



## WORKFLOWS IN COMPLEX SYSTEMS: AN ANALYSIS OF OUTPATIENT STATE MEDICAL REGULATION

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### Abstract

The health system faces challenges in providing adequate care to the population, and it is essential to consider organizational models that guarantee universal and efficient access. Typically, systems can be fragmented, characterized by a lack of communication between levels of care, or based on health care networks (RAS), which integrate services in an articulated manner. RAS promote continuous and integrated care for patients, facilitating access to different levels of care.

Regulating care is essential to coordinate the provision of services and guaranteeing adequate access to users. However, there are challenges related to communication between the various information systems used in the different stages of regulation, which can result in delays and failures in care.

In the Brazilian context, regulation occurs at different levels - municipal, regional, state and national - and involves communication between various bodies to ensure the adequate provision of services throughout the country. However, problems such as the lack of communication between information systems and the limited capacity to provide services can create bottlenecks and impact the quality of care provided.

Interventions to improve the regulatory system include improving information technology tools, training health professionals involved, and coordination between different spheres of the health system. These measures aim to reduce delays, improve system efficiency, and ensure more effective care for users of the Unified Health System (SUS).

**Keywords:** regulation of care; cognitive ergonomics; work process; public health.

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## 1. INTRODUCTION

Health care systems are programs aimed at meeting the needs and demands of the population in a given time, operating according to the health situation of users, and must be universal, equitable, comprehensive, effective and efficient, articulating with the desired results. (JATOBÁ *et al.*, 2019).

According to the National Council of Health Secretaries (2015) and the School of Public Health of the State of Minas Gerais (2011), the most commonly found typologies worldwide are fragmented systems and Health Care Network (RAS) systems.

Fragmented systems are based on the assumption of an organizational model of isolated points, which refers to the location of the components of the structure being in uncoordinated locations, resulting in a hierarchical system and with incommunicability between the different levels of care - thus impairing the efficiency of health care, the provision of continuous care to the user and access to secondary and tertiary levels. (JATOBÁ *et al.*, 2019; MENDES, 2011).

On the other hand, the operability of the RAS is structured through a set of points articulated with each other that together form the network. In the logic of this model, the patient is able to obtain continuous and integrated care, access to different outpatient levels, and effectiveness in the internal organization of the network, such as resource allocation, clinical coordination, among others (JATOBÁ *et al.*, 2019; MENDES, 2011). Outpatient procedures are: emergency and urgent care, outpatient health care and services, outpatient services, and clinic visits.

According to Ordinance No. 4,279, of December 30, 2010 (BRASIL, 2010a), the components of the RAS include: communication center, points of care, support systems, logistics systems, transportation system and governance systems.

To manage the availability of information in the HCN, aiming at the continuity of care, there are three types of coordination: information coordination, clinical management coordination, and administrative or organizational coordination. The coordination of information encompasses the communication between the different services and levels of care for the user. Clinical management coordination refers to the "[...]coherence of care, accessibility between levels, and adequate user monitoring" (ÁVILA, 2022). Administrative, or organizational, coordination refers to administrative activities to promote accessibility between the primary, secondary, and tertiary levels. (MENDES *et al.*, 2021)



With the intention of ordering and coordinating the different points of the RAS system, Primary Health Care (PHC) has become the communication link of the various components. (BRAZIL, 2010)

Conceptually, according to the Department of Health, ([n.d.]), PHC can be defined as a "[...] the set of individual, family and collective health actions that involve promotion, prevention, protection, diagnosis, treatment, rehabilitation, harm reduction, palliative care and health surveillance [...]" that, articulating with the practices of a multidisciplinary group of professionals in the area and the integration with vertical services, assume the responsibility for the care of a certain group of individuals.

Its structure is based on seven premises, attention in first contact, longitudinality, comprehensiveness, care coordination, family orientation and community focus, and on three functions, resolution, organization and accountability. (BRASIL, 2010b; SHIMAZAKI, 2009)

In Brazil, the expansion of PHC occurred in 1994, as a result of the formation of the Family Health Program with the National Primary Care Policy, based on the model of the Family Health Strategy in 2006 (JATOBA *et al.*, 2019).

This event resulted in a significant growth in the demand for health services, which began to serve about 80% to 90% of the population. Consequently, care in secondary and tertiary care also suffered an increase in requests for care.

To organize and rationalize the demand for services at the aforementioned levels of care, the National Regulation Policy emerged, instituted by Ordinance No. 1,559, of August 1, 2008, which focuses on strengthening the process of regionalization, hierarchization and integration of health actions and services (BRASIL, 2008).

According to Ordinance No. 1,559 (BRASIL, 2008), there are three dimensions that permeate regulation:

I Regulation of Health Systems: its object is the municipal, state and national health systems, and its respective public managers are subjects, defining from the principles and guidelines of the SUS, macro-guidelines for the Regulation of Health Care and executing monitoring, control, evaluation, audit and surveillance actions of these systems;

II - Regulation of Health Care: exercised by the State and Municipal Health Secretariats, according to the agreement established in the Term of Commitment to Management of the Pact for Health; its objective is to ensure the adequate provision of services to the population and its object is the production of direct and final health care actions, being, therefore, directed to public and private providers, and as subjects their respective public managers, defining strategies and macro-guidelines for the Regulation of Access to Care and Control of Health Care.



also called Care Regulation and control of the supply of services performing actions of monitoring, control, evaluation, auditing and surveillance of health care and assistance within the scope of the SUS; and

III - Regulation of Access to Care: also called regulation of access or care regulation, its objects are the organization, control, management and prioritization of access and care flows within the scope of the SUS, and its respective public managers are subjects, being established by the regulatory complex and its operational units and this dimension covers medical regulation, exercising health authority to guarantee access based on protocols, risk classification and other prioritization criteria.

Although all dimensions of regulation are important for the efficient use of the RAS, the regulation of access to care stands out because it does not require the user to prioritize and direct the patient appropriately at the right time, in which these actions are operated by local regulatory complexes.

According to Brasil (2010b), the regulatory complex "consists of an organization of the set of actions of the Regulation of Access to Care, in an articulated and integrated manner, seeking to adapt the supply of health services to the demand that is closest to the real health needs".

Taking this into account, the implementation of emergency regulation centers, hospital admission, consultations and outpatient exams of medium and high complexity seeks precisely to manage beds, schedule specialized consultations and therapeutic diagnostic support service. (BRAZIL, 2006)

However, when analyzing the Brazilian health system, it is legitimate to admit that with the attenuating advent of the demand for care and low resources made available by the State, regulatory physicians and nurses have faced a hostile work environment on a daily basis, generated by bottlenecks in outpatient regulation procedures, pressures to make appointments, attention to filling out forms and a large workload.

In this sense, the article aims to identify the bottlenecks in the process of medical regulation of outpatient care in a given state of the Brazilian Federation. In this context, the work sought to identify and conduct a preliminary analysis of the different flows that make up this process, focusing on the support of information technology (IT) tools to these flows, in addition to analyzing the cognitive aspects of the regulatory agents.



## 2. METHODOLOGY AND DEVELOPMENT

The study was formulated from an exploratory qualitative design, with a view to identifying, describing and analyzing the main workflows related to the process of regulation of vacancies in outpatient procedures. The Methodology was divided into four stages, described below.

The first stage was to review the scientific and technical literature in the field of public health regulation, with the objective of understanding the dynamics of work within regulation centers and regulatory complexes, through public, technical-scientific and institutional documents that describe aspects of the regulation of access to care.

The second stage involved the collection of primary data through semi-structured interviews with physicians and nurses who work in the regulation centers, in which testimonies were collected regarding the operation of the regulation of care at the different levels of health care, complexity and government.

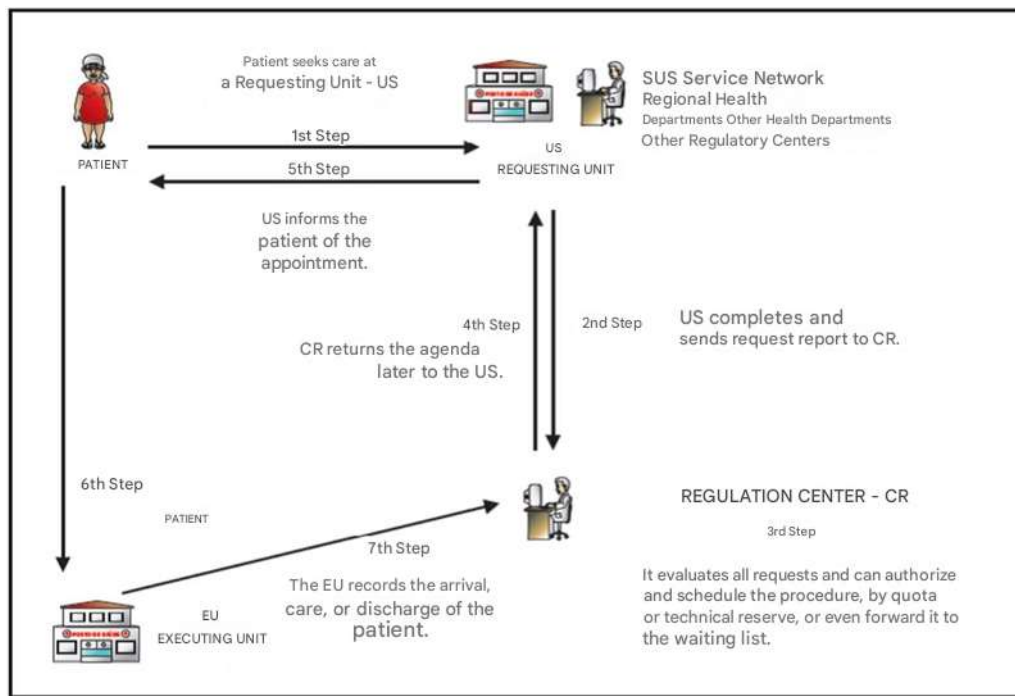
The third stage consisted of data coding based on content analysis (BARDIN, 1989).

Finally, the last step involved modeling the data through the elaboration of flow diagrams and preliminary analyses.

## 3. FINDINGS

The literature review allowed the identification of the process of regulation of outpatient care at a high level.

In this sense, the National Council of Health Secretaries (2016) presents the flow of the process in a schematized way, Figure 1, in order to illustrate the procedure adopted to regulate public health care.



**Figure 1:** Procedure flow scheme for regulating access to care. (SOURCE: NATIONAL COUNCIL OF HEALTH SECRETARIES, 2016)

The procedure for regulation is based on the assumption that the patient is referred to a requesting unit (HU) in search of outpatient care, in which during the care, the physician in charge, realizing that the user will need more robust treatment, fills out and sends a request to the regulating physician at the regulation center (CR) to carry out the following transmissions of the appointment.

The submitted document is then evaluated by the regulator, who will analyze and make the decision to authorize the appointment, deny or ask the applicant to reevaluate the request.

Assuming that the regulating physician authorizes the request, the next step is to schedule the request and notify the HU, and then notify the user of the final result of the referral request.

The user receives the notice, goes on the scheduled day and time to the performing unit and performs outpatient care. After the service, the performer notifies the CR about the arrival, the care performed and whether the patient has been discharged.

Every procedure presented proceeds through reports and software in the units involved in the scheme.

However, during the interviews, it was observed that depending on the flow between regulator, requester and offeror, there is no communication between these agents, except for



those flows that are operated via one of the IT platforms employed. In many cases, each municipality has its own IT system, the regional ones a standard software and the state one varying from one or more programs.

When the requester makes a request, the IT tool used will be the one the regulator uses.

To exemplify, assuming that the HU uses the TI Saúde program and the requester Saúde TI, for the HU to make the request, he will have to learn how to handle TI Saúde, because in it he will have to fill out the form, considering that the regulator uses this software.

Also related to IT supports, the survey identified, through the data collected, failures in communication between the different points of the RAS, starting from the absence of notification between regulator, offeror and requester to the lack of synchronization of the system with other government digital platforms to update user data.

Regarding the notices between the authors involved, it was noted that the responses to the requests, especially if they were denied, could not be passed on by the system to the appropriate responsible persons, causing long waits for the patient in line for outpatient care. On the other hand, warnings about the failure to notify users about the appointment due to unforeseen events could not be reported to the IT support, resulting in the patient's non-attendance at the service.

Another reason that causes patient absenteeism, according to the deponents, is the lack of updating of the patients' own data, which could be carried out through conciliation with other digital platforms.

Similarly, and also related to the updating of data, in this case specifically on the waiting list, another obstacle that was perceived is the lack of synchronization with digital tools for recording deaths. In cases of deaths of patients waiting in line, the removal of the patient from the waiting list needs to be carried out manually, instead of automatically.

The last problem to highlight regarding IT support is the cancellation of requests that have been pending and not resolved in a given period of time. When there is a need to pending a request, a *follow-up is generated in the system*. However, as sometimes the communication between the requester, executor and regulator is compromised by external and internal factors, the notifications end up not being passed on to the specific responsible party.

Having said that, at the present time in the state context studied, there are four levels of care regulation, which vary according to the degree of complexity, supply and demand of requests, which are: municipal, regional, state and national.





The regulation carried out at the municipal level, according to the literature, is usually of low complexity and for vacancies offered in the municipality itself. In other words, it is from institution to institution in the city itself. The regulatory complex that operates in this type of location is the Municipal Regulation Center (CMR). In addition, each municipality has its own CMR, with the exception of the capital that is managed by another regulatory complex.

The regional level is composed of regions of the state that is formed by a group of specific municipalities, in which each region has a Regional Central (CREG) that governs regulation. When a municipality does not have a certain vacancy for a certain request and another municipality in the same region has a vacancy offered, the CREG is activated to carry out communication between the cities and schedule the procedure. In addition, as the capital does not have a CMR, it is governed by the CREG to carry out the communicability between the points of the offerors and the requesters.

In some cases, cities enforce the contract. The municipality that does not have certain vacancies available for certain procedures and another municipality does, the city with a supply deficit buys the vacancies from other cities for its citizens to enjoy them.

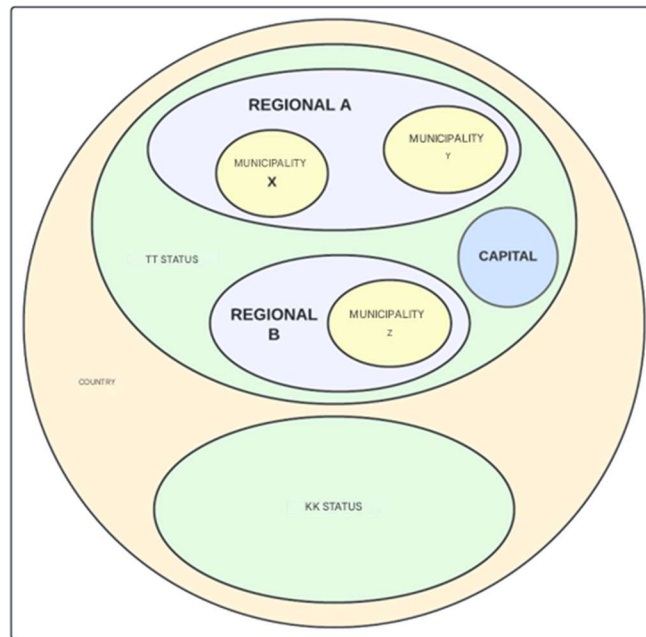
At the state level, regulation is carried out by two or more centrals, namely: High Complexity Regulation Center (CERAC), Internal Regulation to the State and, if the state decides, other centrals.

Through them, it is possible to have communicability between regions of the state to carry out regulation between them. In other words, if one region does not have a certain vacancy available and another region has an offer, the Centrals at the state level carry out the transaction between them.

Finally, at the national level, the National Center for Regulation of High Complexity (CNRAC), which regulates requests at this level. CNRAC carries out interstate communication aiming to allocate patients in from state to state with high or very high complexity.

Thus, Figure 2 seeks to exemplify in a playful way the levels of regulation currently present in Brazil.

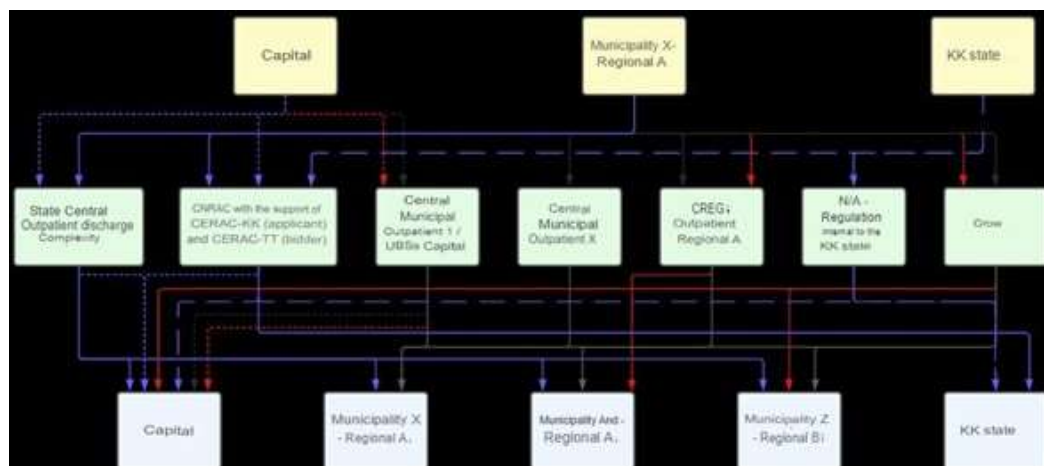




**Figure 2:** Representation of health levels.

The color orange represents national regulation. The green corresponds to the regulation referring to the State, in which the acronyms KK and TT represent the acronyms of the name of the state. The lilac color is the regions, which can be observed by the acronyms A and B, which make up the state. The yellow ones are related to the municipalities, represented by the acronyms X, Y and Z. Finally, the blue refers to the state capital.

From the transcriptions of the statements of the deponents, the elaboration of the flow diagram presented on the screen, in Figure 3, in order to compare different flows and focusing on the aspects of IT support.





**Figure 3:** Flow Diagram for Outpatient Medical Regulation in the TT state.

#### 4. DISCUSSION

The first point to highlight is in relation to the technological supports for carrying out the regulation procedures. In this regard, the results indicate a scenario capable of generating obstacles in several of the mapped flows, due to the lack of standardization of technical support at the municipal, regional and state levels, in addition to the lack of synchronization with other digital platforms for updating user data and waiting list for registered deaths, harming the agents who operate, the patient and generating bottlenecks.

As the programs are often different between requesters, regulators and performers, HU professionals will need time to adapt and learn about new IT tools, as well as conditions for training new professionals hired by HUs who will operate the request for outpatient procedures.

The potential impacts of the aspects raised regarding gaps in support by IT tools are: accumulation of functions during the regulation operation, mistakes in filling in patient data, cognitive work overload and difficulty in decision-making.

From the observation of Figure 3, it can be seen that there is a great demand for highly complex procedures. Thus, it is possible that there may be bottlenecks at this level of complexity that would act as obstacles to the performance of outpatient care.

Another point to note is the high demand for requests from municipalities for different levels of complexity, as well as the fact that vacancies located in the capital are eventually required by all requesting municipalities. This requirement, referring to the capital, is the result of it having the largest number of offers for different procedures. However, although the number of vacancies per performing units is high, the demand for requests exceeds it for many of the procedures, generating waiting lines.

In summary, the bottlenecks generated by the high demand for regulatory procedures, mistakes in user forms, gaps in adequate IT support and in aspects of work organization, can impact both the quality of the regulation operation and the problem-solving capacity of care for patients using the SUS.



## 5. CONCLUSIONS

This study carried out a preliminary analysis of the workflows carried out from a macro-process of regulation of outpatient care at the state level.

Throughout this study, it was perceived that there are several aspects with the capacity to generate potential obstacles in relation to the flows of regulation of access to care.

The main difficulties identified in the regulation system were the lack of communication between the various support software, the alignment of the navigation workflow of these software to the regulation process and the organization of work between offering agents. Such problems end up being precursors of bottlenecks, delays in outpatient care and an environment less conducive to the resolution of certain requests.

With the intention of contributing to solving the aforementioned obstacles, the preliminary results obtained indicate opportunities for interventions in the regulation system, such as the functionalities of the software used, the number of regulatory physicians, as well as the training of health professionals who work in the units requesting and performing outpatient procedures.

From interventions in the IT tools used, it is also relevant to formulate training for the regulation teams of the regulatory complexes at the municipal, regional and state levels regarding the updates made available to the use of software, in addition to a study on impacts on public health policies that are related to the regulation of access to outpatient care.

Regarding IT tools specifically, the results showed the need for interface mechanisms that allow communication between systems, enabling the migration of data between systems, thus reducing errors in filling out user forms, and rework, thus avoiding delays in the performance of procedures, reducing absenteeism and contributing to improving the problem-solving capacity of care.

It is also important to note that, for bottleneck procedures with typically lower supply than demand, strategies that articulate the municipal and state spheres to increase the number of vacancies in certain municipalities and regions can have a significant impact on reducing waiting lists, contributing to achieving the principles of the SUS.

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