REVISTA Ação Ergonômica

R. Ação Ergon., 17(2), 2023.
ISSN 2965-7318. doi: 10.4322/rae.v17n2.e202310.en

MANAGEMENT OF VARIABILITY IN TEST REQUESTS: THE WORK OF RECEPTIONISTS AT THE CLINICAL ANALYSIS LABORATORY OF A PUBLIC UNIVERSITY HOSPITAL

Yan Santos Rodrigues[1]*

Anna Sophia Piacenza Moraes[2]

Renato Luvizoto[3]

Daniel Braatz[4]

Abstract

Hospital work involves managing several variables that arise due to what is at the center of such contexts: the sick human being undergoing treatment. This study was developed in the clinical analysis laboratory of a public university hospital. It was based on a complaint from the workers themselves about delays and rework in the processing of tests. The main objective was to broaden the understanding of the work of the receptionists in such laboratory. To this end, the Ergonomic Work Analysis method was used. The main elements of the task and activity were highlighted. Numerous variables present in the processing of laboratory tests were identified, as well as several strategies developed by the receptionists to manage these variables. It was observed that these strategies are important mainly with regard to communication between the various professionals involved in the processing of tests. Finally, the important role of receptionists in managing the variables that arise, such as the clinical condition of the patient, the types of tests requested and the urgency of the procedure, is highlighted.

Keywords: Ergonomic Work Analysis; Activity Ergonomics; operating strategies; hospital work.

1. INTRODUCTION

Work in hospital contexts involves several variabilities. Martin and Gadbois (2007) cite that the working conditions in a hospital constitute for the ergonomist a particular field of problems due to what is at the center of such contexts: the sick human being. In this sense, the association of some treatment process can also be highlighted. In other words, it is expected that changes in the health status of patients will be present. Thus, the development of activities in hospital contexts depends on the collection and treatment of complex and constantly changing information (MARTIN, GADBOIS, 2007).

[1]Universidade Federal do Triângulo Mineiro.* yansantos00@outlook.com.
[2]Universidade Federal Fluminense.
[3]Universidade Federal de São Carlos.
[4]Universidade Federal de São Carlos.

In the context of a supervised internship, the main author of this study followed the routine of the workers of the clinical analysis laboratory of a public university hospital. Recurring complaints from workers about the occurrence of delays and rework in the processing of exams were observed. From then on, an analysis process was initiated aiming at a better understanding of such issues.

Guérin et al. (2001, p. 85) mention that conducting the analysis process in ergonomics is a construction that, based on demand, is elaborated and takes shape throughout the course of the ergonomic action. Thus, based on the preliminary analysis of the workers' complaints, the work carried out at the reception of the laboratory was outlined as the object of study.

The analysis was supported by the theoretical foundations of Activity Ergonomics. As a starting point, the conceptual distinction between task - prescribed work - and activity - real work is highlighted. Antipoff and Soares (2021, p. 365) interpret as a task the prescriptions or even the objective proposed by the organization for the workers. Regarding the concept of activity, the authors, in reference to Dejours (2002, p. 43), explain that:

> To achieve the proposed objective with the available means and under the given conditions, the worker develops an activity, which is the way in which he or she, in a work situation, relates to the proposed objectives, to the organization of work, to the means provided, and to the real (ANTIPOFF, SOARES, 2021).

For Nascimento and Rocha (2021, p. 414), activity is the product of a continuous process of interaction between the subject and the environment.

The concept of operative strategies is also relevant for the development of the analysis. In the context discussed by Gemma et al. (2021), understanding strategies and operating modes helps to detect situations that can lead to errors, failures, and accidents at work. Operative strategies are logical steps used to solve problems, while operative modes are actions tailored to the demands of the task and the individual's abilities, crucial to promoting safety and success in the workplace (GEMMA et al., 2021).

Thus, the general objective of this study was to broaden the understanding of the work of receptionists in the clinical analysis laboratory in the processing of laboratory tests. Among the specific objectives, the following are mentioned: (i) to identify the variabilities present in the processing of laboratory tests, specifically in the arrival and registration of test requests; (ii) to present some of the strategies developed by the receptionists to deal with the variabilities identified.

2. DEVELOPMENT

As mentioned, the present study originated in the context of a supervised internship, carried out between November 2021 and April 2022, in a public university hospital.

Taking as a starting point the complaints of the workers of the clinical analysis laboratory regarding delays and rework in the processing of exams, the Ergonomic Analysis of Work (AET) was used, a method systematized by Guérin et al. (2001). Data collection was conducted using techniques and tools recommended by the method, such as direct observation of the receptionists' work activity and the collection of verbalizations.

For the analysis of the tasks, documents made available by the organization, such as Operational Procedures, as well as materials available on the hospital's website, were consulted. Minutes of previous sectoral meetings were also examined, seeking to identify recurring topics that signaled possible causes previously identified for the problems in question.

Regarding the results of the analysis, the main variables taken into account by the receptionists in the processing of the exams were identified. Using process mapping techniques, 6 characteristic groups were formed from the main actions and decisions taken by these professionals. APPENDIX A presents a flowchart prepared with the aim of representing the receipt and registration of test requests at the laboratory reception for each of the identified groups.

3. FINDINGS

The university hospital where the present study was developed offers health care services through the Unified Health System (SUS), with a focus on high and medium complexity. It has 296 fully functioning inpatient beds and serves 27 municipalities in the interior of the state of Minas Gerais, covering a population of approximately 633,191 inhabitants.

To meet the monthly demand of approximately 65,000 exams, the hospital has a clinical analysis laboratory operating on an on-call basis 24 hours a day, every day of the week. The laboratory has the capacity to perform about 250 different types of laboratory tests and clinical tests, which contribute significantly to medical reasoning, diagnosis and confirmation of pathologies.

The tests are carried out from biological samples such as blood, urine, cavitary fluids, sweat, secretions, among others. The diversity of available tests is also accompanied by a wide

range of time for the generation of clinical results: the tests can present results in short periods, of approximately 90 seconds, to longer periods, of up to 7 days, depending on the exam.

3.1. The processing of laboratory tests in the hospital context

In a simplified way, the processing of the exams begins with the issuance of the request for laboratory tests (PE), made exclusively by the doctor in charge. The NP contains essential information such as the patient's name, bed, medical record number, care unit, other tests requested, time for sample collection and tests, in addition to other relevant clinical information. The NP is issued using the Hospital Information System (HIS), the hospital's main management system, providing the management of the flow and storage of information of routine hospital services.

Once the PE is issued, it is forwarded, via system or physically, to the laboratory in order to be processed. The beginning of such processing takes place with the reception and registration of the NP, tasks of the laboratory receptionist. To this end, the laboratory management computer system, here called the Laboratory Information System (LIS), is used.

It is important to highlight a central aspect for understanding the work involved in the processing of the tests: both systems, HIS and LIS, do not work in an integrated way, that is, the data from the HIS need to be transcribed and entered into the LIS for the tests to be processed by the laboratory.

After registration, the LIS generates identification labels that must be attached to the PE (label identifying the patient - ID_P) as well as to the corresponding biological samples (label identifying the sample - ID_A). Labels offer traceability for both samples and PEs.

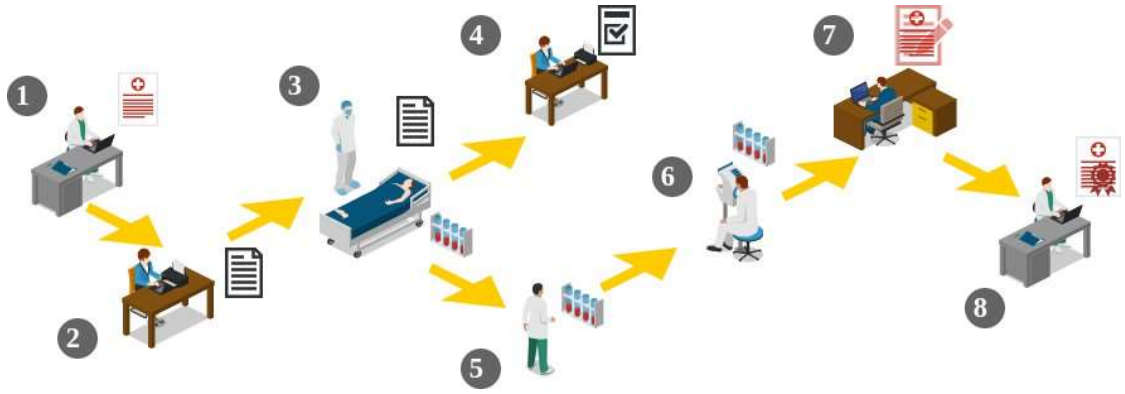
Biological samples from patients must be labeled, transported and delivered to the separation sector of the laboratory, which is the responsibility of the collectors. Subsequently, the samples are sent for testing and the PE are retained at the laboratory reception for proper "discharge"[1] at the LIS.

After obtaining the results of the exams, a technical report is issued that undergoes review in the release sector. The final report is then made available in the HIS for the physician.

Figure 1 illustrates the simplification of exam processing described above.

[1] The write-off is configured as a mechanism for recording the execution of the PE, signaling the delivery of biological samples to the clinical analysis laboratory.

Figure 1 – Simplification of exam processing



Legend: 1 Doctor generates the order; 2 Receptionist receives and registers the order; 3 Collector collects samples; 4 Receptionist "writes" off the order with collection performed; 5 Separation sector performs sorting; 6 Clinical tests are conducted; 7 Clearance sector issues report; 8 Physician receives report.
Source: Created on Icograms by the author, 2022

3.2. The work of the receptionists of the clinical analysis laboratory

3.2.1. The organization of work

As mentioned, the clinical analysis laboratory operates on an uninterrupted basis. Several professionals work directly and indirectly in the processing of exams, organized into positions such as receptionists, technicians, managers, among others.

The laboratory's reception operates on shift shifts starting at 7:00 am and ending at 7:00 pm. During the day shifts, a receptionist occupies the post, while in the night shifts, a period characterized by a low demand for exams, the laboratory technicians assume the same tasks.

During the present study, the work at the reception was performed by two receptionists[2], one with 3 years of experience and the other with 5 years of experience in the same function. The two receptionists alternated in shifts of 12 for 36 hours.

3.2.2. The tasks of receptionists: registration of exams and customer service

The set of prescriptions and Standard Operating Procedures (SOP) provided by the hospital organization for the work of receptionists mainly cites two tasks: the registration of exams and the service to the public. Guidelines also describe some procedures to be followed, as illustrated in Chart 1.

[2] That is why it was decided to use, in this text, the designation of the position exclusively in the female.

All tests performed in the laboratory must be registered in the LIS, a task performed exclusively at the laboratory's reception. The main procedures describe: the need to verify new NPs in the HIS, register them in the LIS, make identification labels and deliver them to the person responsible for collecting the samples.

Regarding customer service, receptionists are responsible for guiding doctors in viewing the results of the tests processed by the laboratory and answering the phone in an agile way.

Chart 1 – Tasks and procedures of the receptionists of the clinical analysis laboratory[3]

Task	Procedures
Registration of exams	Receptionists must check the release of new exam requests at all times in the HIS.
	Register all requests for exams during the current on-call period. At the same time, make the identification tags.
	Deliver the labels to those responsible for the collection for the labeling of the bottles, and the labels can be made prior to the collection of the material.
	The service to the bell signal must be carried out simultaneously by the reception and the technical area. The reception should not come into contact with any biological material.
	The reception will proceed to the immediate registration of the exams, generating the necessary labels, and the laboratory technician will receive the biological sample, verifying that it is "in agreement" to carry out the requested exams.
	Write off the requests for exams performed.
Phone Support | Customer service	Instruct physicians to view the results with "Released" status in the LIS adopted by the Institution.
	The phone should be answered as soon as possible, avoiding possible future complaints, but the more exams are in "Released" status, the lower the chances of communicating exams by phone.

Source: Adapted from the hospital's website, 2022

[3] Some of the terms found on the hospital's website and in the SOPs were adapted according to the engineering literature of the work, in order to facilitate understanding.

3.2.3. The activity of receptionists: the management of variabilities

The analysis of the activity evidenced the existence of several variables inherent to the processing of the NP at the laboratory reception. It was possible to identify different treatments according to the type of patient, the scheduling or not for sample collection, the level of urgency of the tests, among others.

As mentioned, the main actions and decisions taken by the receptionists were mapped, as well as the main variables involved. The flowchart in APPENDIX A visually represents the 6 groups[4] identified and below it is described how the NP is received and registered at the reception for each group.

3.2.3.1. Receipt of test requests

The receipt of the NP at the reception marks the beginning of the receptionist's participation in the processing of laboratory tests. The first relevant information considered for the proper referral of the NP is whether the patient is hospitalized or not.

For hospitalized patients[5] (Groups 1, 2, 4, 5 and 6), the prescribed is as follows: once a new NP is identified in the HIS, the receptionist prints it. Then, it transcribes the information contained in the NP and registers in the LIS. However, in the case of exams requested from patients in emergency care, the NP is printed in the sector where the patient is and the delivery of the NP at the reception takes place in person (Group 3). In this case, only the transcription and registration of the NP in the LIS is done.

It was observed that while the face-to-face delivery complies with the regime of individual arrivals and by batches, the entry in the HIS occurs punctually, but with greater concentration in the morning since most of the exams require compliance with minimum fasting.

3.2.3.2. GROUP 1 – Requests for tests for routine clinical

Group 1 is mostly formed by the set of low-urgency exams intended for the follow-up and evolution of hospitalized patients. The processing of the NP of this group is among the first activities of the receptionists' workday. Once the EP that is accumulated during the night shift is registered, the receptionists update the HIS during the day, in order to verify the launch of new EPs.

[4] In it, the EP was determined as the focus object. The creation of the EP in HIS was established as the starting point and the "write-off" of the document in LIS as the end point.

[5] Hospitalized patients are understood to be those who are allocated to a hospital bed.

However, the exams of this group may or may not have a scheduled time for sample collection. It was observed that the receptionists separate the NPs according to scheduling or not. The use of organizing boxes and a board is highlighted, shown in Figure 2. While the EPs without an appointment are placed in the organizer box located on the left (Figure 2-1), the EPs with an appointment are pasted on the scheduled collection board (Figure 2-3). The PEs separated into the boxes and on the board by the receptionists accumulate until they are collected by the laboratory collection team. In other words, these are operative strategies collectively developed by the laboratory team to assist the organization of the NP in the reception, the visualization of the NP in processing, as well as the communication between the receptionists and the collectors.

Figure 2 – Organizer boxes and scheduled collection board

Legend: 1 Organizer box for PE without collection scheduling; 2 Organizing box for test orders in which the collection of biological samples is not carried out by the laboratory team; 3 Scheduled collection table.

Source: From the author, 2022

After collecting the NP at the reception, the collectors collect samples from the patients. Subsequently, they return the EP to the receptionists and deliver the samples to the separation sector of the laboratory.

3.2.3.3. GROUP 2 – Requests for tests in which the collection of biological samples is not carried out by the laboratory team

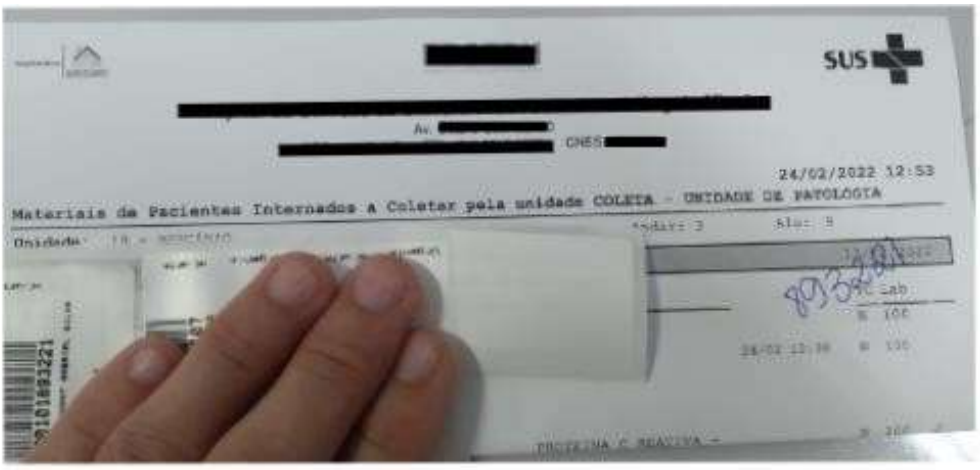
The start of processing a Group 2 PE is similar to Group 1. However, some of the actions taken for the processing of Group 2 NPs differ in that they involve hospital professionals who are not part of the laboratory team. Generally, these are exams for patients hospitalized in units with access restrictions.

Once the NP is registered in the LIS, it is placed by the receptionist in the specific organizing box (Figure 2-2), located to the right of the organizing box intended for requests from the clinical routine without an appointment. The EPs are collected at the laboratory reception by professionals from the unit where the patient is hospitalized. The collection of biological samples and their delivery are also the responsibility of the team in the sector where the patient is hospitalized.

An example of Group 2 is the Nursery NP. The receptionists reported that, usually, between 8:00 a.m. and 8:30 a.m., a technician from the Nursery is sent to the laboratory to collect the NP released by the physicians in the sector. Thus, after the registration of the Group 1 NPs issued during the night shift, the registration of the NPs coming from the Nursery is prioritized.

However, a variability was observed to be considered in the processing of the NP from the Nursery: the identification label is ID_P pasted on a control notebook instead of being attached to the NP. In this case, the receptionists manually write down the barcode number of the ID_P on the printed PE, as shown in Figure 3.

Figure 3 – Requests for Nursery exams



Legend: Identification number of the ID_P written in pen in the request for exams.

Source: From the author, 2022

3.2.3.4. GROUP 3 – Requests for exams for patients in emergency care

As mentioned, the NPs that characterize Group 3 are printed at the emergency care unit where the patient is and delivered to the reception in person. In this case, the laboratory collectors collect the EP in the emergency room, collect the biological samples and go to the

reception for delivery. As soon as they arrive at the reception, the receptionists transcribe and register the EP in the LIS and issue the identification tags. The identification labels of the ID_A sample are given to the collectors and the PEs, identified with the ID_P are retained at the laboratory's reception.

It was observed that when the collectors arrive at the laboratory reception with the NP and the samples, if there is a queue for service at the reception, they are instructed by the receptionists to wait until the queue is empty. It is, therefore, another strategy of receptionists to manage their tasks.

3.2.3.5. GROUP 4 – Requests for high urgency tests

The processing of high-urgency EPs, classified as Group 4, can be understood as an "expressway" format. It is intended for blood gas and hematimetry tests, performed on venous blood samples. These tests, which can be performed in about 2 minutes, are commonly important for taking urgent clinical measures.

The NPs in this group are identified by the receptionists based on their knowledge about the hospital's care units, as well as informal clinical knowledge acquired through their experience, as reported in the following excerpt from the interview with one of the receptionists:

> "we pull here [at HIS] from minute to minute and see what we are going to ask for, so we go out doing it mainly from the adult ICU [...] There are doctors who arrive in a hurry for the result of the blood gas analysis, because it determines whether the patient will be intubated or not."

Therefore, as soon as an EP that fits into this group is identified in HIS, the receptionists promptly print it, register it in LIS and generate the identification labels.

A fundamental strategy was observed to monitor the processing of the tests in this group: the receptionists paste the identification labels of the ID_A sample in the corner of the computer monitor itself, keeping them always in view. As soon as the professional in charge arrives at the laboratory reception with the sample collected, the receptionist promptly hands over the identification label ID_A and the identified sample is sent to the separation sector.

3.2.3.6. GROUP 5 – Requests for tests in which registration is dependent on the arrival of biological samples

This group includes tests performed on urine and feces samples, that is, samples in which the collection depends on the patient's ability to provide them. Therefore, the processing of the EP of this group by the laboratory occurs at uncertain times.

That way, as soon as they identify a new PE in HIS, the receptionists print the PE and put it on hold. Only when the sample arrives at the laboratory does the receptionist transcribe and register the NP in the LIS and generate the identification labels. Again, the ID_A is delivered to be glued to the container with the sample and the ID_P is glued to the printed PE.

3.2.3.7. GROUP 6 – Arrival of samples for orders that were not posted in HIS

Group 6 is characterized by the arrival of biological samples at the laboratory's reception, but which, however, did not have the PE released in the HIS. Despite the triviality, it is observed that the decisions and actions taken by the receptionists for the processing of the NP in this group are carried out in a dynamic work context.

In these cases, receptionists must make a quick discernment and reading of the situation. From this reading, acquired with the work experience and skills obtained, receptionists are prepared to adopt different operating modes for each of the situations.

4. DISCUSSION

The development of activities in hospital contexts depends on the collection and treatment of complex and constantly changing information (MARTIN, GADBOIS, 2007).

It was possible to observe, through the monitoring of the work routines of the receptionists of the clinical analysis laboratory, that the processing of test requests is done differently due to the information on the patients' health status, but also to several other variables inherent to the process, as well as to the conditions of the work. The list of tests performed in the laboratory, the variation in the time required to process certain types of tests, in addition to external factors such as urgency, the unpredictability of arrivals, as well as the patient's ability to provide samples, are variables considered for a correct and agile processing of the NP. Receptionists manage these variabilities, guiding their actions and decisions from the arrival of test requests, through registration in the LIS, to their "cancellation".

The strategies developed allow the collection and transport of biological samples to happen with greater agility. Organizer boxes and boards facilitate the organization of information and help receptionists communicate with other hospital professionals. Still on the strategies, one can also exemplify the simple action of folding the sheet of paper of the test request and stapling the leaflet with the identification labels. This cooperation strategy considers the need for collectors to view information regarding the location of hospitalized patients.

Regarding the complaints of delays and rework, the starting point of the analysis, it was possible to associate them with the way in which the flow of information within the hospital takes place. The deficiencies present in the flow of information become evident in the reception of the laboratory, because during the registration of requests, problems arise due to the variabilities inherent to hospital work. This raises an alert about the working conditions and the expected results of the work of receptionists, as well as the role of these workers in the transmission of information of a fundamental nature for the care provided to patients. Martin and Gadbois (2007, p. 524) point out that paper-tools are the product of an elaboration based on general professional practices and local options. In this sense, the discussion is opened to the way in which the LIS is used in the hospital analyzed and, consequently, the effectiveness of the available information tools, whether manual or computerized.

In view of the way in which the processing of test requests takes place, it is possible to infer that receptionists also have the secondary role of monitoring the performance of tests by the laboratory. It was possible to observe, in the context of this study, that the receptionists act as the front line of the meeting between various hospital professionals (nurses, stretcher bearers, residents, etc.) and the internal laboratory team, such as technicians and biomedical professionals. Occasions were observed when receptionists were asked to inform whether or not there was a delivery of biological samples, for example. That is, aware of the environment around them, receptionists indirectly monitor the care of patients in the hospital.

5. FINAL CONSIDERATIONS

The present study, developed in the context of a supervised internship, focused on the work performed by receptionists at the clinical analysis laboratory of a public university hospital. Complaints regarding delays and rework in the processing of tests by the clinical analysis laboratory constituted the starting point. The analysis was conducted using the method

of Ergonomic Analysis of Work and supported by the theoretical concepts of Ergonomics of Activity.

The identification of variabilities during the arrival and registration of test requests showed the differences between the task and the activity and allowed for a broader understanding of the work performed by the laboratory receptionists. The strategies developed to manage these variabilities support the processing of exams and optimize communication with several other professionals in the hospital.

The present study revealed that the work of the receptionists of the clinical analysis laboratory involves much more than the registration of test requests, at first glance necessary due to the simple fact that the two information systems, the hospital and the laboratory, are not integrated: it involves the management of several variables. It can be mentioned that it includes the understanding and evaluation of specific situations, their proper referrals, and indirectly, the monitoring of the health status of patients undergoing treatment.

REFERENCES

ANTIPOFF, R.; SOARES, R. Cognição e trabalho. *In*: BRAATZ, D. *et al*. **ENGENHARIA DO TRABALHO**: Saúde, Segurança, Ergonomia e Projeto. Campinas: Ex Libris Comunicação, 2021. cap. 15, p. 363-384. ISBN 978-65-994611-0-1. Disponível em: <http://engenhariadotrabalho.com.br/wp-content/uploads/2021/11/EngenhariaDoTrabalho_1Ed_v20211027.pdf> Acesso em: 13 dez. 2022.

DEJOURS, C. **O fator humano.** 3ª ed. Rio de Janeiro: FGV, 2002.

GEMMA, S.; ABRAHÃO, R.; LIMA, F.; TERESO, M.. Abordagem ergonômica centrada no trabalho real. *In*: BRAATZ, D. *et al*. **ENGENHARIA DO TRABALHO:** Saúde, Segurança, Ergonomia e Projeto. Campinas: Ex Libris Comunicação, 2021. cap. 14, p. 343-362. ISBN 978-65-994611-0-1. Disponível em: <http://engenhariadotrabalho.com.br/wp-content/uploads/2021/11/EngenhariaDoTrabalho_1Ed_v20211027.pdf> Acesso em: 13 dez. 2022.

GUÉRIN, F. et al. **Compreender o trabalho para transformá-lo: a prática da ergonomia**. São Paulo: Edgard Blucher, 2001. E-book. ISBN 9788521214885. Disponível em: <https://integrada.minhabiblioteca.com.br/#/books/9788521214885/. Acesso em: 13 dez. 2022>

MARTIN, C.; GADBOIS, C. A ergonomia no hospital. *In*: FALZON, Pierre. **Ergonomia**. 1. ed. [*S. l.*]: Editora Blucher, 2007. cap. 36, p. 519-533. ISBN 9788521213475.

NASCIMENTO, A.; ROCHA, R. Análise do trabalho em ergonomia: modelos, métodos e ferramentas. *In*: BRAATZ, D. *et al*. **ENGENHARIA DO TRABALHO:** Saúde, Segurança,

Ergonomia e Projeto. Campinas: Ex Libris Comunicação, 2021. cap. 17, p. 411-436. ISBN 978-65-994611-0-1. Disponível em: <http://engenhariadotrabalho.com.br/wp-content/uploads/2021/11/EngenhariaDoTrabalho_1Ed_v20211027.pdf>Acesso em: 13 dez. 2022.

APPENDIX A - Flowchart for receiving and registering test requests