DOI: 10.1590/1413-81232023285.18052022EN

Organization of primary health care and surveillance in response to COVID-19 in municipalities in the Northeast of Brazil

Nília Maria de Brito Lima Prado (https://orcid.org/0000-0001-8243-5662) [1]
Ana Luiza Queiroz Vilasbôas (https://orcid.org/0000-0002-5566-8337) [2]
Cristiane Abdon Nunes (https://orcid.org/0000-0001-6352-9858) [2]
Ítalo Ricardo Santos Aleluia (https://orcid.org/0000-0001-9499-6360) [3]
Rosana Aquino (https://orcid.org/0000-0003-3906-5170) [2]

Abstract *The aim of this study was to analyze the organization and development of primary health care and surveillance, including normative frameworks and the implementation of local health actions. Qualitative descriptive multiple-case study involving three municipalities in the state of Bahia. We conducted 75 interviews and a document analysis. The results were categorized into the following two dimensions: approach to the organization of the pandemic response; and development of care and surveillance actions at local level. Municipality 1 was found to have a well-defined concept of the integration of health and surveillance with a view to organizing team work processes. However, the municipality did not strengthen the technical capacity of health districts to support surveillance actions. In M2 and M3, delays in defining PHC as the entry point for the health system and the prioritization of a central telemonitoring service run by the municipal health surveillance department compounded the fragmentation of actions and meant that PHC services played only a limited role in the pandemic response. Clear policy and technical guidelines and adequate structural conditions are vital to ensure the effective reorganization of work processes and foster the development of permanent arrangements that strengthen intersectoral collaboration.*

Key words *Primary health care, Health surveillance, COVID-19*

[1] Instituto Multidisciplinar em Saúde, Universidade Federal da Bahia. R. Hormindo Barros 58, Quadra 17, Lote 58, Candeias. 45.029-094 Vitória da Conquista BA Brasil. nilia.prado@ufba.br
[2] Instituto de Saúde Coletiva, Universidade Federal da Bahia. Salvador BA Brasil.
[3] Centro de Ciências da Saúde, Universidade Federal do Recôncavo da Bahia. Santo Antônio de Jesus BA Brasil.

Introduction

Health systems in various countries faced major challenges tackling the COVID-19 pandemic due to the rapid spread of the Sars-Cov-2 virus[1] and pre-existing weaknesses in infrastructure and the organization of public health services[2,3]. This situation highlighted the need for integrated actions and services to ensure an effective pandemic response[4,5].

From this perspective, public universal health systems anchored in a robust, effective, accessible, and socially and culturally competent primary health care (PHC) model are more able to adopt a comprehensive and proactive approach to health care and surveillance during a pandemic[6-9].

Countries like Belgium, Holland, England, and Ireland adopted PHC as the point of entry for COVID-19 cases, reorganizing care facilities to manage internal patient flows[10,11]. Remote consultations have become a key component of health care in many countries, permitting treatment and follow-up and case referral, depending on the complexity and severity of the illness[12-16]. In other countries, the potential of PHC was underestimated and responses to the pandemic were hospital-centered[17,18].

In Brazil, the country's community-based PHC model, anchored in the Family Health Strategy (FHS)[19-22], could have implemented the management, surveillance and prevention actions needed to respond to the pandemic. However, underfunding of the country's public health system, the *Sistema* Único *de Saúde* (SUS) or Unified Health System, and government denialism and the late pandemic response gave rise to a set of political and operational difficulties that constrained the ability of state and municipal health authorities to effectively coordinate risk management policies[23,24], hampering the planning of the pandemic response[25].

Primary and community care were largely neglected during the pandemic. Moreover, the apparently "consensual" health surveillance approaches employed by the government adopt differing, albeit not antagonistic, concepts[23], which can result in varying responses to the pandemic. The aim of this study was therefore to analyze the organization and development of primary health care and surveillance actions, including normative frameworks and the implementation of health actions at local level.

Method

Study design

This study is part of the ObservaCovid project, funded by the National Council for Scientific and Technological Development (CNPq) and approved by the research ethics committee (reference nº 4.420.126, 25 November 2020).

We conducted a qualitative descriptive multiple-case study with the aim of capturing the main aspects of the reorganization of primary health care and surveillance during the pandemic.

We sought to answer the following core questions: What guidelines and strategies guided PHC care and surveillance in each municipality? What was the level of integration of primary care and surveillance during the pandemic?

It is important to mention that the purpose of this study was not to judge municipalities, but rather study representative cases to understand the processes by which actions were integrated across municipal catchment areas, permitting insights into the multiple interrelations between the aspects observed[26].

Case locations

The case municipalities were intentionally selected from the largest municipalities in a state in the Northeast of Brazil using convenience sampling.

In 2021, the municipalities occupied the first three places in the ranking of most populous municipalities. Primary care and FHS coverage in 2019 were as follows: 42.1% and 31.9% in M1; 77.4% and 66.2% in M2; and 60.6% and 48.9% in M3. The first case of COVID-19 in M2 was confirmed on 6 March 2020. During the period March 2020-August 2021, the state recorded 1,209,284 COVID-19 cases and 26,484 deaths[27]. During the same period, M1 and 2 had the first and second highest cumulative number of cases and deaths in the state: 234,881 (19.3%) cases and 7,849 (30.0%) deaths and 54,472 (4.5%) cases and 1,046 (4.0%) deaths, respectively. M3 recorded 35,608 (2.9%) cases and 618 (2.4%) deaths.

Data collection

The data were collected using interviews and document analysis. We analyzed technical standards, plans, and state and municipal patient

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flowcharts containing guidance and recommendations on the organization of primary care and surveillance actions in response to COVID-19.

The interviews were conducted in pre-defined locations and lasted an average of 80 minutes. Seventy-nine participants were interviewed, including 35 primary care and surveillance managers and administrative staff, and 44 PHC professionals.

Data analysis

We carried out a content analysis of all the material, including the categorization, description, and interpretation of results. The analysis was performed in two stages: data organization and preparation, including interview transcription, data coding, and the creation of a text corpus; and data processing and lexical analysis using the software *Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires* (IRAMUTEQ)[28] version 0.7 alpha 2. At the end of the process, the data were saved as a text file using UTF-8 Portuguese character encoding.

The text segment was clustered using the Reinert method for descending hierarchical classification. The chi-squared test (chi2) was used to measure the association between words and their respective classes, indicated by X^2 value ≥ 3.84 (p-value ≤ 0.05). Based on the analysis and interpretation, the text segments were restored and the most frequent lexical unit made sense in relation to the context of the discussion, clustering responses according to their likeness to form thematic categories[29].

We based the analysis of the level of integration of care and surveillance on the community-based PHC framework described by Aquino et al.[4] This framework helped to identify the approach to the technological organization of care and surveillance actions in each municipality (adoption of protocols for modifications to physical facilities and work processes, professional training, establishment of logistic and operational flows, coordination of PHC with other levels of the health system) and the implementation of health care and surveillance actions at patient level (screening, consultations, clinical testing and monitoring) and community level (home visits and other community actions).

Results

The word cloud in Figure 1 shows the interconnections and relationships between the words. The strength of word co-occurrence index is indicated by the size of the words (chi-squared test). The central core is the word "patient". Intrinsically linked to this term, the other words form clusters of co-occurring terms, creating semantically distinct subgroups.

The analysis of word connectedness and meanings that emerged in the interviews and documents revealed two empirically-based dimensions and corresponding criteria: approach to the organization of the pandemic response; and development of care and surveillance actions by health teams at local level (Chart 1).

Municipality 1 (M1)

The results (Chart 2) show that the organization of the pandemic response involved coordination between various sectors of the municipal health department. The integration of primary care and surveillance was addressed by pre-existing guidelines. With the onset of the pandemic, a stronger focus on integration was required, highlighting the importance of the community-based FHS model for the integration of primary care and surveillance actions.

As part of the pandemic response, 16 new family health centers (FHSs) with 51 health teams were opened, additional health workers were hired, and critical patient stabilization rooms were fitted in floating clinics. However, low PHC coverage prevailed, which, combined with understaffing in health district coordination offices, seems to have hampered the expansion of surveillance actions.

The normative framework (Chart 3) details biosafety standards and guidelines for modifications to the physical facilities of health centers. Specific training was provided to PHC workers, covering topics ranging from biosafety standards and clinical management to testing and epidemiological surveillance actions. A range of organizations participated in or provided training, including the Ministry of Health, Oswaldo Cruz Foundation (Fiocruz), the Brazilian Hospital Services Company (EBSERH), Telehealth Center, and professional organizations.

Common roles and responsibilities and those specific to each type of PHC professional were standardized. The results of the interviews and document analysis show that tasks assigned to professionals working in comprehensive family and primary health care centers (NASF-ABs) and oral health teams included the detection of respiratory symptoms and monitoring of patients placed in isolation.

Chart 1. Synthesis of the criteria for organizing and developing care and surveillance for symptomatic COVID-19 patients in each location.

Dimensions	Criteria	M1	M2	M3
Approach to the organization of the pandemic response	Formal participation of PHC managers in general planning	**Y**	**Q**	**Q**
	Availability of organizational protocols	**Y**	**P**	**P**
	Provision of training by the municipal health department	**Y**	**P**	**P**
	Availability of supplies (PPE)	**Y**	**Y**	**P**
	Availability of supplies (sanitizers)	**Y**	**Y**	**P**
	Availability of primary care supplies (oximeters)	**Y**	**Y**	**P**
	Availability of primary care supplies (oxygen)	**Y**	**Y**	**P**
	Availability of primary care supplies (infrared thermometers)	**Y**	**Y**	**P**
	Availability of technology supplies (cell phones, tablets)	**Y**	**Y**	**Y**
	Availability of land line	**Y**	**Y**	**P**
	Availability of internet connection	**P**	**P**	**P**
	Decentralization of PCR testing to FHCs/PCCS during the study period	**P**	**Q**	**Q**
	Structural changes/modifications to physical facilities	**Q**	**Q**	**P**
	Separate access for patients with respiratory symptoms	**Y**	**Q**	**P**
	Hiring of professionals for PHC teams	**Y**	**Q**	**Q**
	Relocation of PHC professionals to other sectors	**Y**	**Q**	**P**
	Remote working for PHC professionals	**Y**	**Q**	**Q**
Development of care and surveillance actions by health teams	Patient flows include PHC	**Y**	**Q**	**Q**
	Protocols for screening of suspected cases	**Y**	**Y**	**Q/P**
	Creation of new roles and responsibilities for PHC professionals	**Y**	**Q**	**Q**
	Specific teams for treating symptomatic patients	**Y**	**Y**	**Y**
	In-person care for symptomatic patients	**Y**	**Q/P**	**Q/P**
	Care/teleconsultation for symptomatic patients	**Y**	**Q/P**	**Q/P**
	Monitoring of clinical signs and symptoms in patients in home isolation	**Y**	**Y**	**Q/P**
	Systematic remote monitoring of patients in home isolation	**Y**	**Y**	**Y**
	Notification of suspected cases by PHC teams	**Y**	**P**	**P**
	Contact tracing in catchment areas	**N**	**N**	**N**
	Risk communication	**N**	**N**	**N**
	Educational activities	**Y**	**Y**	**Y**
	Availability of medications for patient stabilization	**Y**	**P**	**P**
	Adoption of drug therapy (early treatment)	**N**	**Y**	**Y**
	Availability of rapid tests/testing carried out in health centers	**Y**	**Y**	**Y**
	RT-PCR testing in FHCs/PCCs	**P**	**P**	**P**
	Planning of moderate and severe case referral flow	**Y**	**Q**	**Y**
	Rearguard patient transport (SAMU 192)	**Y**	**Y**	**Y**

Key: Y = yes; N = no; P = partial; Q = questionable (contained in the norms and standards).

Source: Authors.

Community health workers (CHWs) performed their activities in accordance with the norms and standards issued by the municipal health department, which largely restricted their work to within the walls of the health facilities. Although CHWs played an important role in COVID-19 vaccination, changes to roles and responsibilities lead to a shift in attention from the community to other health problems.

Regarding COVID-19 patient flows, PHC services (including both health centers with and without family health teams), urgent care centers, and referral centers were the point of entry for patients with flu-like syndromes, and mini-urgent care centers were set up in some health centers for the stabilization of moderate and severe cases. Patient transport was provided by the Mobile Emergency Care Service (SAMU 192).

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Chart 2. Synthesis of the main results and notable comments made by the interviewees in the three locations.

Municipality	Synthesis of main results	Notable comments
Salvador	Integration of PHC and surveillance	"The moment was not just the integration of surveillance and PHC actions, I think we were able to coordinate with other sectors such as the department's staff training office; and it was a moment where we had all this cooperation and communication. But in terms of the issue of PHC and surveillance as a whole, a project was written that was developed that actually started to happen and was carried out, which was the integration of surveillance and PHC." (EGSSA8)
	New roles and responsibilities for CHWs	"…it's something that comes more naturally to family and primary health professionals, realizing how important the relationship between surveillance and care is." (EGSSA6)
	Difficulties in ensuring social distancing and physical separation of suspected cases from other patients in FCCs/PPCs	"Initially, one of the difficulties in our FHC was that the entrance and exit are the same door. So it was really difficult to organize patient entry. There was very little room for the number of patients to keep a safe distance, so we tried our best to limit the number of appointments." (EPSSA22)
	Online clinical monitoring of mild cases of COVID-19 in home isolation	"We receive symptomatic patients here. The city council sent a protocol saying that patients who arrived with suspected SarsCov2 infection should be received and monitored every 24 or 48 hours. We would telephone to find out how the patient was progressing." (EPSSA6) "There is a remote modality, but it's very difficult to put it into practice because the quality of the tablet is poor, the quality of the sound and internet connection are poor. The patients' internet connection is bad and the place where they are can often be noisy. Yet we tried to put it into practice with some very selective cases. But it's really hard." (EPSSA18)
	Effective communication with patients	"Create strategies together with the CHWs to establish a flow of information. And with the municipal health department to prioritize groups of actions that can produce positive results in the catchment area, and support from the health department. We spend a lot of time inside the health center and have wound down community visits during the pandemic" (EPSSA13).

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Patient flows were standardized to facilitate the scheduling of beds, testing, and provision of care to the homeless, residents of long-term care facilities for the elderly, children, and adolescents. Specific care stations for health workers were also created. PHC managers highlighted that FHCs/primary care centers (PCCs) were the main point of entry for screening and initial treatment of suspected cases (Figure 2).

It is worth mentioning the following initiatives geared towards the reorganization of health care and surveillance brought together by a program created to strengthen the use of information and communication technologies: unscheduled care of suspected cases, remote monitoring of patients in home isolation, risk communication and community engagement (ACOM), and surveillance, management and permanent education (VGEP).

The actions developed by unscheduled care and remote monitoring teams were consistent followed established norms and standards. Pa-

Chart 2. Synthesis of the main results and notable comments made by the interviewees in the three locations.

Municipality	Synthesis of main results	Notable comments
Feira de Santana	Integration of PHC and surveillance	"We managed to integrate PHC and health surveillance to a certain extent, but it started to diminish because if you don't have managers with integrated planning across all sectors it diminishes over time." (EGFSA4).
	Reorganization of PHC team work processes	"A technical note arrived and we received over a thousand messages in the groups. And when we asked why we didn't know about the patient flows, they said. "Ah, but it was in the technical note sent to the WhatsApp group. Patient flowcharts should be formally issued when updated." (EPFSA7).
	Difficulties in ensuring social distancing and physical separation of suspected cases from other patients in FCCs/PPCs	"The room that was created already existed. It was a room where we held meetings, and we turned into an isolation room. We put some chairs in and a tape like that for people to keep their distance from the attendant so that patients wouldn't get close, but it was us who did it". (EPFSA7)
	Hiring of CHWs	"As there are no CHWs, they should hire a community health agent to identify people with symptoms in the catchment area and draw up a strategy." (EPFSA8).
	Online clinical monitoring of mild cases of COVID-19 in home isolation	"We carry out remote monitoring of cases…. There's a spreadsheet that we fill in for ten days, recording the patient's symptoms". (EPFSA4) "This was another major problem in some places that needed to install internet or telephone lines and didn't have [internet] because there was no coverage; and this really needs to improve". (EGFSA5).
	Effective communication with patients	"The FCC doesn't carry out educational activities to tackle COVID-19 in the catchment area. It doesn't disseminate information or do leafleting, because the center doesn't have a CHW". (EPFSA8)
Vitória da Conquista	Integration of surveillance teams into FCCs/PPCs	"… surveillance ended up taking the lead, in the sense of taking on the organization, to pass things on later to our colleagues, especially those in other sectors." (EGVDC4) "The response demanded a lot from PHC and managers were not always able to understand exactly what needed to be done." (EGVDC3)
	Reorganization of PHC team work processes	"One team attended non-symptomatic patients in the morning and another symptomatic patients in the afternoon." (EPVDC4)
	Difficulties in ensuring social distancing and physical separation of suspected cases from other patients in FCCs/PPCs	"The PCC handles suspected cases and confirmed cases, so we closed the reception room and used it temporarily for asymptomatic patients. And we had to put up this makeshift partition to isolate consultations from reception because patients were coming in and out a lot and crowding the corridor." (EPVDC9)
	Relocation/changes to the roles and responsibilities of CHWs	"Before, we didn't have a receptionist and we got a rural CHW to help out in reception to control screening, reception, and symptomatic patient flows" (EPVDC9)
	Online clinical monitoring of mild cases of COVID-19 in home isolation	"We telemonitored the cases using the telemedicine service. The only thing we did in-person was notification." (EPVDC4)

Source: Authors.

Chart 3. Synthesis of normative documents and interviews with health managers regarding structural changes in the three locations, 2022.

Core Area						
Source		Modification of the physical facilities of health centers to meet biosafety norms and standards	Hiring or relocation of health professionals to PHC	Reorganization of team work processes, including in-person and remote working options using ICT	Adoption of protection and safety protocols for staff working in health centers/the community and patients.	Community surveillance actions: contact tracing, case notification, telemonitoring, community prevention strategies.
M1	Documents	Technical notes 001/2020 (19/03/2020) and 009 (23/06/2020).;	COVID-19 Action Plan.	Technical notes 008 (19/06/2020) and 009 (23/06/2020); Municipal Contingency Plan, updated on 28/05/2020.	Technical note 001/2020 (19/03/2020).	Flowchart 1 for suspected cases in PHC services; Municipal Contingency Plan (03/2020); Technical note 002/2020 (25/03/2020); New Coronavirus Contingency Plan (28.05.2020). DAS/SMS/SSA.
M2	Documents	Municipal Contingency Plan (03/2020).	Not applicable.	Not applicable.	Municipal Contingency Plan (03/2020).	Municipal Contingency Plan (03/2020).
M3	Documents	New Municipal Coronavirus Contingency Plan (18/03/2020, updated on 06/2020).	Decree 20289 (06/05/2020) for COVID-19 referral services (does not apply to PHC).	Decree 20194, 18/03/2020.	New Municipal Coronavirus Contingency Plan (version updated on 06/2020).	New Municipal Coronavirus Contingency Plan (version published on 18/03/2020 and updated on 06/2020); Decree 20353 (23/06/2020).

Source: Authors.

tients with mild symptoms were instructed to self-isolate at home and remotely monitored every 24-48 hours. Cell phones with additional SIM cards were purchased and health professionals were registered to a WhatsApp® Business app account. However, some PHC professionals reported insufficient availability of phones.

Although the norms and standards state that moderate and severe cases of COVID-19 should be stabilized in the health center and then transferred by ambulance to another level of care, some interviewees suggested that ambulance services were insufficient to meet the high demand caused by the spike in COVID-19 cases.

Due to poor laboratory testing capacity in the first six months of the pandemic, patient flows were managed for testing of suspected cases in PHC services. Certain health centers were designated as sample collection centers for RT-PCR testing, while the rest performed sample collection for serology testing, provided scheduled RT-PCR test sample collection, or referred patients to other collection stations. It was only in the second semester of 2021 that sample collection for RT-PCR testing was fully decentralized to PHC services, albeit with a restricted number of tests.

ACOM actions aimed at COVID-19 prevention were limited. Interviewees expressed con-

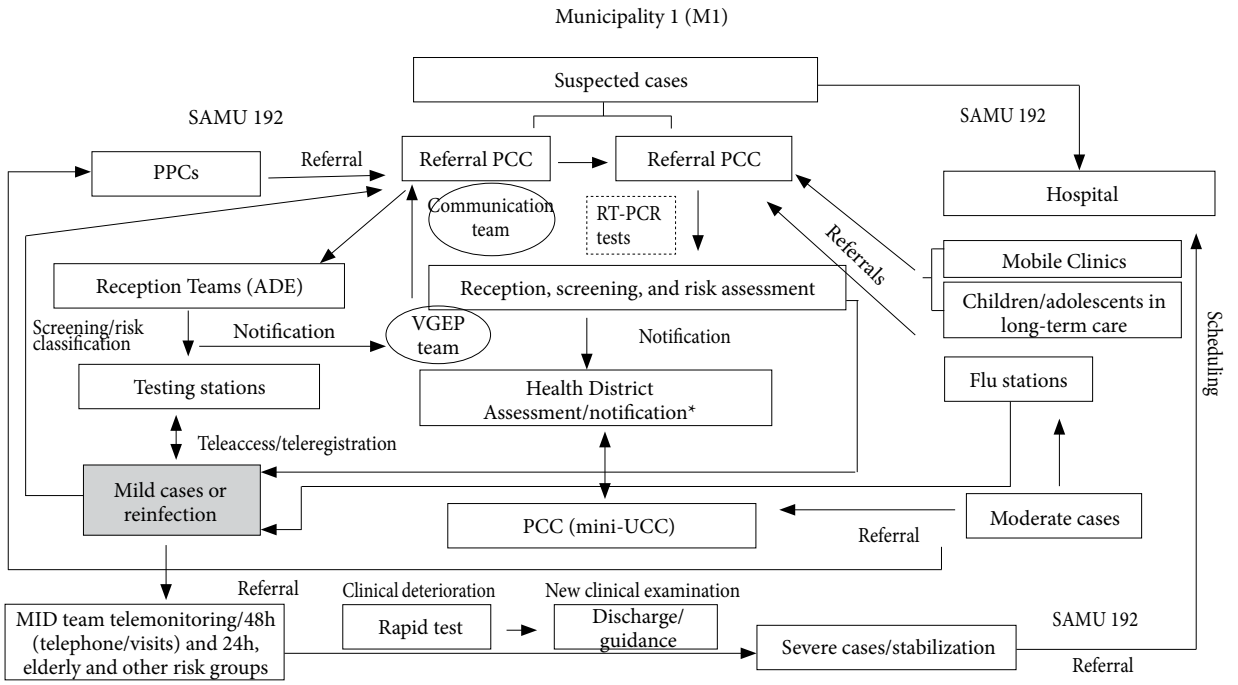

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Figure 1. Synthesis of patient flow and surveillance for suspected cases of COVID-19 in the three case studies, January 2020 to August 2021.

cerns over the shift away from the family and community approach in health teams, suggesting the need to "take services back to the community" and reestablish community communication in PHC.

Educational activities were largely restricted to initiatives within the walls of health facilities and sending information by WhatsApp. These findings highlight the lack of risk communication to the community.

A program created to promote the use of telemedicine services for monitoring and following-up COVID-19 cases by FHC/PCCs included VGEP. The program was coordinated in conjunction with the local health surveillance and permanent education units of the municipal health department. In some districts, disease surveillance professionals were appointed to work as focal points for family and primary care centers. COVID-19 surveillance actions were limited to the notification and monitoring of mild cases in patients seeking treatment in care centers and testing.

Municipality 2 (M2)

The COVID-19 pandemic response was organized by the municipal epidemiological surveillance department (VIEP), which initially faced challenges in coordinating activities with other council departments, with PHC playing only a limited role.

There was no evidence of local government investment in the expansion of the population coverage for the FHS and the interviewees reported that health teams were left understaffed, with a particular shortage of CHWs.

Training was provided in clinical management, patient flows, COVID-19 case monitoring, infection prevention, and vaccines. Priority was given to rapid dissemination strategies, such as WhatsApp cards and online presentations.

Another limitation was the crude normative framework for the pandemic response, which essentially consisted of the Municipal Contingency Plan, the only document found in the public domain. Although managers mentioned that the

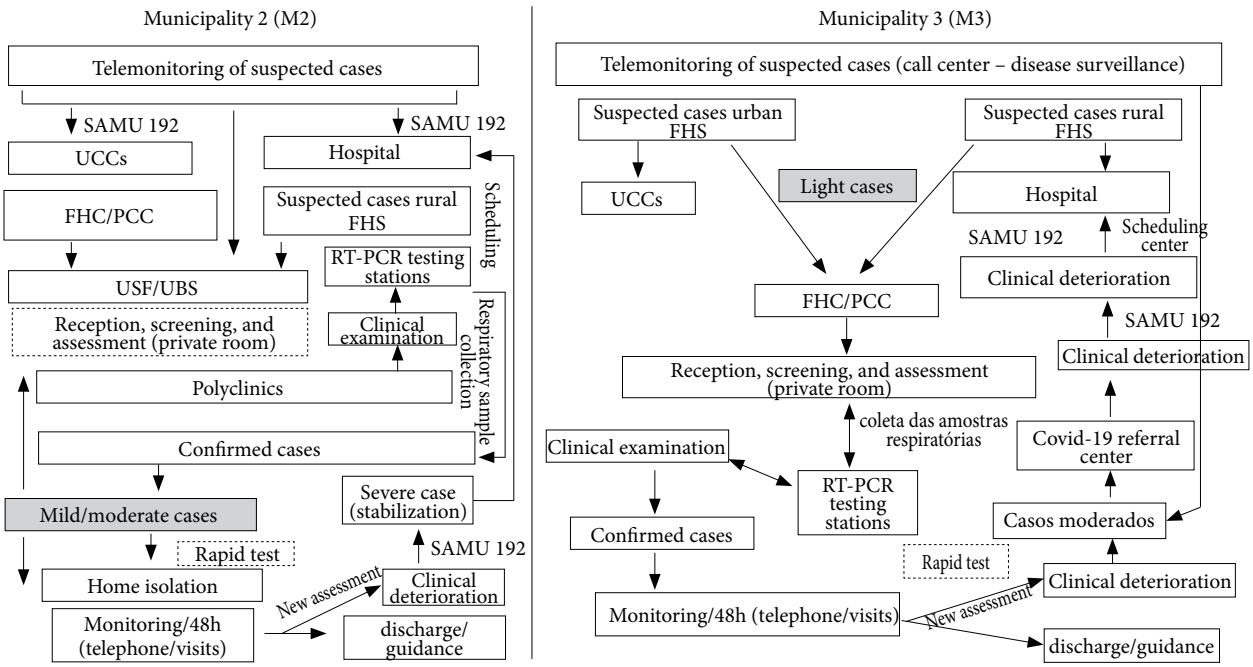

Figure 1. Synthesis of patient flow and surveillance for suspected cases of COVID-19 in the three case studies, January 2020 to August 2021 (continuation).

FCC – Family Care Center; PCC – Primary Care Center; UCC – Urgent Care Center; SAMU – Mobile Emergency Care Service; ADE – reception and unscheduled care; MID – home isolation remote monitoring; ACOM – risk communication and community engagement; VGEP – surveillance, management and permanent education.

Source: Authors.

local government adopted pandemic response protocols following recommendations issued by the Ministry of Health and state department of health, these documents were not found on the municipal department of health's website and not made available to the researchers.

Regarding work processes, the contingency plan recommends that all professionals working in family and oral health teams and NASF-ABs perform clinical monitoring of patients in home isolation every 48h and assessment of their general condition.

The patient flowchart contained in the contingency plan shows telemonitoring services to be one of the points of entry to the health system for suspected cases and outlines the care pathway for suspected cases and scheduling of more severe cases in emergency or hospital services, following state health department guidelines. However, the contingency plan fails to provide guidelines on coordination between PHC services and other levels of the health system. At the beginning of the pandemic, PHC teams only performed screening of patients who visited care centers and referred mild and moderate cases to polyclinics for clinical diagnosis. Later, the teams were assigned responsibility for the clinical monitoring of mild cases referred by polyclinics, which was largely carried out remotely by nurses, dentists, and professionals working in NASF-ABs.

Screening, clinical monitoring, and contact tracing were performed by a municipal surveillance team via the telemonitoring service, using a specific telephone line for this purpose. Subsequently, when case numbers began to exceed the capacity of the surveillance team, PHC teams began to receive patients from their catchment area identified by surveillance teams and by CHWs during outside home visits. One of the factors that hampered remote working was slow internet connection. Some PHC doctors adhered to the early treatment protocol, despite the lack of scientific evidence proving its effectiveness.

To meet the demand of suspected COVID-19 cases it was necessary to make changes to health center work arrangements, including the reduc-

tion of appointments or suspension of routine activities to create a temporary unit for patients with respiratory symptoms. In addition, the interviewees mentioned that some rooms were allocated to other activities and makeshift partitions were put up to divide spaces within the premises.

According to health professionals, the CHWs performed outside home visits to patients in isolation to ascertain symptom severity and infection of family members. Obstacles highlighted by the interviewees included the shortage of CHWs in some catchment areas and patient refusal to receive home visits for fear of infection. These factors weakened community communication and prevention actions, which were restricted to the provision of information in waiting rooms to patients visiting the health center.

At the beginning of the pandemic, sample collection for PCR testing was performed by the disease surveillance team in fixed and mobile testing stations. Health centers only offered rapid testing, with PCR testing being performed in specific centers only after referral. Special arrangements were made for PCR testing in long-term care facilities for the elderly. The managers and health professionals reported that it was only in the second semester of 2020 that FHCs/PCCs started to perform PCR testing and notify cases.

Municipality 3 (M3)

While the normative documents and some of the managers interviewed by this study suggest that there was a certain level of coordination between PHC and health surveillance, the health professionals pointed to a disjointed management process and challenges in ensuring the effective coordination and integration of the response to the health crisis. The latter was led by the health surveillance department, with PHC playing a limited role in the process.

Due to the limited technical capacity of the municipality's health managers, external consultants were brought in to support the organization of work processes, patient flows, and local disease monitoring. The main frame of reference were recommendations issued by the Centers for Disease Control and Prevention (CDC) and guidelines published by the Ministry of Health, with technical support from the state department of health. However, the decision-making process was underpinned by a rhetoric focusing on risk groups and drug therapy for which there is no evidence of efficacy against COVID-19.

The first measures implemented in the municipality were the opening of a specialist COVID-19 treatment center and creation of a telemonitoring center in the department of health offices to trace, monitor and notify suspected cases. PHC services did not play a key role in this process in the first year of the pandemic. According to one of the health managers, telephone lines were rented and/or transferred for this purpose and data were inputted into an online case monitoring platform.

Subsequently, proposals were made to modify the physical facilities of FHCs/PCCs. However, most of the services, especially those in rural areas, functioned in buildings without adequate facilities. According to the professionals, due to poor physical infrastructure and lack of supplies, facilities were largely makeshift. This, combined with the lack of personal protective equipment, limited the response in the first months of 2020. Few health centers were able to maintain adequate patient flows due to poor physical facilities, opting to divide team shifts in order to separate care for symptomatic and non-symptomatic patients.

Due to the shortage of PCR tests and adequately equipped professionals, testing was largely centralized at the beginning of the pandemic, being restricted to rapid testing in only some FHCs.

Despite low PHC coverage, primary health care and surveillance staffing levels were not increased, focusing on the recruitment of professionals for COVID-19 referral services in accordance with Decree 20289, issued in May 2020. Workers were transferred to new roles, especially those not working in family health teams, in particular NASF-AB staff, who were posted to the telemonitoring center.

The contingency plan provides a general definition of common roles and responsibilities of family health professionals and home care and health surveillance teams, including some tasks performed by CHWs. The interviewees reported weaknesses in permanent education actions aimed at COVID-19 case referral and telemonitoring teams.

Patient flows outlined in the contingency plans underwent changes during the period studied. In the first year, the preferred point of entry was the telemonitoring service, which carried out screening and notification of suspected cases, testing station scheduling, and daily transmission of the list of mild cases for remote clinical monitoring by the PHC teams. Patients with

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severe symptoms were referred to the COVID-19 referral center.

Despite the creation of a fast-track system, uncertainties persisted regarding the patient flow. It was only in the second year, when case numbers began to exceed surveillance capacity, that FHCs/PCCs started to receive patients with respiratory symptoms for unscheduled care, maintaining remote clinical monitoring of cases, with special emphasis on patients from risk groups.

However, screening continued to be carried out by telemonitoring services. Screening was performed in-person in health centers only for patients without a telephone number and with the assistance of CHWs. However, according to the interviewees, form B was completed where possible by telephone.

It is important to note that there was a lack of patient flow planning for symptomatic patients living in rural areas. This element was only included in the second version of the contingency plan. This hampered laboratory diagnosis, clinical monitoring, and referral of moderate and severe cases to COVID-19 referral centers and emergency care centers/hospitals, due to delay in patient transport.

The identification of patients with respiratory symptoms in the community through contact tracing or mapping of social interaction networks and places of conviviality was not mentioned. While managers claimed that testing flow was organized and qualified professionals were always on hand, professionals working in more remote areas highlighted lack of testing and trained professionals.

Health education was limited to information sent by WhatsApp and was not a key priority in the different catchment areas.

Discussion

In the three municipalities, PHC responses were characterized by care delivery, case notification and monitoring, health education strategies using WhatsApp and within the walls of health facilities, and limited health surveillance (contact tracing and risk communication in catchment areas).

In M2 and M3, the delay in defining PHC as the point of entry to the health system and prioritization of telemonitoring services compounded the fragmentation of actions, with the findings revealing that PHC played only a limited role in the municipalities' pandemic response. Only M1 promoted preparedness and effective management of the response, with the creation of a normative framework and well-defined concept of the integration of primary health care and surveillance. The municipality organized PHC team work processes and focused efforts on expanding PHC coverage and implementing strategies to improve the effectiveness of care delivered to COVID-19 patients. However, the evidence shows that these efforts were not enough to drive changes in care practices.

Theoretically, a comprehensive pandemic response requires a PHC model that incorporates health surveillance actions and vice-versa. However, only M1 came close to this model from a an ideological/normative point of view. In the other municipalities, health surveillance was passive, characterized by reactive disease surveillance – led by demands arising from the central surveillance structure and/or from symptomatic patients seeking health services – and damage control, with diverging and individualized work processes. The catchment base was used to create lists of patients identified by the municipal health surveillance teams to be monitored by health centers. However, this process lacked systematic "active surveillance" to identify patients with respiratory symptoms in their homes.

The inconsistencies demonstrated by decision-makers were particularly striking, giving priority to institutional mechanisms that failed to break with the logic of the prevailing care model, characterized by the fragmentation of care work processes.

Framing emergency actions in a health care model underpinned by community-centered PHC requires additional efforts from Brazil's state and municipal governments[30]. To be successful, responses need to bring together a mix of community-based surveillance actions, reinforcing the need for measures to strengthen the pivotal role played by PHC in health systems and its professional and social legitimacy in the face of this global health crisis. Countries with universal health systems anchored in strong comprehensive primary health care services, such as Scandinavian nations, New Zealand, Australia, Canada, Japan, and South Korea, have been more successful in controlling the pandemic, as have Vietnam, Cuba, Sri Lanka, and Thailand, known for relatively more universal health care systems[31].

The introduction of comprehensive surveillance is recommended as an urgent public health measure to control and mitigate the global spread

of the disease. However, the implementation of this measure has shown itself to be challenging, for it requires interorganizational coordination involving a diverse range of actors. In Latin America[32,33], it is worth highlighting the implementation of interorganizational coordination strategies for COVID-19 surveillance in Colombia, particularly those in Bogotá, Cali, and Cartagena.

The Cuban approach to massive manual contact tracing involved "door-to-door" surveillance of acute respiratory infections. Its success was facilitated by pre-existing conditions, including a broad and well-organized primary health care system and high number of doctors *per capita*[34].

In this regard, it is important to reflect on the viability of integrated health processes. There are different perspectives on the main factors influencing the arrangements for coordination between the different institutions that make up health systems, one of which highlights the coordination challenges. These include the coordination of collective surveillance programs (for example, community initiatives) in conjunction with individual interventions (for example, clinical treatment), prioritizing population needs[35].

This analysis reveals that the reorganization of team work processes is a persistent challenge. One of the compounding factors in this regard is that each municipality adopts its own approach to the development of traditional surveillance actions. The evidence shows that organizational roles in the COVID-19 responses were poorly defined at the beginning of the pandemic due to lack of communication between the diverse range of actors involved in the health system[36].

These issues reveal the need for greater collaboration in responses to both short-term and long-term crises. Thus, when planning new coordinated surveillance strategies, it is vital to understand the influence of and interaction between interorganizational coordination mechanisms in specific contexts. Moreover, it is important to underline the fundamental importance of political and technical guidelines and adequate structural conditions for the reorganization of work processes across sectors in order to create permanent arrangements that promote enabling conditions and strengthen cross-sector collaboration[37]. The following question remains, however: How can we institutionalize this collaboration in the midst of a "health war" and lack of coordination at national level?

Examining the organization of PHC as the cornerstone of strong health systems essentially requires us to reflect on the dismantling of primary care brought about by the changes made to the National Primary Health Care Policy[38], compounding barriers to quality health care. In this regard, practice-related barriers to the effective integration of PHC and surveillance in themselves constitute a problem that needs to be addressed on an ongoing basis and not only during a pandemic.

This study analyzed the approach to primary health care and surveillance adopted in response to the COVID-19 pandemic in three municipalities in the Northeast of Brazil. One potential limitation of this study is the methodology employed, which allows the researcher to make objective and theoretical inferences but does not permit the generalization of study findings. Despite this limitation, this study seeks to promote debate on this theme in the wider Brazilian context, focusing especially on the integration of primary health care and surveillance actions during the pandemic response, which, when investigated employing a comprehensive and contextualized approach, has the potential to prompt reflection in other settings.

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Collaborations

All authors contributed equally to the conception, design, acquisition, analysis, and interpretation of data in the development of the work as an important intellectual critical content for the approval of the final version to be published. They are responsible for reporting all aspects of the work, ensuring that questions regarding the accuracy or completeness of any part are adequately investigated and resolved.

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Article submitted 09/11/2022
Approved 25/01/2023
Final version submitted 27/01/2023

Chief editors: Romeu Gomes, Antônio Augusto Moura da Silva