# Scribbles

## Project Team

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## Project Description

Scribbles is a mobile application that aims to centralize communication within healthcare communities by creating a dedicated platform for seamless interaction between nurses and doctors. The system will facilitate efficient communication between doctors and nurses, enabling swift decision-making by medical professionals. This system addresses the critical need for improved communication in healthcare for enhanced patient care and overall operational efficiency.

## Motivation

*By: Levith Andrade Cuellar*

This project is inspired by the experience of my parents, both of which are doctors. My parent's phones buzz with notifications all day long; they are in constant communication with nurses and other doctors regarding patient care. They utilize WhatsApp to ask each other questions, to send each other patient photos, and when necessary, to iron out inconsistencies in patient care. They utilize email to review patient studies, X-Rays and related patient records as well as to communicate with hospital secretaries regarding administrative matters. When they're out of the hospital they receive phone calls to alert them of emergencies or when nurses need to clarify critical aspects of patient care. When they're in the hospital they'll receive text messages asking them to relocate or to consult a certain patient. With the development of the internet my parents' jobs have become increasingly dynamic and reliant on their personal smartphones. This has revolutionized the way they approach patient care but has unfortunately added a degree of chaos in the way they communicate. They use several apps on their smartphones for both personal and professional matters. Critical information regarding patient care exists

unorganized, decentralized, and exposed to privacy breaches in their personal phones. What I would like my team and I to achieve with this project is a more centralized and safe alternative to communication between healthcare professionals, particularly between doctors and nurses. With an application like ours, potential users like my parents and their colleagues in the healthcare industry (which I have personally witnessed to be facing the same problem) would see increases in productivity, great reductions in complexity and gains in security and professionality.

# Business Goals

- Enhance patient care through efficient communication by providing healthcare workers a centralized chatting and calling function.
- Streamline patient information for faster operations by providing on-the-go access to patient records.
- Shorten response times for emergencies or other time-sensitive issues by providing a mobile pager.
- Facilitate lookups of patient information by integrating Artificial Intelligence summaries and analyses.

### Values and Anticipated Outcomes, Benefits, Results

The healthcare sector grapples with significant technological hurdles, notably in handling the extensive troves of patient data, especially concerning storage and retrieval. Addressing this issue could entail the development of mobile interfaces that grant healthcare providers instantaneous access to patient records (Kaur, 2023). Our mobile application offers a streamlined solution, **facilitating quick retrieval of vital patient information** - encompassing patient details, medical histories and diagnoses - via an intuitive and readily accessible interface, enhancing efficiency for medical professionals.

Expanding on this objective, our application also aims to **address the challenge of remote access to patient records** for physicians who may be outside their primary work location. Storing patient data within the application provides doctors with the ability to easily and efficiently access patient records when they are away from the hospital but need to quickly retrieve data during emergencies or for other purposes.

Our healthcare app aims to **revolutionize communication in medical settings** by providing an interface for doctors and nurses to communicate patient-related information efficiently. In response to the alarming 250,000 annual patient deaths in the United States due to medical errors linked to communication gaps, our platform ensures doctors have efficient, mobile access to comprehensive patient records (The HIPAA Journal, 2023). Communication breakdowns leading to medical errors often occur during hand-offs, a prevalent scenario where patient care transitions between healthcare professionals. These transitions may take place during shift changes among nurses or doctors, and between doctors and nurses. Crucial information pertaining to patient care must be effectively communicated during these hand-offs. Omissions or miscommunications in this process can lead to misinterpretations of requirements, posing potential risks to patient safety. Our application would provide an interface to connect with the hospital's patient database, proving indispensable for informed decision-making, particularly in emergencies and hand-offs, enabling secure and instant information exchange between doctors and nurses.

Beyond data-keeping, our app is a dynamic solution that **enhances collaboration across various hospital operations**. While acknowledging that direct communication may not always be necessary in certain medical procedures, our platform ensures effective communication in critical situations.

## Main Features (Engineering Objectives)

Our system will cater to its two main types of users, doctor and nurses, with the use of user-dependent interfaces.

- **Feature 1:** **Chatting**
  *(User Interfaces: Doctors and nurses)*
    - A service that doctors and nurses can use to communicate short messages regarding patient care with each other. They will typically use this feature when asking each other for clarification, when sharing small updates, or when asking each other short questions.
- **Feature 2:** **Calling**
  *(User Interfaces: Doctors and nurses)*

- ○ A service that doctors and nurses can use to hold remote conversations regarding patient care. They will typically use this feature when the need for a short discussion arises or when an important piece of information needs to be communicated.

- **Feature 3:** **Pager**

  *(User Interfaces: Doctors and nurses)*

  - ○ A service that users can use to page, or call, each other to a certain location inside the hospital. This feature will be used when the presence of any user is required at a particular location. This feature is distinguished from the chatting feature as this will be implemented as an emergency alert notification, which will be crucial in efficiently responding to hospital emergencies.

- **Feature 4:** **Patient Record Database**

  *(User Interfaces: Doctors and nurses)*

  - ○ A service available for users to view patient records and add comments to them on-the-go. Doctors and nurses will use this feature while caring for the patient — doing an initial review, adding notes during checkups, etc.

- **Feature 5:** **AI Support System**

  *(User Interfaces: Doctors and nurses)*

  - ○ A service available to doctors and nurses to make the process of reviewing patient records more efficient. Predetermined prompts will be provided to users where they will be able to query the AI for patient record summaries, overviews of last comments, key highlights from patient records, etc. This feature will be facilitated by the AI Integration Module and OpenAI's Chat Completions API.

- **Feature 6:** **Reminder Feature**

  *(User Interfaces: Nurses)*

  - ○ A service available to nurses to help them manage patient care. They will use this service to manually create reminders of scheduled visits, times to give medications to patients, etc.

## Scope

To tackle this section of the proposal, we decided to build the following context diagram:
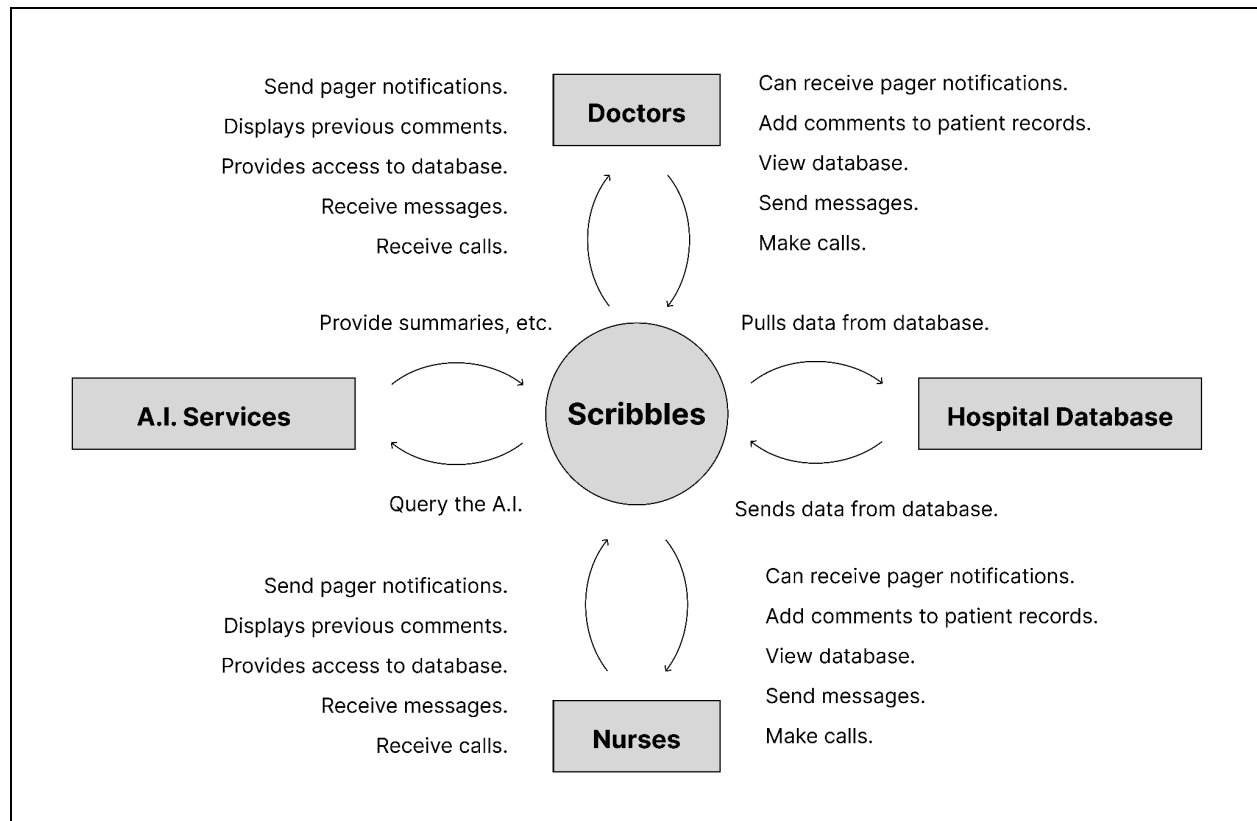
It's important to note what our project isn't:

- Our project does not intend to diagnose diseases or provide medication advice.
- Our system includes a notification system but its scope is greater than that, our system includes other prominent features of hospital communication like the integration of patient records, calling and messaging.

## Stakeholders

In summary, stakeholders involved or affected by our project include: private hospitals, governments, public hospitals, nurses, doctors, patients, members of hospital administration teams, programmers of the system, ministries of health, hospital accreditation bodies, consumer protection agencies, members of hospital leadership boards, pager manufacturers, other digital communication platforms and environmentalists.

To identify these stakeholders, we decided to answer the following questions.

**Who is paying for the system?**

Our system is a service that private hospitals subscribe to. Hospitals charge patients for the system under "hospital services," and patients are able to pay for this charge either by using their insurance or by paying out of pocket. Governments may also pay for our service to be used in public hospitals.

**Who is going to use the system?**

Nurses and doctors would use the system to communicate about hospitalized patients.

**Who is going to judge the fitness of the system for use?**

Our users, which are nurses, doctors, and members of hospital administration, would judge the fitness of the system for their everyday tasks.

**What agencies (government) and entities (non-government) regulate any aspect of the system?**

1. Programmers of the System: This would ensure software-related security guidelines as outlined by organizations such as the National Institute of Standards and Technology (NIST), International Organization for Standardization (ISO), SANS Institute, Center for Internet Security (CIS), and/or IEEE.

2. Ministry of Health and Hospital Accreditation Bodies: This would be the entity responsible for accrediting our system and giving hospitals the green light for use. They would ensure that our system is compliant with any legal regulations or restrictions. In the UAE the responsible entity would be the Ministry of Health and Prevention.

3. Consumer Protection Agencies: This would be the entity responsible for checking service standards and protecting consumer rights. Specifically, in the context of our project, they would enforce the responsible use of consumer (patient) data. In the UAE the responsible entity would be the Ministry of Economy.

4. Hospital Leadership or Board: This entity would assess if the system is necessary in their particular context. Once subscribed, they would oversee the implementation of the system and verify that the system is running correctly and truly serving its intended purpose.

**Who is involved in any aspect of the specification, design, construction, testing, maintenance, and retirement of the system?**

- Specification, Design and Construction: Developers are responsible for the specification, design, construction and maintenance of the system.
- Testing: Developers and direct users, in the case of our platform doctors, nurses, and hospital administration, would be responsible for testing the system.
- Retirement: Developers would provide technical assistance while hospital administration would take the decision to retire the system.

**Who will be negatively affected if the system is built?**

- Members of hospital administration; secretaries in particular, may observe salary reductions as the system assumes some of their day to day tasks, such as record-keeping. This would probably be a minor effect as they would still be helpful in the maintenance and management of our system.
- Pager manufacturers; our app features a fully digital pager system. Pager manufacturers may lose sales with the adoption of our app.
- Patients; while the app is likely to improve response times from their healthcare providers, patients may complain about extra costs related to the hospital's subscription to the platform.
- Other digital communication platforms, like WhatsApp, may experience some minor decreases in usage as adoption increases amongst hospitals and healthcare workers.

**Who else cares if this system exists or doesn't exist?**

- Environmentalists may see our system as a positive since it would help reduce the amount of printing that is required in the healthcare industry. Since healthcare workers would be able to access and update patient records digitally, and on-the-go, printing patient records would become redundant.

# Constraints

Some constraints and limitations to highlight are the following:
- **Budget Constraints**
  - Paying for APIs: our system will utilize some paid API services to support its integration of artificial intelligence. The cost will depend on the number of calls our users perform.

- ○ <u>Paying for developers to maintain the system;</u> developer salaries are significant and having developers continuously update the system is an essential activity for the long-term progression of our project.
  - ○ <u>Limited initial investments;</u> it will take several months to secure long-term investors that can support our project in the long-term.
- **Time Constraints**
  - ○ <u>Thorough testing;</u> our users are busy people with extremely important jobs. Testing may take longer than usual and schedules for testing may be inefficient for our timeline.
  - ○ <u>Complete development within the scope of the semester;</u> while there are some defined features our team will implement during this time there are so many others that will need to wait.
- **Design Constraints**
  - ○ <u>Functional over aesthetic design;</u> while designing the system our team will have to prioritize functionality over fancy and appealing designs. This is so it is easy and efficient for healthcare workers to communicate with each other using our app.
  - ○ <u>Complying with design guidelines</u> such as the iOS Human Interface Guidelines.
- **Technical Constraints**
  - ○ <u>Working under the scope of an app development kit;</u> such as Flutter, may be restrictive to our development goals. Each app development kit has different functionalities and structures.
- **Implementation Constraints**
  - ○ <u>Importing data onto the platform</u> will be tricky as different hospitals have different existing database structures.
  - ○ <u>App is developed within the implementation criterias</u> mentioned within the project goals for the class which includes a need for a user interface and the use of object oriented programming for the development of the app.
- **Resource Constraints**
  - ○ <u>Acquiring data for testing our system</u> will be difficult since healthcare related data is confidential and it is not easily accessible.

## Risks

- **Preventing privacy breaches;** a potential risk is overlooking security vulnerabilities. Our platform will provide doctors and nurses full access to patient records. This exposes the system to a privacy breach.
    - Mitigation: Implementing more comprehensive privacy and security guidelines.
- **Working around internet outages;** a potential risk are performance issues during internet outages. These events may result in communication delays when using our platform's messaging and calling features. This may lead to slower response times from healthcare workers.
    - Mitigation: The app will notify the user if their internet connection is slow and will ask them to use other means of communicating with their colleagues.
    - Mitigation: Any patient that has been assigned to a nurse, or that a doctor is actively treating, is automatically cached upon addition. This ensures that doctors and nurses are able to access their information in case of a slow connection or an internet outage.
- **Adapting to diverse database structures;** a potential risk is platform integration. Each hospital has its own system and its own database structure. Integrating our system with these existing structures could result in data inconsistencies or communication breakdowns.
    - Mitigation: Our team would collaborate closely with technology teams at hospitals to ensure that their databases and other relevant technological systems are integrated seamlessly with our app.
- **Preparing for scalability** is a potential risk that depends heavily on the size of each hospital. As the number of subscribed hospitals grows, the platform may face scalability issues, leading to performance degradation.
    - Mitigation: Our team will design the platform with scalability in mind by using cloud-based infrastructures and conducting load testing to identify potential bottlenecks.

## Appendix

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