

SYSTEM OF UTILITIES AND PATIENT FOLLOW- UP BY NURSING (SUPER)

Heloisa H. Müller

Universidade de Campinas, COTUCA,
Department of Mechanics
Campinas – SP
<http://lattes.cnpq.br/9024253053698134>

Adriel Naiber Willis Fuentes

Universidade de Campinas, COTUCA,
Department of Mechanics
Campinas – SP
<http://lattes.cnpq.br/0125635495660262>

Olívia Orneles Pereira

Universidade de Campinas, COTUCA,
Department of Mechanics
Campinas – SP
<http://lattes.cnpq.br/2315279231600805>

Lemuel José da Silva

Universidade de Campinas, COTUCA,
Department of Mechanics
Campinas – SP
<http://lattes.cnpq.br/9853309590898286>

Giselle Aparecida de Arruda Mello Martins

Universidade de Campinas, COTUCA,
Department of Nursing
Campinas – SP
<http://lattes.cnpq.br/3463942015634305>

Gisele Barreto de Deus

Universidade de Campinas, COTUCA,
Department of Nursing
Campinas – SP
<http://lattes.cnpq.br/8204958507926678>

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Ana Carolina Megda Alves

Universidade de Campinas, COTUCA,
Department of Nursing
Campinas – SP
<http://lattes.cnpq.br/6225552002597389>

Júlia Madiuto Grégio

Universidade de Campinas, COTUCA,
Department of Nursing
Campinas – SP
<http://lattes.cnpq.br/0038714117890753>

Abstract: In intensive care units and hospital beds, professionals from the multidisciplinary team, especially those from the nursing team, have a systematic routine of monitoring patients in their beds. Due to the unusual pandemic situation of COVID 19 concomitant with other health problems of the population, there was an imbalance between the number of patients and the health professionals available to provide hospital care. Nursing professionals manually record the activities performed at the bedside, such as: performing invasive procedures and other therapeutic care prescribed in standardized forms at the institution. In order to allow the nursing team more time to carry out activities, interact with patients, and provide them with greater safety and comfort, it was proposed to create a digital application, hosted on an Android cell phone, which allows the recording of patients via QR-code (Quick Response Code), where nursing notes are inserted, in real time, during the execution of care based on medical and nursing prescriptions. The partnership between the areas of health and technology made it possible to build this tool, where teamwork and the exchange of needs were reciprocal, with the aim of respecting the individuality of patients, and guaranteeing care provided with quality and in a timely manner. safe.

Keywords: Nursing notes; Embedded Software; Artificial intelligence; Android application; Mobility.

INTRODUCTION

In intensive care units and hospital beds, the multidisciplinary team of patient care, especially professionals from the nursing team, has a systematic routine of monitoring patients in their beds. In order to maintain comprehensive care, it performs work based on various procedures such as administering

medication, monitoring the patient's vital signs by controlling blood pressure, heart rate, temperature, respiratory rate and other important measurements requested in the medical prescription.

The volume of patients in hospitals is large due to the circumstances of health problems of the population, its natural aging (REIS et al, 2016) and other sources of problems arising from socioeconomic development (CARRAPATO et al, 2017). In 2020, considering the unusual situation of the "COVID 19" pandemic, there was an increase in the number of patients in hospitals (NORONHA et al, 2020). Also in 2021, 2022 and 2023, hospitals are still adapting to meet the different demands for beds after the pandemic.

In this context, there is a situation of imbalance between the number of patients and health professionals, and the number of beds available for hospitalization. In intensive care units there is equipment that monitors the vital signs of patients. This information can be received via data communication network in a supervision and control center, which intervenes in alert and serious situations. However, in other areas of hospitals there are also beds that often do not have this technology, where nursing professionals manually record activities performed at the bedside, such as performing invasive procedures and other therapeutic care prescribed on standardized forms in the hospital institution. Other equally relevant information, such as the medical prescription, the clinical evolution and the requests and test results, are already included in the electronic medical record of the patients in the hospital institutions. Since the objective of the nursing team is to work based on technical competence, on the continuous improvement of quality offered in an integral and safe way, the records of

the patients' conditions, the evolution of the clinical and recovery conditions are also very important. In order to optimize these records and systematize the information, an information recording device was developed, and an intelligent systematic so that automatic forms can be created by the supervisory team without the need for systemic intervention from the technology area, i.e., care forms and other nursing procedures can be created at runtime within the application itself. The objective of this action is to offer the nursing team more time to carry out activities, interact with patients, and provide them with more safety and comfort. In addition to allowing the work of the nursing team to be made feasible and systematized, it would be equally important for hospital administration, since it would save on forms and on the organization of medical records, remembering that these are legal instruments that prove the care provided to patients.

Information relating to patients is confidential and therefore, if these data need to be sent to the hospital's system, they can be downloaded in files encrypted by the application itself and received on a server with a database to store the information. The cell phone would be working in a corporate way and so the application would run in proprietary mode as if it were a clipboard where its use is restricted to nursing services as if it were a work instrument like a stethoscope or a thermometer.

METHODOLOGY

A survey was carried out of the main procedures performed by the nursing team in a hospital reality (BRACCIALLI, A R J et al, 2014), listing the most recurrent routines of the nursing team and their respective notes.

A methodology for surveying nursing procedures was adopted and created to be

intelligently registered in the application so that the nursing note forms were dynamically generated by the application without the need for prior programming. In the methodology, to describe and document the notes, the “Google Documents” tool was used (GOOGLE DOCS, 2022). However, it was necessary to normalize the annotations using domain and known description typifications and fewer arbitrated values in descriptive fields as exemplified in Figure 1. The “Google Forms” tool (GOOGLE FORMS, 2022) was chosen, creating annotation models specific for each procedure. These forms are subsequently registered in the SUPER application by the supervision team in order to automate the recording of care using these procedures as a basis and their models and contents are stored in the application’s database, to later automatically generate the screens care record to be completed eventually.

<p>Oxygen therapy devices</p> <ul style="list-style-type: none"><input type="radio"/> Inhalation<input type="radio"/> nasal catheter<input type="radio"/> Nebulization continues with face mask<input type="radio"/> Mask with Venturi device<input type="radio"/> Oxygen Reservoir Mask<input type="radio"/> Oxygen Tent<input type="radio"/> Others

Figure 1: Example of standardization and typification of procedure items.

The application’s functionalities allow the nursing user to carry out and monitor the nursing routines in real time, since as soon as the patient is admitted to a hospital institution, he receives an identification bracelet with the date of birth, full name without abbreviations and number of record

– medical record (BRASIL. Ministério da Saúde, 2022) and a Quick Response Code (QR code) as shown in Figure 2. When admitted to a hospitalization unit, the nurse with access authorization (login and password) will capture this information from identification via application, hosted on the cell phone. Through it, it is possible for nursing professionals to record the time of care provided, the values of vital signs and specific general notes (observations, care and nursing procedures), where the records will be made via the cell phone keyboard. This data is encrypted and hosted in the application’s cache area, and at the end of the shift will be forwarded to the electronic medical record with the professional’s registration number (COREN - Conselho Regional de Enfermagem), as this is reliable and confidential information. This information after transfers is permanently deleted from the application’s cache area. The flow of this information is schematized in Figure 3.

The tool was developed for the Android cell phone and operating system, using Java and Kotlin language (KOTLIN, 2022). To make communication and remote connection possible between the patient (GIUSEPPE and LO RE, 2014) and the ward similar to ICU systems (KOUNTCHEV and IANTOVICS, 2013), Bluetooth and WI-FI protocols were used., Wireless Fidelity) for transferring information.

The nursing team’s records would be captured to a centralized system by downloading these data in real time or when changing shifts, using standard CSV (comma-separated values) or XML (comma-separated values) file formats. Extensible Markup Language) encrypted. The application was developed to be hosted on a cell phone with a specific purpose and in an exclusive mode, configured only to enable

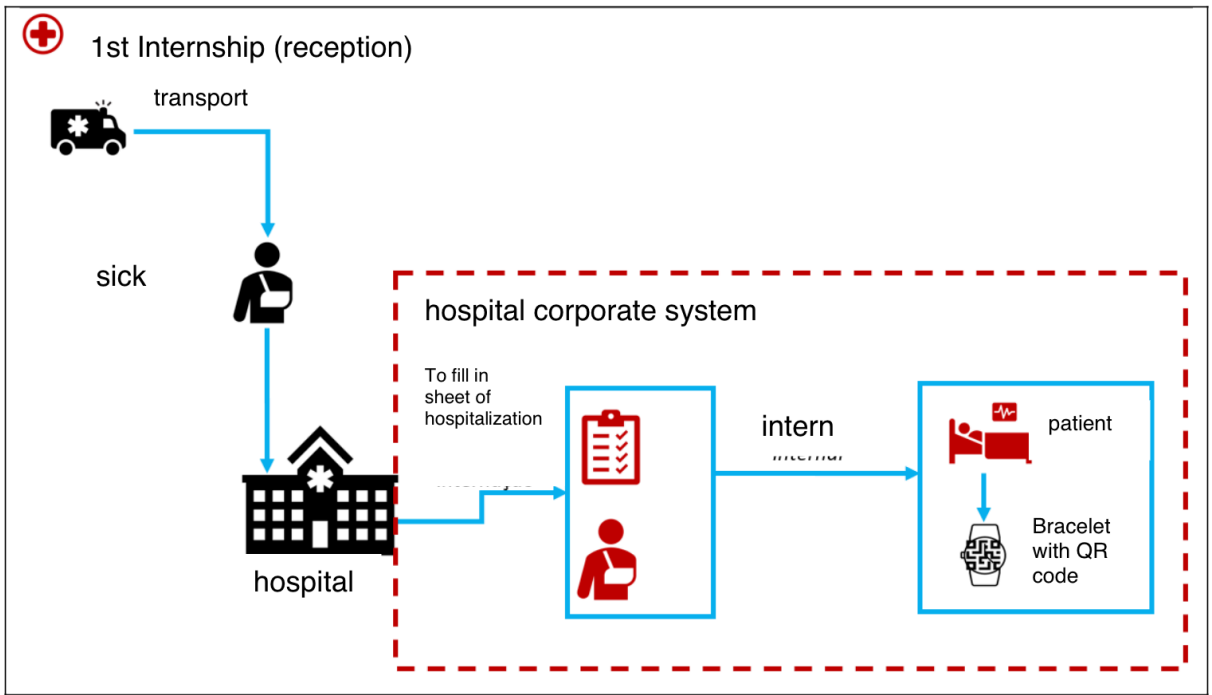


Figure 2: Patient reception.

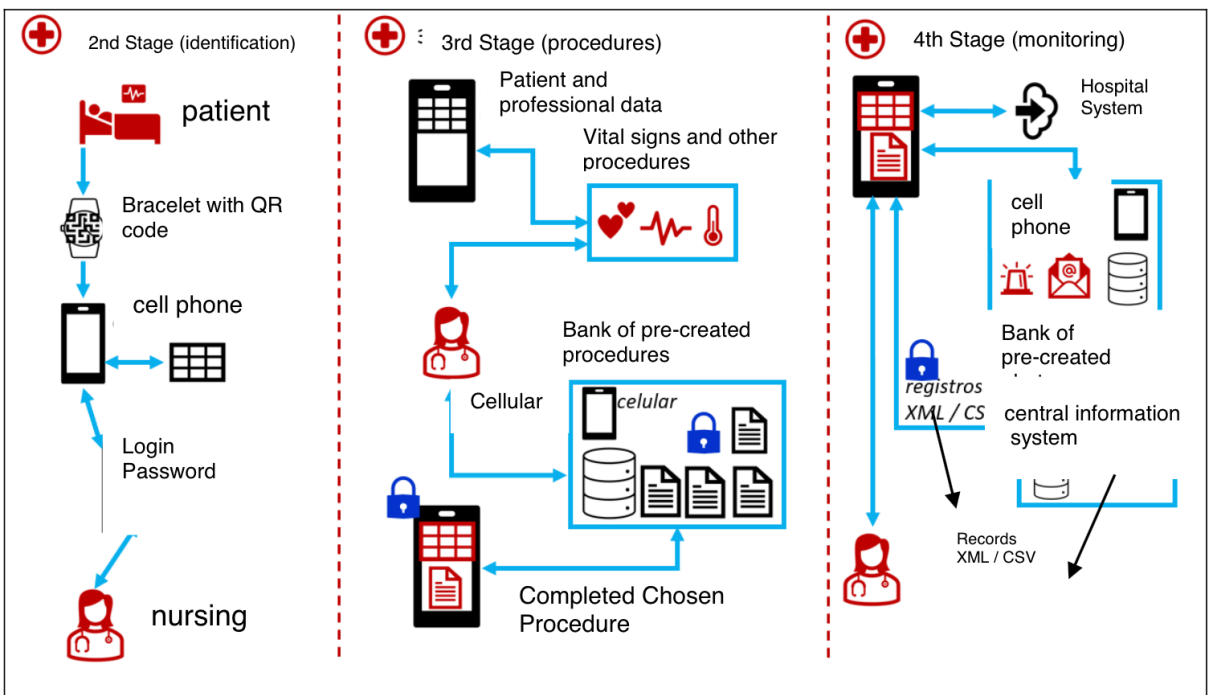


Figure 3: Information flow in the app SUPER.

nursing procedures and notes, with a single and closed application that facilitates control and communication.

For the application, the Android Studio development environment was used, which is a free IDE (Integrated Development Environment) (ANDROID STUDIO, 2022) for the Android operating system. After installing the software, it was necessary to study programming languages, for knowledge and proper management of resources in construction and applicability. Initially, the application's XML (Extensible Markup Language) screen files were created, and then the functions were placed for each activity performed. Everything that was done followed a data model created at the beginning of the project, which was modified according to the needs that arose. In this way, a login and password system was created for the application, registrations for the nursing professional and for patients, by reading the QR-code. The tool also allows the nurse, the professional who coordinates the nursing team, to delete or register new procedures, their detailed items, and the classes or typifications of each item, such as a list of values, a type of textual or multiple information. choice, in order to meet the peculiarities of the hospitalization unit. Therefore, in addition to assisting and optimizing nursing notes, by completing the forms prepared based on the procedures, the information is exported to the hospital's electronic medical record. To use the application, some previous actions are necessary to configure the logical and physical environment of the cell phone, the main ones are represented in figure 4.

RESULTS AND DISCUSSION

The application was developed to be practical and quick to use by nursing professionals. In this way, the team of

software developers took into account the programming language, development environment, database and operating system that best suited the project proposal. The languages used were Java and Kotlin (KOTLIN, 2022), with greater emphasis on encodings in Kotlin when considering the advantages that the language has. Kotlin was chosen because its code is clean, simple and readable, and because it has fewer rules when compared to Java and other programming languages. Both Java and Kotlin can be used to build high-performance applications, but Google has taken a Kotlin-centric approach primarily for libraries, tools, documentation, and learning resources. Kotlin offers much simpler and shorter code than Java code to tackle the same tasks. Kotlin programs dispense with the use of semicolons, which makes them easier to read and understand, in addition to smart string templates. Concise language code means not only less potential for bugs, but also less chance for run-time and compile-time errors. There is also Java compatibility, where various libraries and frameworks can be used in Kotlin projects, including advanced frameworks. Also, translating Java to Kotlin is easy, just use a plugin in IntelliJ or Android Studio. Kotlin is a fully interoperable language with Java (LOERNET, 2022).

It is important to say that the facilities achieved with the use of a high-level language associated with a rapid development methodology provided more time for the team to interact with nursing professionals, eliminating technological barriers and design flaws that distance the user from the developer. There was greater coexistence and better understanding of nursing needs.

Considering the practicality and time spent learning and carrying out the project, the entire application was developed in Android Studio, a free IDE for development

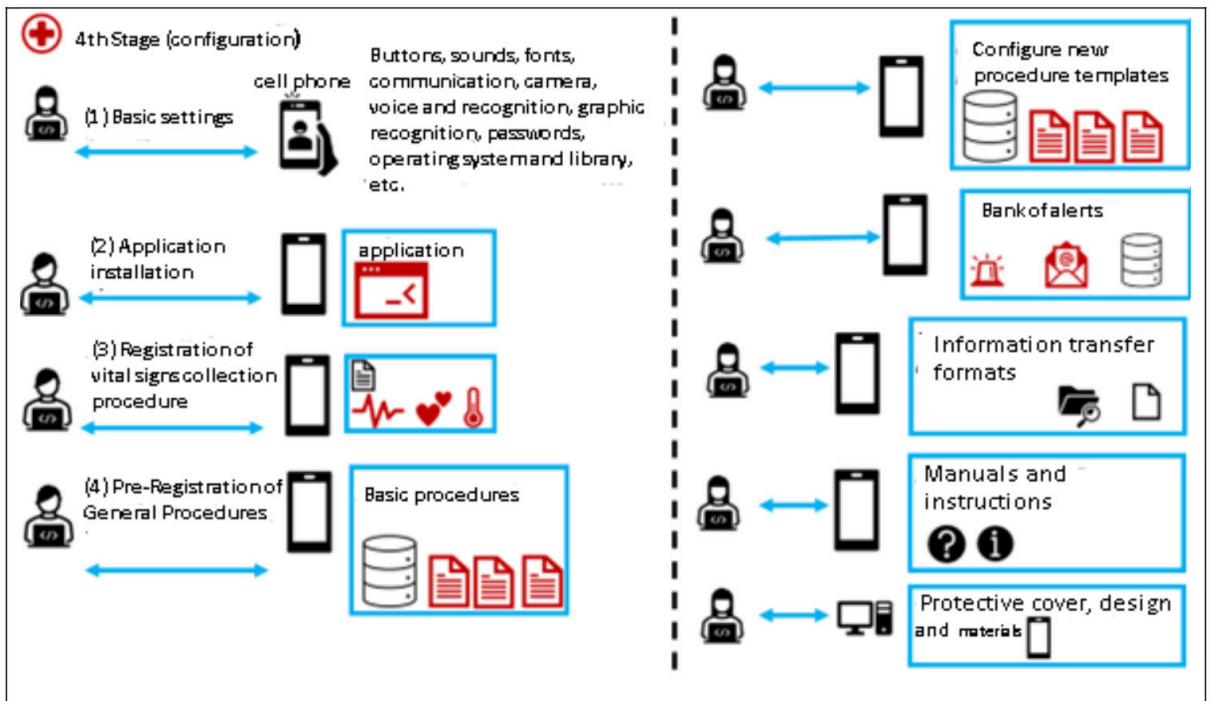


Figure 4: Settings needed to use the app.

SUPER

Coren

Password:

To enter

I forgot my password

New register

Nurse's name:

ex: Olivia Orneles Pereira

Date of birth:

ex: XX/XX/XXXX

Nurse's CPF:

ex: XXX.XXX.XXX-XX

Nurse's coren:

ex: COREN-SP-123.456-ENF

Nurse's email:

ex: oliviaorneles2005@gmail.com

Administrator

Password:

Type the password 0/16

Confirm the password

Confirm the Password 0/16

To save

Figure 5: Admin login screen.

on the Android platform, which is one of the reasons why it was chosen as the operating system, in addition to be a platform widely used by developers (ANDROID, 2022).

For the storage of information in the application, a survey was carried out on which database best suited the requirements, and SQLite (SQL, 2022) was chosen for being complete, fast, free and highly reliable (VIEIRA, 2022), (CANGUÇU, 2018), (SOLID IT, 2022), (STACKSHARE, 2022).

The nursing team actively worked on shaping and harmonizing the application's screens, choosing sequences, colors, formats, letter fonts, illustrative icons and many other objects that appear on the screen and when interacting with the application. For the applicability of the tool, sequential screens were created that allow users to navigate and record information. In the first access, the nursing professional must register, insert his professional registration number (COREN) and create a password as shown in figure 5.

After the password validation process, there is a menu that allows selecting options, among which there is a system for registering new procedures, items and classes, connected to each other through a hierarchy of foreign keys. This functionality allows the nurse, the professional who coordinates the nursing team, in the role of developer, to delete or register new procedures to meet the peculiarities of the hospitalization unit, in a practical and easy way. The patient's registration in the application will be done by reading the QR-code, installed on the identification wristband that he receives upon hospitalization, according to figure 6. After logging, the user will have access based on related permissions to its activities, as shown in figure 7.

In this way, you will have access to teammates in the sector (nurse and nursing technicians), patients, care, and duly registered

nursing notes.

To perform the care, the user must select the patient and then the care to be performed and registered. The records will be encrypted and hosted in the application's cache area, which can be viewed in the nursing notes item, as shown in figures 8, 9 and 10. tests. The content of the procedures were obtained after standardizing the questionnaires and choosing them

The nursing team tried the tool and approved its interface and did not have many difficulties in filling in the information and registering the standard procedures. The new generations are familiar with the technology and were very interactive with the procedures on their cell phones in the validation tests. They suggested using the system in nursing course classes, which would facilitate the understanding of the important information in the notes and would serve as a learning guide in theoretical classes about the existence of these procedures and what information they collect and fill in, in addition to the practice of their execution.

CONCLUSIONS

The development of the project is of great importance, aimed at helping and optimizing nursing notes in a standardized, practical and safe way. The partnership between the areas of health and technology made the construction of the application possible. The teamwork and the exchange of needs were reciprocal, with the objective of offering the nursing team more time to carry out care, in real time, based on the determinations of the Code of Ethics for Nursing Professionals (CEPE), while respecting the individuality of the person and directing the service to their needs (SOUZA A B G et al, 2021), as well as confirming the importance of using the identification bracelet, an item necessary to access the system and allow safe and quality

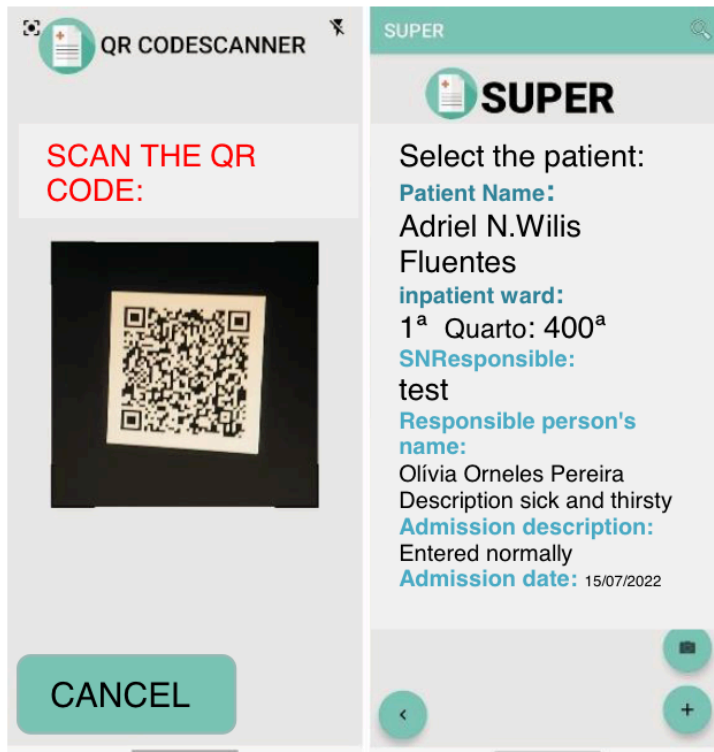


Figure 6: Patient registration by QR-code.

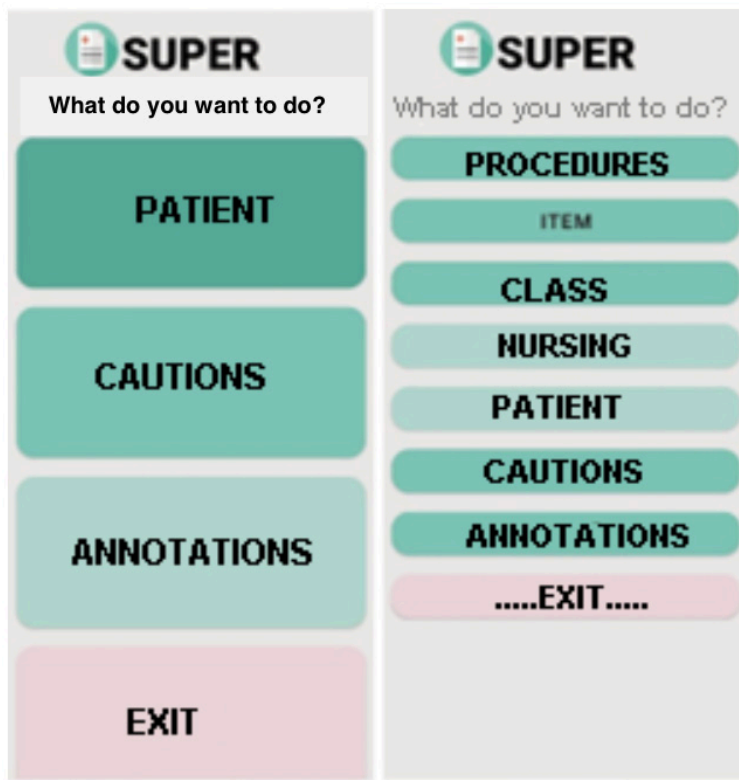


Figure 7: Nursing and supervision functionalities menu.

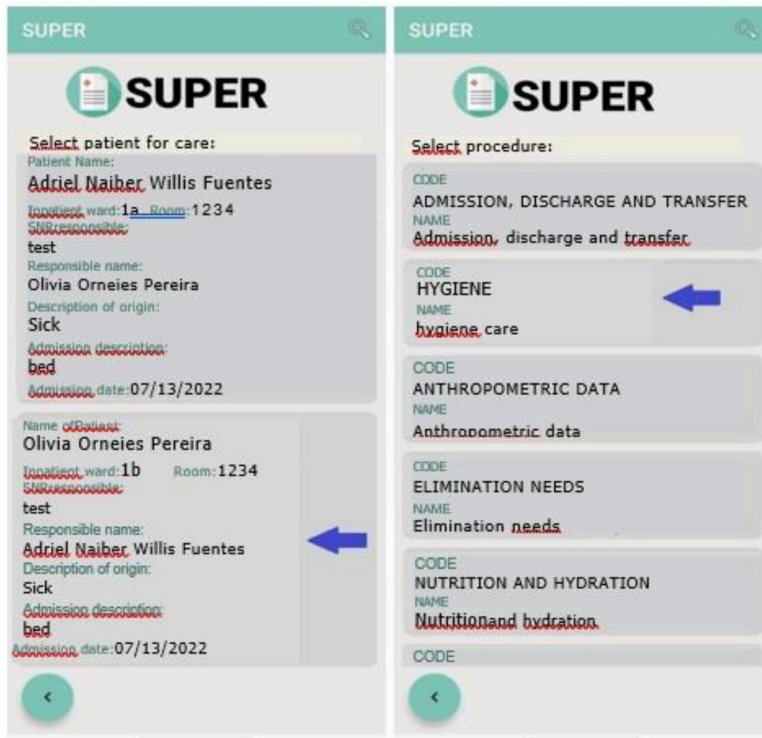


Figure 8: Sequence of screens associating patient and procedure.

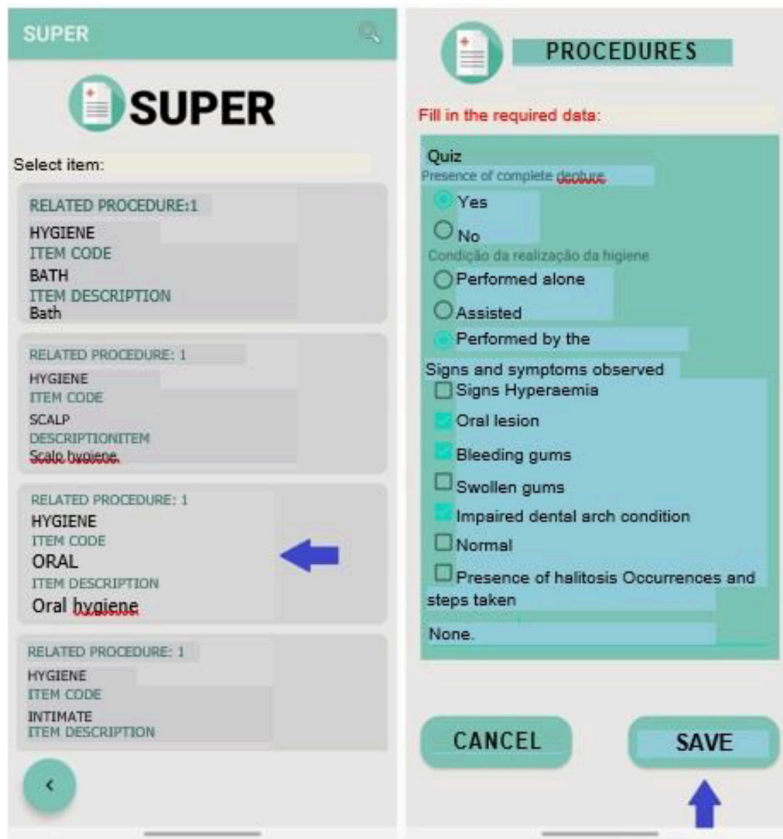


Figure 9: “Care” screen sequence part 1.

care. The use of the application to support nursing notes in a corporate way in hospitals and health institutions depends on a broader discussion about how the technology could meet the demands of hospital sectors with a more restricted presence of technology compared to other sectors with a greater presence. Only the opportunity to discuss these ideas and walk a path of propositions and solutions showed us how simple ideas can be useful for certain processes within an environment that is so important for society.

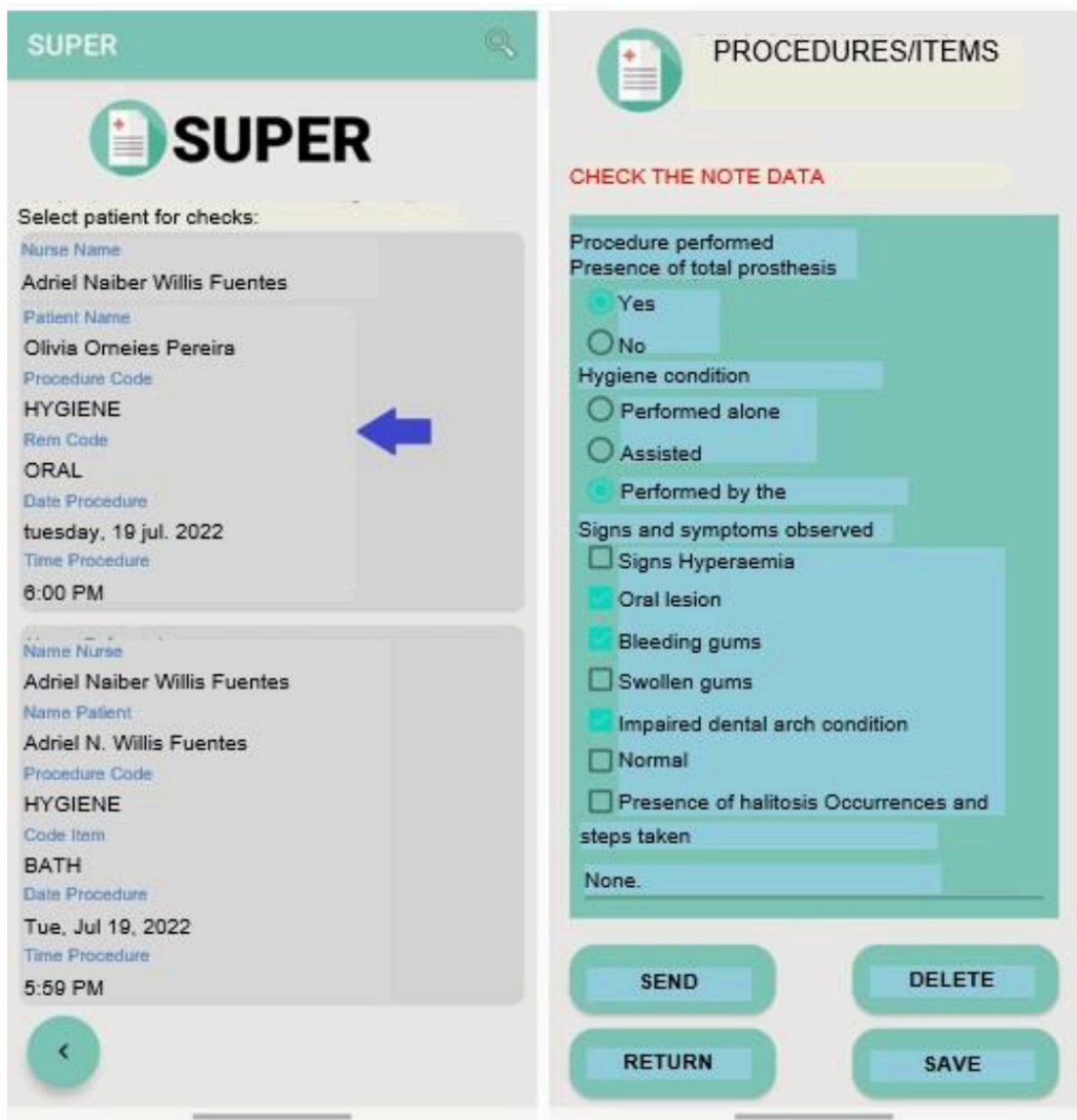


Figure 10: "Care" screen sequence part 1.

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