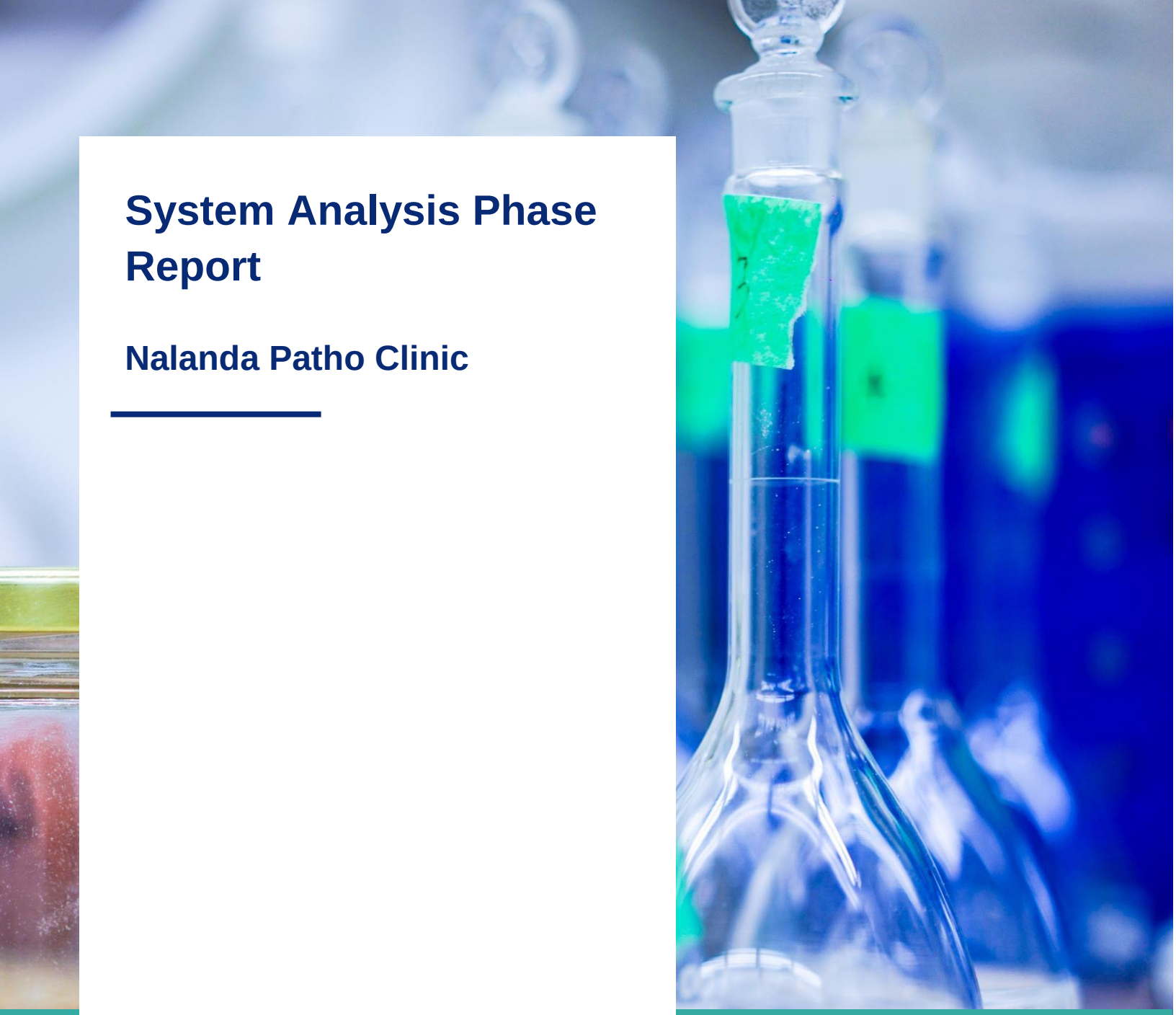

System Analysis Phase Report

Nalanda Patho Clinic

APRIL 1

Authored by: Team 18

Vaibhav Dubey, Shruti Gupta, Aashay Kedar, Arushi Kumar, Shivam Raj, FNU Shivangi

Contents

System Analysis Report for Nalanda Patho Lab

1. Approved SOW

Expert Consultants
College Park, MD-20740

SOW 02 for Agreement for Consulting Services to Nalanda Patho Centre

Date	**Services Performed By:**	**Services Performed For:**
March 27, 2019	**Expert Consultants** **College Park** **MD - 20740**	**Nalanda Patho Centre** **Bihar, India**

This Statement of Work (SOW) is issued pursuant to the Consultant Services Master Agreement between Nalanda Patho Centre ("Client") and Expert Consultants ("Contractor"), effective February 13, 2019 (the "Agreement"). This SOW is subject to the terms and conditions contained in the Agreement between the parties and is made a part thereof. Any term not otherwise defined herein shall have the meaning specified in the Agreement. In the event of any conflict or inconsistency between the terms of this SOW and the terms of this Agreement, the terms of this SOW shall govern and prevail.
This SOW # 01 (hereinafter called the "SOW"), effective as of February 13, 2019 is entered by and between Contractor and Client and is subject to the terms and conditions specified below. The Exhibit(s) to this SOW, if any, shall be deemed to be a part hereof. In the event of any inconsistencies between the terms of the body of this SOW and the terms of the Exhibit(s) hereto, the terms of the body of this SOW shall prevail.

1.1 Period of Performance

The services shall commence on February 13, 2019 and shall continue through May 10, 2019.

1.2 Scope of Work

Closely examine the existing information system that the client uses to provide recommendations for improvements in the Scheduling, Reporting and Billing systems of the pathology lab, to reduce the average response time and reduce manual effort and manual labor time.
Scheduling

- Patient Registration - Design a system to onboard patients, capturing their name, contact information, purpose of visit and information of the source of reference, if any, on their first visit. Consecutively,

designing capabilities to keep the customer information database up to date, with additional information captured for returning patients.

- Real time updates and response - Designing a system, while also working on the operational issues with the client, to provide patients real-time updates of the status of their appointment, waiting time and scheduling delays, if any, via text messages, phone calls and other/or WhatsApp messages.

1.2.1 Reporting

- Design Templates - Design digital copies of templates for each of the standardized tests that the pathology lab performs, and provide training documents on their usage and enhancement, so that they could be easily adopted and implemented by lab technicians with limited computer skills.
- Digital Reports - Design capabilities into the client's information system so that electronic copies of reports could be generated for each customer through data entry into the designed templates.
- Report Archival - A storage system must be maintained on a local database for easy retrieval of reports at any time.

1.2.2 Deliverable Materials

- A comprehensive design document for the scheduling and reporting systems, containing elements as talked about under the Scope of Work.
- User manuals pertaining to applications developed as per our design document, keeping in mind the limited computer skills of the users.

1.3 Project Objectives

Contractor shall have fulfilled its obligations when any one of the following first occurs:

- Contractor accomplishes the Contractor activities described within this SOW and detailed below, including delivery to Client of the materials listed in the Section entitled "Deliverable Materials," and Client accepts such activities and materials without unreasonable objections. No response from Client within 2-business days of deliverables being delivered by Contractor is deemed acceptable.
    - Scheduling:
        - Solution to be provided to reduce patients' wait-time by 33%.
        - A plan to provide information through text messages and WhatsApp messages to give real time updates to patients.
    - Reporting:
        - Contractor has provided a solution design to reduce time spent by technician on reporting by 50%.
        - Enhancements to the existing information system have been suggested with an option for the reports to be delivered to patients via e-mail and WhatsApp messages.
        - System design to provide report archival feature for easy retrieval of patient history and a repository for academic research, has been delivered.

- Contractor and/or Client has the right to cancel services or deliverables not yet provided with 20 business days advance written notice to the other party.

1.4 Constraints

- Accessibility of the client's information system is limited and dependent on clients availability, due to geographical separation and difference between time zones.
- Unavailability of lab technicians with advanced computer skills in and around the area where the client's business is located.
- Client's budget is very limited and subject to financing opportunities available at any given time.
- Time constraint because of the hard deadline bound by the course itself.
- As the scope of this project is limited to only the design of the systems, actual implementation would be delivered by another party, which may lead to inconsistencies in the developed system from the actual design.

IN WITNESS WHEREOF, the parties hereto have caused this SOW to be effective as of the day, month and year first written above.

	Nalanda Patho Centre			**Expert Consultants**
By:			**By:**	
Name:	**Pawan Kumar Choudhary**		**Name:**	**Shivangi**
Title:	**Proprietor**		**Title:**	**Project Manager**

2. Fact findings and Information Gathering Techniques

Fact Finding or Requirement Gathering for the project was done keeping in mind the intention of improving and optimizing customer service at the client's pathology lab, as per our preliminary discussions with the proprietor of the lab. The methodologies used were:

- Interviews
- Questionnaires
- Document Analysis

These methodologies adopted were constrained by the fact that the client is based overseas and, by the scope of the project. Following strategies were employed for requirement gathering:

- Problem Analysis

- Root Cause Analysis
- Informal Benchmarking

2.1 Steps followed for requirement gathering

2.1.1 Problem Analysis

Initial discussions with the proprietor of the lab helped us in formulating a problem statement as well as gain a precursory understanding of the solutions on the mind of the various stakeholders. For this the team interviewed the doctor, technicians at the lab, computer technician, receptionists and the patients. Interviewees were chosen based on their direct and indirect interaction with the system.
As is the case with problem analysis we followed an iterative process which helped us in removing ambiguity about the scope of the project.

2.1.2 Root Cause Analysis

After eliciting information from the client regarding the processes followed at the pathology lab, the team proceeded with the root cause analysis. It was necessary to gain clarity about the issues plaguing the system and shortlist the solutions necessary to streamline the processes. To perform root cause analysis, the team interviewed the technicians, receptionists and the patients who were directly affected by poor customer service.
To gain further clarity and remove conflicting viewpoints regarding the processes followed at the lab questionnaires were sent to the head technician and his subordinates. A questionnaire was also sent to the receptionist to get insights on the primary interaction of a patient at the lab.
Document analysis also helped in chalking out the solutions for improving the system.

2.1.3 Informal Benchmarking

The team studied the processes followed at similar organization in US and India to get an understanding of industry standards and best practices.

3. System Models of Current Systems

3.1 Data Flow Diagrams

3.1.1 Scheduling Narrative

Scope:
From client calling the lab for booking an appointment to client coming in for their test

External entities:
- Doctor
- Patient
- Receptionist
- Lab Technician

Data stores:

- Patient register – Physical register that stores patient details
- Doctor register – Physical register that stores doctor details and doctor schedule
- Appointment Register – Physical register that stores appointment details of all patients

Processes:

1. Request for appointment
2. Appointment booking
3. Record retrieval
4. Patient on-boarding/check-in
5. Sample collection

Narrative:

- A patient gives appointment details to Request for appointment process which forwards Patient Details and Test details to receptionist. Receptionist relays information to patient if appointment is confirmed via Request for appointment process
- Receptionist sends these details to Appointment booking process. This process updates doctor's schedule in Doctor register, adds appointment details to Appointment register and updates patient register with patient details. This process also sends status of appointment to receptionist
- Patient confirms arrival at Appointment date or even an Ad-hoc arrival at the Reception where the receptionist checks Appointment details from appointment register
- Patient then checks-in at the Sample collection desk which checks Test details from Appointment register. Once check in is complete, patient submits the sample from sample collection process to the technician for further processing

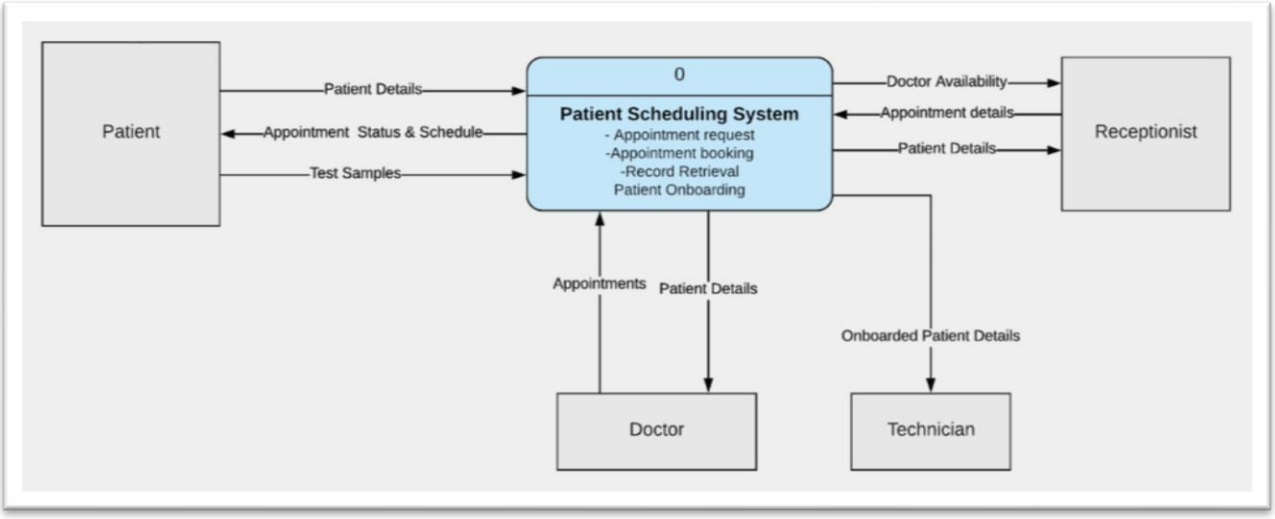

Figure 1 - Context Level Diagram – Scheduling

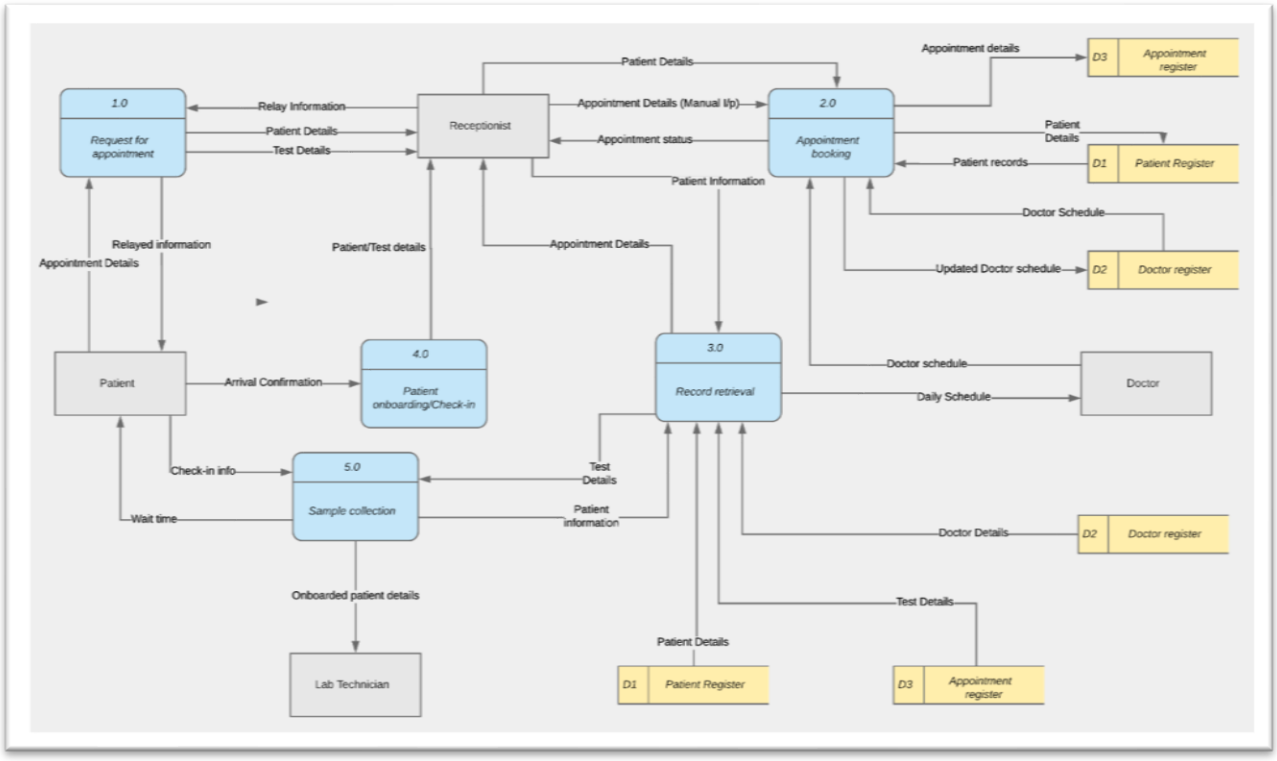

Figure 2 - Level 0 DFD – Scheduling
Note: Check Image 1, Appendix A for a higher resolution image for Figure 2

3.1.2 Reporting narrative

Scope :
Right from the point where a patient is attended by a technician till the point where patient receives the report.

External Entities :

- Patient
- Lab technician
- Computer technician
- Doctor

Data stores :

- Collected samples – Physical store where all the samples are stored
- Level-1 test results – Physical register that stores hard copies of primary test (chemical test) results
- Final test results – Physical register that stores hard copies of secondary test (microscopic test) results
- Reports – Physical register that stores hard copies of final consolidated reports

Processes :

1. Sample collection
2. Collect required sample
3. Primary analysis (Chemical tests)
4. Collect required primary analysis results
5. Secondary analysis (Microscopic tests)
6. Computer reporting
7. Dispatch reports

Narrative :

- Technician attends the patient and obtains test sample from him.
- Test sample extracted from the patient is stored in Sample Store.
- Technician fetches the required sample from the Sample Store and conducts primary analysis (Level-1 test) on it.
- Results obtained from the primary analysis are stored in the Level-1 Test Results data store.
- Doctor gets the required primary analysis results from Level-1 Test Results data store and performs secondary analysis (Final test) on it.
- Results obtained from the secondary analysis are stored in the Final Test Analysis Results data store.
- Computer technician gets the required final test results from Final Test Analysis Results data store and feeds these results into a digital report.
- Consolidated report is stored in the Reports data store.
- Report is then dispatched to the patient.

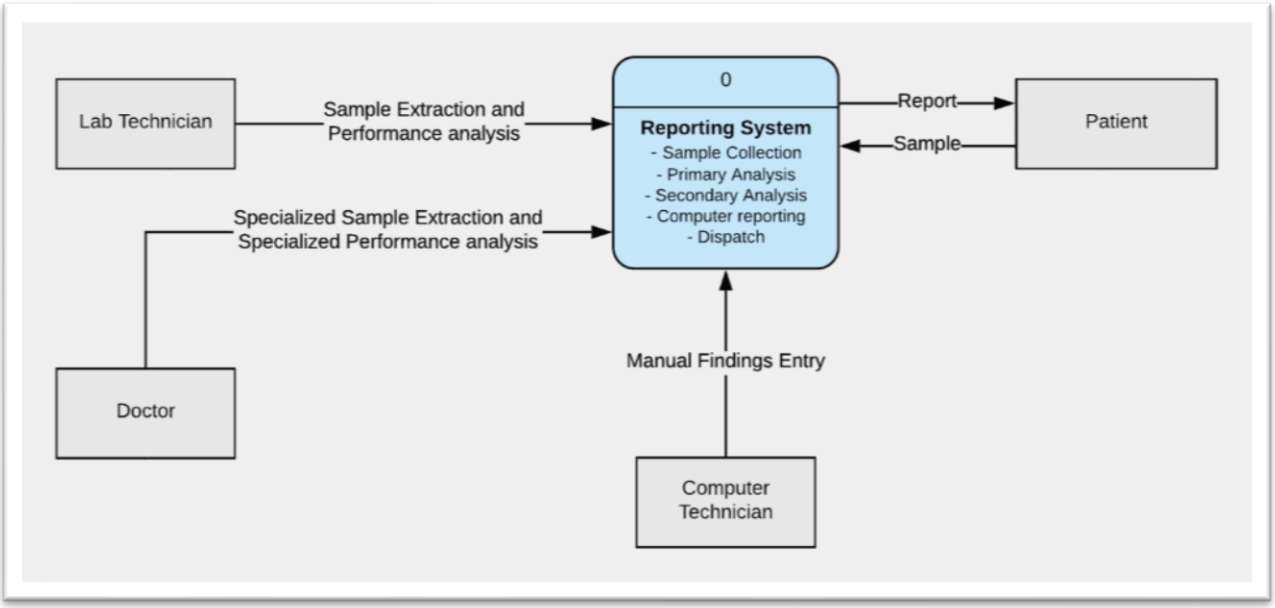

Figure 3 - Context Level Diagram – Reporting

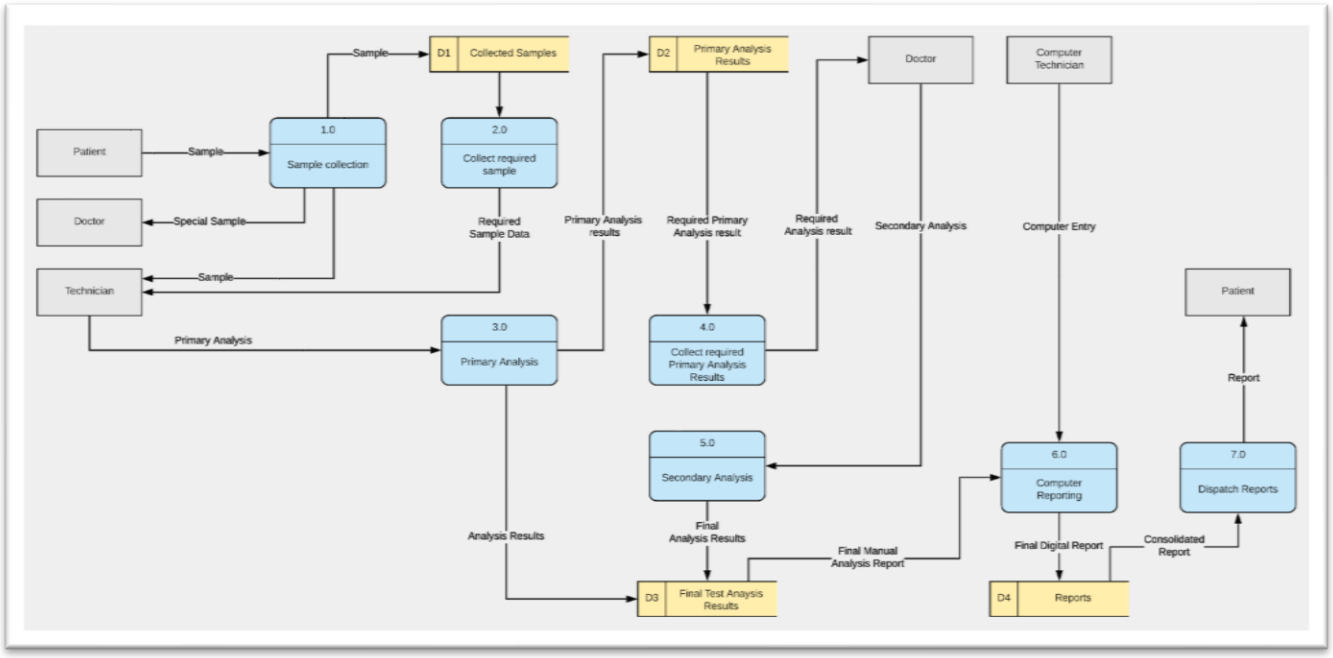

Figure 4 - Level 0 DFD – Reporting
Note: Check Image 2, Appendix A for a higher resolution image for Figure 4

3.2 Entity Relationship Diagram

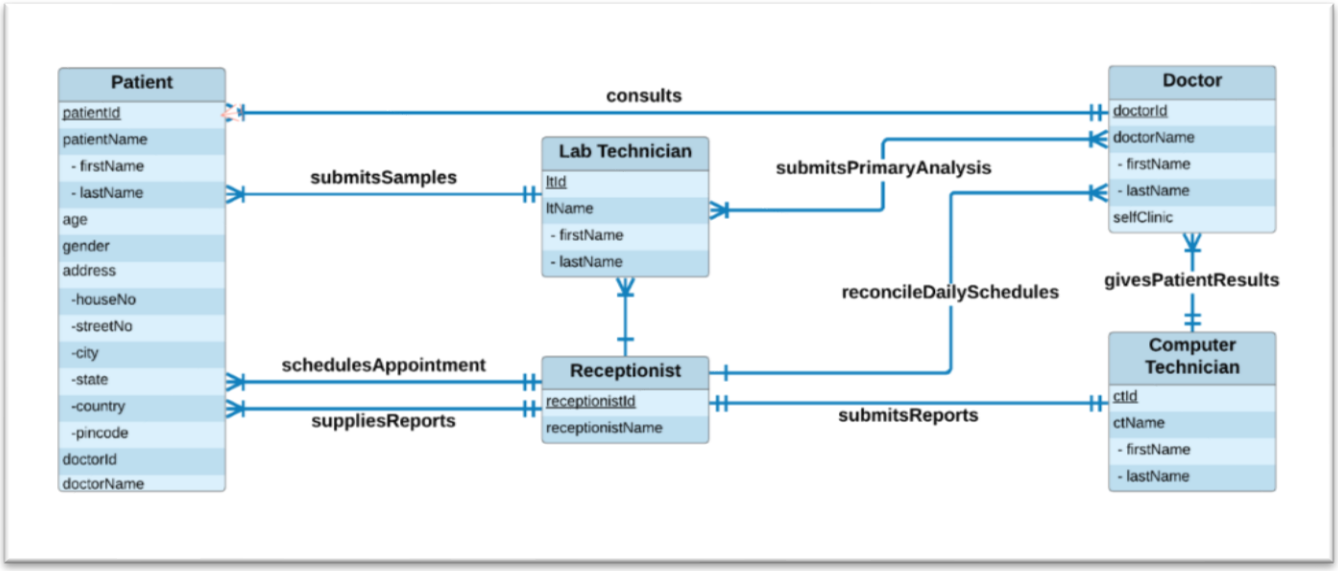

Figure 5 - ERD - Current System (Scheduling & Reporting)
Note: Check Image 3, Appendix A for a higher resolution image for Figure 5

Appendix A

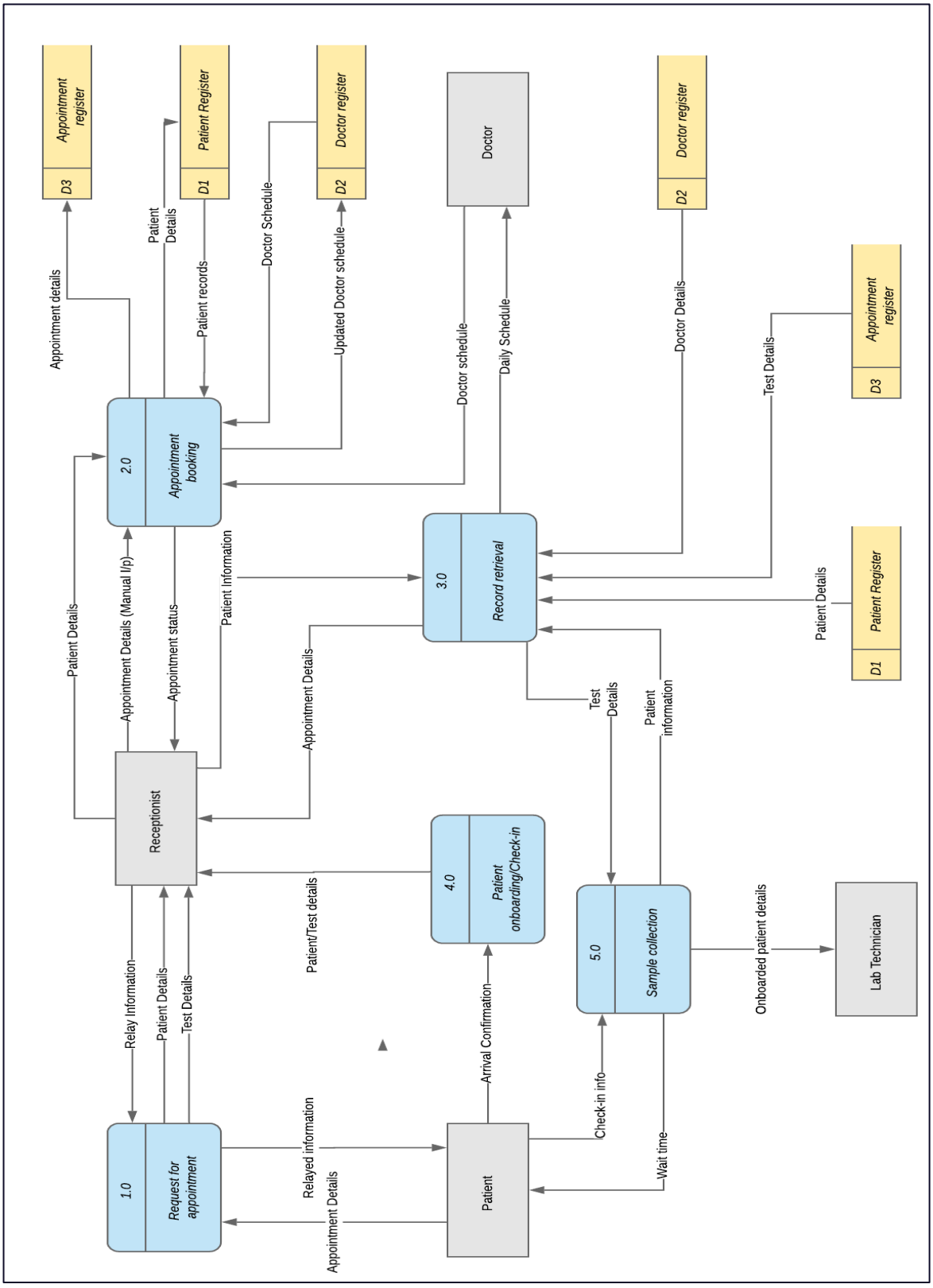

Image 1 - Level 0 - DFD - Scheduling

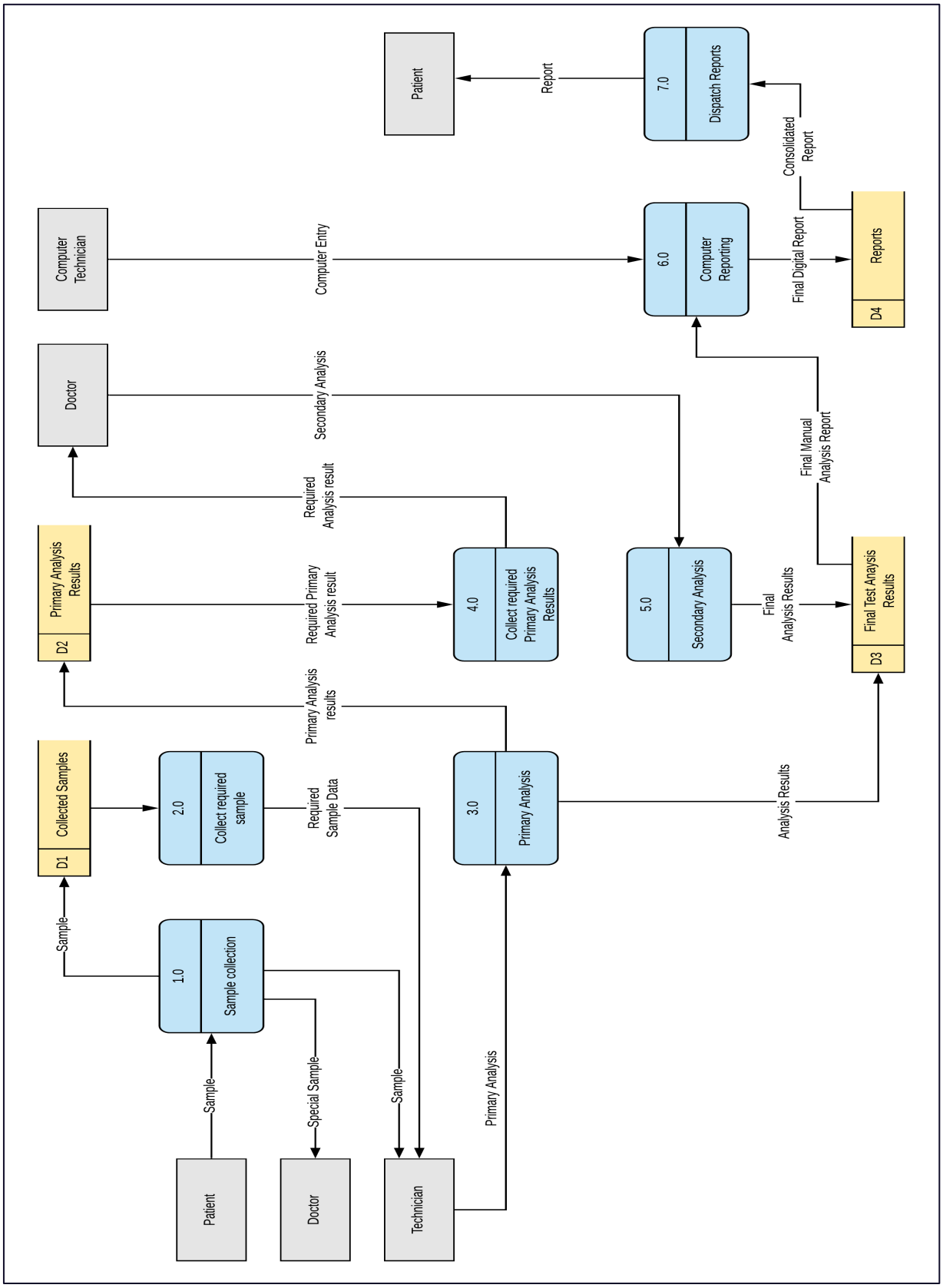

Image 2 - Level 0 - DFD - Reporting

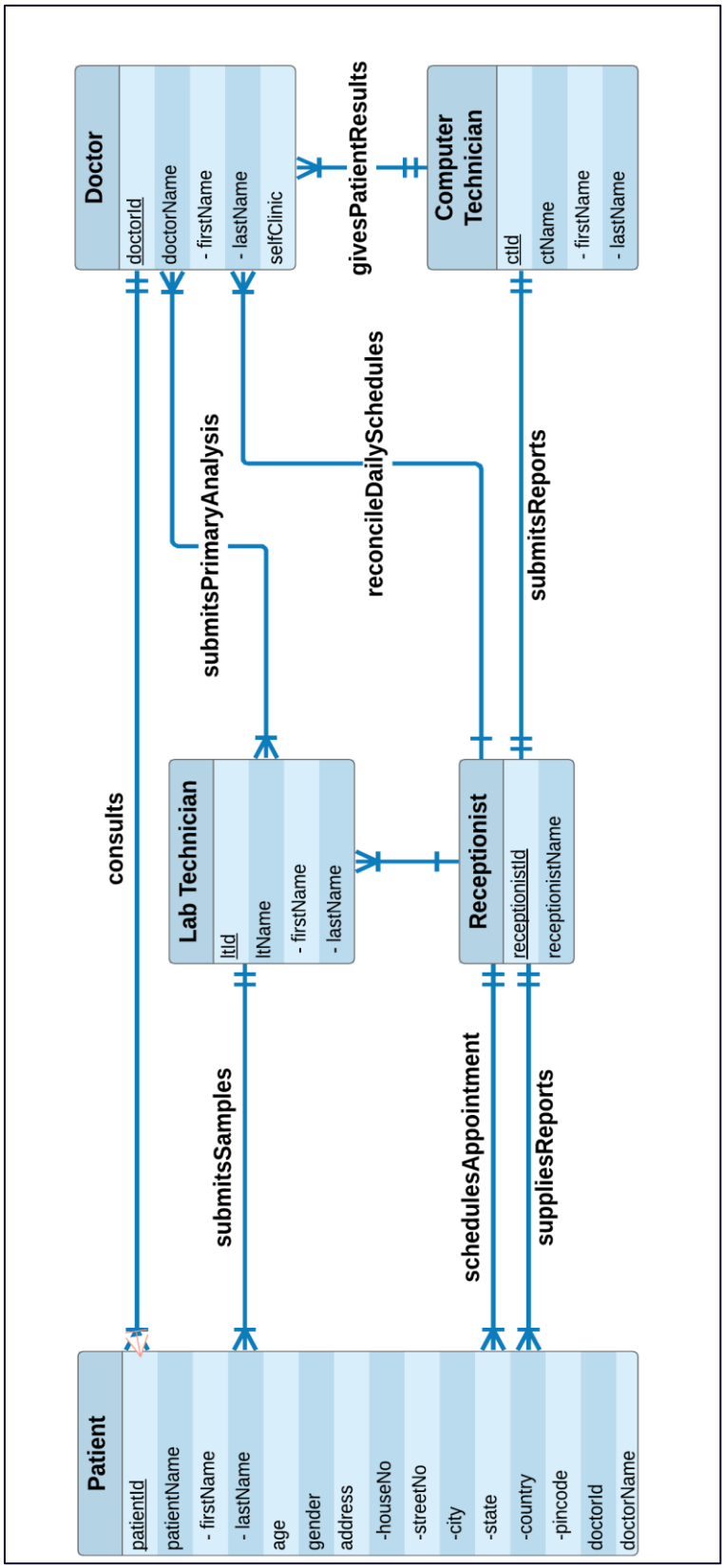

Image 3 - ERD - Current System (Scheduling & Reporting)