Software Requirement Specification (SRS)

Cover

SRS for TTPS Covid System

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Purpose

The purpose of this document is to gather all the requirements, assumptions and restrictions in order to design and implement a hospital management system to record and monitor the evolution of patients with COVID-19 from the moment they arrive at the hospital, until they are ready to be discharged.

Therefore this document serves as the unambiguous guide for the developers, and for any user who wants to understand the foundations of the software system.

In order to achieve this, we will include in the present document the definition of roles and responsibilities for each person and subsystem involved in the process, the definition of the status flow to record the evolution of each patient, and a guide on how to manage the resources available at the hospital.

Index

LEL Glossary (Language Extended Lexicon)

Table with Symbols and descriptions

Category	Notion	Impact
Subject	Who is it?	What does he do?
Doctor	Medical Doctor	• Register patients when they arrive to the hospital • Receive alerts from their assigned patients • Document patients evolution
Chief Medical Officer	Manager of a particular system	• Register patients when they arrive to the hospital • Receive alerts from their assigned patients • Document patients evolution • Assign doctors to patients in the system they manage
Manager	Someone with absolute control over the application	• Register basic entities of the hospital • Modify clinic stories in the first 72 hours since they were created • Set an infinite number of beds for the ER
Rule Administrator	Someone who can only administer rules	• Activate o deactivate rules • Modify rule's parameters
Object	What is it?	What actions does it receive?
Patient	A sick person that is checked into the hospital to get better	• Be checked in the hospital and be put in a bed • Get their progress check by a doctor, to see if their condition is improving • Be moved around systems

		depending on how badly or well their illness is ● Be dismissed from the hospital when their illness is cured
System	Different systems of the hospital where patients are hospitalized	● Hospitalize a patient in one of the system's wards as long as it has enough beds
Ward	A space with beds where patients reside while hospitalized	● Receive patients to put into the ward's beds
Bed	A single patient space	● Be occupied/unoccupied by a patient
Hospitalization	Medical records of the patient since the beginning of its treatment in the hospital until the patient is discharged, or passes away	● Get multiple illness developments added to it ● Terminate it when the patient gets better
Evolution	Patient's development while they're hospitalized	● Be updated by the doctor that created it 72 hours after creation
System rule	Automatized rule that controls that a patient hasn't entered a critical state	● Be modified by the rule administrator
Verb	What goal does it pursue?	How is the goal achieved?
ID 1 Login into the system	Allow a user to authenticate itself, so it can access all the available functionalities of its role	● The user enters its username and password ● Those values are authenticated against the database ● If the credentials are valid, then the user is granted access to the system

ID 2 Move patient to ER	Receive a patient in the ER system, and assign it to a bed	● A doctor from another system checks the availability of beds in the target system ● If there are available beds, it performs the action of moving the patient to the receiving system ● The system records the movement liberates the resources in the previous system, and allocates a bed for the patient in the new system
ID 3 Move patient to ICU	Receive a patient in the ICU system, and assign it to a bed	● A doctor from another system checks the availability of beds in the target system ● If there are available beds, it performs the action of moving the patient to the receiving system ● The system records the movement liberates the resources in the previous system, and allocates a bed for the patient in the new system
ID 4 Move patient to Covid Floor	Receive a patient in the Covid Floor system, and assign it to a bed	● A doctor from another system checks the availability of beds in the target system ● If there are available beds, it performs the action of moving the patient to the receiving system ● The system records the movement liberates the resources in the previous system, and allocates a bed for the patient in the new system

ID 5 Move patient ro residence	Receive a patient in the Residence system, and assign it to a bed	● A doctor from another system checks the availability of beds in the target system ● If there are available beds, it performs the action of moving the patient to the receiving system ● The system records the movement liberates the resources in the previous system, and allocates a bed for the patient in the new system another system
ID 6 Move patient to Hotel	Receive a patient in the Hotel system, and assign it to a bed	● A doctor from another system checks the availability of beds in the target system ● If there are available beds, it performs the action of moving the patient to the receiving system ● The system records the movement liberates the resources in the previous system, and allocates a bed for the patient in the new system
ID 7 Log out of the system	End the active session	● The user that has an active session performs the action of logging out from the system ● The system destroys the session variables ● The system is available for another user (or the same one) to log in again
ID 8 Create a hospitalization for a new patient	Create a new patient in the system, and associate a new hospitalization	● A doctor enters in the system the information about a new patient ● If there are available beds in ER, the information is recorded and the patient is

		saved ● There's a new hospitalization record, for that patient
ID 9 Create a hospitalization for a previous patient	Associate a new hospitalization, to a patient	● A doctor enters in the system the national ID of a patient ● If the patient previously existed in the system, the information is retrieved ● There's a new hospitalization record, for that patient
ID 10 Create a patient evolution	Add a new evolution record to a patient hospitalization record	● A doctor enters completes all the required information for the evolution ● The system records the information ● The evolution is attached to the patient hospitalization record ● The system rules are run
ID 11 Assign doctor to a patient	Allow a doctor to create new evolutions, receive alerts, and access the medical records of that patient	● A chief medical doctor assigns a doctor to a patient ● The system records the transaction ● Now, the doctor has access to create new evolutions, receive alerts, and access the medical records of that patient
ID 12 Discharge patient	To end the patient's hospitalization	● The user retrieves the patient ● The user completes the requiered informarion and discharges the patient ● The system records the information and makes the bed the patient was using available again
ID 13 Declare death	Declare a death of a patient from any of the systems	● The user retrieves the patient ● The user completes the requiered informarion and

		declares the death the patient ● The system records the information and makes the bed the patient was using available again
ID 16 Configure oxygen saturation rule	Set a value to oxygen saturation, to evaluate after creating every new evolution	● A rule administrator sets a new value for the parameter ● The parameter is updated on the rules management system ● When the system rules are runned, the value is dynamically retrieves to compare with the patient evolution indicators
ID 17 Configure respiratory frequence rule	Set a value to respiratory, to evaluate after creating every new evolution	● A rule administrator sets a new value for the parameter ● The parameter is updated on the rules management system ● When the system rules are runned, the value is dynamically retrieves to compare with the patient evolution indicators
State	What does it represent?	What other states can it change to?
Discharged	The state of a patient when it stops being hospitalized, and is healthy again	● Discharged: The patient has been cured ● The bed and the doctors assgined to that patient are free again
Dead	The state of a patient when it stops being hospitalized, and declared dead	● Dead: The patient has passed away ● The bed and the doctors assgined to that patient are free again
System with	The state of a system when it	● Is not possible to receive

unavailable beds	has no more available beds to receive patients	new patients into this system
ER system with infinite beds	The state of a system when it's set to have infinite beds	● Is always possible to receive new patients into this system
System with available beds	The state of a system when it has available beds to receive patients	● Is possible to receive new patients into this system, as long as this state is maintained
Unseen Alert	The state of an alert when it hasn't been seen yet, by the corresponding doctor	● None, the alert stays unseen until it's seen by the corresponding doctor
Seen Alert	The state of an alert when it has been seen, by the corresponding doctor	● None, the alert stays seen
Patient hospitalized	The state of a patient when its hospitalized and occupying a bed in any of the systems	● One or more doctors are assigned to the patient, one or more bed are occupied in different systems during the while the hospitalization takes place
Doctor assigned to a patient	The state in where a doctor is assigned to a patient	● The doctor can create new evolutions for the patient, and receives all the alerts associated to that patient
Doctor assigned to a system	The state in which a doctor is assigned to a system	● The doctor can be assigned to patients in that system
Chief medical doctor assigned to a system	The state in which a chief medical doctor is assigned to a system	● The chief medical doctor can assign doctors to patients in that system
Oxygen saturation rule set to a specific value	The state in which the oxygen saturation rule has a value different than null	● This value will be evaluated when the rule is runned and this value is used to decide if an alert should be created

		for that rule
Respiratory frequence rule set to a specific value	The state in which the respiratory frequence rule has a value different than null	● This value will be evaluated when the rule is runned and this value is used to decide if an alert should be created for that rule

Context

Domain of the app

The COVID-19 virus is an infectious disease that causes mild to moderate respiratory problems and patients infected by it usually recover without requiring special treatments. However, older people and people with underlying health problems are more likely to develop a serious illness. It spreads mainly through an airborn medium and is highily contagious.

To reduce the COVID-19 number of cases, different measures have been taken by a number of countries, Argentina ordered at first to self-isolate, and it escalated to a full on mandatory isolation, also the use of face masks and the closing of non-essential services has been mandated. Even though these measures have been taken, the number of cases keep increasing.

Amidst this situation and the complications encountered by different hospitals becoming overrun with a high number of cases, this application is made to make the managing of the continuously increasing number of patients easier.

This application will offer various tools to simplify the work of doctors keeping a record of their patients' condition throughout the development of their COVID-19 cases.

Scope of the system

The system's main purpose is to manage the evolution of patients with covid-19 in a hospital, the treatment and control of patients with other unrelated illnesses it's outside of scope for this project.

Assumptions restrictions and dependencies

Regarding the technical requirements we assume that the users will have all laptop with reliable internet connection to access the system.

For testing purposes we will use fake data to comply with the legal regulations about patient confidentiality.

Regarding the purpose of this application, the useful life depends on the release of a COVID-19 vaccine, which, when released, would make the application obsolete. It can be extended to take care of other known illnesses to extend its lifetime.

Requirements

Use cases

ID 1. Title: Login to the System

Aim / postconditions: The logged in user is able to use the permitted functionalities of the system. They should see their dashboard after login in.

Preconditions: The user must have been registered in the system by an administrator.

Actors: Chief Medical Doctor or Doctor

Happy path:

A Doctor user enters a valid username and password and selects the doctor option, then they press login and gets redirected to a view of their system.

A Chief Medical Doctor enters a valid username and password and selects the medical doctor option, then they press login and get redirected to all the systems' view.

Exceptional path:

The user enters and invalid username or password.

Then when they press login, they see an error message on the screen.

The user is not able to log in because it's not registered as a user or because it has an invalid combination of password/username.

ID 2. Title: Change patient active system to ER

Aim / postconditions: The user successfully registered the patient in the new system, also if applicable the hospital resources were liberated from the original system, and were marked as occupied in the new system.

Preconditions:

- The user is authenticated and has the right privileges to change the patient to a different system (it belongs to the same system than the patient that is trying to move)
- The system that is going to receive the patient has available beds

- The patient is registered into the system

Actors: Doctor, Chief Medical Doctor

Happy path:

The authenticated user (Doctor or Chief Medical Doctor), checks the availability of beds in the target system

If there are available beds then it assigns a user to the ER system

The software system records the movement and the is now occupying a bed in the new system

Exceptional path:

The authenticated user (Doctor or Chief Medical Doctor), checks the availability of beds in the target system

If there are no availables beds on the target systems, the action cannot be performed

ID 3. Title: Change patient active system to ICU

Aim / postconditions: The user successfully registered the patient in the new system, also if applicable the hospital resources were liberated from the original system, and were marked as occupied in the new system.

Preconditions:

- The user is authenticated and has the right privileges to change the patient to a different system (it belongs to the same system than the patient that is trying to move)
- The system that is going to receive the patient has available beds
- The patient is registered into the system
- The patient comes from ER or from the Covid Floor

Actors: Doctor, Chief Medical Doctor

Happy path:

The authenticated user (Doctor or Chief Medical Doctor), checks the availability of beds in the target system

If there are available beds then it assigns a user to the target system

The software system records the movement and the patient is now occupying a bed in the new system, also the bed it was occupying on the previous system is liberated.

Exceptional path:

The authenticated user (Doctor or Chief Medical Doctor), checks the availability of beds in the target system

If the patient is currently in a system different than the ones listed on the precondition, the action cannot be performed

If there are no availables beds on the target systems, the action cannot be performed

ID 4. Title: Change patient active system to Covid Floor

Aim / postconditions: The user successfully registered the patient in the new system, also if applicable the hospital resources were liberated from the original system, and were marked as occupied in the new system.

Preconditions:

- The user is authenticated and has the right privileges to change the patient to a different system (it belongs to the same system than the patient that is trying to move)
- The system that is going to receive the patient has available beds
- The patient is registered into the system
- The patient comes from ER or from ICU
- **Actors:** Doctor, Chief Medical Doctor

Happy path:

The authenticated user (Doctor or Chief Medical Doctor), checks the availability of beds in the target system

If there are available beds then it assigns a user to the target system

The software system records the movement and the patient is now occupying a bed in the new system, also the bed it was occupying on the previous system is liberated.

Exceptional path:

The authenticated user (Doctor or Chief Medical Doctor), checks the availability of beds in the target system

If the patient is currently in a system different than the ones listed on the precondition, the action cannot be performed

If there are no availables beds on the target systems, the action cannot be performed

performed

ID 5. Title: Change patient active system to Hotel

Aim / postconditions: The user successfully registered the patient in the new system, also if applicable the hospital resources were liberated from the original system, and were marked as occupied in the new system.

Preconditions:

- The user is authenticated and has the right privileges to change the patient to a different system (it belongs to the same system than the patient that is trying to move)
- The system that is going to receive the patient has available beds
- The patient is registered into the system
- The patient comes from the Covid Floor

Actors: Doctor, Chief Medical Doctor

Happy path:

The authenticated user (Doctor or Chief Medical Doctor), checks the availability of beds in the target system

If there are available beds then it assigns a user to the target system

The software system records the movement and the patient is now occupying a bed in the new system, also the bed it was occupying on the previous system is liberated.

Exceptional path:

The authenticated user (Doctor or Chief Medical Doctor), checks the availability of beds in the target system

If the patient is currently in a system different than the ones listed on the precondition, the action cannot be performed

If there are no availables beds on the target systems, the action cannot be performed

ID 6. Title: Change patient active system to Residence

Aim / postconditions: The user successfully registered the patient in the new system, also if applicable the hospital resources were liberated from the original system, and were marked as occupied in the new system.

Preconditions:

- The user is authenticated and has the right privileges to change the patient to a different system (it belongs to the same system than the patient that is trying to move)
- The system that is going to receive the patient has available beds
- The patient is registered into the system
- The patient comes from the Covid Floor

Actors: Doctor, Chief Medical Doctor

Happy path:

The authenticated user (Doctor or Chief Medical Doctor), checks the availability of beds in the target system

If there are available beds then it assigns a user to the target system

The software system records the movement and the patient is now occupying a bed in the new system, also the bed it was occupying on the previous system is liberated.

Exceptional path:

The authenticated user (Doctor or Chief Medical Doctor), checks the availability of beds in the target system

If the patient is currently in a system different than the ones listed on the precondition, the action cannot be performed

If there are no availables beds on the target systems, the action cannot be performed

ID 7. Title: Log out of the System

Aim / postconditions: The user that is logged in to the user, ends it active session, this means that the system shouldnt allow him or anyone else to perform any action, until a new user logs in again.

Preconditions: The user has an active session

Actors: Chief Medical Doctor or Doctor

Happy path:

The user that has an active session performs the action of logging out from the system

The system destroys the session variables

The system is available for another user (or the same one) to log in again

ID 8. Start a patient hospitalization, for a new patient

Aim / postconditions: A new patient is created, it's data is recorded into the system, and it's occupying a bed in the ER system

Preconditions:

- The user is authenticated
- The patient wasn't previously in the system
- The ER system has available beds

Actors: Doctor, Chief Medical Doctor

Happy path:

The user records all the personal information, and contact information required about the patient

The information is saved into the system database, meaning a new patient is created

The patient is allocated in one of the ER beds

Exceptional path:

If the user is not authenticated, it cannot access to the create a new hospitalization functionality

If the ER system doesn't have available beds, the user cannot add a new patient, since this is the default system for a new user

If the patient already existed in the system, then its not possible to create it again (the user should follow the steps of the next user case)

ID 9. Start a patient hospitalization, for a patient that had been in the system before

Aim / postconditions: A new hospitalization is created for the patient, the patient is now into the ER system

Preconditions:

- The user is authenticated
- The patient was previously in the system
- The ER system has available beds

Actors: Doctor, Chief Medical Doctor

Happy path:

The user enters the patient National ID, to identify it on the system

The system retrieves the patient from its records

The patient is allocated in one of the ER beds, and a new hospitalization is recorded

Exceptional path:

If the user is not authenticated, it cannot access to the create a new hospitalization functionality

If the ER system doesn't have available beds, the user cannot add a new patient, since this is the default system for a new user

If the patient does not exist, then it cannot be retrieved from the system (the user should follow the steps of the previous use case)

ID 10. Create a patient evolution

Aim / postconditions: The current status of the evolution of the patient is now successfully recorded in the system and attached to the patient's medical history.

Preconditions:

The user is authenticated and has the right privileges to upload the patient evolution, meaning is a doctor assigned to that patient

The patient is registered in the system, and has an active hospitalization

Actors: Doctor, Chief Medical Doctor

Happy path:

The user retrieves the desired patient from the system

The user completes all the required information for the evolution

The evolution is saved in the system, and attached to the patient medical history, and the current hospitalization

The system rules are run

Exceptional path:

If the user is not authenticated, it cannot access to the functionality

If the patient doesn't have an active hospitalization, or doesn’t exist in the system, it cannot be retrieved

If the doctor is not assigned to the desired patient, then the patient cannot be retrieved

ID 11. Assign doctor to a patient

Aim / postconditions: A doctor is assigned to a specific patient, this means that they will receive alerts linked to that patient, has access to its medical record, and can create evolution for that patient

Preconditions:

The user is authenticated and has the right privileges to assign a doctor to a patient, meaning that the role is a Chief Medical Offices

The patient is registered in the system, and has an active hospitalization

The Chief Medical Doctor, the doctor, and the patient are in the same system

Actors: Doctor, Chief Medical Doctor

Happy path:

The Chief Medical Doctor retrieves a patient from the system

The Chief Medical Doctor selects one of the available doctors from the same system and assigns it

The doctor is assigned to that patient, therefore has access to its medical record, and can create evolution for that patient, and receives associated alerts

Exceptional path:

If the user is not authenticated, it cannot access to the functionality

If the patient doesn't have an active hospitalization, or doesn’t exist in the system, it cannot be retrieved

If the Chief Medical Officer, the doctor and the patient don't belong to the same system, the action cannot be performed

ID 12. Discharge a patient

Aim / postconditions: When the doctors consider a patient can be discharged, they proceed to record it in the system, this event is attached to the patient medical history (including all the relevant details about it) and the hospital resources the patient was using in the system are liberated.

Preconditions:

The user is authenticated and has the right privileges to discharge the patient,

The patient is registered in the system, and currently registered as an active patient in one of the system hospitals.

The Chief Medical Doctor or the doctor, and the patient are in the same system, the doctor is assigned to that patient

Actors: Doctor, Chief Medical Doctor

Happy path:

The user retrieves the patient

The user completes the requiered informarion and discharges the patient

The system records the information and makes the bed the patient was using available again

Exceptional path:

If the user is not authenticated, it cannot access to the functionality

If the patient doesn't have an active hospitalization, or doesn’t exist in the system, it cannot be retrieved

If the Chief Medical Officer, or the doctor and the patient don't belong to the same system, the action cannot be performed

If the doctor is nor assignes to the patient the action cannot be performed

ID 13. Declare death a patient

Aim / postconditions: When a patient dies, the doctors proceed to record it in the system, this event is attached to the patient medical history (including all the relevant

details about it) and the hospital resources the patient was using in the system are liberated.

Preconditions:

The user is authenticated and has the right privileges to discharge the patient,

The patient is registered in the system, and currently registered as an active patient in one of the system hospitals.

The Chief Medical Doctor or the doctor, and the patient are in the same system, the doctor is assigned to that patient

Actors: Doctor, Chief Medical Doctor

Happy path:

The user retrieves the patient

The user completes the requiered informarion and declares the death the patient

The system records the information and makes the bed the patient was using available again

Exceptional path:

If the user is not authenticated, it cannot access to the functionality

If the patient doesn't have an active hospitalization, or doesn’t exist in the system, it cannot be retrieved

If the Chief Medical Officer, or the doctor and the patient don't belong to the same system, the action cannot be performed

If the doctor is nor assignes to the patient the action cannot be performed

ID 14. Export clinic history to PDF

Aim / postconditions: The medical history is exported to a PDF document, with a functional view and can be downloaded and saved outside the system.

Preconditions:

The user is authenticated and has the right privileges to acces the medical history of the patient,

The Chief Medical Doctor or the doctor, and the patient are in the same system, the doctor is assigned to that patient.

Actors: Doctor, Chief Medical Doctor

Happy path:

The user retrieves the patient

The user downloads the medical history for the patient

Exceptional path:

If the user is not authenticated, it cannot access to the create a new hospitalization functionality

If the patient doesn't have an active hospitalization, or doesn’t exist in the system, it cannot be retrieved

If the Chief Medical Officer, or the doctor and the patient don't belong to the same system, the action cannot be performed

If the doctor is nor assignes to the patient the action cannot be performed.

ID 15. Title: Take care of a patient alert

Aim / postconditions: When a patient enters a critical status, an alert is triggered to inform all their assigned doctors, and they are notified about it at the moment.

Preconditions:

The user is authenticated and has the right privileges to acces the medical history of the patient,

The Chief Medical Doctor or the doctor, and the patient are in the same system, the doctor is assigned to that patient.

An alert was triggrered and remains unseen

Actors: Doctor, Chief Medical Doctor

Happy path:

The doctor assigned to a patient receives its alert

When the doctors sees the alert for the first time, the alert is marked as seen

Exceptional path:

If the user is not authenticated, it cannot access to see the alert

Non Functional Requirements

Find below the list of all non functional requirements, identified during the interviews with the clients.

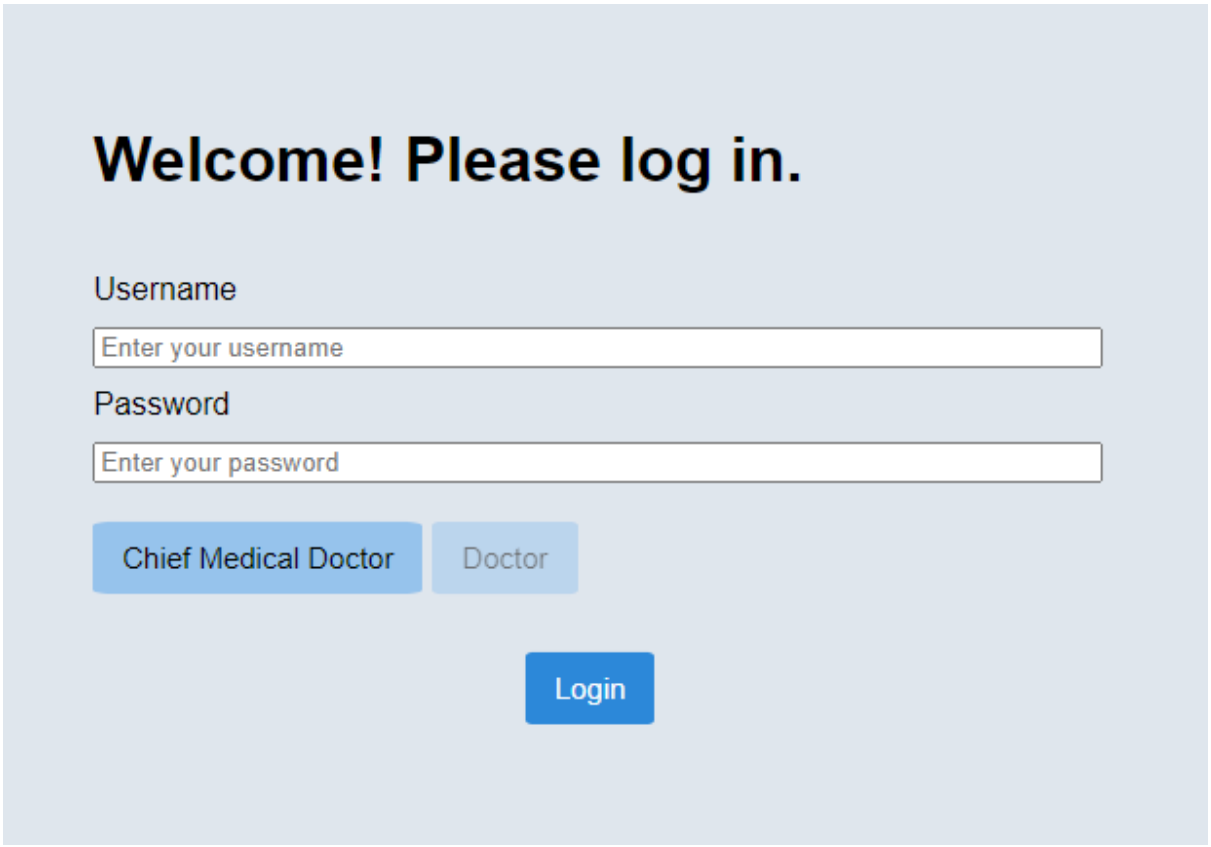
- Regarding the availability and reliability of the system: Its required to have a high availability with an SLA of 99% uptime/availability results in the following periods of allowed downtime/unavailability
    - Daily: 1m 26s
    - Weekly: 10m 4s
    - Monthly: 43m 49s
    - Quarterly: 2h 11m 29s
    - Yearly: 8h 45m 56s
- Regarding the storage capacity and confiability of the system: It's required to have a plan to do daily backups outside business hours (defined from 8:00 to 19:00 ARG Time). This includes having the backups in at least one server in a different location/datacenter than the main one
- Regarding the legal regulations of the country about medical records and confidentiality of the patients: It's required to have all sensible data encrypted through all instances of the systems. this includes the information stored in the databases and the communication between different networks.
- Regarding the usability and compatibility of the system: It's required to have a high level of compatibility with mobile devices,this includes being able to see the applications in multiple screen resolutions, and different OS systems, this includes being able to install and executes the different components of the system.

Screen Mockups

ID1. Login Mockup

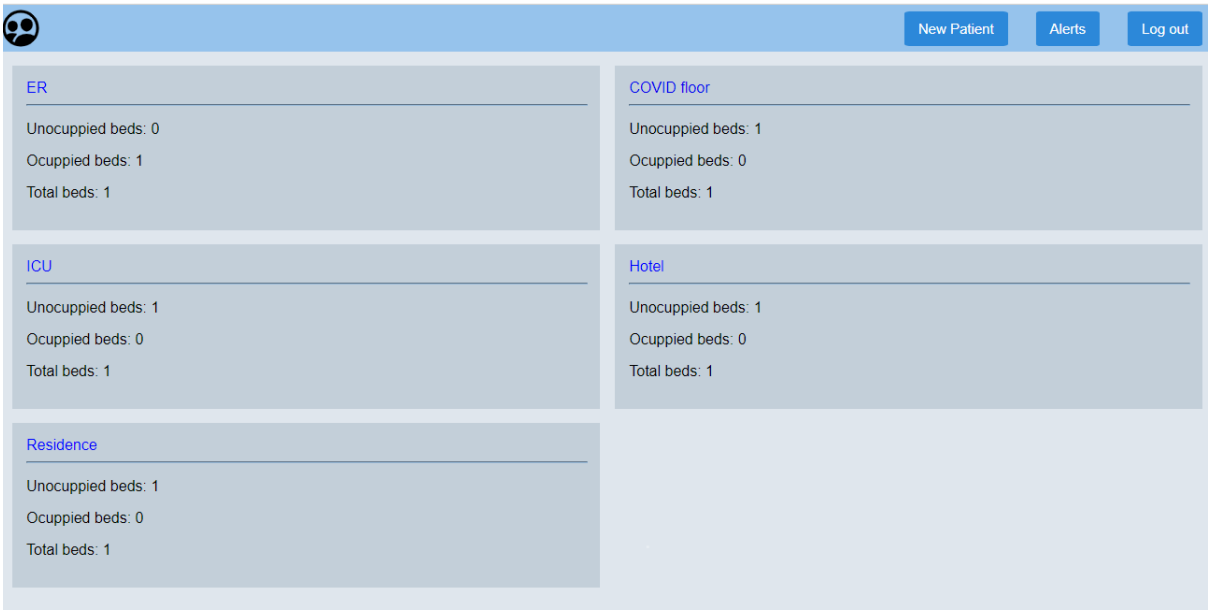
On the login screen we'll see a form with two fields, one for the username, and the other one for the password, and an option to choose the role of the user (Doctor, or Chief Medical Officer).

If the user fails when entering its credentials, then on the same screen we'll see an error message informing of the situation.



Main screen mockup, this is the first screen we'll see after login, with both roles, as chief medical officer or as doctors. This screen includes the different dashboards to monitor all the subsystems, with the details about bed occupation, and total beds.

In this mockup we can also take a look at the header, which we'll maintain along all the screens the user can see when is logged in, through this header we have the basic and main functionalities such as add a new patient, see all the alerts available for that user, and log out

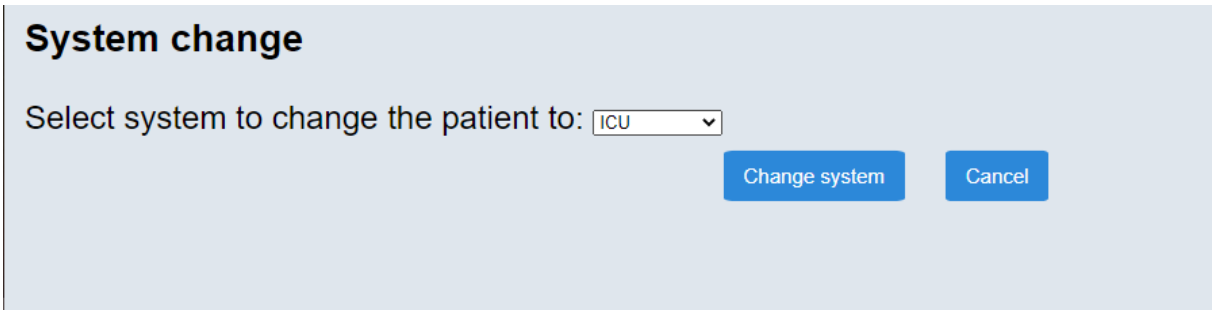


ID 2 - ID 3 - ID 4 - ID 5 - ID 6. Move a patient to a different system Screen

The following mockup represents the view when a user tries to move the a patient to a different system.

On the select the user should see all the systems with available beds in the receiving system to perform the operation, and also the system in which the patient is allowed to go according to the permitted system flow.

If there were no available beds or the patient cannot be moved directly to a system, then that system won't be available in the selection item



ID 7. Log out of the system

In this mockup we can also take a look at the header, which we'll maintain along all the screens the user can see when is logged in, through this header we have the basic and main functionalities such as add a new patient, see all the alerts available for that user, and log out.

After logging out the user is redirected to the main login screen.

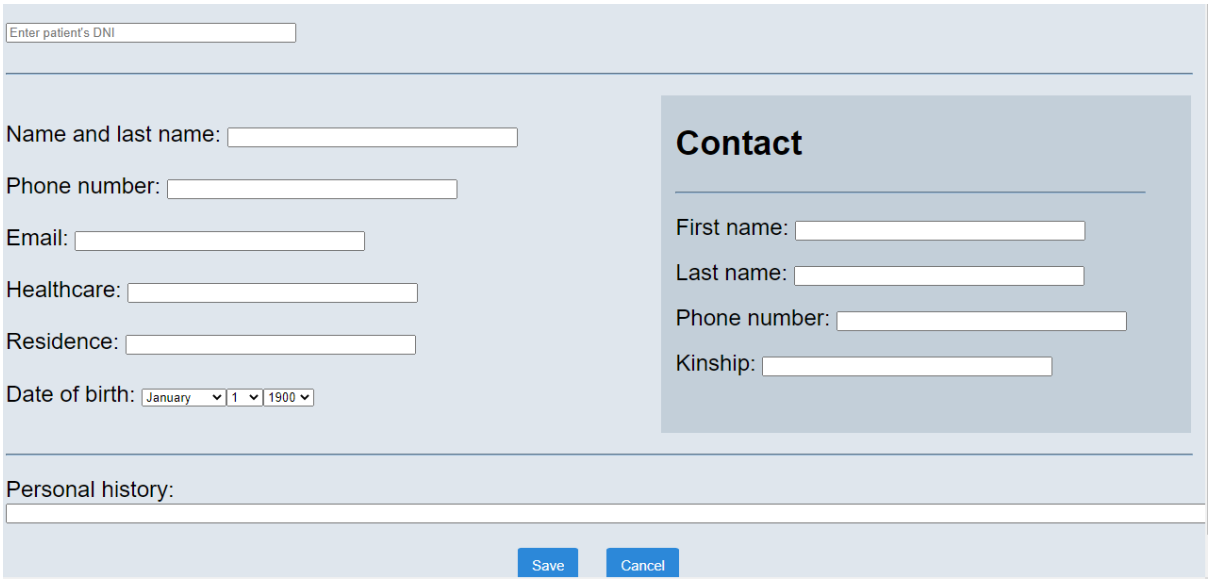
After clicking on add a new patient the user is redirected to a form to add it to the system (see ID 8)

ID 8 - ID 9. Create a new hospitalization

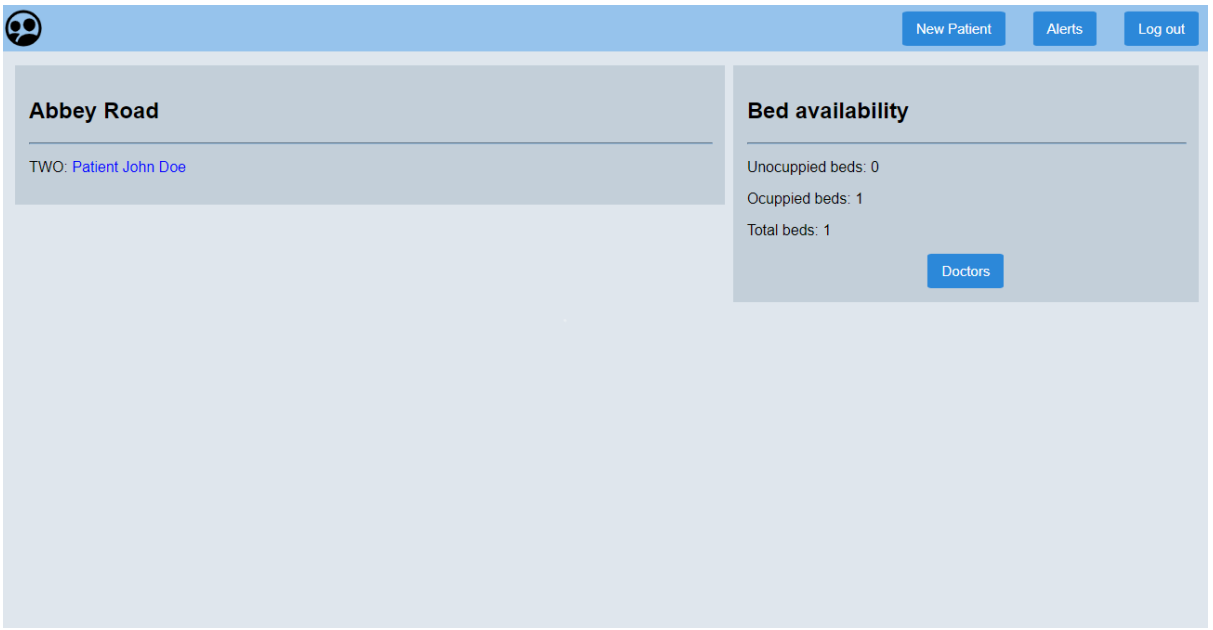
The create a new hospitalization.

In the case that the user already exists, after entering the ID the patient is automatically retrieved from the database

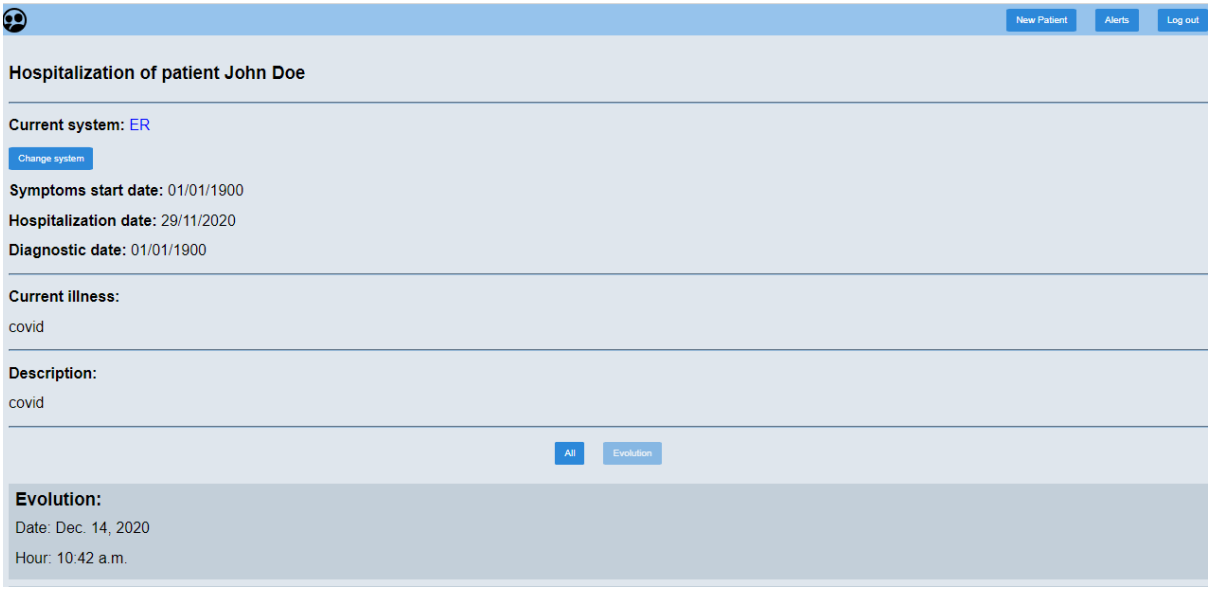
In the case the patient does not exist the user must enter all the required information in all the fields



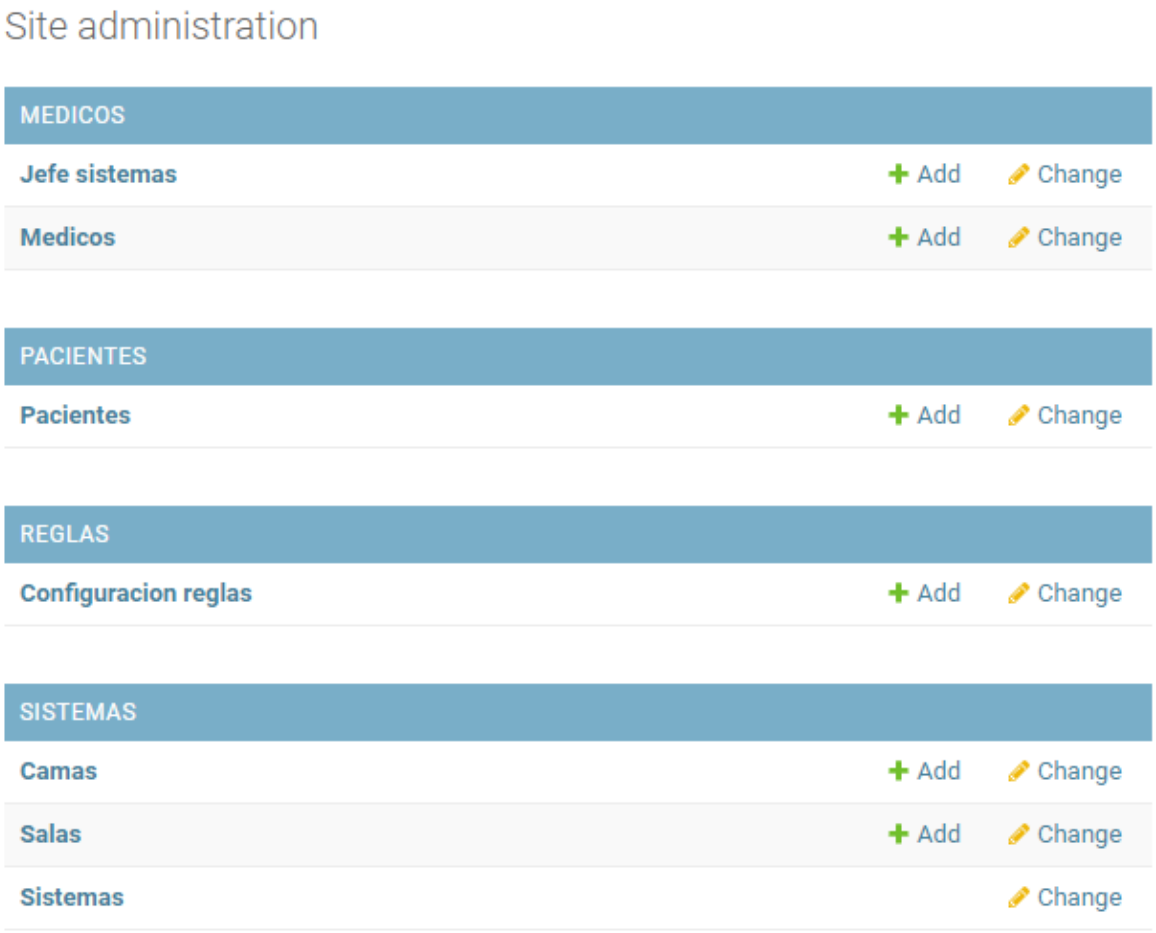
Mockup inside one of the subsystems, this is the view we have once we click inside one of the subsystem listed on the previous mockup. Again what we see it's a detail about bed availability, and the list of rooms and with it's beds and patients inside those beds



View of a patient, in this mockup we can see a patient's personal information, contact information, and a list of hospitalizations that occurred inside the hospital, and its assigned doctors. From this screen we can access to the functionalities of exporting the medical history to a .pdf document, declare death, see and add a new evolution, and unassigned doctors.



View of a patient evolution, in this mockup we can see a the medical history of a patient, if we were to scroll down we would see a list of all its associated evolution, and a button to add a new one. Another functionality we can access from this is screen is to the option to move it to another subsystem.



In this mockup we have a view of the configuration menu, medical chief officers can access to configure for example the rules of the system, add new beds, etc.

Test Cases

Test cases for the system rules

When any doctor creates a new evolution for any of its patients (please refer to doctors and patients initial data in the section below), if the rules are set with the values according to the initial configuration the following rules will run, and will create an alert.

Rule	Triggered alert
Somnolence is marked as true	Evaluate moving the patient to ICU
Bad or Regular respiratory mechanics	Evaluate moving the patient to ICU
Respiratory frequency exceeds the value that was set up in the system rules	Evaluate moving the patient to ICU
10 days have passed since the beginning of the symptoms	Evaluate discharge
Oxygen saturation less than the value that was set up in the system rules	Evaluate prono and oxigen therapy
Oxygen saturation less than 3% compared against the last evaluation	Evaluate prono and oxigen therapy

Initial Data

Chief Medical Doctor

User	**Password**	**System**
mhoughton	jefe5	covid-floor
hjalter	jefe4	ICU
crice	jefe3	hotel
wkaelin	jefe2	residence
pratcliffe	jefe1	ER

Doctor

User	Password
cmilstein	medico1
lfleloir	medico2
bahoussay	medico3
cgrierson	medico4
rfavaloro	medico5
rchacon	medico6
jmramosmejia	medico7
aroffo	medico8
lagote	medico9
epichonriviere	medico10
pcossio	medico11
smazza	medico12
racrrillo	medico13
fescardo	medico14
emaradona	medico15

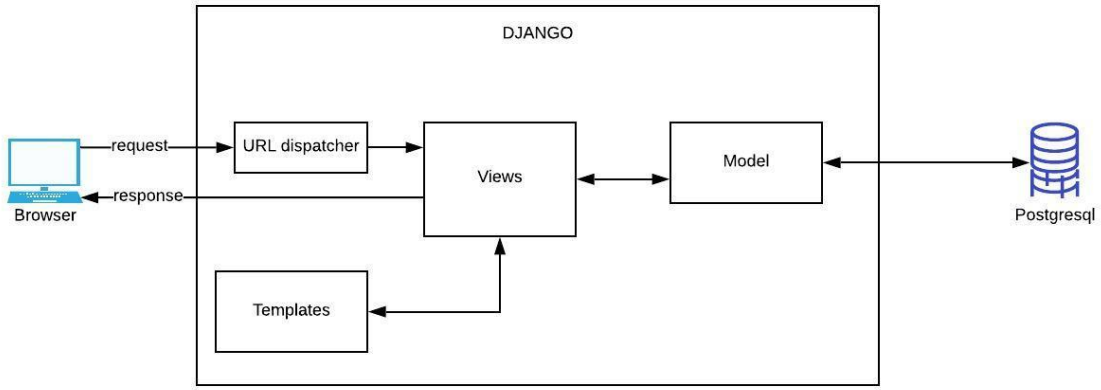
Rules

The values for the rules are configurable. However since the value cannot be null, by default the system has the following values on the initial set up.

Rule name	Default Value
saturacion_oxigeno	80
frecuencia_respiratoria	40

Architecture

Architecture diagram



Anexo Especificaciones (en español)

A continuación en este anexo encontramos las especificaciones detalladas para el desarrollo del sistema. La razón por la cual, a diferencia del resto del documento esta sección se encuentra en español, se debe a que al tener conversaciones con nuestro usuario en este idioma, decidimos evitar confusiones u omisiones y copiar citas textuales o tomar notas rápidas durante nuestras reuniones y luego editarlas.

Usuarios del sistema

Doctor

- Puede hacer cambios de sistema a un paciente (Guardia a Piso COVID por ejemplo)
- Puede estar en un unico sistema, pero puede ser cambiado del sistema en el que esta
- Puede dar de alta a pacientes
- Puede hacer la evolucion de un paciente del sistema al que pertenece (no solamente de los pacientes a los que esta asignado)
- Puede marcar alertas como vistas
- Atributos:
    - Nombre
    - Apellido
    - Legajo
    - Mail
    - Usuario
    - Contraseña

Jefe de Sistema: jefe de un sistema en particular (Jefe de Piso COVID por ejemplo)

- Puede hacer todo lo que hace un médico y tiene sus mismos atributos
- Pueden asignar médicos de su sistema a pacientes de su sistema

Administrador: Solo carga datos en la base inicial y modifica variables (ej guardia con camas infinitas). No usa el sistema per se.

- Puede configurar la guardia con camas infinitas
- *Puede modificar pacientes las primeras N hs desde su carga las horas las decide el administrador. *(requerimiento intermedio)*
- Puede cargar entidades básicas: por BD, o (premium) por UI
    - Salas
    - Camas
    - Médicos
    - Jefes de sistemas
- *ABMs de las cargas de datos *(requerimiento intermedio)*

Configurador de reglas: Solo se encarga de las reglas

- Puede prender o apagar reglas (apagada no se corre)
- Modificar los parámetros de las reglas

Entidades del sistema

Paciente: Persona que entra al ser dada de alta al sistema de guardia por enfermedad COVID. Un paciente y una historia clínica son lo mismo, no existe la historia clínica.

- Atributos:
    - Antecedentes personales
    - Lista de Internaciones
    - Alta por curado (vacio hasta el egreso, solo una alta de las dos)
    - Alta epidemiológica (vacío hasta el egreso, solo una alta de las dos)

        - Lista de médicos: (Cuando salta una alerta de un paciente, se le avisa a estos), inicialmente tiene al jefe del sistema, cuando el jefe asigna a un médico, el jefe deja de estar en la lista
        - Datos filiatorios:
            - Nombre y apellido
            - Teléfono
            - Fecha de nacimiento
            - Mail
            - Obra social
            - DNI
            - Domicilio
            - Contacto:
                - Nombre
                - Apellido
                - Teléfono
                - Parentesco

Sistemas:

- Son 5:
    1. *Guardia*: Se puede configurar para tener camas ilimitadas o no
    2. Piso COVID
    3. UTI
    4. Hotel
    5. Domicilio
- Cada sistema tiene los atributos:
    - Lista de salas

Sala: Incluidas en algún sistema

- Atributos
    - Nombre
    - Lista de camas

Cama: Representa una cama en una sala que puede ser ocupada por un paciente

Internación: Representa la enfermedad desde que ingresa hasta que egresa por dada de alta o por obito

- Atributos:
    - Fecha de inicio de síntomas
    - Fecha de diagnóstico
    - Enfermedad actual (texto libre)
    - Descripción
    - Fecha de internación (automático, fecha actual)
    - Fecha de egreso
    - Fecha de óbito
    - Lista de evoluciones
    - Lista de cambios de sistema (historial de sistemas por los que paso)

Cambio de sistema: Representa el cambio de un sistema a otro de un paciente

- Si se intenta cambiar a un paciente de un sistema a otro y el sistema destino no tiene camas, debe informar un error y no realizar el cambio.
- Movimientos:
    - Siempre se comienza en el sistema de guardia

    - Del sistema de guardia se puede pasar al sistema UTI (si esta mas grave) o al sistema de piso COVID (si está menos grave)
    - Desde UTI se puede pasar a piso COVID y viceversa (por complicación o mejora), en el caso de que no haya camas en UTI, se puede devolver a un paciente a la guardia desde piso COVID
    - Desde piso COVID se puede externar a hotel o domicilio (exclusivamente)
    - Desde hotel y domicilio se puede pasar a piso COVID
- Atributos:
    - Sistema al que se cambio (inferido)
    - Fecha de cambio (inferido)

Evolución:

- *El usuario que creó la evolución puede modificarla las primeras N horas *(requerimiento intermedio)*
- Atributos:
    - Fecha de hoy
    - Hora actual
    - Signos vitales:
        - Temperatura (numérico con 1 decimal)
        - TA Sistólica (numérico sin decimal)
        - TA Diastólica (numérico sin decimal)
        - FC (numérico sin decimal)
        - FR (numérico sin decimal)
    - Sistema respiratorio:
        - Mecanica Ventilatoria (Buena/Regular/Mala)
        - Requiere O2 suplementario (si/no) (toma por defecto el valor anterior)
            - En caso que si:
            - Tipo:
                - Cánula nasal de oxígeno (debe elegir cantidad de litros por minuto que es un valor entre 1 y 6)
                - Máscara con reservorio (debe elegir porcentaje de O2 que es un valor entre 1 y 100 con decimal)
            - Sat O2: (porcentaje sin decimal)

        - PaFi (PaO2/FiO2) (si/no): si elige sí, debe indicar el valor PaFi que es un número sin decimal
        - Prono vigil (si/no)
        - Tos (si/no)
        - Disnea (0/1/2/3/4)
        - Estabilidad / desaparición de síntomas respiratorios (si/no)
- Otros síntomas:
    - Somnolencia (si/no)
    - Anosmia (si/no)
    - Disgeusia (si/no)
- Estudios realizados hoy: (todos desplegables en caso de si)
    - Rx Tx (si/no)
        - Normal
        - Patologico
            - En caso de patológico, se debe ingresar una descripción (texto libre)
    - TAC de tórax (si/no)
        - Normal
        - Patologico
            - En caso de patológico, se debe ingresar una descripción (texto libre)
    - ECG (si/no)
        - Normal
        - Patologico
            - En caso de patológico, se debe ingresar una descripción (texto libre)
    - PCR COVID (si/no)
        - Normal
        - Patologico
            - En caso de patológico, se debe ingresar una descripción (texto libre)
- Observación (texto libre)
- *Campos específicos de UTI que solo se vea en pacientes UTI: *(requerimiento intermedio)*
    - ARM (si/no):
        - Campo libre para completar
    - Traqueostomía (si/no)
    - Vasopresores (si/no):
        - Campo libre para completar

Reglas de sistema: Reglas lógicas que mandan alertas a los médicos asignados a un paciente cuando se cumplen, se evalúan después de cada evolución.

*Creación y edición de reglas por usuario. * (requerimiento intermedio)*

*Se hace push a la aplicación cuando hay una alerta en true. *(requerimiento premium)*

Se debe poder ver un historial de las alertas (incluso las vistas). Cada médico ve las alertas hasta que las marquen como vistas (si A marco como vista, B la sigue viendo)

- Reglas:
    - Si somnolencia => Evaluar pase a UTI
    - Si tiene mecánica ventilatoria regular o mala => Mecánica ventilatoria {valor}, evaluar pase a UTI
    - Si FR > 30 minutos (configurable) => Frecuencia respiratoria mayor a 30, evaluar pase a UTI
    - Si pasaron 10 días desde el inicio de los síntomas => Pasaron 10 días del inicio de los síntomas, evaluar alta
    - Si saturación de oxígeno < 92% (configurable) => Saturación de oxígeno menor a 92%, evaluar oxigenoterapia y prono
    - Si saturacion de oxigeno bajo 3% respecto de la evolución anterior y no salto la regla 5 (no se debe usar un o lógico corriendo la regla anterior) => Saturación de oxigeno bajó un 3%, evaluar oxigenoterapia y prono
- Atributos:
    - Nombre del paciente
    - Condición
    - Texto que se muestra si la condición se cumple

Alerta: Se crea al dar True una regla del sistema

- Atributos:
    - Fue vista (inferido)

Acciones del sistema

Alta: Al dar de alta un paciente, se debe ingresar su DNI, esto crea al paciente, en caso de que el dni ya este registrado en el sistema, me devuelve sus datos, si no

está registrado, se deben ingresar los datos filiatorios del paciente y crearlo. Luego se agrega una internación al paciente. Los médicos hacen un alta. *Solo los médicos de guardia * (requerimiento intermedio)*

Egreso: Representa la terminación de una internación

- Solo puede ingresarse un paciente si está en piso COVID, domicilio o hotel
- Al hacer un egreso se carga al paciente egresado si el egreso es por que se curó o por alta epidemiológica (cumple cantidad de días desde el último síntoma). También se completa la fecha de egreso en la internación del paciente.

Obito: No es egreso

- Se puede declarar desde cualquier sistema

Exportación a PDF de historia clínica electrónica: Se exporta a PDF una historia clínica con todas las internaciones y para cada internación sus evoluciones y el historial de los cambios de sistema.

Vistas de pantallas

Vista de una internación:

- Tiene dos versiones:
    - Completa: Muestra una internación con las evoluciones y cambios de sistema intercalados por fecha.
    - Resumen: Como resumen estaría bueno que se vean solo los cambios de sistema.

Vista de dashboard (resumen de sistemas): Solo para jefes de sistema

- Se ven todos los sistemas y para cada sistema, las camas libres, las camas usadas y las totales. Los sistemas son clickeables y llevan a la vista de un sistema.

Vista de un sistema:

- Se ven las camas libres, las camas usadas y las totales al costado del sistema
- Un panel para cada sala del sistema, y en cada sala la lista de los pacientes que están en la sala. Se puede clickear un paciente y se va a la vista de paciente

Vista de paciente: Jefes de sistema y médicos

- Se agregan evoluciones desde esta vista
- Muestra la información del paciente
- Se puede asignar un médico al paciente desde esta vista (si sos jefe del sistema específico donde está el paciente (inferido))

Vista de menú de alertas: Jefes de sistema y médicos

- Muestra todas las alertas que no hayan sido marcadas como “vistas”
- Se puede marcar una alerta como vista y desaparece del menú

Vista de autenticación: Jefes de sistema, médicos y administradores (si se hizo el premium para cargar entidades por UI)

- Se elige médico o jefe de sistema
- Se ingresan nombre de usuario y contraseña
- Puede usar oauth2 o desde base de datos directa (con encriptacion en lo posible)
- Estaria bueno que use google login

Fin del documento.