RevolutioniSing

PATIENT CARE

How might we develop a secure system of alerting doctors of an urgent lab result?

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23206779
Human Computer Interaction

UCD School of Information and Communication Studies | UCD iSCHOOL

HCI Project 2024

OUR PARTNER

Dr. Maeve Doyle

represents Ireland on the UEMS section for Medical Microbiology, contributed to the European curriculum, and played a key role in the European Medical Microbiology examinations.

She collaborates with University College Dublin and Cork Institute of Technology. Her extensive experience in medical education, clinical microbiology, and leadership has significantly influenced medical training and practice nationally and internationally.

Key Contributions

Head of Department and Lead Consultant in Education and Training at UHW

Clinical Lead for Postgraduate Education and Training at UHW.

Clinical Lead for the Trainer Project at RCPI

Previous Leadership Roles

Director of Education and Training, Faculty of Pathology, RCPI

National Specialty Director for Clinical Microbiology

OUR PARTNER

Dr. Grace Chan

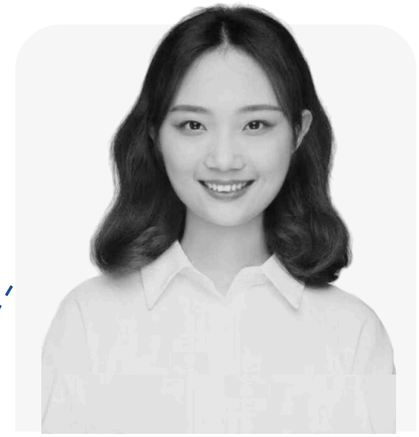
Dr Grace Chan is a Consultant Clinical Microbiologist currently working at the South East Regional Microbiology Laboratory at University Hospital Waterford, having obtained her medical degree from University College Dublin.

Dr Chan is a Fellow of Royal College of Physician Ireland (FRCPI) and Fellow of Royal College of Pathologist UK (FRCPath). She is currently the South East Regional Antimicrobial Stewardship Lead and the Secretary of the Irish Society of Clinical Microbiologists (ISCM).

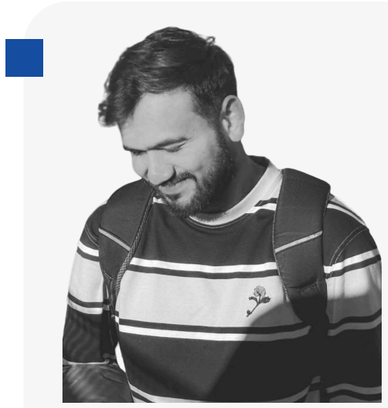
Dr Chan leads the implementation of antimicrobial stewardship and laboratory diagnostics initiatives in tackling global public health threat of antimicrobial resistance in the South East Region of Ireland.
Her clinical interest lies in optimising laboratory diagnostics to improve clinical decision making in the management and prevention of complex bacterial, viral and fungal infections

ABOUT US

Let's meet the TEAM3



Wang Yanfei
Product Manager



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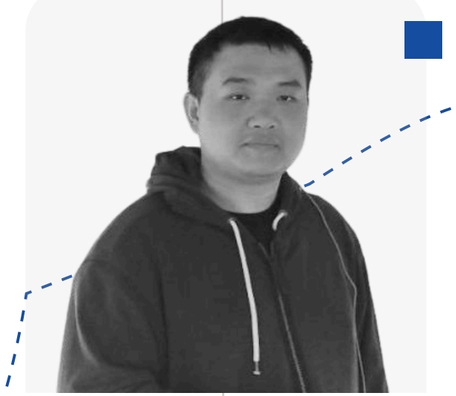

Jiang Yuxuan
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CHALLENGE

Challenge1

How might we develop a secure system of alerting doctors of an urgent lab result?

Effective communication of urgent lab results is critical in Clinical Microbiology Management. The timely reporting of these results can lead to more timely clinical interventions, improved treatment outcomes. The communication of critical laboratory results must be secure and reliable. As per the insights from our project partner the current methods of using BLIP system and telephonic communication have along waiting time, leading to slower reponses and thereby endangering patient.

Considerations

The system must ensure timely and secure communication while being user-friendly and easily integrated into hospital workflows. It is also essential to adhere to privacy and data protection regulations.

Challenge2

How might we develop an adaptive computer-based test for a European Exam?

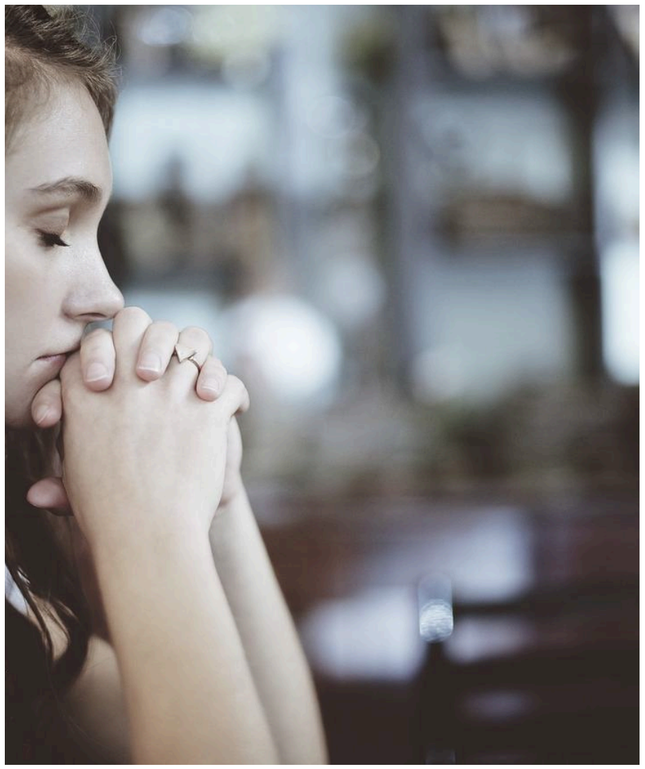
adjust their operations and content based on users' needs and behaviors, are widely used in fields like education, recommendation, and personalized healthcare. Evaluating these systems is crucial to ensure their effectiveness and user satisfaction, but it is a complex and challenging task. Item Response Theory (IRT) and its advancements serve as the foundation for many adaptive assessments [2, 3].

Considerations

Considerations for Challenge 1 include ensuring the required competency levels for CM practice are met [4]. It is also crucial to adhere to European healthcare standards [4], while taking into account individual backgrounds and diversity [5]. Additionally, integrating with current electronic health record systems [6] is essential for effective and efficient practice.

LITERATURE REVIEW

How might we develop a secure system of alerting doctors of an urgent lab result?



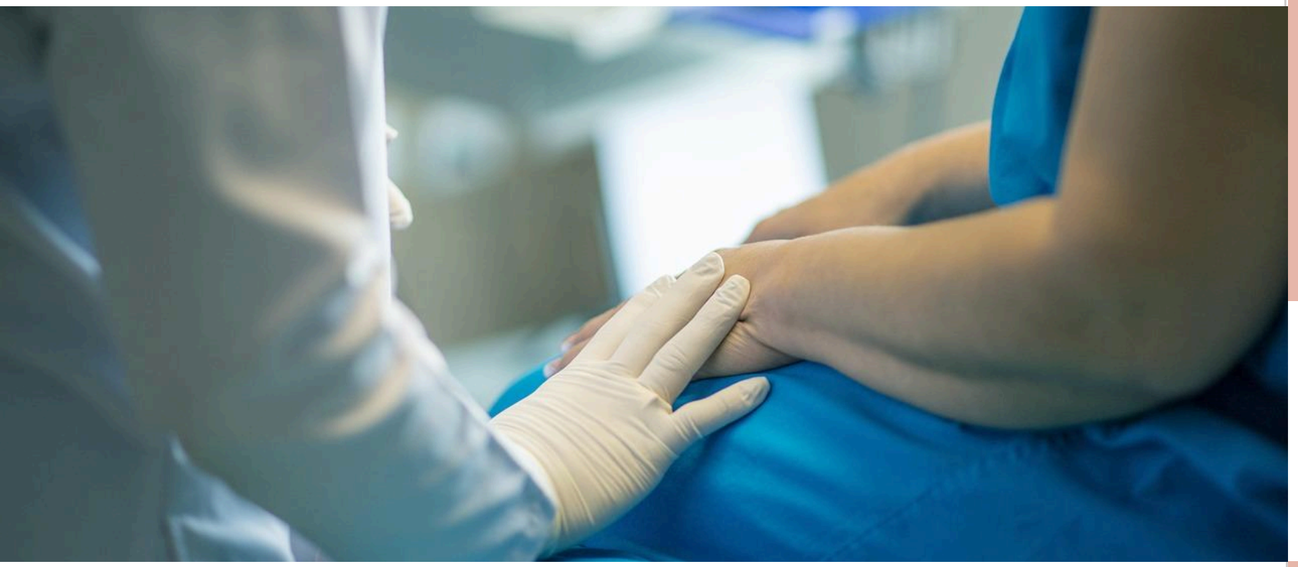
Secure messaging is effective for critical value alerts in healthcare. Research at Geisinger Me Center showed it reduced lab result communi time by almost 8 minutes compared to traditic methods. Additionally,85% reported that secu text messaging for critical value notifications increased efficiency, 95% found it more effect than pager-phone-call systems and 83% said enabled better, faster patient care [16].

Secure Communication Protocols in Healthcare

Secure communication protocols are vital in healthcare to safeguard patient data and enable effective communication among providers. A study [15] implemented Hospital Information System (HIS) that significantly boosted productivity by reducing medication delivery time and enhancing patient satisfaction. It also improved communication and data validation, allowing patients to receive timely lab results via SMS notifications and online access.

LITERATURE REVIEW

How might we develop a secure system of alerting doctors of an urgent lab result?



Healthcare Communication Systems

Hospital communication systems, including software and technologies, facilitate information exchange among hospital staff to improve patient care and operational efficiency. Key systems include Electronic Health Records (EHRs), emails, nurse call systems, intranets, messaging platforms, public address systems, pagers, telehealth, and staff messaging tools. Effective communication is crucial for patient safety, especially for urgent lab results, as delays or errors can jeopardize patient well-being and compromise care quality. Secure communication is essential for patient safety, privacy, and overall care effectiveness [12, 13].

Secure Alerting Systems

Developing secure alert systems for urgent lab results is crucial in clinical microbiology. These systems should provide real-time alerts for critical results and include a feedback mechanism to confirm receipt [14].

» STATE OF ART

How might we develop a secure system of alerting doctors of an urgent lab result?

Digital Systems in Practice

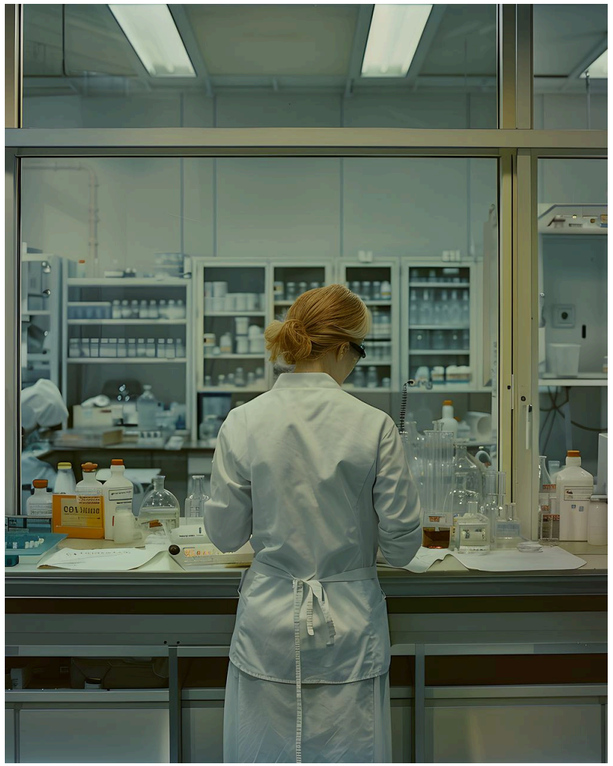
Digital systems for alerting doctors of urgent lab results have evolved significantly, incorporating various technologies to enhance efficiency and security. One such system is the use of automated pathways that integrate short messaging systems (SMS), auto-escalation, and manual telephone backup. This approach has been shown to improve the rate and speed of physician acknowledgment and intervention compared to manual methods alone [17].

Desired Features and Security Concerns

key features desired in these systems include clear alert thresholds, direct communication with physicians, and tight timelines for acknowledgment and intervention. Automation, combined with manual backup, has been found to be effective in ensuring timely responses without adversely affecting intervention rates [17]. Security concerns, such as ensuring the confidentiality and integrity of patient data, are paramount. Use of secure communication channels and robust authentication mechanisms are essential to address these concerns and GDPR compliance.

LITERATURE REVIEW

How might we develop an adaptive computer-based test for a European Exam?



Statistics and Motivations

Improved patient satisfaction, reduced errors, lower costs, and trust building can be achieved through effective communication. Communication tools should enable clear, instantaneous information sharing among healthcare teams.

The European Context

European Union of Medical Specialists (UEMS) has established professional standards for clinical microbiology through the development of European curriculum and implementation of European examination in medical microbiology. A survey conducted in 2021 involving 21 European countries showed that all countries had structured clinical microbiology training programs with a curriculum, dedicated trainers, and a record of training activities. 15 countries required trainees to pass an exit examination, and over 60% of countries participated in continuous workplace-based assessment [8].

LITERATURE REVIEW

How might we develop an adaptive computer-based test for a European Exam?

Current Assessment and Evaluation Mechanisms

Currently, clinical microbiology assessment in Europe are combination of formative and summative assessments. Formative assessments, such as logbooks and continuous workplace-based evaluations, are used to monitor trainees' progress throughout their training. Summative assessments, including exit examinations, are employed to ensure that trainees have achieved the necessary knowledge, skills, and attitudes to practice as specialists in clinical microbiology. The European examination in medical microbiology, developed by UEMS in partnership with ESCMID, is based on a comprehensive curriculum and best practice guidelines.

Importance of Adaptive Testing

The use of open-source software can keep costs low and reduce man-hours and other expenses. Design considerations like user access control, data privacy, and the ability to manage large workloads in departments like laboratory and radiology, will ensure efficient and secure operations.

STATE OF ART

How might we develop an adaptive computer-based test for a European Exam?

Advancements in Adaptive Testing for the European Clinical Microbiology Exam

Digital systems such as the UEMS-ESCMID European Examination in Medical Microbiology employ online platforms with remote invigilation to ensure accessibility and security. These systems are designed to align with the European Training Requirements and best practice guidelines, incorporating multiple-choice questions and other assessment formats to evaluate the knowledge and skills of candidates effectively. These innovations are crucial for maintaining the rigor and relevance of high-stakes exams in clinical microbiology [8, 10].

Machine Learning Perspective

Integrating Machine Learning into CAT involves optimizing components such as cognitive diagnosis models, question bank construction, and test question selection. This inclusive approach promises a future of adaptive testing that is more interdisciplinary and comprehensive [11].

» KEY TAKEAWAYS

01

The importance of effective communication in healthcare [13]

Improved patient satisfaction, reduced errors, lower costs, and trust building can be achieved through effective communication. Communication tools should enable clear, instantaneous information sharing among healthcare teams.

02

The communication of critical and unexpected pathology results [14]

Systems need to be scalable and cost-effective to quickly communicate the results. Automated electronic systems for real-time alerts can boost efficiency and cut costs. Adaptability to local needs, avoiding system overload, and maintaining diagnostic accuracy and collaboration with stakeholders are vital in the system design.

03

In-Patient Medication Delivery in Mobile App and Out Patient Online Lab Results for Hospitals [15]

The use of open-source software can keep costs low and reduce man-hours and other expenses. Design considerations like user access control, data privacy, and the ability to manage large workloads in departments like laboratory and radiology, will ensure efficient and secure operations.

04

Secure Messaging Enhances Critical Value Alerts [16]

Secure text messaging (STM) is more scalable and cost- effective than traditional methods like phone calls and pagers. Modern, secure communication technologies will improve workflow and efficiency in healthcare.

05

Innovative strategy for effective critical laboratory result management: end-to-end process using automation and manual call centre [17]

Automated features like SMS notifications and auto-escalation improved the speed and rate of physician responses compared to manual methods. Scalability of this system, using existing hospital systems and mobile technology, will reduce manual labor and costs. Combining automation with human oversight will deliver an efficient and reliable CLR management systems

Our decision to move ahead with Challenge 1

After conducting a thorough review of literature and state-of- the-art research on both design challenges, we engaged in discussions via email with our project partner, Dr. Maeve Doyle. Our review covered adaptive computer-based tests, particularly focusing on their implementation and relevance in the European healthcare context, and secure systems for urgent lab result communication.

Considering the complexity of designing an adaptive assessment system within our final semester's limited time, we found it impractical to address that challenge fully. On the other hand, the need for a secure system to alert doctors about critical lab results in Ireland is a more feasible and impactful project. Therefore, we decided to move forward with Design Challenge 2, aiming to develop a secure, reliable, and suitable solution for communicating urgent lab results.

CASE STUDY

Case Srudy - 1

Optimizing Critical Laboratory Value Reporting with Secure Messaging: A “Cortext” Case Study [3]

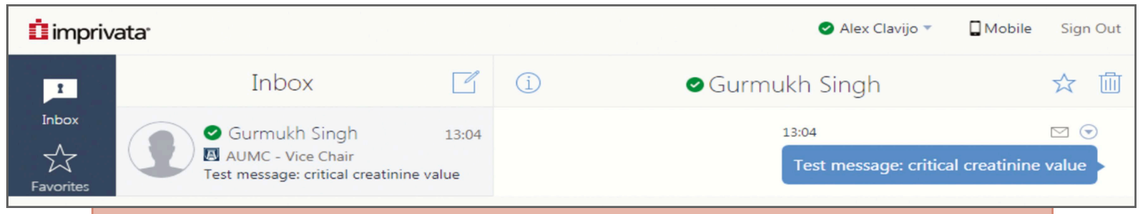
Cortext is a secure messaging system for communication of protected health information (PHI). The app is designed to replace pagers and is usable in computers and on smartphones. All of the providers, including in-house staff members, can be contacted by secure messaging through this app.

Cortext maintains the record of communications; those records are retrievable through the electronic medical record, as needed.

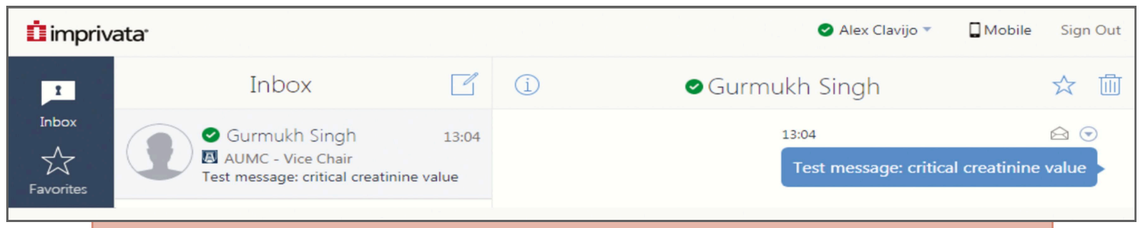
The records include:

- Patient identity
- The identities of the persons reporting and receiving the message
- The date and time of communication
- Record of receipt and reading of the message.

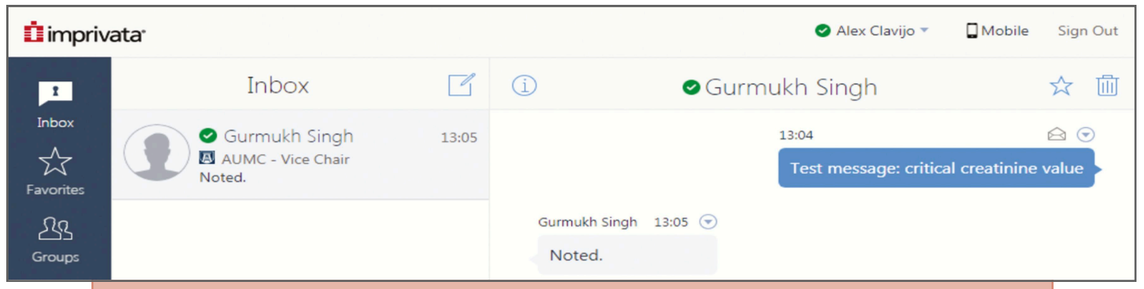
Screenshots from the Imprivata Cortex secure messaging app



Initiation of the message. Alex can see that Gurmukh Singh is available (indicated by the green dot with check marks next to the name).



Indicates that Gurmukh Singh received and opened the message, as indicated by the open envelope on the right side of the blue message box.



When recipient acknowledges the message.

Case Srudy - 2

Is Computerized Notification System Effective? [4]

The hospital clinical information system (HCIS) (e-Health Solutions Medical Software, developed by GMD, version 3.8, Noematica, Bologna, Italy) integrates medical and administrative IT systems, supporting clinical workflows.

It handles clinician requests and assembles information from diagnostic services (clinical laboratory, imaging) along with supplying clinicians with real-time lab results from laboratory information system (LIS).

Process

1. Critical Values Notification: Upon validation by a clinical pathologist, an email is sent from LIS to HCIS.
2. Actions Triggered:

- SMS Notification: Sent to the cell phone of the referring physician.
- Video Alert: Flashing alert on the monitor of the ordering clinician, that stops only after 60 minutes or upon confirmation.

3. Privacy Compliance: Messages include patient ID codes, critical analyte, and lab contact.
4. Documentation: HCIS logs the status of notifications, indicating success or failure.

- Success: Logged with green color coding.
- Failure: Indicated with red color coding and the term "expired," followed by telephone communication.

Results

Computerized Notification System

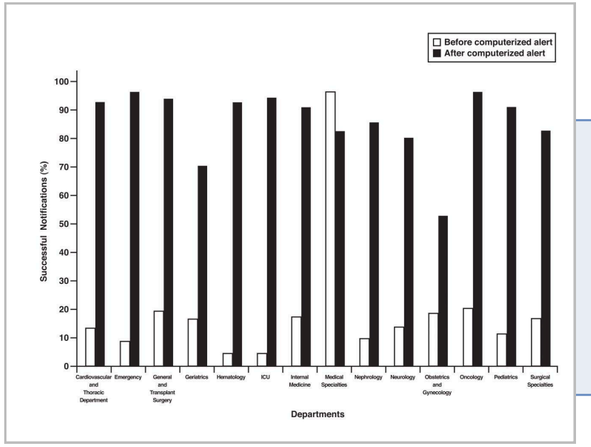
Average Notification Time:
11 minutes (receipt and confirmation).

Unsuccessful Notifications:
10.9% (notification without confirmation within 1 hour).

Telephone call system

Average Notification Time:
30 minutes. (looking up the number, dialing, finding the clinician, relaying information, and reading back)

Unsuccessful Notifications:
Over 50% (notification made after more than 1 hour).



Comparison of successful notifications within 1 hour, for the traditional phone process with those of the computerized system

DESIGN PROCESS

Empathize

- Initial meetings with Dr. Maeve Doyle.
- Understanding the problem.
- Understanding the current pain points of doctors, staff and patients.

Define

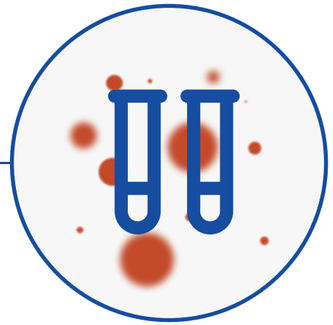
- Conduct literature review and find state of the art.
- Understand the insights in the domain.
- Synthesize key takeaways from the review.
- Select one challenge.

Ideate

- Brainstorm ideas with team.
- Generate multiple design solutions.
- Create low-fidelity prototypes.

Prototype

- Create a rough draft of the solution.
- Develop high-fidelity prototypes.
- Collect feedback from Dr. Maeve and Team.



Test

- Conduct usability testing with target users.
- Collect and analyze feedback on prototypes.
- Iterate based on test results.

Assess

- Develop the final product based on the refined prototypes.
- Implement the solution in a pilot environment.
- Monitor performance and gather feedback for further improvement.

PARTNER INTERVIEW

During our Zoom interview with Dr. Grace Chan, we gained valuable insights for our design project. We thoroughly understood the current process for communicating urgent lab results, which relies on a pager/BLIP system and manual phone calls to GPs—a method that is both tedious and inefficient. Dr. Chan highlighted the pain points and challenges faced by doctors and shared her expectations and desired features for the new system we are designing. Additionally, we reviewed the WHO's Laboratory Quality Stepwise Implementation (LQSI) tool, which offers a structured plan and guidelines for implementing a quality management system.

Dr. Grace recommends focusing the project on blood culture samples for Sepsis for the following reasons:

01

Simplified management: By focusing on one sample type, the scope of the project is more focused and easier to manage.

02

Criticality: Blood culture samples for sepsis are time sensitive and require urgent attention.

03

High impact: Sepsis is a life-threatening disease, commonly reported in the news, and of high importance.

04

Scalability: After the system's success with blood culture samples, it can be applied to other sample types.

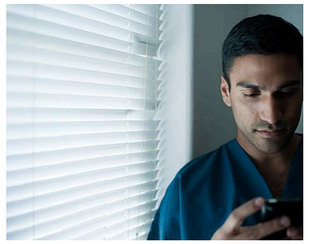
05

Demonstration of value: Improved communication of key results can provide strong evidence for widespread adoption of the application.

06

Clear workflow: Sepsis patients are evaluated and treated with a clear timeframe, making it easy to define application requirements.

» CURRENT STATUS

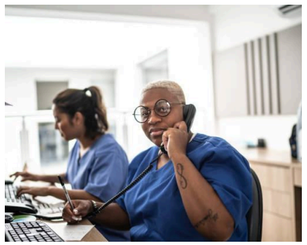


Pager/Beep System

- Doctors receive pages with extension numbers to call back.
- No information about the nature of the call or patient details.
- Often leads to delays in communication.
- Multiple attempts may be needed to reach the correct team.

Manual Processes

- Reliance on phone calls and callbacks.
- Time-consuming and prone to errors.
- No automatic tracking of whether results have been communicated.



Challenges with Satellite Hospitals

- Communication requires going through hospital operators.
- Can't directly page doctors in other hospitals.
- Significant delays in reaching the right person.

Phone Calls for Critical GP Results

- Lab staff call GP office landlines.
- Often face long wait times due to automated messages and receptionists.
- GPs may be unavailable, leading to further delays.

Data Protection Concerns

- Limited use of personal phones due to data security issues.
- Difficulty in securely transmitting patient information.

Healthlink for Non-Urgent Results

- Electronic transmission system for routine results to GPs.
- Not used for critical or urgent results.

Lack of Electronic Health Records

- Most hospitals don't have comprehensive electronic systems.
- Difficult to access patient history and previous results quickly.

SURVEY

- **Background**
- **Statistical**
- **Takeaway**
- **Thematic Analysis**

» BACKGOUND

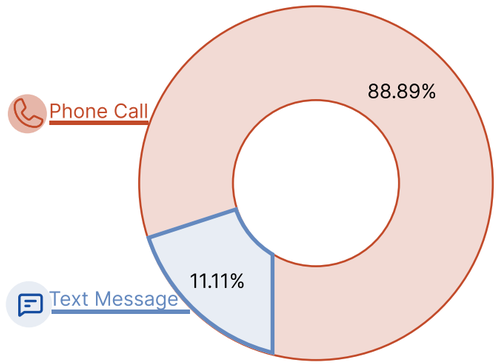
Introduction

> This survey aims to gather insights from healthcare professionals on their experiences, challenges, and preferences regarding alert systems to improve the way urgent laboratory results are communicated to doctors, with a focus on increasing the speed, efficiency, and safety of current notification systems.

Methodology

Google Form **FOR** lab Staff, microbiologist, Doctor

Current System Overview



Urgent lab results communication methond

44.44% (4/9) rated system as 2 (effective)

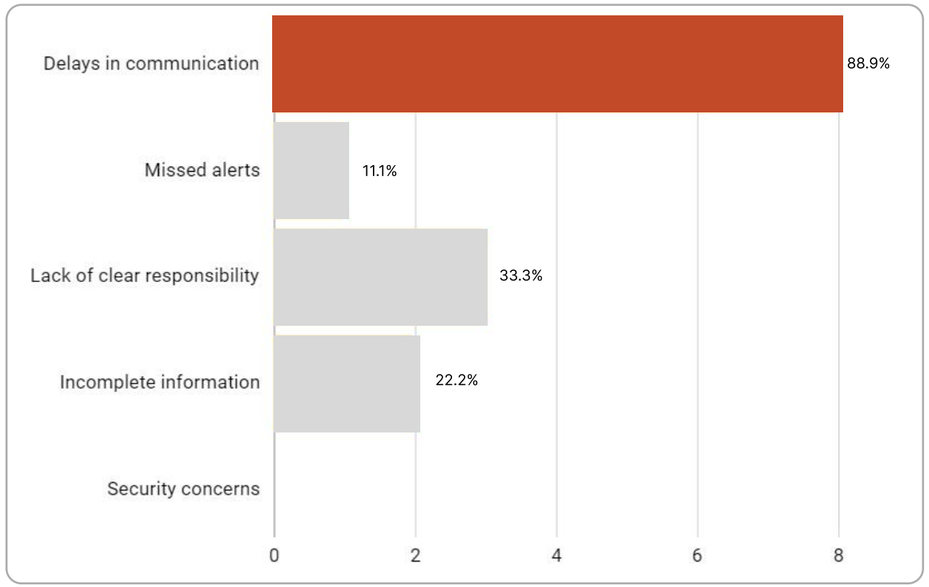
33.33% (3/9) rated system as 3(neutral)

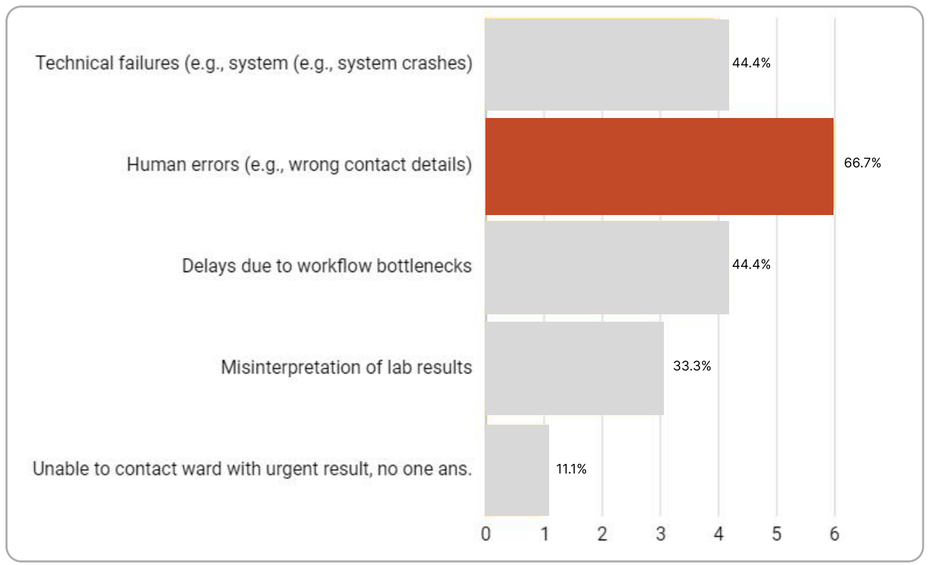
22.22% (2/9) rated system as 5 (very ineffective)

Most respondents expected to receive urgent lab results within 1 hour (33.33%) or within 30 minutes (22.22%).

» STATISTICAL ANALYSIS

Challenges and Pain Points





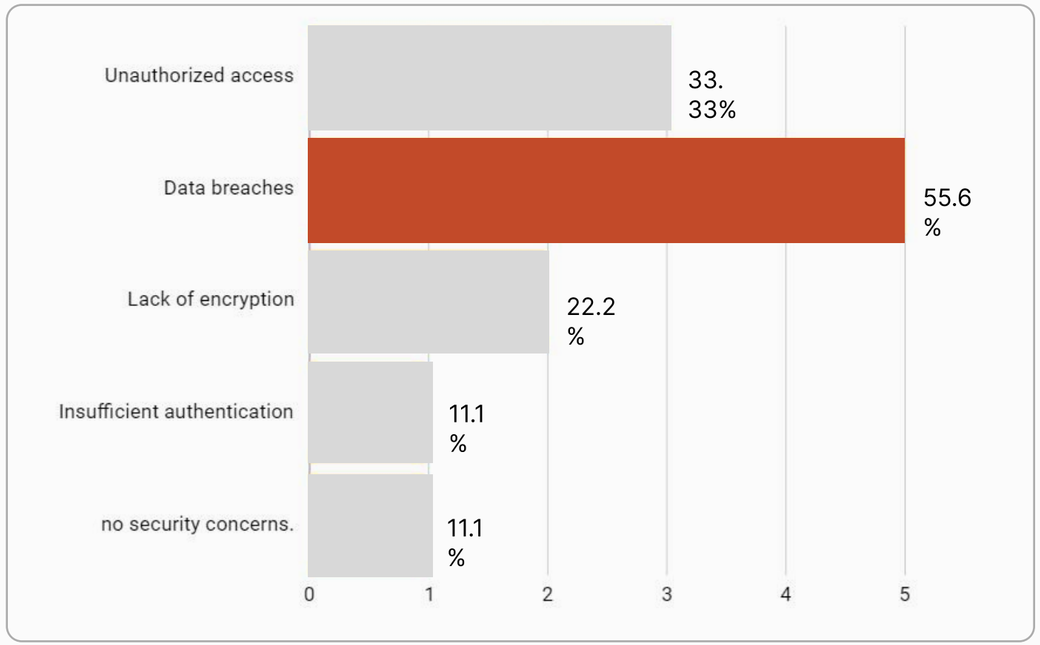
The most frequently mentioned challenge was

Delays in communication,

cited by 88.9% of respondents. This highlights a critical area where timely information flow is essential but currently lacking, potentially leading to significant delays in patient care. Other notable challenges include **a Lack of clear responsibility (33.3%)**, **Incomplete information (22.2%)**, and **Missed alerts (11.1%)**. These issues indicate broader systemic problems that contribute to inefficiencies and errors in the current alert system.

» STATISTICAL ANALYSIS

Security Concerns

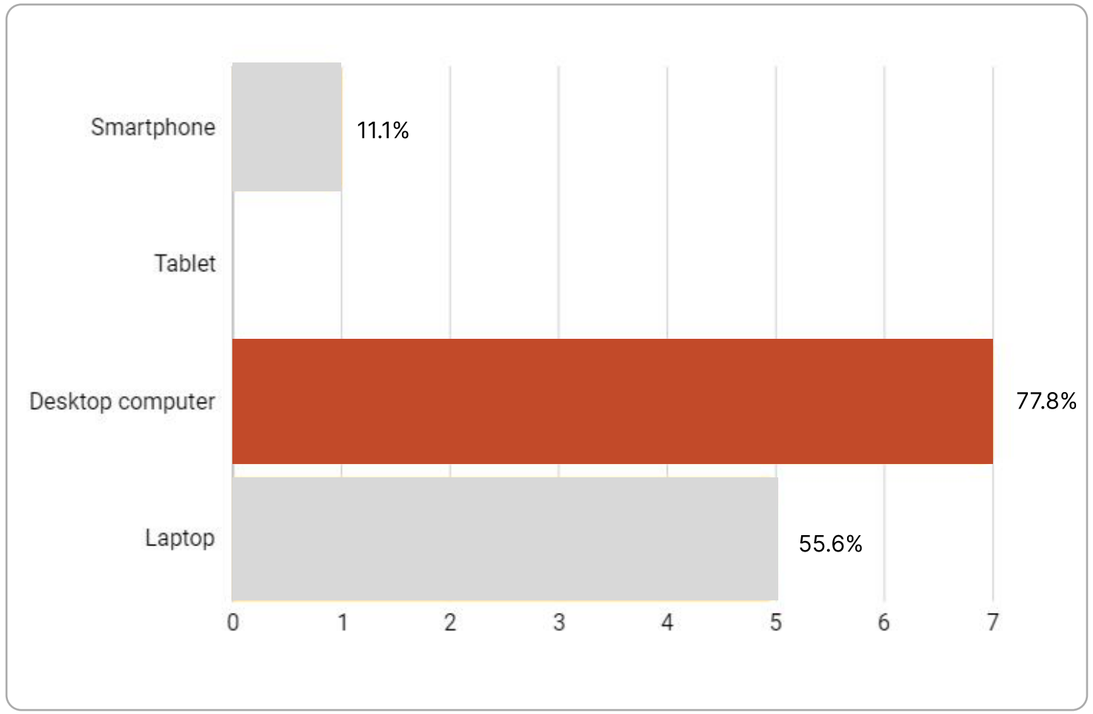


The most pressing security issue highlighted was **Data breaches,** cited by 55.6% of participants, indicating a substantial risk to patient confidentiality. **Unauthorized access** was another major concern, mentioned by 33.3% of respondents, reflecting fears about who might have access to sensitive information. Additionally, **Lack of encryption** (22.2%) and **Insufficient authentication** (11.1%) were identified as vulnerabilities that could potentially compromise the security of the system. Notably, one participant reported having no security concerns.

This data suggests that while there is some confidence in the current system's security measures, a significant proportion of users either see room for improvement or are unsure about the system's ability to safeguard sensitive information. These findings emphasize the need for a more secure and robust alert system that addresses these vulnerabilities, **ensuring that patient data is adequately protected from breaches and unauthorized access**.

STATISTICAL ANALYSIS

Technology and Usability

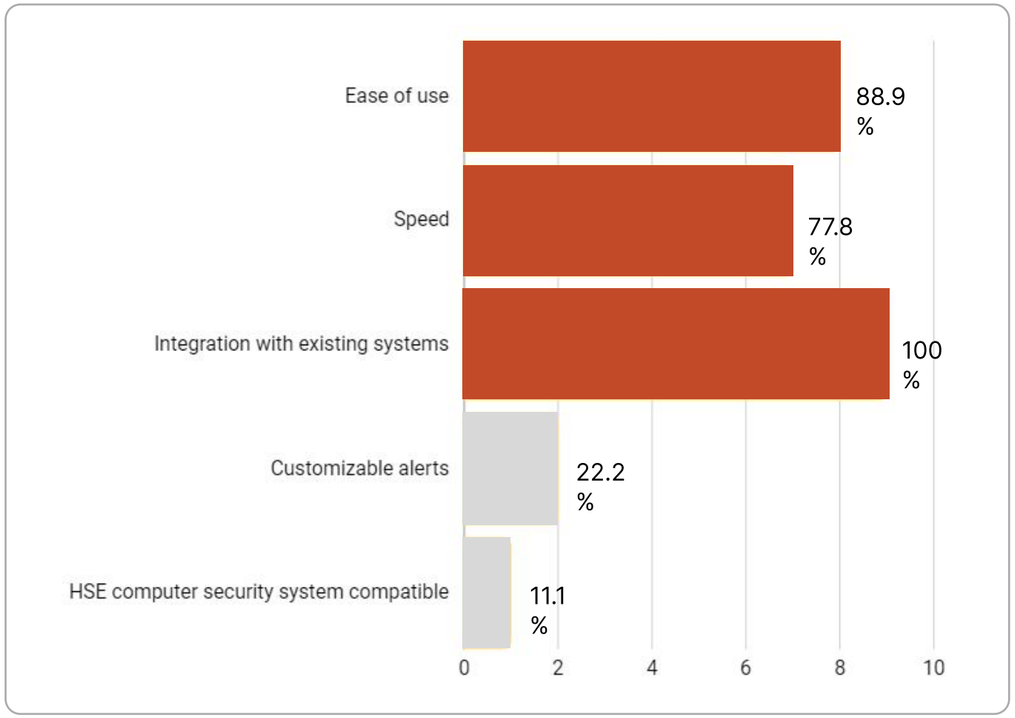


Desktop computers are the most commonly utilized technology, with 77.8% of respondents incorporating them into their daily workflow. This is followed by Laptops, used by 55.6% of respondents. Smartphones are utilized by 11.1% of participants, while Tablets are not used at all. The widespread use of desktop computers and laptops suggests that

any new system should be optimized for these platforms,

although the presence of smartphone usage indicates

a need for mobile compatibility as well.

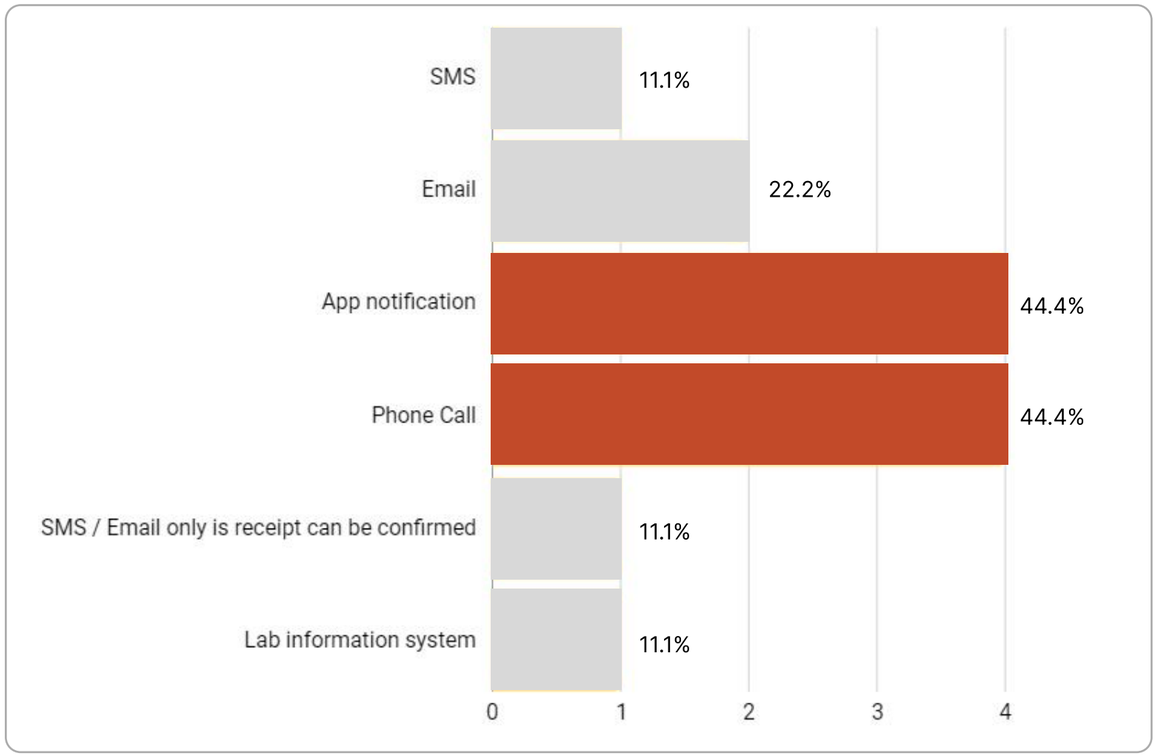


The survey also revealed that most respondents are comfortable with adopting new technologies, indicating a general readiness for system upgrades. When asked about the key usability features they desire in a new alert system, respondents emphasized the importance of

ease of use (88.9%), **speed** (77.8%), and **integration with existing systems** (100%). These preferences highlight the need for a user-friendly, fast, and seamlessly integrated solution that fits into the existing technological environment of healthcare professionals.

» STATISTICAL ANALYSIS

Desired Features for New Alert System



App notifications and **Phone calls** were the most preferred methods of receiving urgent lab results, each selected by 44.4% of respondents. One participant expressed a preference for SMS and App notifications specifically if receipt can be confirmed, highlighting the need for a reliable acknowledgment system. Additionally, another respondent suggested using a Lab Information System (LIS), a method not originally included in the survey options, indicating

a demand for integration with existing lab systems.

Respondents also stressed the importance of prioritizing the information provided in urgent alerts. The most critical elements identified were Patient identification details and Lab result specifics. These were followed in importance by the Urgency level and Recommended actions, with Contact information for follow-up being the last priority. This feedback underscores the necessity for an alert system that not only delivers notifications through preferred channels but also

clearly organizes and prioritizes critical information to ensure swift and effective action.

» STATISTICAL ANALYSIS

System Status Assessment

- Efficiency Issues: The data shows that the current system has a low efficiency score, especially for professionals who expect to receive results faster. This shows that the current system is insufficient in terms of timeliness and accuracy.
- Security Issues: Security is a major concern. The survey showed that many professionals are dissatisfied with the security of the current system and are concerned about unauthorized access and data leakage.

System Improvement Direction

- **Improve timeliness**: Data shows that many professionals expect to receive emergency results faster. Therefore, the new system needs to optimize the notification process and reduce delays.
- **Enhance security**: According to the survey results, the new system must address the shortcomings of the current system in terms of security. Adopt more stringent authentication and encryption measures to ensure the secure transmission of patient information.
- **User-friendliness**: Professionals have high requirements for the system's ease of use and integration with existing systems. The new system needs to be designed to be more user-friendly and seamlessly integrated into the existing hospital information system.

Needs of Different Professional Roles

- Doctors & Lab Staff vs. Microbiologists: Different professional roles have different needs and evaluations of the system. **Doctors (average evaluation: 2.6) and laboratory staff (average evaluation: 2.5) have a higher evaluation of the system, while microbiologists (average evaluation: 1.5)** have a relatively low evaluation of the system. This suggests that we need to consider the specific needs of different professional roles when designing a new system.
- The Impact of Years of Service: Professionals with more years of service are more satisfied with the system, indicating that they may be more adapted to the current system or have more experience in dealing with the shortcomings of the system. This requires improvements in training and support, especially for professionals with fewer years of service:
  - **0-2 years: Average Evaluation 2.0**
  - **3-5 years: Average Evaluation 2.4**
  - **6-10 years: Average Evaluation 2.5**

47

» STATISTICAL ANALYSIS

What is the most critical feature that an alert system must have to ensure patient safety and effective communication?

By Doctor

- Acknowledgement of receipt of alert by clinical team
- Read receipts to ensure it has been seen by the person who needs to see it
- Timely and reliable communication
- Correct result to correct patient in a timely manner

By Consultant Microbiologist

- That message has been received (confirmation)
- Receiver acknowledgement of result, secure transmission of result, timely and automated process

By Lab Staff

- That correct result is communicated to team with clinical responsibility for the patient, i.e. that person receiving results is familiar with patient's case.

Do you have any concerns or suggestions that we haven't covered?

By Lab Staff

- Very difficult to contact ward on call, people not willing to take results.
- Results can be urgent/non urgent depending on patient situation. Often not enough background information on patient to know whether a result is important until discussed with requesting team.

By Consultant Microbiologist

- GDPR compliance

Echoing Previous Findings

Priority Notification Management

New systems still need to include clear priority tagging capabilities (e.g., red, yellow, green) to help doctors quickly identify the urgency of lab results. This priority management system ensures that the most critical alerts receive the immediate attention they need, ensuring patient safety and effective communication.

Unveiling New Insights

Notification Acknowledgement and Tracking

Acknowledgement of Receipt: As emphasised by these respondents, an acknowledgement system is critical. This feature ensures that clinical teams acknowledge receipt of alerts, reducing the risk of missed notifications.

Timely and Reliable Communication

Sending the Right Results to the Right Patient: Alert systems must ensure that the right results are sent to the right patients in a timely manner. This accuracy is critical for effective patient care and minimises the risk of errors in the communication process.

Concerns about communication barriers: A notable concern raised by laboratory staff was the difficulty in contacting the on-call ward, as people are often reluctant to receive results. This barrier can significantly delay the communication process and impact patient outcomes.

USER PERSONA

Jonathan Hayes
Laboratory Assistant

Bio

He is responsible for overseeing lab tests and communicating critical results. Known for his attention to detail, he works closely with healthcare teams to ensure timely and accurate reporting of critical values.

Goals

- Ensure swift and accurate communication of critical value alerts.
- Enhance patient safety through timely result reporting.
- Streamline the alert process to improve lab efficiency.

Pain Points:

- Difficulty reaching the right healthcare professionals quickly.
- Time-consuming manual steps in the alert process.
- Challenges with integrating alert systems into existing hospital workflows.
- Security concerns regarding patient data confidentiality.

Needs

- Fast, reliable alert system integration.
- User-friendly interface with seamless integration.
- Read receipts and acknowledgment features.
- Strong security measures for patient data protection.

Dr. Emily Carter
Microbiologist

Bio

She is an experienced Microbiologist responsible for acknowledging critical lab alerts and coordinating patient treatment. Known for her clinical expertise and focus on timely communication, she plays a key role in patient care.

Goals

- Quickly acknowledge critical lab alerts.
- Provide accurate treatment plans based on lab results.
- Improve coordination between lab and clinical teams.

Pain Points:

- Delays in receiving alerts impact patient care.
- Difficulty accessing complete patient information quickly.
- Managing a high volume of alerts while ensuring accuracy.
- Ensuring secure communication of patient data.

Needs

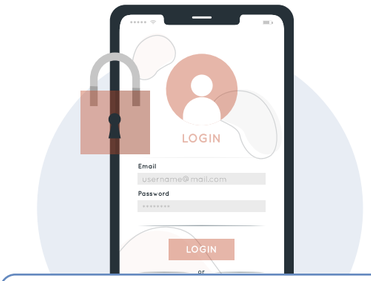
- Reliable and prompt alert notification system.
- Easy access to patient information and lab results.
- User-friendly interface for quick action.
- Secure communication channels.

USER JOURNEY

Stages	1 Sample Collection and Analysis	2 Result Generation and Initial Review	3 Alert System Activation	4 Doctor's Response to Alert	5 Feedback and Improvement
Actions	Lab technician **processes** the sample.	Lab technicians **test and generate results**. Results are reviewed and **flagged if urgent**.	Flagged urgent results trigger a system alert. The alert is **securely sent** to the doctor.	Doctor **acknowledges** the alert. Doctor **accesses** the full lab report. Doctor takes necessary **action** (e.g., contact patient, prescribe treatment).	Collect feedback about the alert system. Analyse data for improvement areas.
Touchpoints	Patient-lab technician interaction. Sample transportation and logging.	Lab information systems. Lab staff communication.	Secure communication platforms. **Doctor's devices.**	Hospital's EHR system. Secure messaging apps.	Surveys, feedback forms. **Usage analytics**.
Pain Points	Sample collection **delays**. Sample **mislabeling or loss**.	Result **generation delays**. **Human error** in urgent result flagging.	**Communication security**. Doctor **alert fatigue**.	Timely acknowledgment and response to alerts. **Quick access** to full patient details.	Gathering **honest feedback**. Implementing feedback-driven changes.
Opportunities	Implement barcoding for sample tracking. Use electronic logs for sample status tracking.	**Automate** result **flagging** based on criteria. **Implement quality checks**.	Use encrypted messaging. **Prioritise alerts** by urgency and context.	Integrate alerts with **EHR** for seamless access. Provide action summaries in alerts.	Regularly **update the system**. Engage stakeholders in improvement.

USER FLOW

‘Lab Scientist’



1 Login (Securely)

Lab scientist securely logs into the lab result system.

2 Select Urgent Result

The lab scientist identifies the urgent lab result and verifies its accuracy before selecting it for alert notification.

3 Categorise Alert (A, B, or C)

Assign a priority category to the lab result:
Category A: Immediate danger, notify within 2 hours.
Category B: Significant, notify within 24 hours.
Category C: Important, notify by next working day.

4 Send Secure Alert

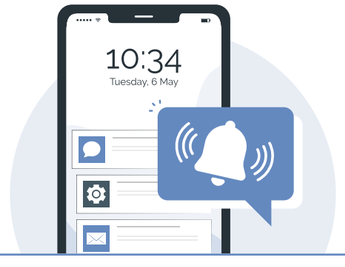
Enter relevant details of the lab result and select the receiving doctor(s).

5 Compose Alert

Send the alert through a secure, encrypted channel (e.g., secure email, app notification) based on the priority.

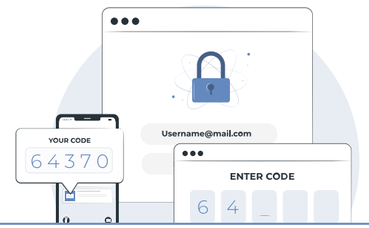
USER FLOW

‘Doctors’



1 Receive Notification (With Priority Level)

Doctor receives an alert on their preferred device (smartphone, tablet, computer), indicating the urgency level (A, B, or C) and the type of critical lab result.

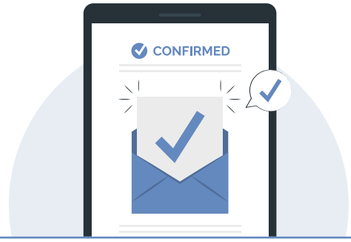


2 Authenticate (Securely)

Doctor securely logs into the system using two-factor authauthentication to access patient data and ensure information security.

3 View Urgent Result

Doctor accesses and reviews the urgent lab result immediately, assessing its criticality and determining necessary actions for patient care.



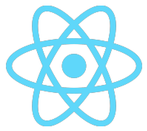
4 Acknowledge Receipt

Doctor acknowledges receipt of the alert by clicking a confirmation button or sending a message, ensuring the lab knows the result has been reviewed.

ARCHITECTURE

Fronted Components

Mobile Application



Reactive Native

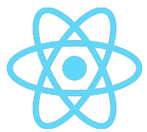
Kotlin

EXPO

Swift

"Cross-platform (iOS & Android)"

Web Management platform



React

Vite

Tailwind CSS

"Provides an interface for managing data and operations."

Backend Components

Server

Node.js

Nest.js

"handles API requests from the frontend"

Database

MongoDB

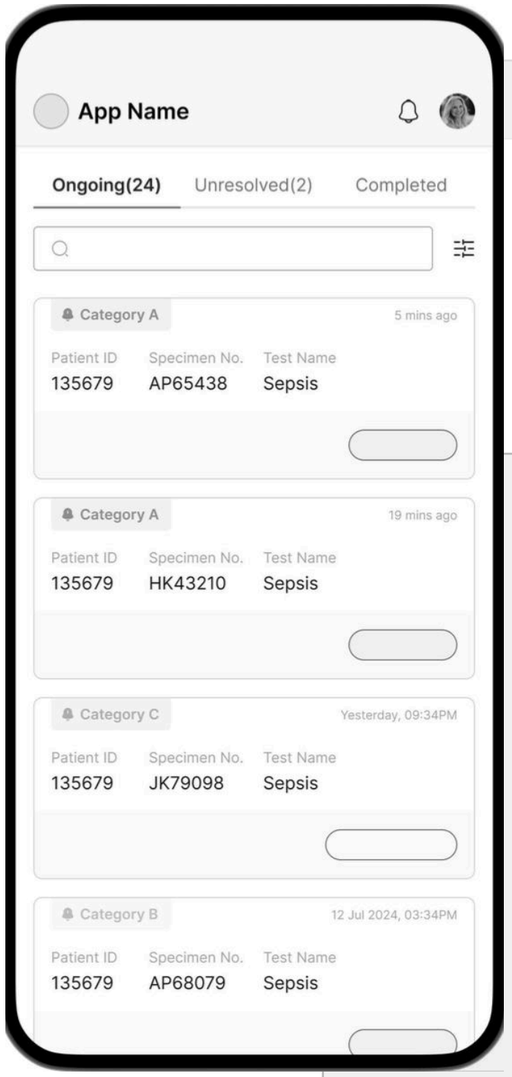
"store application data."

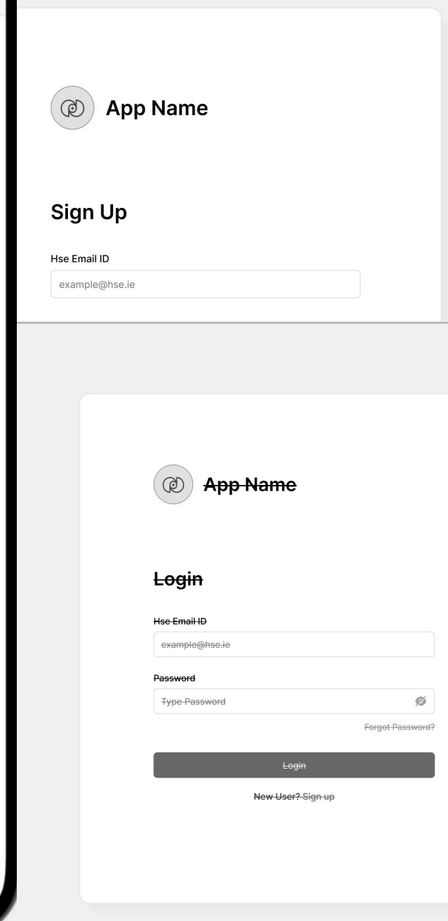
Cloud Services

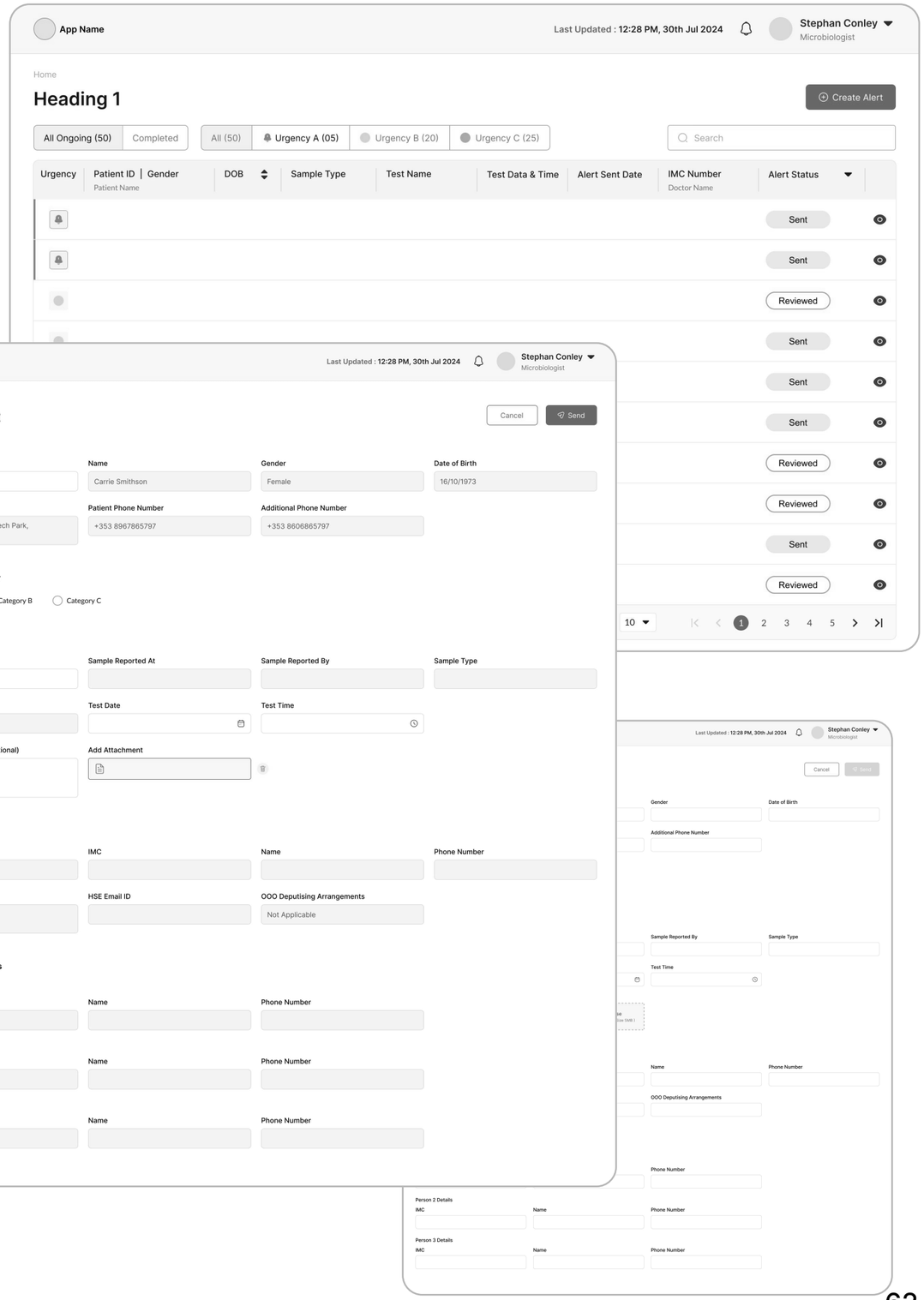
"hosting, storage, and additional functionalities."

PROTOTYPE

Led by Tanushri, our team collaborated closely to complete the prototype. I was primarily responsible for delivering the low-fidelity wireframes, while Tanushri and Dhrux, both professional UI designers, produced the high-fidelity prototypes. We all actively contributed our feedback throughout the process.







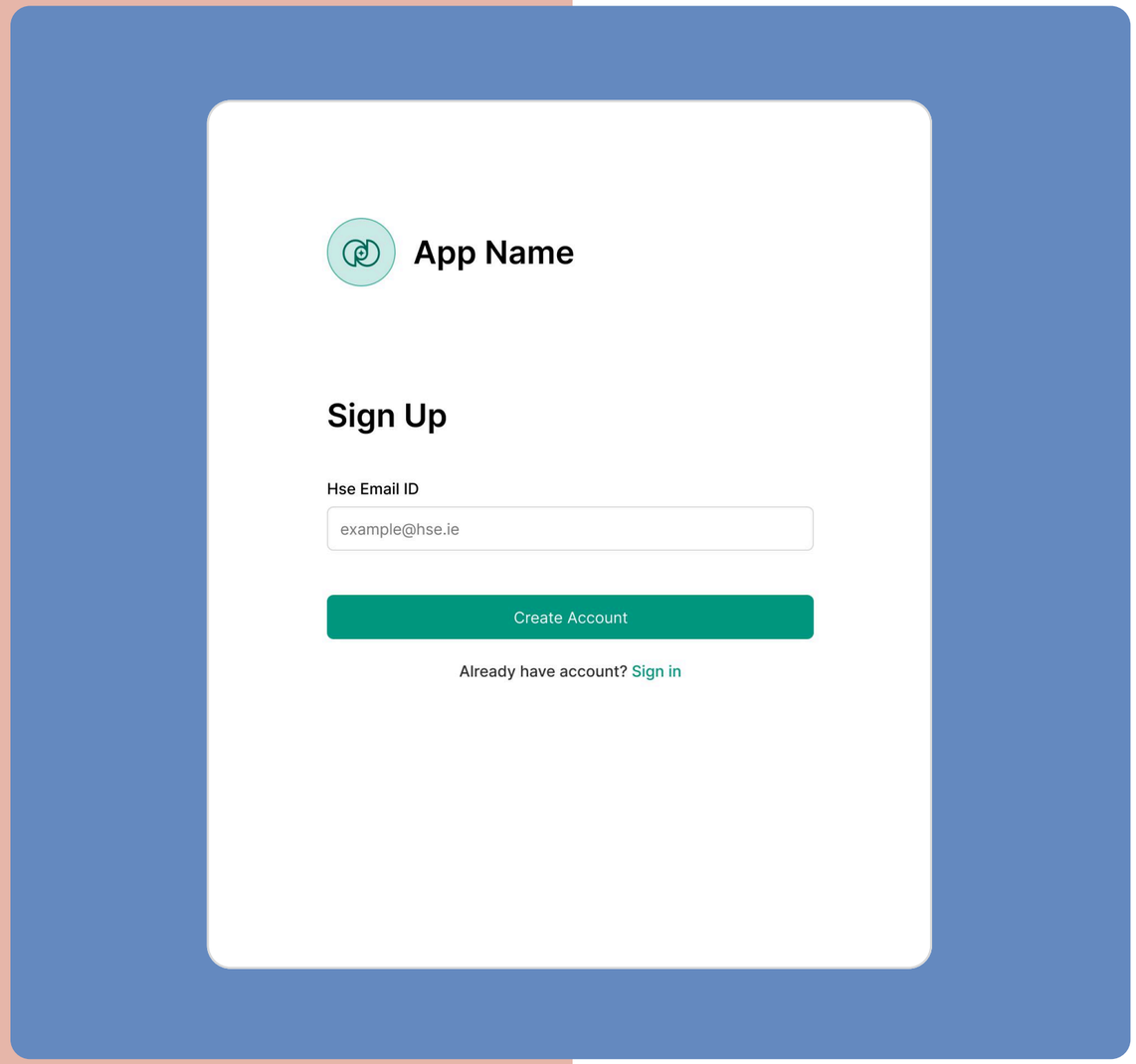
Sign Up Page

Restricted Access for Lab Technicians:
Lab technicians cannot sign up directly. They must use their HSE email ID.

Verification Link:
Upon entering their HSE email ID, a verification link is sent to their email.

Verification and Password Setup:
Users click the verify button in the email, which redirects them back to the web app to set their password.

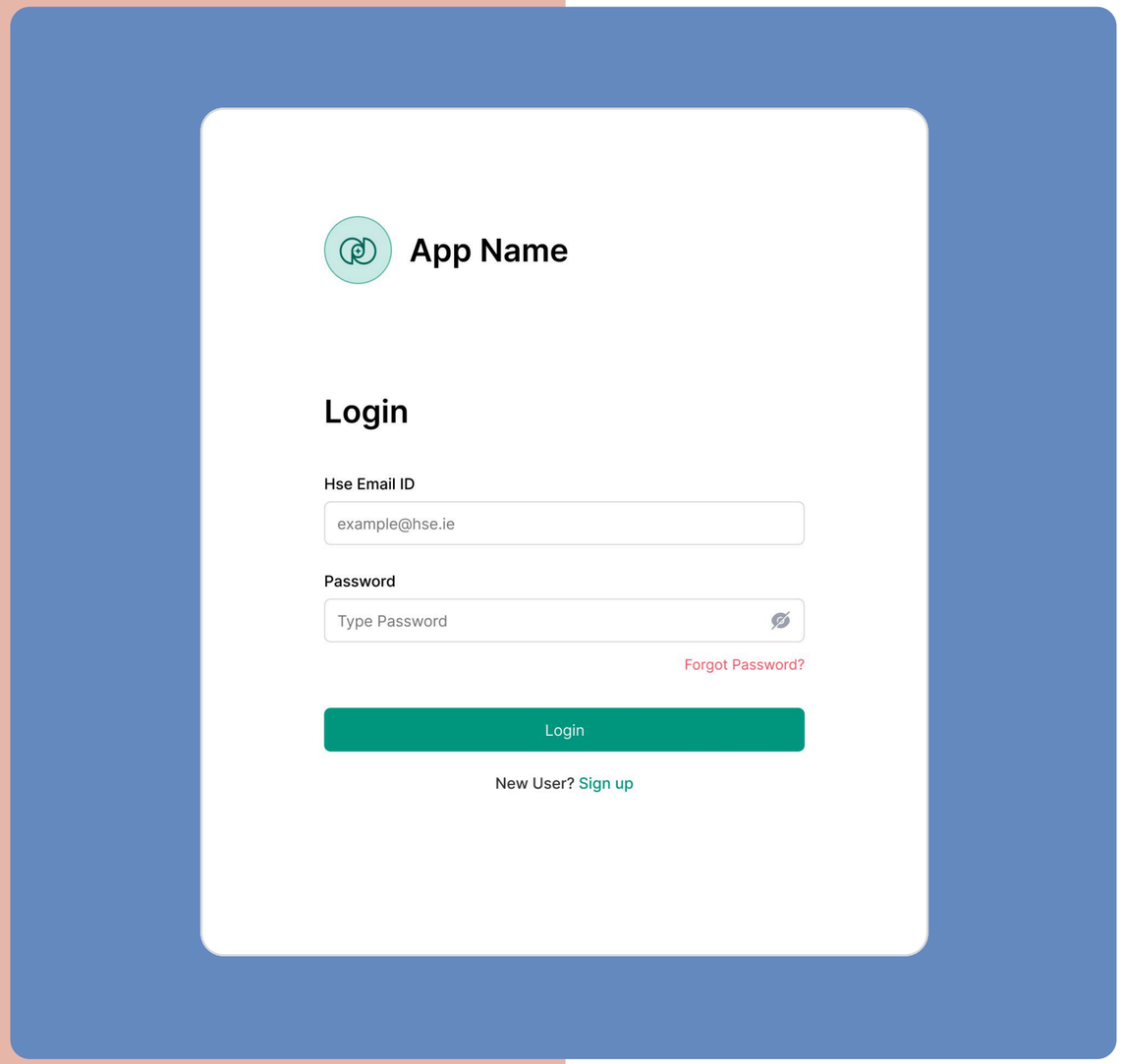
Account Activation:
After setting their password, users can log into the app using their new credentials, ensuring secure and verified access.



Login Page

Sign In with HSE Email:
Users can sign in using their HSE email ID and the password they created during registration.

Forgot Password:
The forgot password process follows the same steps as the sign-up flow, ensuring users can securely reset their passwords.



Homepage

Header

The header section features a Profile Icon, where users can access Profile Settings and Terms & Conditions. Next to it is the Notification Button, which displays new or updated alerts for quick reference.

Main Action

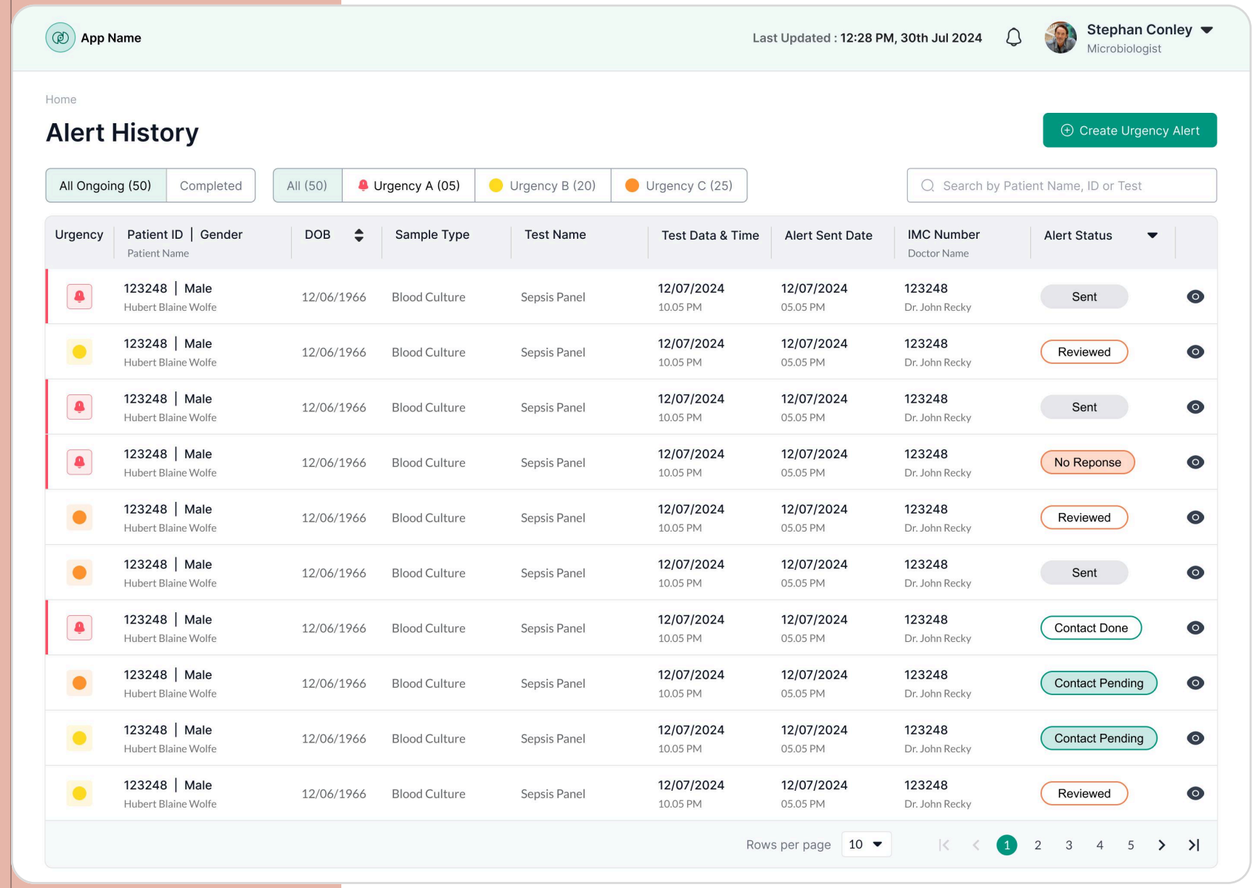
The Create Alert CTA is prominently displayed, allowing users to initiate the creation of a new alert with ease.

Filters and Search

Users can filter alerts using the Ongoing & Completed Alerts Filter to switch between active and past alerts. The Priority Filter helps prioritize tasks by urgency levels (A, B, or C). Additionally, the Search Tab enables users to quickly find alerts by entering patient names or test details.

Alerts Table

The alerts table includes several key columns such as Urgency, which displays the priority level (A, B, or C) of each alert, Patient Details with information about the patient, Test Details with specifics about the test, and Sample Details about the collected sample. GP Details provide information about the General Practitioner. Users can view or edit alert details using the View and Edit CTAs. Pagination controls at the bottom of the table allow navigation through multiple pages of alerts.



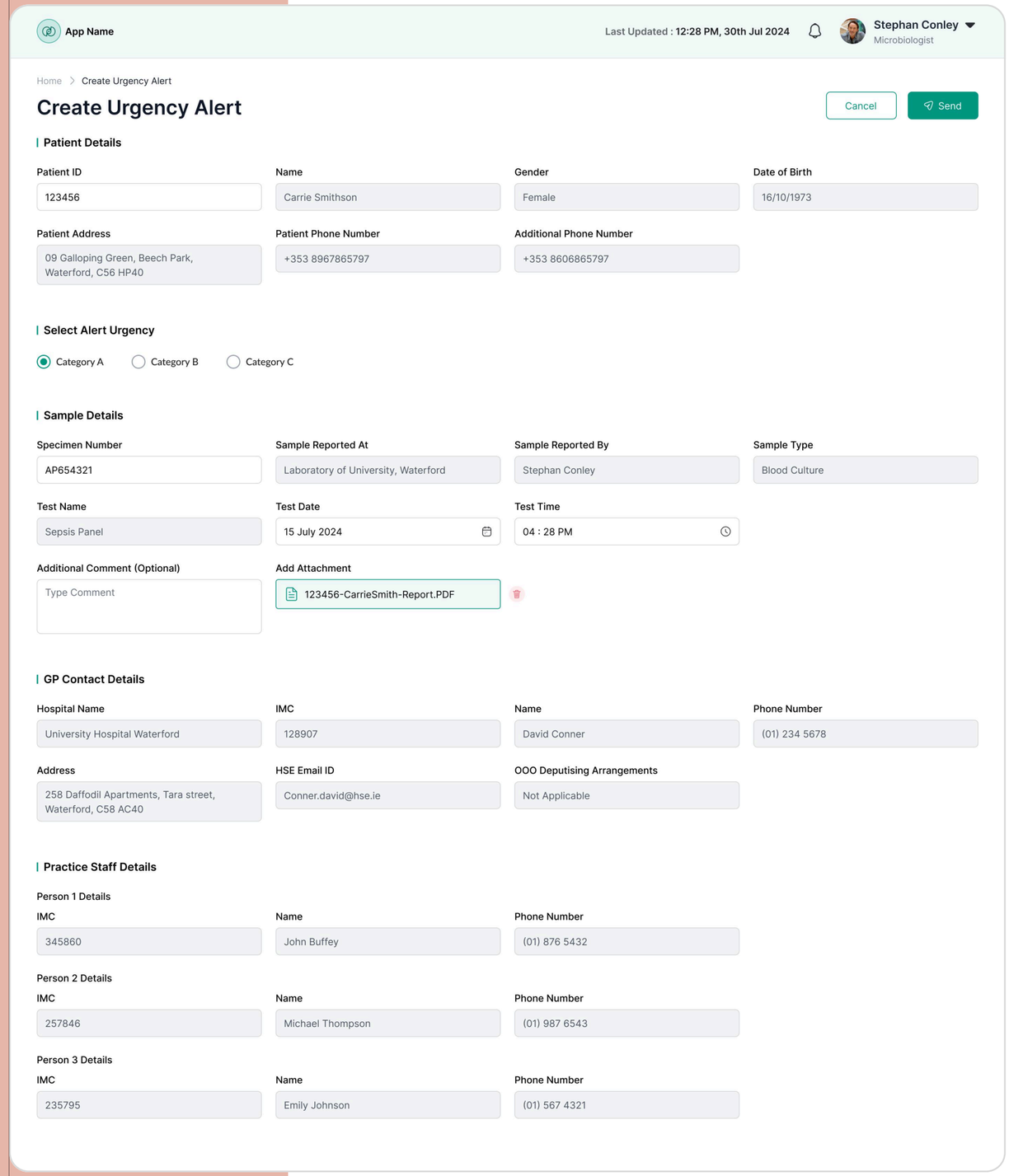
Create Urgency Alert Page

Input Fields

The Create Alert Page for lab technicians includes text input fields for entering the patient's information under Patient Details, and allows technicians to select the urgency level of the alert (A, B, or C) under Urgency Selection. It provides fields for entering details about the collected sample in the Sample Details section, and for entering contact information for the General Practitioner in the GP Contact Details section. Additionally, fields for entering details about staff members under the General Practitioner are included under Staff Under GP Contact Details.

Action CTA

The Actions section includes a Cancel CTA, which takes lab technicians back to the homepage without saving any changes, and a Send CTA, which submits the alert and redirects users to the homepage.



Homepage

Profile Section

Located at the top right, the profile icon allows users to access their personal details, terms and conditions, and app settings.

Notifications Tab

Next to the profile icon, the notifications tab alerts users to any new updates or messages related to their ongoing alerts.

Tabs

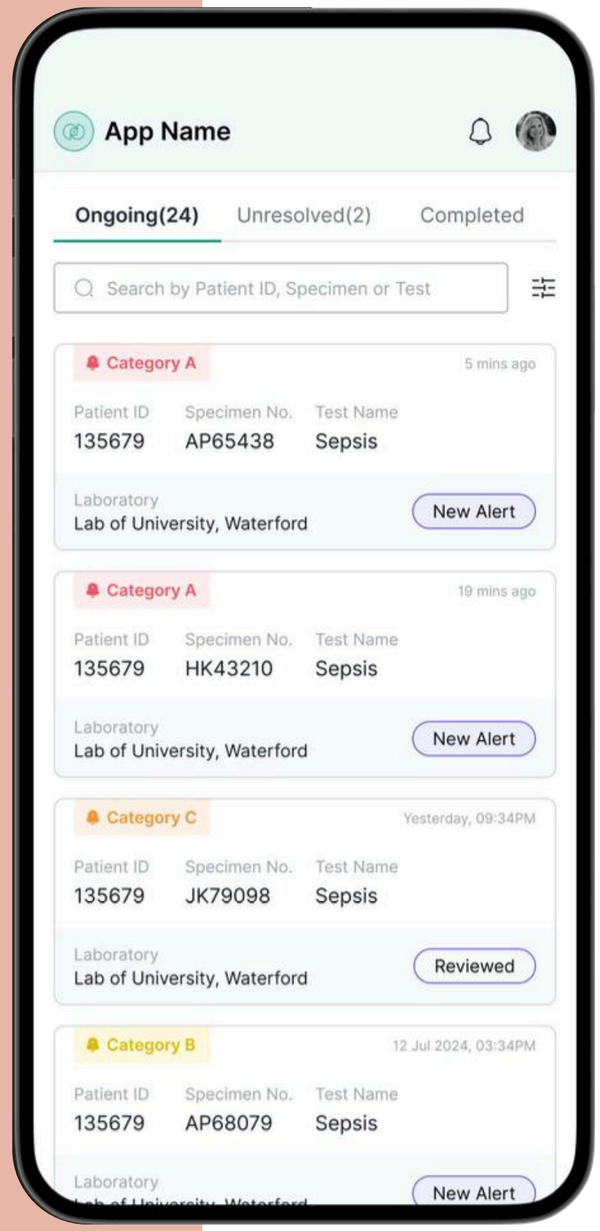
The homepage features three main tabs for easy navigation: Ongoing, which displays active alerts that require immediate attention; Unresolved, where alerts that have not yet been addressed or need further action are listed; and Completed, containing alerts that have been fully addressed and resolved.

Alerts Cards

Each alert is presented in a small card format, displaying critical information such as the category of urgency (A, B, or C), patient ID, specimen number, test name, and the laboratory that issued the alert. The cards also show the time the alert was sent and allow users to interact with them by opening the alert for more details or marking them as reviewed or new.

Search and Filters

A search bar is available for users to quickly locate specific alerts by patient ID, specimen number, or test name. Filters can also be applied to sort and organize alerts according to different criteria, making it easier to manage and respond to them efficiently.



ALERT DETAIL PAGE

Category Label

A color-coded "Category A - Alert" label at the top, indicating the urgency level of the alert.

Patient Details Section

Displays essential patient information, including Patient ID, Name, Gender, Date of Birth, contact numbers, and address.

Sample Details Section

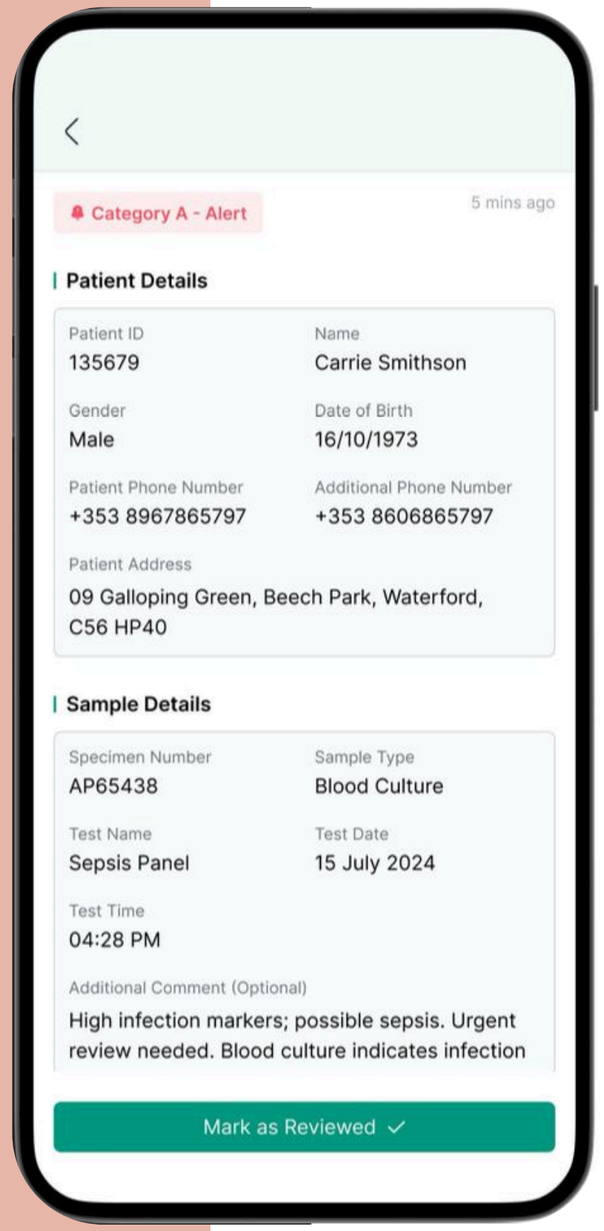
Provides information about the specimen, including Specimen Number, Sample Type, Test Name, Test Date and Time, along with any additional comments from the lab. It also includes a link to an attached PDF report, which can be viewed but not edited.

Laboratory Details Section

Lists the name of the laboratory that processed the sample and the name of the reporting laboratory technician.

Action Button

A "Mark as Reviewed" button is available at the bottom, allowing the user to confirm that the alert has been acknowledged and addressed.



CONCLUSION

As a product manager, my experience has primarily focused on designing B2B products, where my priority was ensuring that the product's functionality was comprehensive and feature-rich. However, this project has profoundly shifted my perspective, allowing me to focus more on people rather than just the product. Throughout this year, I have learned to design with the user at the center—considering the needs and pain points of doctors, laboratory staff, and even patients who are impacted by the current notification system.

These experiences have sharpened my ability to empathize with users, allowing me to more effectively identify and address their challenges within the product experience. This newfound sensitivity to user experience has been transformative, not only in my professional approach but also in my everyday life. I can now observe and empathize with the nuances of user interactions more acutely.

Looking ahead, I aspire to become a public infrastructure product designer. Since moving to Ireland, I have been deeply impressed by the societal inclusivity towards people with physical disabilities. Public spaces are thoughtfully designed with features such as designated areas for wheelchair users on buses and ramps to facilitate easy boarding. In contrast, in my home country, it is rare to see people with physical disabilities in public spaces because the environment is primarily designed for those without disabilities, making it unsafe for them.

I hope to contribute to this area by designing solutions that bring about meaningful change, ensuring that public spaces are accessible and safe for everyone, regardless of physical ability. This project has been a stepping stone in my journey toward making a difference in the world of inclusive design.

CONCLUSION

My Reflectivity

In this project, what I cared about most was understanding and meeting the true needs of the users affected by the current notification system. My primary focus was on improving their experience by identifying pain points and designing solutions that genuinely impact their daily workflow.

I applied my empathy and user-centered design principles throughout the project. My background as a product manager taught me to prioritize functionality, but this project pushed me to go beyond that and consider the human aspect of design. Through group discussions, partner interviews, and surveys, I ensured that our design solutions were not only practical but also user-friendly and easily accepted.

I must admit that our group collaboration on this project was not as smooth as it could have been. We could have spent more time on group discussions to refine our project, but unfortunately, we didn't. We relied too heavily on online communication, which, unlike face-to-face interactions, is not as immediate or effective and often led to delays. The differing schedules of each team member further exacerbated these delays. Additionally, our group lacked clear division of tasks from the beginning. Looking back, we didn't even select a group leader, which inevitably led to some task avoidance and unclear responsibilities, ultimately affecting the team's cohesion.

Here are some of my thoughts

Task Division Issues

At the start of the project, Appoint a project leader and clearly define the roles and responsibilities of each team member.

Develop a detailed project timeline that includes milestones and deadlines. All team members should agree on this timeline and be aware of each other's availability.

Utilize project management tools to track tasks, deadlines, and communication.

Communication Issues

With remote work becoming increasingly common, online communication is unavoidable. To keep the team aligned, it's essential to schedule regular team meetings to discuss progress and address any challenges. These meetings should be consistent, such as weekly or bi-weekly, to maintain momentum.

It is crucial to supplement online communication with real-time discussions whenever possible. If in-person meetings are not feasible, consider using video calls for more interactive discussions. Additionally, establishing clear communication protocols (such as response times) can help reduce delays.

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Visual Identification

Aa

Secondary: Inter

Weight: 16

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abcdefghijklmnopqrstuvwxyz