, were obtainable in the SUS, while drugs for acute events such as infections, pain, and fever were in the group whose priority acquisition was through out-of-pocket payment[29]. However, unlike the results of PNAUM[29], our study showed high availability of analgesics/antipyretics.

The increased availability of drugs, both in general terms and for drugs intended for DANT, with the improved monitoring of chronic conditions and the advance in ESF coverage, may be associated with declining hospitalizations for PHC-sensitive conditions[30].

Interesting results can be observed concerning population size. Regarding the mean availability of critical medicines (without herbal medicines), the results of the second cycle-2 were similar to those found by Mendes et al.[4]: greater availability in strata with more than 100,000 and 500,000 inhabitants[4], which the greater economy of scale can explain due to population size and better efficiency of large centers compared to small municipalities[31].

However, despite the difficulties expected for small municipalities, due to aspects such as the high turnover of professionals and low tax revenue[31], the third cycle witnessed a significant improvement in the availability of critical drugs in municipalities with up to 10,000 inhabitants (up from 59.9% in the first cycle to 73.6% in the third cycle). Centralized drug dispensing in these municipalities may have positively influenced the concentration of efforts to ensure their availability. Furthermore, it may also be associated with federal financial incentives aimed at poor or impoverished municipalities with lower demographic densities, such as the National Program for the Qualification of Pharmaceutical Care (QUALIFAR-SUS), established to contribute to the improvement, implementation, and integration of PC activities in health care networks[32].

The collection capacity of the municipalities and their respective health expenditures may also be reflected in the results found here. Araújo et al.[33] found that municipalities with up to 20,000 inhabitants had higher per capita expenditures for most of the components they studied, including drug expenditure; approaching the median expenditure of municipalities with more than 100,000 inhabitants, which concentrate a more specialized health service network. In line with this, Vieira and Zucchi[34] also observed an inverse relationship between per capita drug expenditure and the municipality's population. Among the hypotheses raised, the authors point out that the most plausible would be a different power and purchase scale[34].

Regarding the total drug availability by pharmacological group in the second and third cycles, similar to the first cycle[4] in some aspects, there is greater availability of antihypertensive drugs in municipalities with up to 10,000 inhabitants. At the same time, antidiabetics and anti-infectives were more available at the population extremes and lower in the central strata, aligned with the findings of Miclos, Calvo, and Colussi[31].

Salazar, Campos, and Luiza[35] point out a high percentage of Family Health teams (eSF) that develop family planning actions (from 88.3% to 96.3%, from the lowest to the highest population strata, respectively). However, our study found that the availability of contraceptives does not accompany this offer of services, which may harm the consolidation of the strategies outlined. We observed an essential improvement in the availability of this group of drugs in the third cycle compared to the second and the first cycle[4]. The study by Mattos et al.[36] presents the report of a municipal manager who points out the difficulties in supplying contraceptives throughout 2013, corroborating our findings from the second cycle. Knowing that these are medicines acquired by the Ministry of Health, we assume that the improved availability throughout the third cycle may be associated with the improvement in the procurement process by that body.

Final considerations

This study had limitations, mainly because the PMAQ-AB was a voluntary adherence program. Thus, although it reached a broad coverage of municipalities with contracted teams, respectively 93.5% and 95.6% in 2014 and 2017, it did not cover all Brazilian UBS. The number of losses in completing the PMAQ-AB variable related to the number of pharmacists in the unit (*box 1*) is also worth

mentioning, which is why the combination with the CNES was necessary, which also has numerous weaknesses such as the possibility of obsolete data. Other limitations identified were the subjective aspect in the term used for the variable about the availability of drugs in sufficient quantity, where no explicit criterion was found for what would be considered a sufficient quantity; and the draw of lots to assess the availability of some drugs in the second cycle of the PMAQ-AB, thus hindering the analysis of the entire list of drugs and also implying disproportionality between the number of drugs per pharmacological group, especially for the psychotropic group.

The break in the longitudinal aspect of the measurement of which professional dispenses the units' medicines was also a significant limitation since the variable was identified only in the second cycle of the PMAQ-AB. It is also worth noting that the instrument did not allow differentiating between pharmacies and dispensaries, as there was no legal requirement for the pharmacist for the latter.

On the other hand, the national scope, the possibility of analysis by municipal size, and the combination of several dimensions (availability, service structure, and the pharmacist's presence) are the strengths of this study.

We managed to bring to the debate the relevance of the pharmacist as a component of the health teams that work in PHC in the SUS by combining data from the PMAQ-AB with those from the CNES. The presence of this professional in the health units enhances the availability of medicines and leads to favorable structural issues of PHC pharmacy services. However, it is still necessary to demonstrate better at the national level the inclusion of pharmacists in the care process and its association with health outcomes.

It is essential to transcend the logic of ensuring the presence of the pharmacist as a mere legal requirement devoid of practical meaning, directing efforts towards health outcomes for individuals, families, and the community. It is essential to promote the inclusion of the pharmacist as an integral part of the health team. It is argued that the pharmacist's role in PHC transcends the walls of the service, engaging in activities such as matrix support for the team, actions in the community, and home visits[21]. Such aspects are not covered by the legislation, which provides for actions only in the pharmacy's physical space. Achieving such advances requires broadening the discussion involving actors such as SUS management bodies, class bodies, and society.

Finally, it is worth emphasizing the critical role of the PMAQ-AB in using several indicators within the PHC. Without a proposed equivalent replacement, the regrettable discontinuity of the program in 2019 interrupted the possibility of future longitudinal analyses with national indicators that addressed management and health care aspects in the PHC.

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Collaborators

Peixoto RT (0000-0002-9362-3770) * and Campos MR (0000-0002-7443-5977)* contributed to the design, calculations, data analysis, and drafting and approval of the final version of the manuscript. Luiza VL (0000-0001-6245-7522)* contributed to the design, data analysis, participation in drafting the paper, and approving the final version of the manuscript. Mendes LV (0000-0002-9027-0287) * contributed to data analysis and review of the final version of the manuscript. ■

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