DATA Care

at MÉDECINS SANS FRONTIÈRES

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United Care Solutions Team
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Team Introduction

We are United Care(UC) Solutions team providing information systems solutions to Médecins Sans Frontières (MSF) field operations, internally. Constantly evaluating new ideas that further our mission is at the core of who we are. In this context, we aim to create an app for tablets to facilitate digital entry of medical information during the field immunization campaigns. This digitized system will greatly increase the accuracy and quality of information collected, leading to better medical care and better management of health data.

Médecins Sans Frontières (MSF) has always been the pioneer in providing emergency medical care to disadvantaged populations in humanitarian crises zones, conflicts, epidemics, natural disasters, and where there is insufficient or inadequate health care.

Team Members Information

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Team Communication & Collaboration Plan

Meetings

- We meet every Friday and Monday for an hour to go over the state of the project, assign additional tasks, give feedback on work completed, and cover any other additional items that need attention.
- Additional meetings are held as needed (either in person or by video conference).

Task Responsibility

- No one person is appointed lead of the team or is responsible for any one particular operation of the group.
- The team will collectively assign responsibility and hold equal responsibility for completion of work (unless otherwise specified, i.e. individuals assigned to specific deliverables).
- Work will be decided collectively and may include individuals doing work or the team dividing up into sub-teams to accomplish particular parts of the project.
- Deadlines will be determined and set in Basecamp (decided upon collectively) and at minimum a draft of what was assigned is due at that time.

- All documents (drafts and final versions) must be posted in Google Doc form, shared with all group members upon creation (using above outlined google accounts), and added to Basecamp for easy access.
- The initial person(s) assigned to draft the first version of a deliverable must inform all other members of the group that they have finished and are ready for feedback. Members not initially assigned to the deliverable should not edit or change any Google Doc until the owner of that doc has invited edits to be made.
- Every member of the team is expected, when a request for edits is made by the owner, to read the document in its entirety and provide constructive feedback. This should be done by opening the Google Doc, changing the mode to “Suggesting”, and then making changes. If no changes or edits are written, that team member must insert a comment at any location in the Google Doc to indicate that they have read it and have no feedback. This will inform the owner that each member has read the document and approves of it.
- All changes to Google Docs by non-owners (or assignees to that deliverable) should be made in “Suggesting Mode” and can only be accepted or rejected by the owner/assignees.
- Any member(s) who believes they will miss a deadline should communicate the delay clearly to the rest of the group before the deadline elapses. This will ensure that other members who might be dependent on that work being completed on time will be notified and can adjust accordingly.
- Any issues, conflicts, or problems that an individual team member has with another member should be addressed privately first, and then if a satisfactory consensus can’t be reached, should be brought to the entire team’s attention.

Communication Tools

- WhatsApp will be used for everyday chatting, updating each other on progress, and asking questions about the project or any other related matter. All messages should be sent within the “UC Solutions” WhatsApp group unless there is an appropriate reason not to.
- Google Hangouts will be used to remotely participate in meetings when a physical presence is not possible or required. When using this service, each member should use the Google ID they outlined above.
- Basecamp will be used to upload all Google Docs, hold the master version of events (meetings), track to-do items, set due dates, assign members parts of the project, and post any other relevant information about the project. This will be the sole repository for all documents related to the project.

Project Charter

Project Title

DATA Care - Digitizing medical information collected in the field

Problem

We seek to reduce the complexity and errors that are inherent in collecting medical information from patients with paper forms. Paper forms often cause confusion and lead to data being written in the wrong places, missing information, or a misinterpretation of what is needed. Additionally, analyzing the data from the thousands of paper forms that often make up one field mission is tedious, inefficient, and impossible on a large scale.

Our Solution

We will build an **app for tablets** that uses **question logic and flow** and **clinical decision support algorithms** to display only relevant information based upon previously entered information and the treatment being given. The algorithm will then recommend a treatment based upon the information collected. Replacing paper forms with digital forms not only saves time by being consistently relevant, but also increases the quality of healthcare data collected by ensuring data integrity. All data entered will be synced and sent to a database at the headquarters and will be searchable locally at the field office. There are endless possibilities to analyze and study the data collected to better understand the effectiveness and efficiency of our work.

Scope of Our Solution

We are proposing to develop one app with customizable questions for vaccines that MSF routinely administers. While this concept could be applied broadly to numerous other areas of MSF's work, the somewhat simplistic process of vaccination campaigns allows us to test if the concept of an app replacing a paper form is of value to the organization.

Goals & Deliverables

At the completion of our project, we will deliver:

An app that is capable of providing support of clinical decisions, capturing and storing user input, and enabling post-mission data analysis.

Database integration with app data that will back up securely per set schedule.

Question flow logic within the app to indicate only present relevant medical questions to the user.

Scope Statement

An Opportunity for Improvement

The current paper based system used for administering healthcare treatment during field operations is prone to data errors, is inefficient, and **leads to lower quality healthcare.**
The **app** we will develop **for tablets** will facilitate the **collection of basic health care information digitally** on a tablet in order to provide a simpler interface, reduce the data error rate and enable power analysis of the data. This will ultimately **enable MSF to deliver higher quality healthcare** to patients. Instead of presenting the field staff with a complete form all at once, the app will show no more than one to two questions at a time on the screen to control the data entry complexity. Subsequent relevant questions will be displayed depending on previous answers and on the purpose of the visit (in this case, vaccinations).

Value/Benefit

Discussed below are several critical ways that MSF field immunization operations will benefit from the introduction of our app.

Increase in data quality by reducing data entry errors through question flow logic and the displaying of only relevant information.

Less expensive and interactive way to collect accurate and reliable medical information for future data analysis. Comprehensive study on the data collected can help MSF understand disease transmission, the source of outbreaks, and the shortcomings of regional healthcare systems in developing countries.

Flexible platform that allows remote offices to adapt to changing requirements and needs. Through the use of the app, information can be shared amongst field teams, doctors and headquarters quickly and securely. Also, questions can be easily modified to fit the varying needs of different vaccines.

Secure storage of confidential health data and physical protection of data from unforeseen events (fires, thefts, etc.)

Cost and weight savings are built-in when converting from a largely paper based system to a digital one.

Key Stakeholders

In order for this project to be successful, we require collaboration from:

IT Department is critical in recommending the appropriate technologies and systems to be used, and also in implementation, integration, and maintenance of the system.

Medical Experts are essential in consulting and ensuring that the necessary information is captured for each iteration of the app for different immunization operations.

Healthcare Providers are at the forefront of assessing, defining, implementing, and supervising the health needs of the communities MSF serves. Healthcare providers are key contributors in defining the functions of the app.

Logistics Teams are an integral part of the physical implementation of the app and tablets during field operations by consulting and supporting the appropriate power, network, and hardware needs.

Key Assumptions

Our aim when building our systems is to minimize dependencies on unproven technology or systems that are impractical or unavailable during field operations. However, in order for our system to operate successfully, the following foundational support structures are assumed to be available.

Sufficient Power at the remote field office is required to charge the tablets. A sufficient number of solar panels will be implemented as the primary method of charging the tablets. When there is inadequate solar production, a generator could serve as an alternative. The need depends on the number of tablets being used and how long they are in use per day.

Internet Access is needed to backup the data collected to a database. We anticipate bandwidth requirements to be reasonable and within the range of what has been previously experienced on field operations. The data could be stored locally for as long as needed and could be uploaded as infrequently as required. The frequency at which data can be uploaded to server will largely be determined by internet availability.

Hardware Protection must be ensured by physically protecting the tablets from the harsh conditions of the field with protective cases, locked safes, and staff training on proper use.

Simplicity - we are assuming that the health screening questions required to administer a vaccination (such as Meningococcal Conjugate Vaccines) are able to be coded in simple question form that requires multiple choice or yes/no questions as opposed to text entry.

Scope Limitations

This app is not meant to work in emergency situations where a patient is unable to provide their own medical information/history to the best of their knowledge.

The data collection from this system is not meant to replace the lack of a patient's medical history or the lack of medical records available within a particular community/country.

We are limiting ourselves to a simple vaccination campaign in order to avoid complex medical screening questions required for other medical services.

System Requirements

Process for Gathering Systems Requirements

Method used: Interviews

We chose to use the Interview method to gather information regarding the requirements and function of our system. We wanted to ensure the current business processes were well understood by our team before moving forward and identifying ways to improve it.

Interview Schedule: We did not have a set interview schedule beforehand as we found it best in this circumstance to "go where the road leads us". Our first interviewee recommended the subsequent people that had direct knowledge and experience with systems and processes relevant to our proposed system.

Types of Questions: We had a mix of open-ended, close-ended, and probing questions. We used a top-down approach by starting with general open ended questions, then drilled down as the interview progressed with probing and more close-ended questions. This allowed us to get a broad picture quickly and then learn more details on specific processes later on in the interview. Our interview type could be best described as unstructured. We knew broad details of current processes beforehand but didn't always know what questions to ask until after the interview had begun.

Interviews

We interviewed three employees of MSF who hold critical positions related to technological solutions to healthcare problems. A rough outline of each interview is outlined below:

All interviewees were given a brief one to two minute explanation about our team, the purpose for the project, and our initial motivation for pursuing this project.

The list of question below were asked in all interviews:

- What is your specific role and responsibilities in the organization?
- Can you describe the major roles associated with a vaccination campaign?
- Who are the key decision makers in approving projects like this one within MSF?
- What kind of patient health information data is collected during field operations and how do you handle that data during and after the mission?
- Are there current areas where the process of entering and analyzing healthcare data can be improved?

Interview 1 (09/08/17)

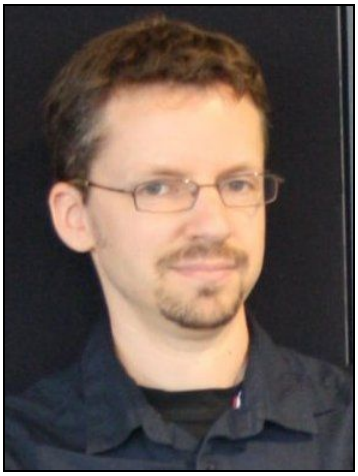
Matthias Chardon
Médecins Sans Frontières (Geneva, Switzerland)
Role: HIS Project Manager

Matthias primarily deals with the data that MSF collects from field operations. He didn't have much detailed knowledge about how apps for tablets are built or used in the field. He did however provide useful insight into the current collection policies pertaining to how MSF handles and analyzes the data resulting from field operations. A rough transcript of the interview is provided below (ref: 09-08-17 Matthias MSF Interview.m4a).

- Matthias said the current tool used to collect data is a custom application and the software used to display data on dashboards is Qlikview.
- Current development is ongoing for a new more integrated database for health information called "DHIS2" created by the University of Oslo (Norway). MSF is starting to implement this free and open source software in order to collect data from field operations within a centralized structure.
- He is currently working on solving the problem of longitudinal patient follow-up in cases of non-communicable diseases. He said this was a problem that MSF currently is trying to solve, namely how to follow up patients within a specific region that require treatments such as a three dose vaccination. He identified this as a central challenge.
- He outlined the current team working on Information Systems at MSF that includes: a Business Analyst, a Medical Epidemiologist, an IT Project Manager, and himself.
- He outlined and recommended we talk to Clotilde Rambaud-Althaus who is currently working on clinical decision support algorithms for pediatric care in the field. He noted that these "apps" were new and "tender" at MSF, requiring further development and evaluation.
- Matthias said the different roles that make up a field operations team depends on lots of factors and suggested we talk to people more familiar with that (Clotilde).
- He identified the Logistician as part of a field team and the person who is mainly responsible for supporting any technology deployed in the field.
- He said the approval process for technology in field operations is not so structured and depends on budget and scope. Anything less than about $50,000 USD could be approved within a unit in MSF and any amount above would need to be approved by the Medical Director.
- Admitted that MSF's policies on data retention, protection, and privacy are weak currently but that they are working on that and educating everyone in MSF of its importance.

- Matthias said he is currently working on a data protection policy and gave opinions about how he thinks it should be outlined.
- He also stated that currently MSF doesn't view itself as the owner of any data collected, but more as a custodian of the data. They try to research data retention policies of the countries they operate within, and then place those restrictions on data collected in that country (ie. if local Ugandan data protection laws state health information can only be kept for 10 years, MSF adopts this as their own for all data collected from Uganda). This applies to digital and nondigital data.
- He said MSF's current data collection is atomized, they are working to centralize and standardize it (DHIS2 system).
- Outlined that data collected by apps in field operations is uploaded once the team is back at base (not feasible to be done at remote health center locations).
- Said "real time" in the nonprofit world is every 2-3 days, as opposed to the definition in IT as "streaming now". MSF is not currently interested in IT's definition of real time for data.
- Said MSF prefers to use open-source software and then contract with external third party providers to customize it.

Interview 2 (09/19/17)



Ludovic Rossel
Médecins Sans Frontières (Geneva, Switzerland)
Role: IT Project Manager

Ludovic had great insight into the history of past failures of MSF trying to deploy tablets in the field and why they didn't succeed. He also provided details about the direction MSF is moving towards as it relates to technology and healthcare data, and specifically why it has taken so long to get there. A rough transcript of the interview is provided below (*ref: 09-19-17 Ludovic MSF Interview.m4a*).

**Beginning of interview was cut off because of technical problems.*

- Outlined a previous initiative that used an app for collecting data for malnourished children in Chad in 2013. The Android app was developed by a medical student from America.
- Data for Chad project was stored in flat tables. App was very simple and largely relied on manual transfer of data. The output was exported to dashboards for analysis.
- This attempt ultimately failed to continue past Chad because there was a lack of collaboration between the medical staff and the IT Department. The app also was too specific for that case and couldn't be adapted for other medical missions. It died when the medical student left MSF after his one year commitment elapsed.
- Later attempts tried but also failed because there was insufficient training and advertisement to staff in using the app. Additionally, the app suffered from a lack of long-term vision of its use/purpose.
- Explained how local staff (medical/non-medical) are often the users of the app, not the expatriate medical staff.
- Outlined E-Care, that name of the system that helps low skilled medical staff make clinical decisions (using algorithms). Said this is not currently being used to his knowledge, but it was the direction MSF wants to go.
- Said an algorithm might not be necessary during a mass vaccination campaign because it would slow down the process. Proposed maybe the app could be instead limited to very basic information (temperature, etc.). Said it ultimately has to be faster than paper to be valuable in that scenario.
- Said the algorithm could be more useful in administering routine vaccinations because there is no time pressure. Vaccinations are given to people in hospitals and not all at once.
- Warned that when apps are created, they should not be so specific that they become useless or can not be adapted to other medical missions beyond their initial use.
- Said MSF uses SQL Server, SIS, and Qlikview for dashboards.

- Said the HIS team within MSF is moving towards the DHIS2 system created for developing countries.
- Outlined some of the features of DHIS2 which include deployable apps for tablets that can be modified and more robust patient tracking.
- Currently MSF can't upload directly from tablets to the SQL server. This is where they want to get in an ideal situation.
- Point of Care System, spearheaded by the HIS team, is a project that seeks to collect information from patients during consultation with doctors. This is more being developed for non-mobile situations (keyboard and mouse).
- Did not have much information about how previous hardware has held up in the field.
- Did mention that the batteries of the tablets during the Chad campaign were having unexpected reliability problems. Also said charging the tablets was a greater challenge than initially anticipated.
- Reiterated previous employees statements that MSF's current privacy and data retention policies are weak and need improvement. Referenced the current policies that MSF has as "vague" and "scattered".
- Mentioned that MSF does try and avoid publishing identifiable information about patients when consolidating data. However stated there is no policy on what types of variables and how many should be removed to anonymize data.
- Stated that projects are usually proposed from a business need. A steering committee is formed with a combination of business and IT people to guide the project.
- Source of funds can come from a department's budget or a combination of departments in the case of collaborations.
- Gave his opinion about why MSF has been slow to adopt these technologies. Said it was due to misaligned priorities, mismanagement (not covering key needs), and lack of investment at the organization level.
- Said the MSF IT Department is about 20 people (4-5 for field support, 2 people for HQ support, 3-4 people for infrastructure, 2 business analysts, 3-4 application managers, 2-3 managers of IS projects, and a couple of software architects).

Interview 3 (09/22/17)

Clotilde Rambaud-Althaus
Médecins Sans Frontières (Geneva, Switzerland)
Role: Innovation Unit Project Manager/Medical Epidemiologist

Dr. Rambaud-Althaus primarily deals with developing the clinical content that goes into the apps MSF deploys. This involves figuring out the flow that question should follow during a patient's visit and ensuring the recommending treatment from the app is medically sound. A rough transcript of the interview is provided below (ref: 09-22-17 Clotilde MSF Interview.m4a).

**Beginning of interview was cut off because of technical problems.*

- Outlined how previous attempts at a algorithm to help healthcare workers determine treatments turned out to be very complex. Because of this, dealing with the data management and storage was an afterthought.
- EPI stands for extended program of immunization - name of national program to try and get all children vaccinated in Central African Republic (CAR).
- MSF uses a vaccination card to determine the vaccination history of a patient. The logic MSF uses in evaluating a patient's vaccination history is:
    - If no card is present during first visit, it is assumed they have no previous vaccinations and are given everything.
    - For 2nd or 3rd visit, if no card was present, mother's memory was good enough to go on.
    - Location of vaccination also helped to identify what vaccinations were given (vaccinations are given in specific locations to aid in this).
- Standard team for a vaccination campaign is 5-6 international people. Healthcare workers are people that register people as they come in, then another person who makes the prescription for the vaccine (this is where the algorithm is used). Another person then prepares and administers the vaccine. There is another person who distributes additional items to people that go along with the campaign (soap, other health related products, etc.). Finally, there are a couple of supervisors, nurses and doctors (whom are usually expatriates).
- Stated the local healthcare workers are sometimes not even medically trained.
- Vaccines are the one of the simplest treatments offered, which made it a prime candidate for the use of an algorithm. Meant that MSF didn't have to have any doctors on the mission.

- The process for getting a project approved depends on size, type, budget, etc. The original pilot was done on a very small budget (CAR, 2014-2015).
- For the original pilot, because it was small and didn't require large new systems, it was approved by a steering committee from within the innovation unit.
- She reiterated what was stated by other employees, that MSF is still working on appropriate data privacy and controls.
- For the pilot of an app for the vaccination campaign, the data was anonymized because data privacy policies were not in place. This meant they couldn't track patients through the data they collected.
- Going forward, MSF wants to make sure any privacy and data policies adhere to EU laws as well as local laws.
- MSF is also working on being able to track patients from visit to visit. They didn't initially do it in the pilot because it was too complex and there were no data policies in place.
- MSF also uses a clinical pathway to only show questions that are relevant. Additionally, MSF is very invested in digitizing their data.
- MSF's ultimate goal is to improve the quality of care. Any technology that enables that, they will pursue.
- MSF's rollout of these apps has been delayed because developing the appropriate clinical content is very complex. It has to be medically sound before being released.
- They are currently using the app in CAR between three health centers. They have held over 10,000 consultations. MSF is very happy with the outcomes from CAR.
- MSF is committed to investing in more of these types of technologies in the future.
- Current scope for CAR is acute illness in children from ages 2-5 years old.
- Plans for extension is to use the currently available software to other field operations and then later expand to different healthcare situations.
- Current structure is to have a local database on each tablet. A Supervisor visits every 3 weeks and synchronizes the data locally before uploading it to Europe.

Benchmarking

Our team conducted an informal benchmarking study to compare our proposed system against the current nonprofit healthcare industry standard (paper based forms).

Features	MSF Data Care	Formstack
Record Information		
Adaptability		
Analyze Data Easily		
Share Data Effortlessly		
Security of Data		
Clinical Decision Support Algorithms		
Tailored for offline editability		
Ability to sync without internet		

Benchmarking summary

We found the proposed MSF Data Care system would create value in previously unforeseen ways, in addition to improving upon existing processes and their functions. All of the advantages that are inherent in using modern technology to collect data are realized in the new and improved process. The key advantage of the digital system over the paper based system is the ability to analyze and share the health data on a scale that was previously impossible. This can lead to powerful insights into health trends at the local and country level. A digital based data solution also enables advanced functions such as clinical decision

support algorithms, which can help low skilled healthcare workers make medical decisions based on the data collected. Lastly, changing the way in which medical information is entered using question flow logic can significantly reduce the chances of entering erroneous data, a problem that plagues a paper based system.

Outcome Analysis

MSF's core mission is to provide high quality healthcare to people in crisis regardless of race, religion or political affiliation. Our team will focus on this goal during the entire process of developing the app. By increasing operational efficiency, data quality and effectiveness, our app will deliver the ultimate value of improving the quality of healthcare for all patients.

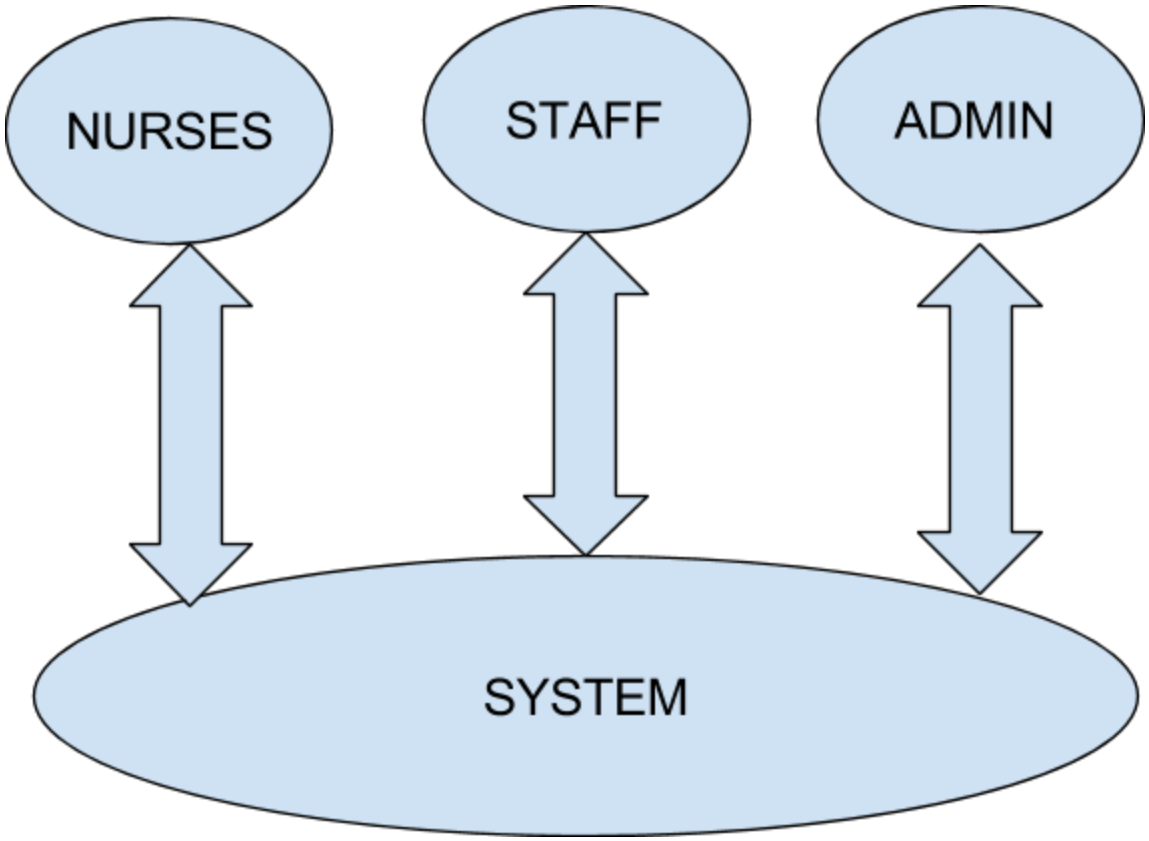
One of the core values our app brings that leads to higher quality healthcare is **increased efficiency** in the day-to-day process of screening patients, without sacrificing quality. Our app reduces the time patients spend waiting in lines to receive critical vaccines that can have a huge impact on their lives. MSF will be able to see a greater number of patients in less time compared with the current system. This increased efficiency benefits the organization as it reduces the cost per patient for treatment, and also benefits the patients by getting the needed vaccines to them quickly and with less chance of error.

Another value that our app provides is **reducing the chance of erroneous data entry**. Sound medical decisions are only be as good as the data they are made from. The app enables MSF to significantly reduce the chance of misdiagnosis through the clinical decision support algorithm and question flow logic. This is in addition to the algorithm that will help low-skilled healthcare workers make better informed decisions regarding patients.

Lastly, our app ensures that vaccines are only administered when they have the highest chance of being effective, by **providing MSF with high quality** data to accurately and quickly assess a patient's medical fitness for vaccination. Patients want to be reassured the time and effort they invest when signing up for a vaccination campaign will be wisely spent. Vaccinating the right people with the right dose for the most effective protection is critical to successful MSF vaccination campaigns.

Our app brings incredible value to MSF's core mission of providing high quality healthcare. MSF as an organization becomes more effective and efficient which ultimately leads to healthier patients living lives free from preventable diseases.

Functional Requirements



The arrow represents general flow of data

Staff

- Saving the information of the patient along with the time and location.
- Post the data collected to the system for healthcare workers to determine vaccination qualification.
- Request focus on the patients which have been identified to have special conditions.
- Fetching information of past patients as they are administered second and third doses.

Nurse

- Recommend or suggest changes in the doses given to the patient.
- Need to take high priority cases as suggested by the staff members.
- Post feedback after reviewing the results of the questionnaire.
- Check the details of patients which do not turn up for follow up doses.

Administrator

- Needs to be able to access all the information of the system.
- Send the information from staff members to the doctors with all the patients on the follow up vaccination doses.
- Need to update the cases as closed according to the list sent by the nurse.
- Update classified patient information upon consultation with nurse.

Non - Functional Requirements

Interface requirements

- The portal should have option for Staff login
- Each screen should have multiple choice questions or simple text entry boxes
- After all questions are answered a review screen should appear before submission

Business Requirements

- The app should support multiple users at a time
- Data must be entered before a request can be submitted.
- All personnel using the system will be trained according to an internal training process
- Screen should only move ahead after the submission of the current question

Regulatory/Compliance Requirements

- The system will limit access to authorized users
- The software can secure data with electronic signatures
- The staff should be restricted from writing the prescriptions for the patients
- All the data in the form of patient's information that would be transferred to the server or vice versa should be encrypted
- The access permissions for editing data may only be changed by the system’s data administrator.
- Passwords shall never be viewable at the point of entry or at any other time.
- Each unsuccessful attempt by a user to access an item of data shall be recorded on an audit trail
- Doctors need to approve a set of questions to be asked to the patients

Project Plan

See file: "Deliverable 8 - Work Breakdown Structure.pdf"

Work Breakdown Structure & Schedule

#	Task Name	Duration	Start	Finish	Dependency
1	Initialize project by meeting with project champion	0.5 wks	Mon 8/21/17	Wed 8/23/17	
2	Identify key users through interviews	2 wks	Wed 8/23/17	Wed 9/6/17	1
3	Develop collaboration plan & development methodology	1 wk	Wed 9/6/17	Wed 9/13/17	1,2
4	**Planning phase is completed**	0 wks	Wed 9/13/17	Wed 9/13/17	
5	Develop & present project charter to project champion	1 wk	Wed 9/13/17	Wed 9/20/17	2,3
6	Deliver project scope to key users	1 wk	Wed 9/20/17	Wed 9/27/17	5
7	Develop initial system requirements	2 wks	Wed 9/13/17	Wed 9/27/17	1,2,3
8	Compare & identify software contractors for project development	1 wk	Mon 9/11/17	Fri 9/15/17	
9	Develop feasibility analysis	2 wks	Wed 9/27/17	Wed 10/11/17	7,8
10	Develop initial project plan for review by project sponsor	1 wk	Wed 10/11/17	Wed 10/18/17	7,8,9
11	**Analysis phase is completed**	0 wks	Wed 10/18/17	Wed 10/18/17	
12	Negotiate and develop contract for project development based on revised project plan	0.5 wks	Wed 10/18/17	Fri 10/20/17	8,10
13	Initial throw-away UI prototype is developed and is assessed by project sponsor and UC Team	1 wk	Mon 10/23/17	Fri 10/27/17	10,12

14	Develop structural and behavioral model of our system based on initial prototype assessment	2 wks	Mon 10/30/17	Fri 11/10/17	13
15	Second basic throw-away prototype is developed based on our model	2 wks	Mon 11/13/17	Fri 11/24/17	14
16	Second prototype is reviewed by field staffs under the supervision and training of UC Team	2 wks	Mon 11/27/17	Fri 12/8/17	15
17	Functional model is refined and finalized based on user feedback from second prototype	1 wk	Mon 12/11/17	Fri 12/15/17	16
18	Final throw-away project is developed and delivered to UC Team	3 wks	Mon 12/18/17	Fri 1/5/18	17
19	Final throw-away project is used in a test study in an ongoing field operation	2 wks	Mon 1/8/18	Fri 1/19/18	18
20	Based on the test study, contractor develops final app version and integrate it into existing database	2 wks	Mon 1/22/18	Fri 2/2/18	19
21	Final delivery of APP is received and loaded onto tablets by UC Team	1 wk	Mon 2/5/18	Fri 2/9/18	20
22	**Iterative design phase is completed**	0 wks	Fri 2/9/18	Fri 2/9/18	
23	Training material development	1 wk	Mon 2/12/18	Fri 2/16/18	21
24	Finalized app rolls out to field operations and monitored by UC Team	4 wks	Mon 2/12/18	Fri 3/9/18	21
25	Final project is delivered with documentation	2 wks	Mon 3/12/18	Fri 3/23/18	24
26	**Implementation phase is completed**	0 wks	Fri 3/23/18	Fri 3/23/18	
27	The project enters into maintenance phase	0.1 wks	Mon 3/26/18	Mon 3/26/18	25

Feasibility Analysis

Technical Feasibility

Risk Variables	Description	Risk Level
Familiarity with the application	Extensive experience in interacting with patients and well trained staff	Low
Project Size	Small in-house staff	Moderate
Compatibility	Straightforward integration with the staging database	Low
Communication and Coordination	Stakeholders belong to the same organization	Low

The UC Solutions' Data Care system for MSF is technically feasible, with the risks outlined below:

Familiarity with the application

MSF on-ground staff have extensive experience in interacting with patients and are well trained to collect important health information. Therefore, we believe the risk is is low. The experience of the staff with handling a mobile app in the field of healthcare is limited. This poses a moderate level risk. Overall, the risk involved with the familiarity of the application is low.

Project Size

MSF currently maintains a centralized database that stores the healthcare records of patients that receive medical care. The UC Solutions development team will create a staging database at the local Headquarters to temporarily store data collected from the app i.e the final backup from the last device, before it is integrated into the Geneva HQ database. This integration will occur once every two weeks. Since many components of the process will be implemented for the first time at MSF, this will require a team of 5-7 developers. With a small an in-house staff, there is a moderate level risk involved here. Since all the stakeholders belong to the same organization, risk involved with lack of communication and coordination between different teams is low.
We are using "Jaime's Software" software development company and are contracting out 200 hours of labor.

Compatibility

Since the central database already exists, the integration with the new staging database should be straightforward. There is low risk involved.

Economic Feasibility

This project is being funded internally by MSF and the funds are being pulled from the Innovation Unit's budget ($50,000USD). As per the current estimation, the project should comfortably be able to adhere to the budget. There is low risk involved.

Cost Breakdown

	Year 1	Year 2	Year 3	Total
Savings on Stationery(Papers,Printing, Maintenance,Ink, Packaging)	$2,000	$2,000	$2,000	
Savings on Warehousing and inventory storage costs	$3,000	$3,000	$3,000	
Savings on Manual Labor cost in tranfers between different centers	$10,000	$10,000	$10,000	
Savings on Courier Costs to HQ	$15,000	$15,000	$15,000	
Total Savings by Year from automation	**$30,000**	**$30,000**	**$30,000**	
Cumulative Present Value of Savings	$27,522	$52,773	$75,938	
Infrastructure	$1,000	$0	$0	
Development Labor	$10,000	$0	$0	
Total Development Cost	**$11,000**	**$0**	**$0**	
Hardware(Development, Testing and Production Environment)	$5,000	$5,000	$5,000	
Software	$5,000	$5,000	$5,000	
Operational Labor	$10,000	$10,000	$10,000	
Total Operational Costs	**$20,000**	**$20,000**	**$20,000**	
Total Estimated Cost by Year	**$31,000**	**$20,000**	**$20,000**	
	NPV @ 9%			**$4,938**
Intangible Benefits	MSF does not currently implement any such service on the field. This deployment would substantially increase the efficiency of the treatment provided, besides improving the accuracy of the data it analyzes, for ensuring the success of future campaigns.			
Break Even Analysis				
Savings By Year	30000	30000	30000	
NPV By Year	$27,522.94	$25,250.00	$23,165.00	
Remaining amount for break even after 2 years	$18,227.00			
Number of Days into the third year for achieving breakeven point	287 Days			
Total Breakeven point	**2.78 Years**			

Intangible Benefits

The use of the app to collect data enhances user confidence in data security. Also, entering data into an app with predefined options offer better clarity in flow which makes it much easier for the staff to collect and store information.

Organizational Feasibility

We are anticipating high feasibility of the UC Solutions' model for MSF at the organization level, with the following risks:

User Acceptance

The primary users of the app will be the field staff, nurses and logisticians. This app is specifically designed to make the task of collecting patient information easier. We anticipate users will easily see the advantages this has over the current process which involves heavy paperwork. We expect that it will be a welcome change and therefore carries low risk.

Project Champion

The MSF Innovation Unit is the internal organization which has taken the initiative to streamline the current data collection process, pre and post vaccination campaign.

Project Sponsor

The Medical Director at MSF heads a panel of doctors with distinct management experience. This panel will be the project sponsor and the highest point of contact for this project.

Project Staffing Plan

UC Solutions Team and Project Roles

UC Solutions team is internal to MSF, and our project management team is comprised of individuals who are experts in handling and leading different functional areas of the project efficiently and effectively. The UC Solutions Team is organized flatly, and team members collectively decide and represent the project.

Project Role	Name	Expertise/Responsibilities
Project Lead	Dulguun Bayarsaikhan	- Oversees the flow of the project - Produces documentations as necessary - Oversees the staffing & contract
Business Lead	William Tardio	- Acts as a key contact for clients and users - Informs key stakeholders of project status - Promotes the project
Technical Lead	Vilas Sharma	- Manages project budget - Oversees technical development - Tests and ensures project quality
Technical Lead	Nishant Sonkar	- Provides technical support to the developer - Ensures technical compatibility of project being developed - Tests and ensures project quality

Contract Software Development Company

Application development will be outsourced to “Jaime’s Software” software development company.

“Jaime’s Software” bills by the hour for development work completed and is contracted to provide 200 hours of 4 phase application development at $80/hour. Initial contract cost is $16,000 for a database integrated iOS application.

Training and Staff Development

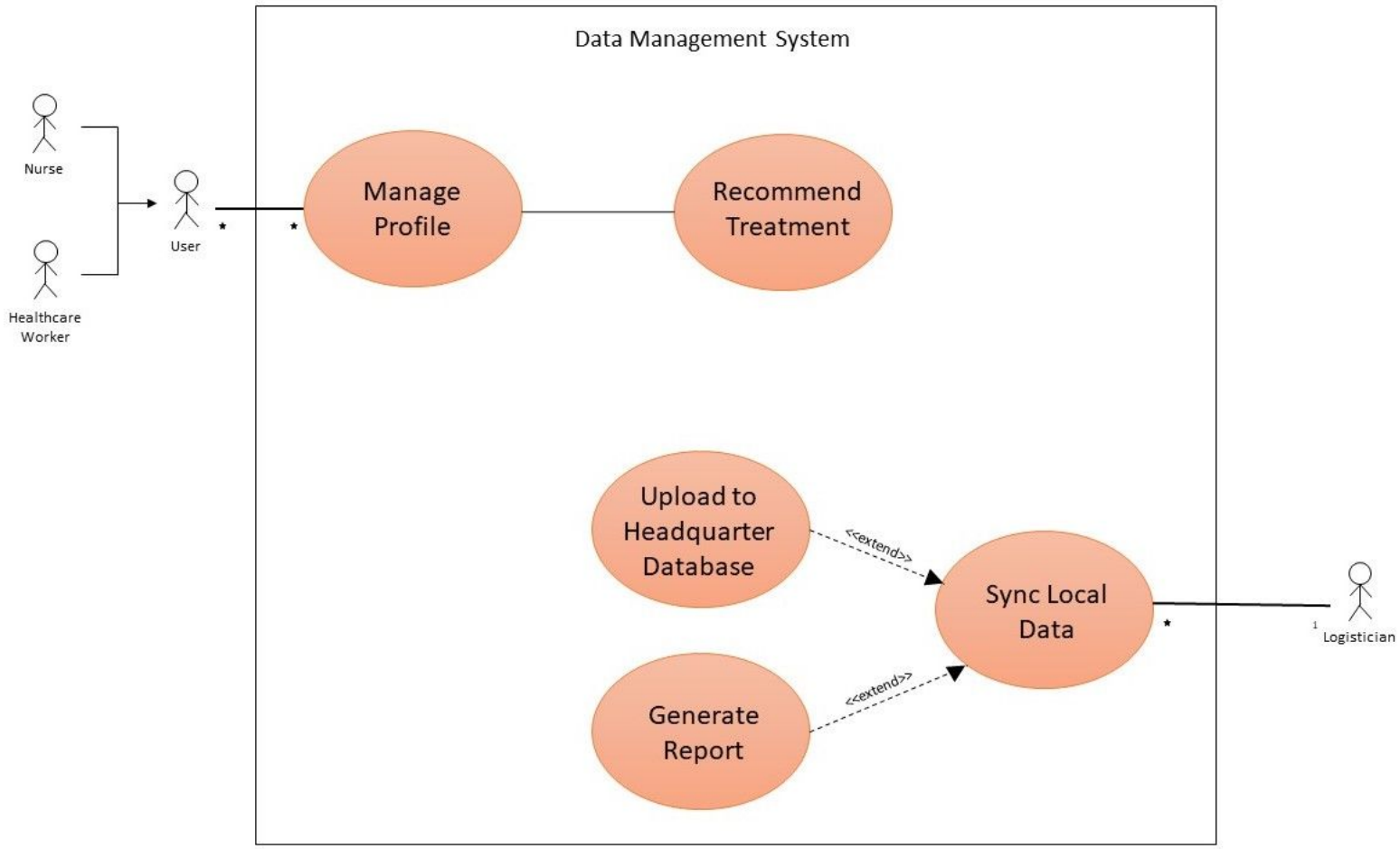
Initial training on the use of app is provided by the UC Solutions Team through instructional videos, booklets and in-person training to key users.

During field operations, the logistician is responsible for providing additional training, software, and hardware support to end-users.

The UC team members and the field logisticians are salaried employees of MSF.

Use-Case Diagram

See file: "Deliverable 8 - Use Case diagram.jpg"



Use-Case Descriptions

Use Case Name: Manage Profile	**ID**: 1	**Importance Level:** Critical
Primary Actor: User	**Use Case Type**: Detail, Essential	

Stakeholders and Interests:

Healthcare Worker – wants to create and update profiles.

Nurse – wants to review profiles.

**Patient* - wants to receive vaccination.

Brief Description: This use case describes how a user can manage profile(s) for patients by creating, retrieving and updating profile(s).

Trigger: Healthcare worker receives a patient and enters his/her information into the system.

Nurse retrieves a patient profile for review.

Type: External

Precondition: User must be authenticated into the system.

Relationships:

Association: Recommend Treatment

Normal Flow of Events:

1. Patient requests vaccination.
2. Healthcare worker enters patient information.
   - If the patient is new to the system.
     - The S-1: Create Profile subflow is performed.
   - If the patient is existing in the system and is receiving treatment
     - The S-2: Update Profile subflow is performed.
   - If the patient is existing in the system.
     - The S-3: Retrieve Profile subflow is performed.
3. The system evaluates and recommends treatment.
   - Executes the Recommend Treatment use case.

SubFlows:

S-1: Create profile

1. Healthcare worker receives and verifies that the patient is new to the system.
2. Healthcare worker creates a profile for new patient.

S-2: Update profile

1. Healthcare worker receives and verifies that the patient exists in the system.
2. Healthcare worker updates the profile for the existing patient.

S-3: Retrieve profile

1. Healthcare worker or a nurse looks up an existing patient profile.

Use Case Name: Generate Report	**ID**: 4	**Importance Level:** Low
Primary Actor: Logistician	**Use Case Type**: Detail, Essential	

Stakeholders and Interests:

Logistician - wants to generate reports as needed.

Nurse – wants to review the reports.

MSF HQ - wants to monitor field operations through reports.

Brief Description: This use case describes how our system can generate reports as needed.

Trigger: Logistician requests the system to generate reports.

Type: External

Precondition: Data must be synced to local database.

Relationships:

Extend: Sync Local Data

Normal Flow of Events:

1. Stakeholder requests reports.
2. Logistician requests system to generate reports.
3. System displays reports.

Use Case Name: Sync Local Data	**ID**: 3	**Importance Level:** High
Primary Actor: Logistician	**Use Case Type**: Detail, Essential	

Stakeholders and Interests:

Logistician – wants to sync the data locally, backup to local device, and sync to HQ database.

Brief Description: This use case describes how a logistician syncs the data to a local database.

Trigger: Logistician starts the syncing process after the last vaccination has been given within a vaccination cycle

Type: External

Precondition: Logistician must be authenticated into the system.

Relationships:

Extend: Upload to Headquarter Database, Generate Reports

Normal Flow of Events:

1. Logistician travels to healthcare center.
2. Logistician syncs data from tablets to local database.
3. Logistician backups to local database.
3. Logistician uploads the data to a headquarter database.

   Execute Upload to Headquarter Database use case.
4. Logistician generates daily reports as needed.

   Execute Generate Report use case.
5. Logistician ensures successful data transfer.

Use Case Name: Recommend Treatment	**ID**: 2	**Importance Level:** Critical
Primary Actor: User	**Use Case Type**: Detail, Essential	

Stakeholders and Interests:

Healthcare Worker – wants to use the recommendation to decide appropriate action.

Nurse – wants to review the recommendation.

Brief Description: This use case describes how our system recommends treatment based on the entered information.

Trigger: All required patient information has been entered.

Type: Temporal

Precondition: Patient information must be fully entered into the system.

Relationships:

Association: Manage Profile

Normal Flow of Events:

1. Healthcare worker inputs patient information.
2. System recommends treatment if the patient is eligible to receive vaccination.
3. System does not recommend treatment if the patient is ineligible to receive vaccination

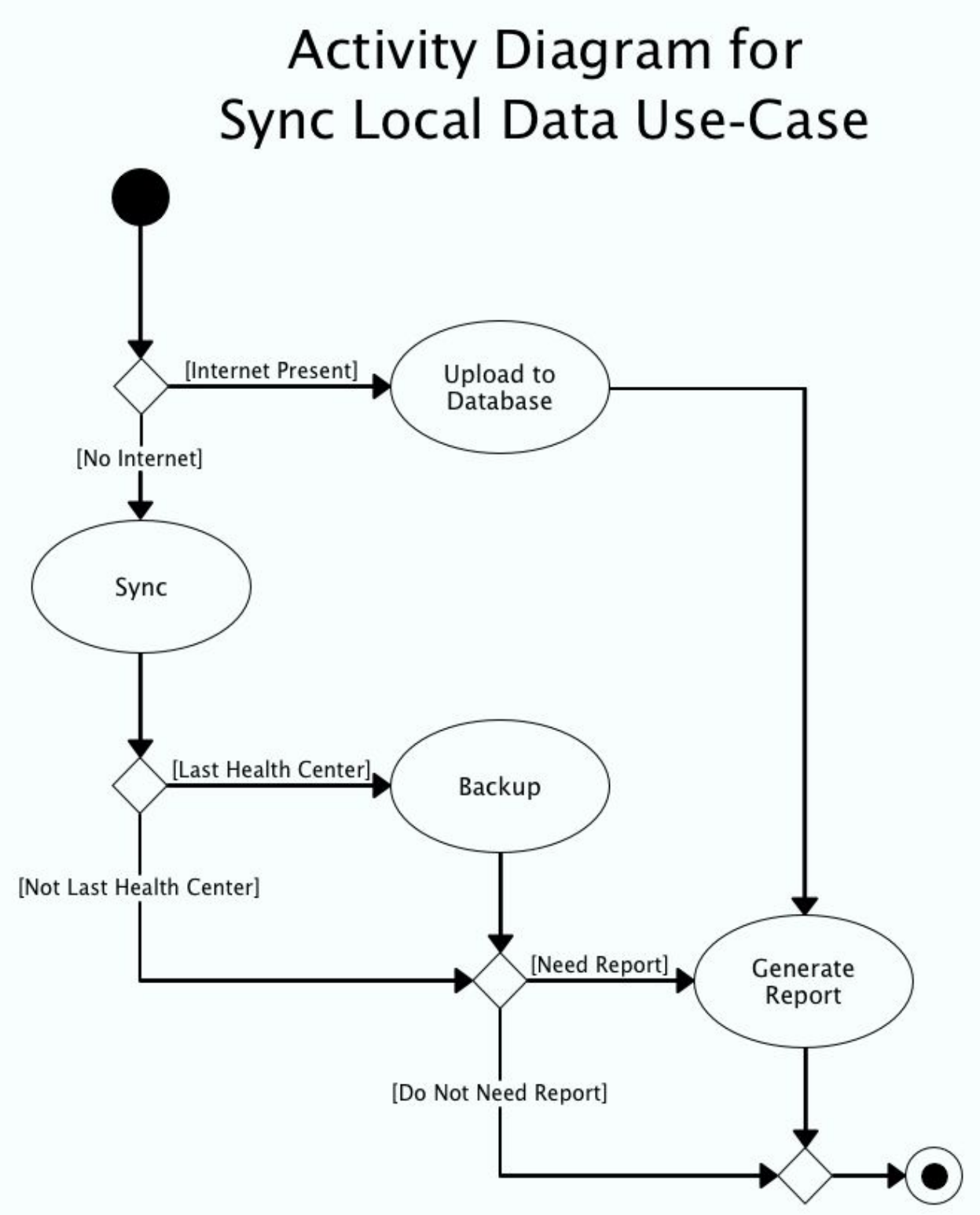
Alternate/Exceptional Flows:

2a. Head nurse overrides system to refuse vaccination.

3a. Head nurse overrides system to administer vaccination.

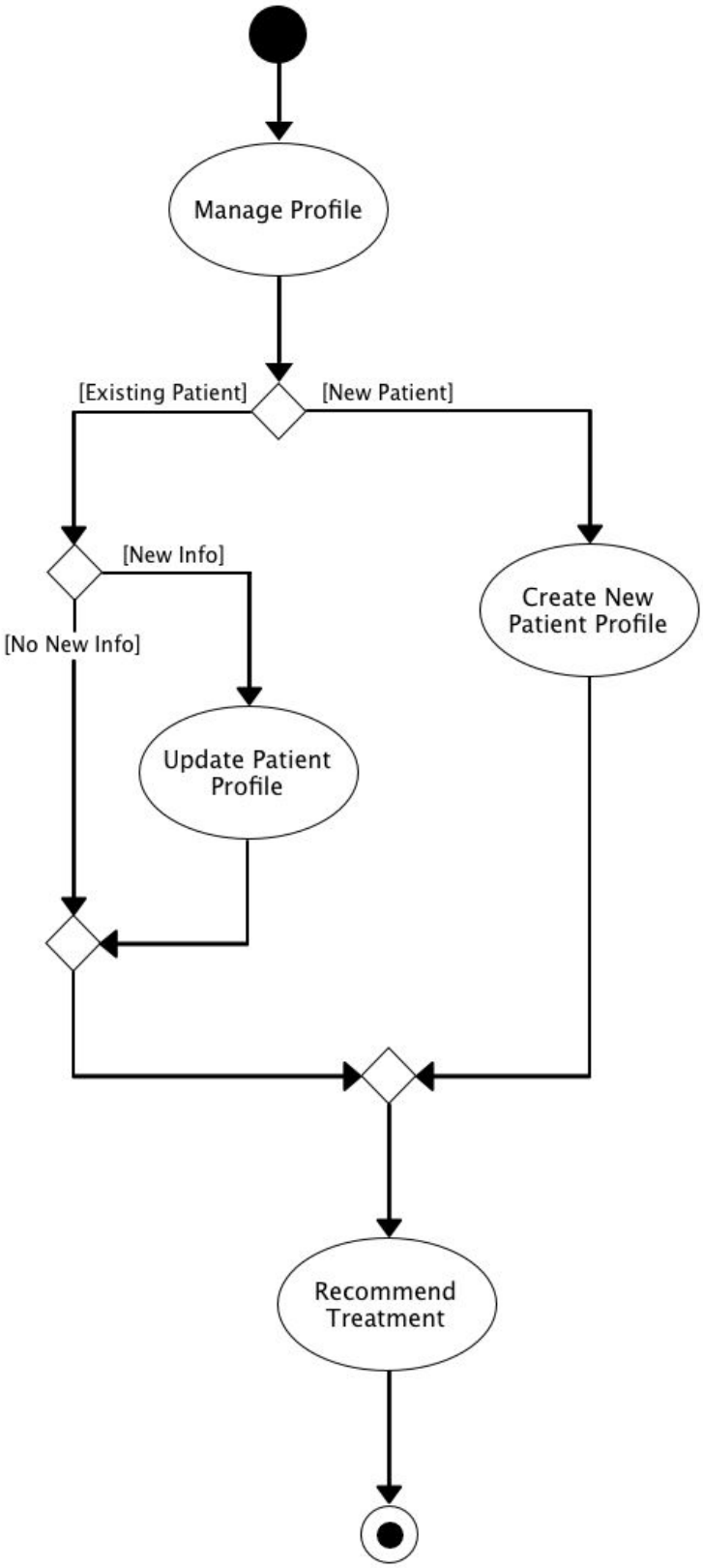
Activity Diagrams

See file: "Deliverable 8 Sync Local Data Activity Diagram.png"



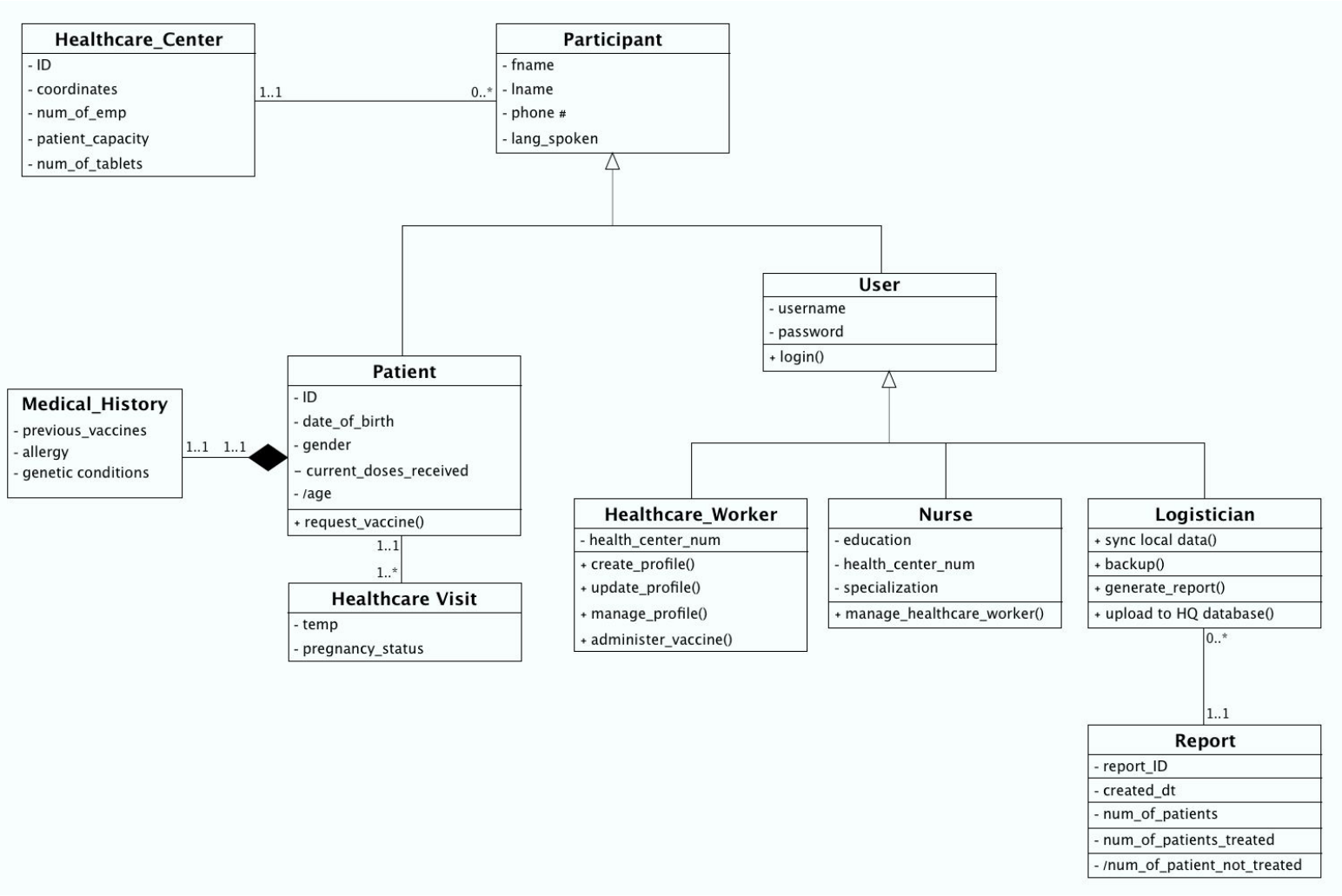
See file: "Deliverable 8 Manage Profile Activity Diagram.png"

Activity Diagram for Manage Profile Use-Case



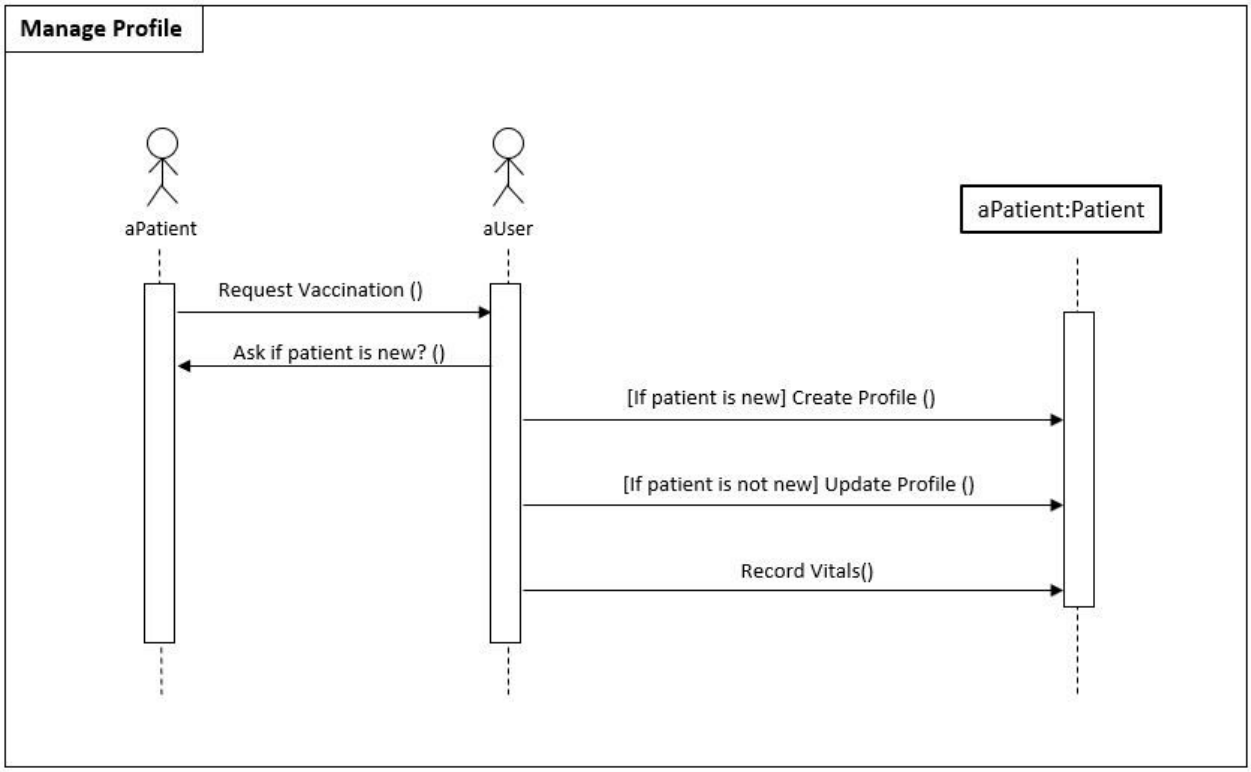
Class Diagram

See file: "Deliverable 8 Class Diagram.png"

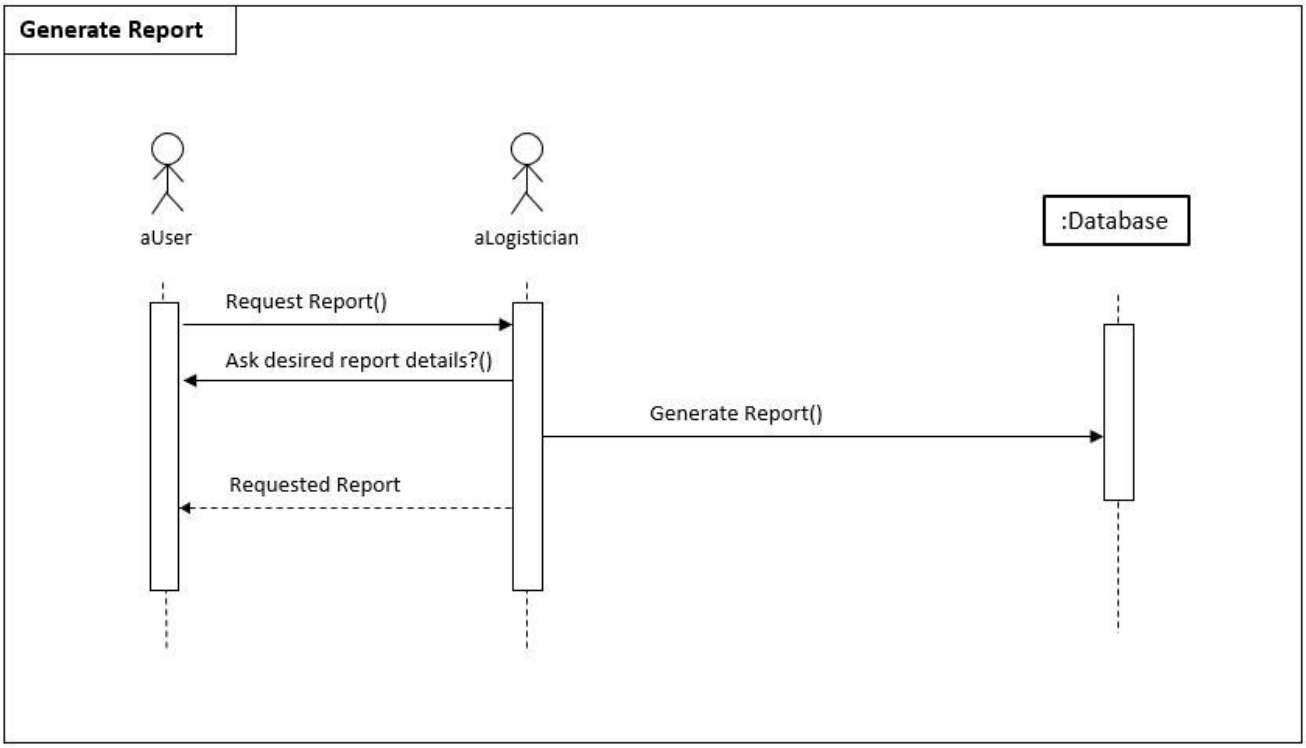


Sequence Diagrams

See file: "Deliverable 8 - Sequence Diagram 1.JPG"

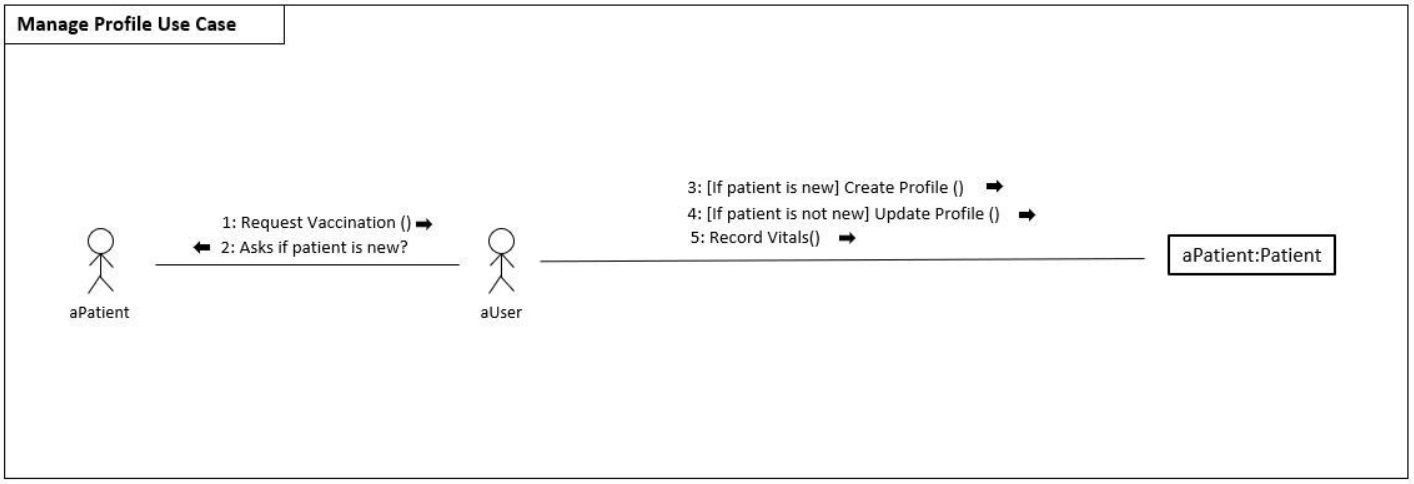


See file: "Deliverable 8 - Sequence Diagram 2.JPG"

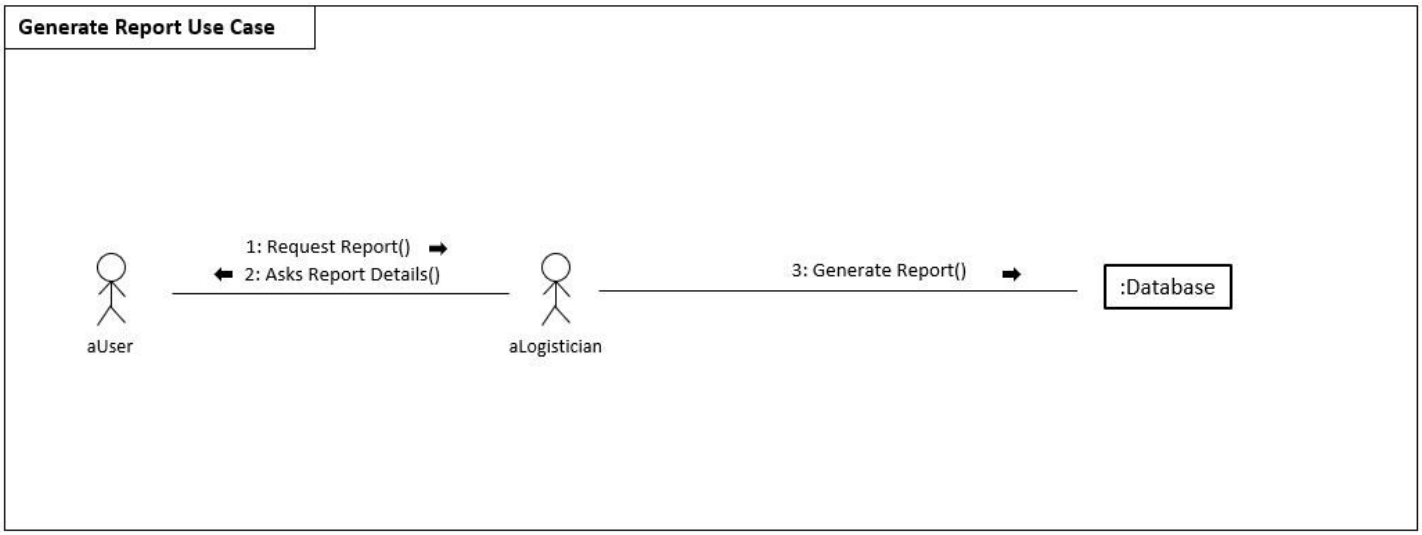


Communication Diagrams

See file: "Deliverable 8 - Communication Diagram 1.JPG"

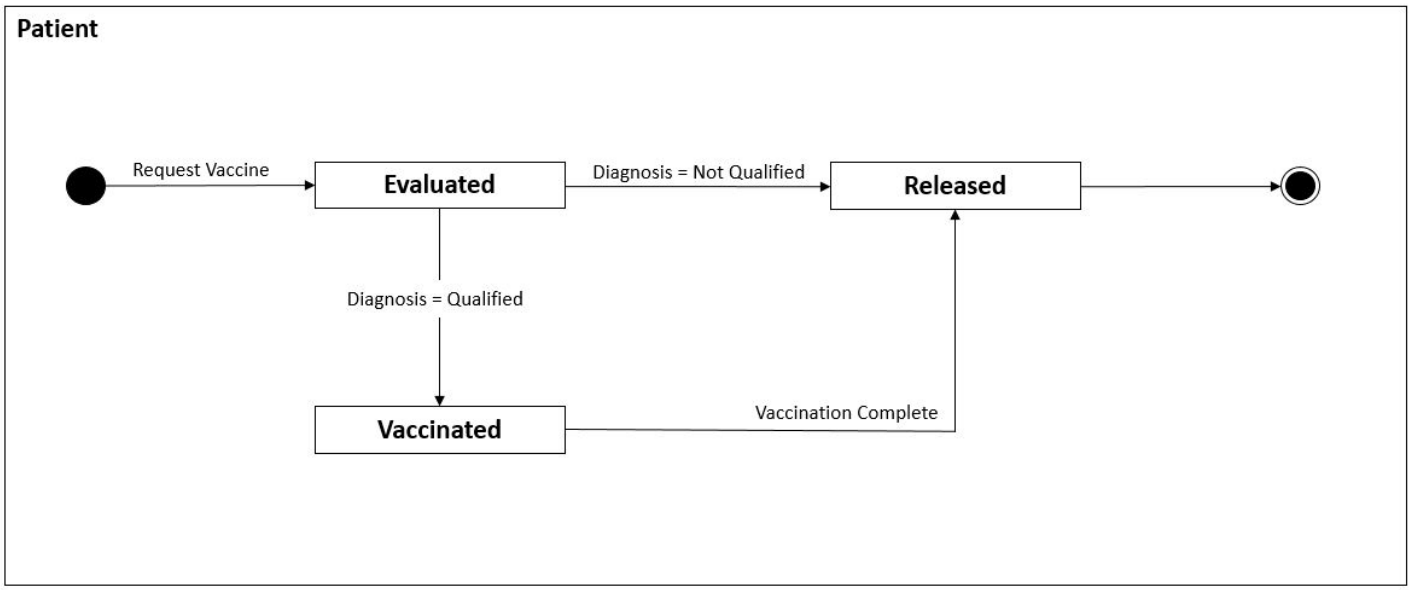


See file: "Deliverable 8 - Communication Diagram 1.JPG"



Behavioral State Diagram

See file: "Deliverable 8 - Behavioral State Diagram.PNG"



Version 2.0

Enhanced Functions

The Data Care system is designed around some key improvements to the current paper based system. The system improves data integrity by centralizing storage of data. The system also increases the quality of the data collected through question flow logic that only displays questions that are relevant to the treatment and the information previously entered. Additionally, our system allows the organization to operate more efficiency through the use of a clinical decision support algorithm. This algorithm will enable lower skilled local healthcare workers to make informed and medically sound decisions about patient treatment. All of these advantages ultimately add up to higher quality healthcare for patients.

Building upon this foundation, the next major feature we want to implement into the system is the ability to track patients between visits. This function would be incredibly useful to not only vaccinations where multiple doses are required, but in situations where follow-up consultations are required. Tracking a patient between campaigns would also allow MSF to essentially build a patient profile, resulting in quicker diagnosis and a greater understanding of a patient's medical history.

Expanded Uses

With the strengths of our system being largely based around efficiency and effectiveness, we believe a natural expansion would be into pediatric malnutrition. Severely malnourished children depend on quick and accurate assessments in order to survive. With the clinical decision support algorithm and the question flow logic, healthcare workers can zero in on the correct treatment for a pediatric patient quicker than ever before. For some patients, this could be the difference between life and death.

We are incredibly optimistic about this app's value to the organization and believe investment and support of the system would be a strategic long-term investment for the organization. With this project, MSF has the opportunity to lead the healthcare industry with innovative solutions that will directly impact millions of lives.