DOI: 10.1590/1413-81232020254.28942019

Access and regulation of specialized care in Rio Grande do Sul: the RegulaSUS strategy of TelessaúdeRS-UFRGS

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Abstract *In Primary Health Care (PHC), access, and integrality are strongly influenced by the coordination of care, which in turn receives a positive impact from the articulation of telehealth actions for teleregulation of care. We created a teleregulation method (RegulaSUS Project) based on specific protocols firmly grounded in scientific evidence. From data of the regulatory system and TelessaúdeRS, we explored the effects of RegulaSUS on PHC and access to specialized care. This method set comprehensive protocols, with a significant mean reduction of 30% in the specialized visits queue over 360 days. It reduced waiting time for medical clinical visits (median of 66 days) but not for surgical appointments. Waiting times for queued cases varied inversely, increasing for clinical and declining for surgical specialties. The use of teleconsultations unrelated to regulation increased with the exposure of professionals to RegulaSUS. The intervention evidence potentiality in the integration of health systems, mainly among low- and middle-income countries, and makes telehealth act as a meta-service, building efficient, qualified, and equitable networks.*

Key words *Primary Health Care, Telemedicine, Teleregulation, Outpatient care, Rio Grande do Sul*

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Introduction

Access is a ubiquitous challenge, and a deficient gateway impairs the achievement of other essential attributes of Primary Health Care (PHC)[1,2]. Brazil has undergone an exponential expansion of PHC[3] since the 1980s, which was not reflected in outpatient care, a professional demographic void where only 4.8% of doctors in the country work[4]. Likewise, the technological incorporation achieved by hospital care has not been extended to other levels of care. Thus, we have a scenario of heterogeneous PHC coverage, and it is difficult to prevent health conditions that are sensitive to it. This leads to excessive demand to specialized outpatient care and emergency care units[5-7]. It is ineffective to increase access by the isolated increased expansion (Roemer's Law)[8] without going through the qualification of supply and the organization of demand, both of which are sensitive to Telehealth actions[9]. As with the Unified Health System (*Sistema Único de Saúde* – SUS), there is no universality and integrality without equity; and there is no equity without a regulated care access. In PHC, access and integrality are highly influenced by the coordination of care[1,10].

The Telehealth Center of Rio Grande do Sul (TelessaúdeRS), which is officially registered in the Brazilian National Register of Health Facilities (CNES), is part of the Post-Graduation Program in Epidemiology of the Faculty of Medicine of the Federal University of Rio Grande do Sul (UFRGS). It receives support and resources from the Ministry of Health, and the State Health Secretariat of Rio Grande do Sul (SES-RS). With a group that was initially without great mastery or technological fluency, but with great naturalness to traverse Epidemiology and PHC, TelessaúdeRS started its activities in November 2007. We started from a vision of the future of health care with minimal barriers and with our feet firmly rooted in scientific thinking and applying the best current biomedical knowledge. As we had few technological tools at hand, in 2007, we started the first teleconsulting using only text editors and e-mail servers, in asynchronous format[9].

A decade later, despite telepresence becoming a reality in the day-to-day life of TelessaúdeRS (more than 20 thousand people evaluated by teleophthalmology as of 2017), technology continues to play a supporting role, as one of the center's differentials is to provide tele-assistance based on current and robust evidence for the entire Brazilian PHC. In 2013, to take the momentum for this leap forward, we took a step back and, countering the current of incorporating increasingly complex technologies, we adopted the technology of the past millennium: conventional telephony[9]. The toll-free telephone line 0800 644 6543 allowed us to reach all Brazilian states, achieving more than 145,000 telephone teleconsulting answered in approximately six years, synchronously and at no cost to applicants. TelessaúdeRS also provides coverage in spirometry, dermatology, and stomatology for the entire state (more than 40 thousand reports) and tele-education actions for the whole country (more than 40 thousand professionals certified in distance learning courses, with about three million views of the online content, and more than 700 thousand downloads of the 22 smartphone applications produced)[11].

The regulation of PHC referrals to specialized care is both a local and global problem. Population aging, advances in biomedical knowledge, increased prevalence of health conditions, and progressively more stringent diagnostic criteria have led to increased multimorbidity rates[12]. Thus, referrals to specialized care are expected to increase[13,14]. In the U.S., the rate that an outpatient appointment leads to referral increased from 4.8% to 9.3% in the 1999-2009 period[15]. Adequate referrals increase the quality of care. Despite this, the high variability of referrals and the lack of clear parameters and acceptable referral rates suggest that both excessive and deficient use of specialized care occurs[16-18]. Moreover, high demand for referrals increases the waiting rate for specialist appointments[19].

The development of mechanisms for the gatekeeping by PHC is associated with improved outcomes in the transition from care to specialized care[20]. We can expand clinical care and increase PHC resoluteness through the coordination and regulation of the network, thus reducing the risk of excessive investigations and treatments[21]. More importantly, this can increase patients' access to general practitioners and stimulate this relationship. Moreover, we can optimize the use of resources, avoid unnecessary travel, and increase efficiency and equity in the management of waiting lists, obtaining objective definitions for the referral of each health condition[22,23].

However, minimal information about patients is necessary to define the indication and priority for specialized care for this coordinating role and streamlined optimized use of PHC[16,24-27]. In this context, referral protocols can guide the PHC care and assist care coordination and regulation.

Despite this, the simple development of referral protocols does not warrant quality informa-

Ciência & Saúde Coletiva, 25(4):1389-1399, 2020

tion, since professionals' adherence to these protocols is usually low[28]. Regulatory actions must be implemented to ensure that the full potential of PHC is used before referral. Health systems and care networks are quite diverse in size, structure, and financing. Brazil has continental dimensions, and specialized care is provided in one or a few larger cities in each state. This leads to frequent and long trips to face-to-face appointments, and difficult communication between doctors performing PHC (whether Family and Community Doctors or not) and specialists. This creates an opportunity to integrate telehealth and regulation actions while optimizing PHC's resoluteness.

In the early days of TelessaúdeRS teleconsultations, we observed that they could avoid approximately 60% of referrals to specialized care. With this effect, the integration of telehealth actions with the process of regulating referrals to specialized care seemed a natural step forward[9]. Besides teleconsulting, teleregulation uses other Telehealth actions additively (telediagnosis, tele-education). TelessaúdeRS in turn uses telehealth not as a health service, but as a meta-service, which can strengthen regulated lines of union between care points[29].

Considering this context, which impacts the coordination of care through the articulation of telehealth actions for the remote regulation of care, we developed a work method that can achieve two simultaneous objectives: (1) assisting the regulation processes of specialized visits from the inland to the state capital; (2) increasing the effectiveness and access in PHC through the use of teleregulation. In this work, we present the method developed in the RegulaSUS project and the results achieved by TelessaúdeRS - UFRGS.

A brief characterization of the State of Rio Grande do Sul

The State of Rio Grande do Sul is located in the extreme south of Brazil and has an estimated population of 11.4 million inhabitants distributed over 497 municipalities and 281.7 thousand km^2. It borders with Santa Catarina, another Brazilian state, Argentina, and Uruguay, besides the Atlantic Ocean. The state's latest Human Development Index (HDI) is 0.746. It had 2,701 public health establishments and 3,004 private health establishments in 2009. Agriculture and industry are the leading economies of the state.

Methods

The RegulaSUS Project and teleregulation actions originated in 2012 with a pilot project and through an approximation between academia and public management, culminating in 2014 with an agreement between the State Health Secretariat of Rio Grande do Sul and TelessaúdeRS.

Development of protocols

We had to develop referral protocols as an initial step to achieve the objectives. The set of clinical information required for referral must be succinct, objective, and limited to what is necessary for decision-making. In the search for a method for developing PHC referral protocols for specialized care, we elaborated a seven-step process for creating (or adapting) local protocols, as shown below:

1. Identifying a specialty or procedure that has a pent-up demand (measured by long waiting times) and that the reasons for referral can be handled in the PHC. As a pilot to develop this strategy, we opted to address the endocrinology queue, which had a waiting list of more than eight thousand people and waiting time longer than one year;

2. Assessing demand within the chosen waiting list. We selected a sample of 5% of the queue, stratified by month, to overcome any seasonal event. Then we evaluated the subjective information of each referencing. The available International Disease Code was not used because it is unreliable;

3. Selecting the most common referral conditions for that specialty/procedure. These conditions should cover 80-85% of all referrals;

4. Reviewing the clinical protocols and available scientific evidence on the clinical management of the selected conditions. References include PHC textbooks, guidelines, and medical decision-support tools. We took special care to exhaust PHC references and considered the contributions of specialized care in the management of the selected conditions/diseases;

5. Defining for each protocol the situations that should and should not be referred for specialized evaluation, thus creating the triggers for referring PHC to specialized care. In our method, each protocol was built by a Family and Community Doctor and reviewed by two other general practitioners (Family and Community Doctors or

Internists). Finally, the protocols were discussed with specialists linked to a university hospital;

6. Determining which situations show the highest risk and, therefore, should have priority access, considering the best interest of the patient. In situations of prolonged waiting times, these conditions should have low prevalence (they should not represent more than 10% of the demand for the specialty). In our initial sample, type 1 Diabetes Mellitus, hyperthyroidism, and high suspicion of thyroid cancer were considered priorities for face-to-face evaluation with an endocrinologist;

7. Establishing the minimum information to be provided by PHC doctors. This information must be clinical history and physical examination data and complementary tests available at the PHC. Therefore, this information should be sufficient to establish the diagnosis or clinical suspicion and guide the regulator's next steps (as defined by the protocol). These data must be objective, limited to five to eight parameters per health condition (Box 1).

Following this process, we developed protocols for each health condition. For example, five parameters are questioned for hyperthyroidism: signs and symptoms, TSH level, T4 level, use of antithyroid drugs, and use of other medications. Age and gender data are already provided automatically by the regulation system. This information allows the regulating physician to infer whether the patient does indeed have hyperthyroidism, whether he is symptomatic and whether he is already being treated. An important task in creating the protocol is to remove any questions that are not essential to the regulatory process. Swift protocols are more friendly and convenient, essential characteristics for PHC practice.

Implementation and integration with telehealth actions

After they were developed, the protocols were approved by the State Health Secretariat of Rio Grande do Sul. All requests for specialized care appointments are analyzed by regulators (physicians) (Figure 1). Despite protocols, PHC physicians perform the referrals without a specific structure (free text). Using the protocols, regulators could authorize referral (when the information was sufficient), request new information for the PHC provider, or indicate a telephone teleconsultation with a TelessaúdeRS-UFRGS physician (teleconsultants), as well as resort to other telehealth actions. The teleconsultants are Family and Community Doctors or specialists who work on the 0800 toll-free channel of TelessaúdeRS, acting directly or interconsulting. Teleconsulting was not compulsory, but the information should be informed by phone or by the electronic referral system. Teleconsultants are supported by a group of monitors who perform the identification of the caller. A sample of the discussions is audited. The flow of Figure 1, primarily modeled in BPMN (Business Process Model and Notation)[30] for this work, as well as the flows of teleconsulting, telediagnosis, and 0800 toll-free channel were registered at the National Institute of Industrial Production.

Data analysis

We evaluated the method's effectiveness in identifying the main reasons for referral (step 2). Thus, in endocrinology, we evaluated the percentage of each reason selected in the initial sample with the reasons for referral identified from November 2013 to May 2016.

We used the database of the computerized referral system to analyze the effects of the work process developed and implemented. We included the referrals of the queues monitored by RegulaSUS for at least one year until the system became inactive, and was replaced by a new system in June 2016. We performed a retrospective analysis of the following variables with this database: 1) queue size and; 2) waiting time (median) of unscheduled referrals at each point in time (we employed the onset of the application of the protocols as "zero time" and observed the situation of the queue 90, 60 and 30 days before, until 30, 60, 90, 180 and 360 days after); 3) the number of appointments in the 30 days before each moment in time and; 4) waiting time (median) until this appointment. The results were analyzed as an aggregate (total and categorized into clinical and surgical specialties) and divided by specialties.

Moreover, we sought data on the use of the teleconsultation platform and assessed the effects of RegulaSUS teleconsultations on the general use of the 0800 channel teleconsulting service (teleconsultations unrelated to regulation).

Results

Implementation and accuracy of protocols

The referral protocols were implemented throughout 2015 to regulate the entire queue of

Box 1. Step by step for the development and adaptation of protocols used by the RegulaSUS Project, TelessaúdeRS-UFRGS, 2019.

1. Identify specialties with pent-up demand and reasons for referral sensitive to primary health care;
2. Sample the pent-up demand;
3. Establish the most frequent reasons for referral;
4. Review the literature corresponding to the frequent reasons;
5. Define, for each referral reason, which clinical situations warrant specialized care;
6. Determine the priority clinical situations for specialized care;
7. Establish the minimum set of information necessary for referral.

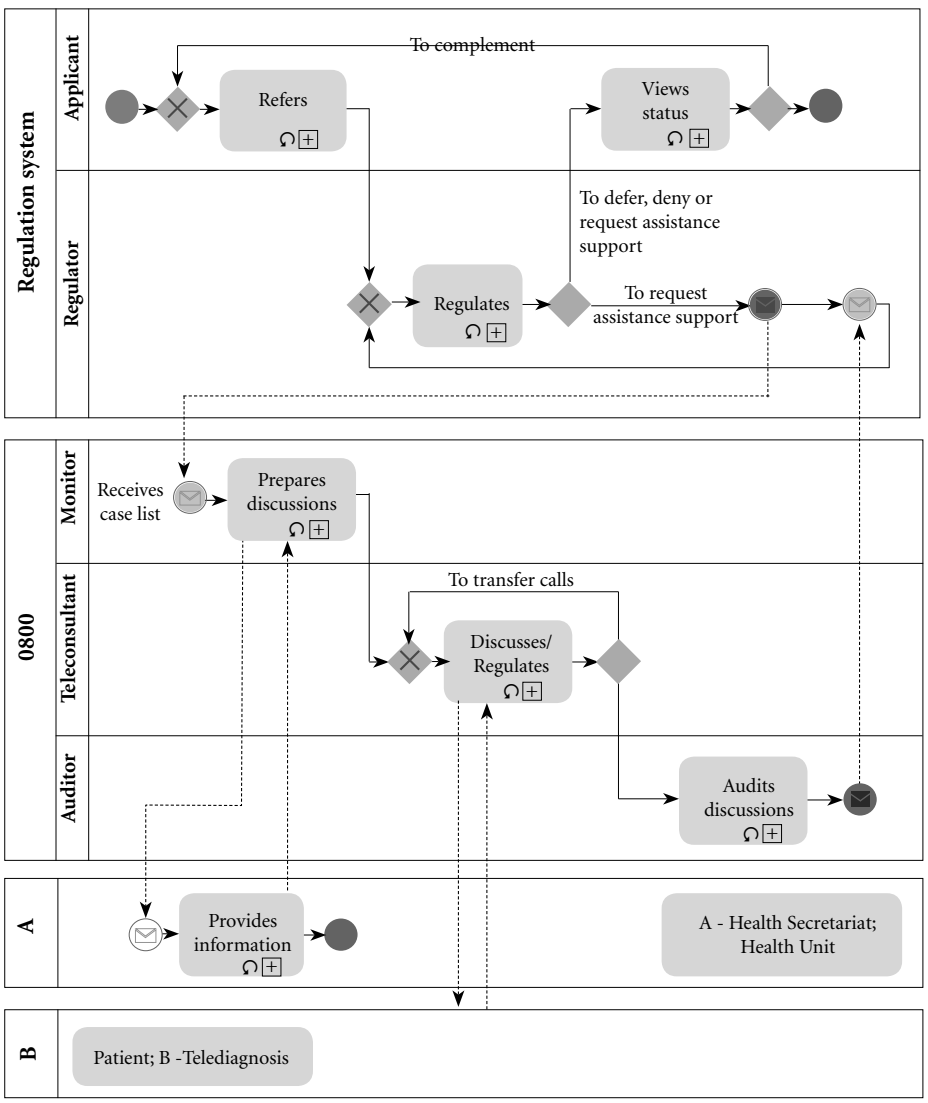


Figure 1. Modeling the flow of request for telehealth actions to support the State Ambulatory Regulation Center. TelessaúdeRS-UFRGS, Porto Alegre, 2015.

selected specialties. The following queues were included in the RegulaSUS, thus, in this analysis, as per the following chronology: endocrinology (01/01/15); nephrology (01/01/15); pulmonology (19/02/2015); urology (19/02/15); neurosurgery (15/05/15); neurology (15/05/15); thoracic surgery (15/06/15); rheumatology (15/06/15).

Regarding endocrinology protocols, six health conditions were selected in the initial sample of endocrinology referrals. More than nine thousand referrals for this specialty were regulated after the development of the protocols. Sampling predicted the most common referral conditions in the complete sample (Table 1).

Effects on the queue

The implementation of the protocols integrated with the teleregulation process is associated, from a chronological viewpoint, with a general reduction of approximately 30% (37,435 to 26,172) of the queue volume for specialized visit. This effect seems to be more intense from 180-360 days from the onset of the intervention and in the clinical specialties (Table 2).

Regarding waiting times for appointments, we observed that the median waiting time for scheduling clinical specialties under intervention was reduced by 66 days (from 234 to 168). On the other hand, the trend was opposite in surgical specialties, with an increased median waiting time (from 219 to 376). These effects were concomitant to a 27% reduction in the supply of scheduled appointments (clinical and surgical).

Another relevant finding is the median waiting time for cases that are in the queue at each moment in time (Graph 1). In this case, the median time increased for clinical specialties (from 328 to 361) and decreased for surgical specialties (from 302 to 261), contrary to the trends of the times for appointments.

Effect on teleconsultations

With increased discussions related to wait-listed patients, stimulated by exposure to RegulaSUS, an increase of 860% is observed in the number of teleconsultations unrelated to regulation from Jan/14 to Jun/16 (Graph 2). An inflection is observed in the number of teleconsultants in Feb/16. This finding has no clear explanation in our data but is potentially attributable to a month with fewer working days.

Table 1. Proportion of selected health conditions sampled and identified in the population. TelessaúdeRS-UFRGS, Porto Alegre, 2019.

Health condition	Sample	Population
Diabetes Mellitus	30%	20.3%
Thyroid nodules	26%	34.6%*
Hypothyroidism	20%	15.0%
Hyperthyroidism	6%	7.0%
Goiter	6%	34.6%*
Obesity	5%	6.8%
Others (non-protocol conditions)	7%	16.3%
Total	100%	100.0%

* Goiter and nodule conditions were aggregated in the final analysis of the data.

Discussion

The telehealth actions coordinated by RegulaSUS reduced waiting lines of the studied medical specialties, mainly the clinical ones. The effects were greater from 180 days of the onset of the operation in the lists. Besides these results, the encouragement of teleconsultations qualifies care, expands the PHC's resolving capacity and access to specialized care in the PHC itself. This also allows for more rational use of the already reduced supply of appointments available in the State. This increase in teleconsultations induced by the RegulaSUS is corroborated by a previous study that found a mean number of 6.52 teleconsultations for professionals who use only the 0800 toll-free channel to teleconsultations unrelated to regulation, and 10.03 among those exposed to the RegulaSUS[31].

The impact in reducing the queues and the waiting time for appointments achieved in clinical specialties reflects the potential of non-presential care support actions such as teleconsulting and telediagnosis on conditions sensitive to telehealth. Even in adverse situations it seems effective, as shown in our study with the reduction of more 1/4 of the supply of specialized visits. The role developed by teleregulation in this project was to explore alternatives to specialized in-person appointments for cases with low technological density demands. This same aspect may explain the increase in waiting time in surgical specialties (Table 2). The dilated time in surgical specialties denotes an insufficient supply that deteriorates over the months. Despite the lower impact of the intervention in these specialties,

Table 2. Number of people on the waiting list for unscheduled referrals, median waiting time for an appointment, and the number of appointments in the previous 30 days, clinical and surgical specialties. TelessaúdeRS-UFRGS, Porto Alegre, 2019.

		Moment in time (0 = onset of intervention)									
		-90	**-60**	**-30**	**0**	**30**	**60**	**90**	**180**	**360**	**Δ 360-0**
Clinical	People on the waiting list	24,734	25,078	25,020	24,691	24,214	23,327	22,763	19,705	14,988	-9,703
	Time for appointment*	341	320	209	234	272	319	346	183	168	-66
	Scheduled appointments	975	863	933	864	877	873	852	827	627	-237
Surgical	People on the waiting list	12,618	12,864	12,770	12,744	12,738	12,848	12,690	11,962	11,184	-1,560
	Time for appointment*	139	127	166	219	239	254	403	328	376	157
	Scheduled appointments	556	389	442	514	461	399	507	401	380	-134
Total	People on the waiting list	37,352	37,942	37,790	37,435	36,952	36,175	35,453	31,667	26,172	-11,263
	Time for appointment*	267	260	196	229	261	298	367	231	246	17
	Scheduled appointments	1,531	1,252	1,375	1,378	1,338	1,272	1,359	1,228	1,007	-371

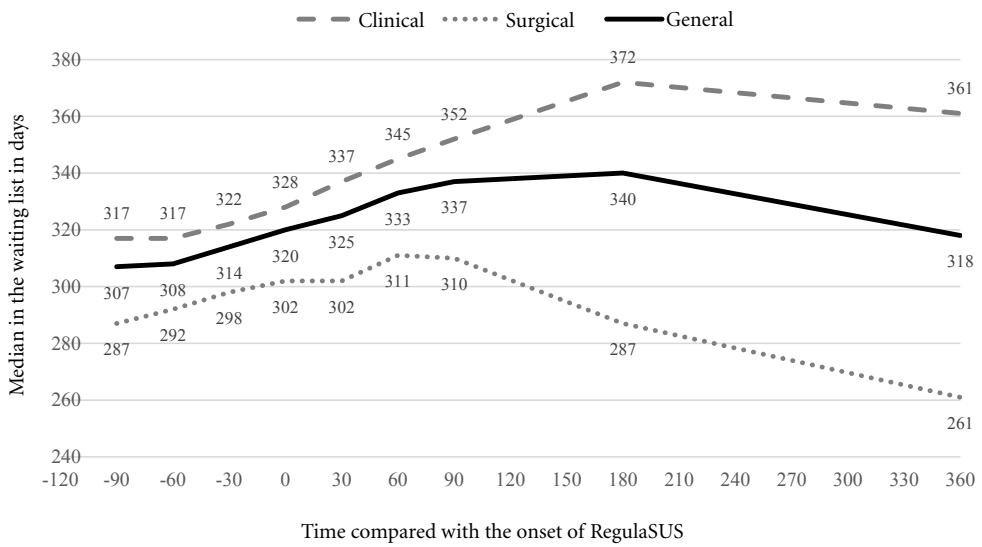
* Median in days.

the role of teleregulation, application of protocols, and discussion of cases may have mitigated even more significant trends in restricting access to specialized care. Also, it ensured that many legacy cases in the queue were qualified for scheduling. As a consequence, we observed lower waiting time of the cases that remain in the queue in the surgical specialties (Graph 1).

An essential aspect of innovation found in this study is the development of simplified referral protocols covering the most frequent referral reasons. In general, broad and complex protocols and guidelines are suggested as the gold standard[32,33]. However, the use, usability and satisfaction of professionals with such protocols are associated with easy use and incorporation into electronic appointment systems[25,34-36]. The leading role of PHC physicians in making such materials was essential, contributing to their greater knowledge about the limitations of the scope of clinical practice at this level of care, and understanding PHC's gatekeeping function in the health system. The review by specialists and regulators was equally essential to attach relevant aspects to the protocols and validate them with the practice in the real world.

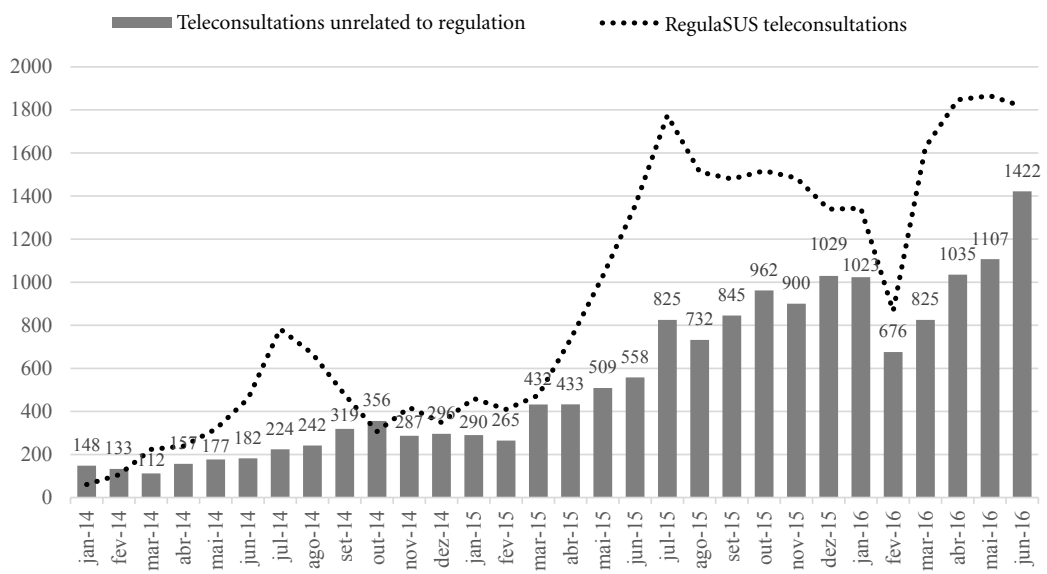
It is unequivocal that health systems must expand their resolution capacity with alternative solutions to traditional care, especially in times of financial crises and austerity. Economic pressure, both due to increased demand and the incorporation of new technologies, requires creative solutions aimed at optimizing access, quality and cost. Telehealth actions can mitigate the problem of the iron triangle of health[37,38]. In this sense, more than mere drawer documents, simplified, objective and official referral protocols can establish clear and transparent roles of the different levels of care within the health system. They protect against the totally autonomous clinical practice, that is harmful in the context of limited resources. This approach, while simple, has very few and specific precedents in Brazil. Electronic consultations, as a strategy to increase access to specialized care in PHC, have been adopted in different parts of the world and for different medical specialties[39]. While most of these initiatives explore asynchronous formats, the model developed in RegulaSUS explores synchronous telephone interaction, often performed in the presence of the patient himself, which can optimize the number of meetings with the patient and immediate care.

The main limitations found in this study is the quasi-experiment design, with a descriptive



Graph 1. Waiting time for a specialized visit.

Note: Median number of days in the waiting list for requests from the inland state of RS for a face-to-face visit in the capital in specialties under the intervention of the RegulaSUS. Time "Zero" is the onset of intervention.
Source: TelessaúdeRS-UFRGS and AGHOS system, Porto Alegre, 2019.



Graph 2. Teleconsultations unrelated to regulation and RegulaSUS teleconsultations in Rio Grande do Sul.

Note: Number of teleconsultations performed at the TelessaúdeRS-UFRGS service in the January 2014-June 2016 period.
Source: TelessaúdeRS-UFRGS, Porto Alegre, 2019.

character of the actions and results, without control for potential confounding biases. Our data derives from a secondary base and is subject to problems of completing and retrieving information. The access measures evaluated – leaving the queue due to exposure to the RegulaSUS and waiting times for scheduling visits – are aggregated and indirect, not considering the outcomes at the individual level. Likewise, no causal inference can be made for the growth of teleconsultations associated with the evolution of teleregulation.

Finally, we understand that medical autonomy in processes such as referrals should be replaced by regulatory strategies based on coordination of care by PHC (gatekeeping), preferably through telehealth actions, ensuring referral to the right specialist, at the right time and in the right place[40]. These actions have a potential role in the integration of health systems, especially among low- and middle-income countries, acting as a meta-service[29] and building efficient, qualified, and equitable networks.

Collaborations

N Katz carried out the conception of the study; data collection and interpretation, literature review, and writing of the initial version of the manuscript. DV Rados and R Roman participated in the data collection, design, analysis and interpretation, literature review, and final version of the manuscript. EB Oliveira participated in the data collection, analysis and interpretation, and critical review. CAA Schmitz, MR Gonçalves, SS Mengue and RN Umpierre participated in the data analysis and interpretation, and critical review. All authors participated in the writing (initial and final stages) and approved the final version of the manuscript.

Acknowledgments

We would like to thank the collaboration of Alfredo Montelongo Flores for the heuristics applied to the database of the regulation system that allowed the reconstruction of the queue at different points in time.

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Article submitted 02/10/2019
Approved 23/10/2019
Final version submitted 25/10/2019