Advanced Databases

March-April 2020

MediTrack

Health aiding app

Under the guidance of

Prof. Frank Hefter

Prof. Dr. Gerd Moeckel

Prof. Dr. Barbara Sprick

Presented by

Talari Venu Sukanya

Contents

1. Introduction

1.1 Problem Statement

To develop an android app to assist the patients, doctors, and the chemist shops with their day-to-day activities.

1.2 Purpose of the Application

In today's busy schedule, we often neglect our health and end up forgetting to take the medicines and proper diet. So, there is a need to have an app which reminds about taking medicines and regularly monitoring one's health.

1.3 Components

- Patients
- Clinic
- Medical_ Precision
- Doctors
- Chemist_Shops
- Exercise

1.4 Description

- ✓ Benefits for Patients
  The user will get the reminders to take the medicine and the prescribed diet and will receive an alert if the medicine stock is available in less quantity. The user can also obtain the details of the clinic and pharmacy shops.
- ✓ Benefits for Doctors
  Doctor can book and view the appointments, see the patient's reports, and update the list of chemist shops for the user from where he can buy the medicines.
- ✓ Advantage for Chemist Shop
  The user can track the availability of medicines and will get a notification if the stock is available in less quantity and will be able to view the ratings from the customer.

1.5 Used Databases

- ✓ MongoDB
- ✓ Redis
- ✓ Neo4j

2. User Stories

2.1 User Stories: Patient

The first user story is all about the patient who wants to store all his reports and tests in the app and want to get reminders for taking the medicines.

This user story is divided into various sub-stories-

- ✓ As an end user, the user searches for the nearest clinic location using GPS and check the contact and address information and can book an appointment with the doctor. The user should be able to see the emergency contact number and he also wants to check for the acceptance of the Health Insurance for that clinic.

- ✓ As an end user, the user wants to get reminders for taking drugs and diet accordingly as directed by the doctor into the app. User should be able to check the current medicines stock and receive an alert if he is left with 2 or 3 days of medication

- ✓ As an end user, user should be using the BP checker, Pulse checker on daily basis for the quality of life and the reports should be updated in the app. He should be able to keep the track of the date when user consulted the doctor.
- ✓ As an end user, the user is able to see the list of chemist shops from where the medicines are available. This will make the task easy for the patient as he will not have to search for the shops to buy the medicines from.

2.2 User Stories: Doctor

The second user story is related to doctor who wants to keep a track of the health status of the patient.

- ✓ As an end user, the doctor can check for the appointments made for that week and by default every appointment will be for half an hour.

- ✓ As an end user, doctor should be able to see all the test reports of patients that are performed in app and update the medicines and diet accordingly. Doctor should be able to arrange an appointment if he finds some problems in the reports of patient.

- ✓ As an end user, doctor can update the list of chemist shops for the patients.

2.3 User Stories: Chemist Shop

The third user story is focused on owner of a chemist shop who wants to keep a record of the available stock of medicines.

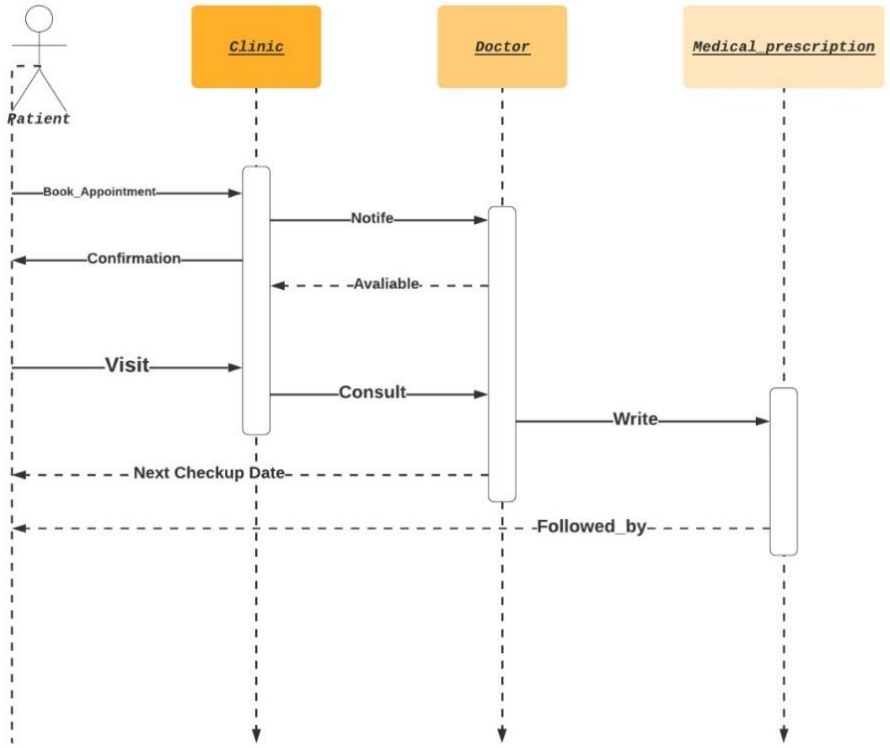
- ✓ As an end user, the user should be able to check the current stock of medicines and receive an alert for the drugs in lesser quantity.

- ✓ As an end user, the user can be able to see the ratings from the customers.

- ✓ Chemist shops should be connected to some clinics. The doctor can refer the patients to go some specific shop and collect all the medicines from there.

3. Use Cases

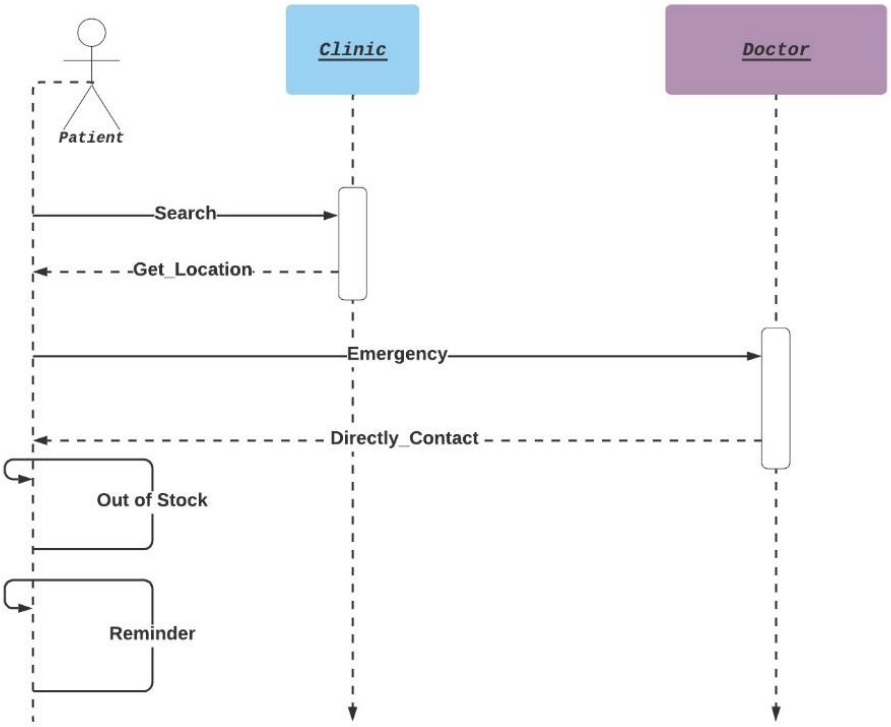
3.1. Use Cases 1:



Use Case Name	Patient, Clinic, Doctor and Medical Prescription
Description	Patient will book an appointment with a clinic, doctor receives notification regarding appointment and check the availability of the appointment and then the confirmation message is sent to the patient regarding their appointment. Patient will visit to a nearest clinic to consult a doctor where doctor examine the patient and give them medical prescription mean while doctor will allocate next checkup date.
Primary Actor	Patient
Secondary Actor	Client, Doctor, Medical prescription.
Pre-Condition	• Book Appointment. • Appointment list will update to doctor.

	• Consulting to a doctor. • Medical Prescription.
Post Condition	• Conformation message. • Next checkup date.
Use of DBs	MongoDB and Neo4j

3.2 Use Case 2:

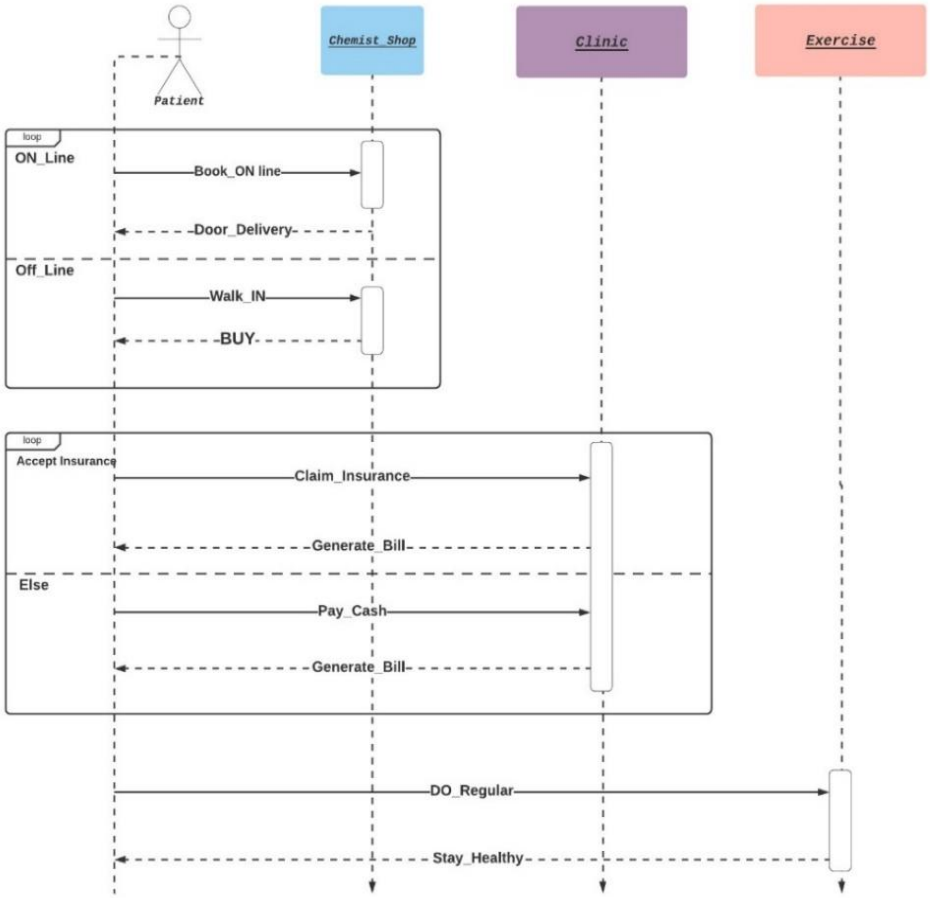


Use Case Name	Patient, Clinic and Doctor
Description	Patient will search for a clinic and get clinic location, contacting to a doctor can be done in two ways by emergency or by making direct contact to a doctor. Patient will also be able to know the stock of their medicines and gets a reminder to take a medicine on time.
Primary Actor	Patient
Secondary Actor	Clinic**, D**octor

Pre-Condition	• Searching location of a clinic. • Emergency contact details of a doctor. • Out of stock.
Post Condition	• Nearest location of clinic. • Contacting the doctor. • Reminder.
Use of DBs	MongoDB and Neo4j and Redis

3.3 Use Case 3:

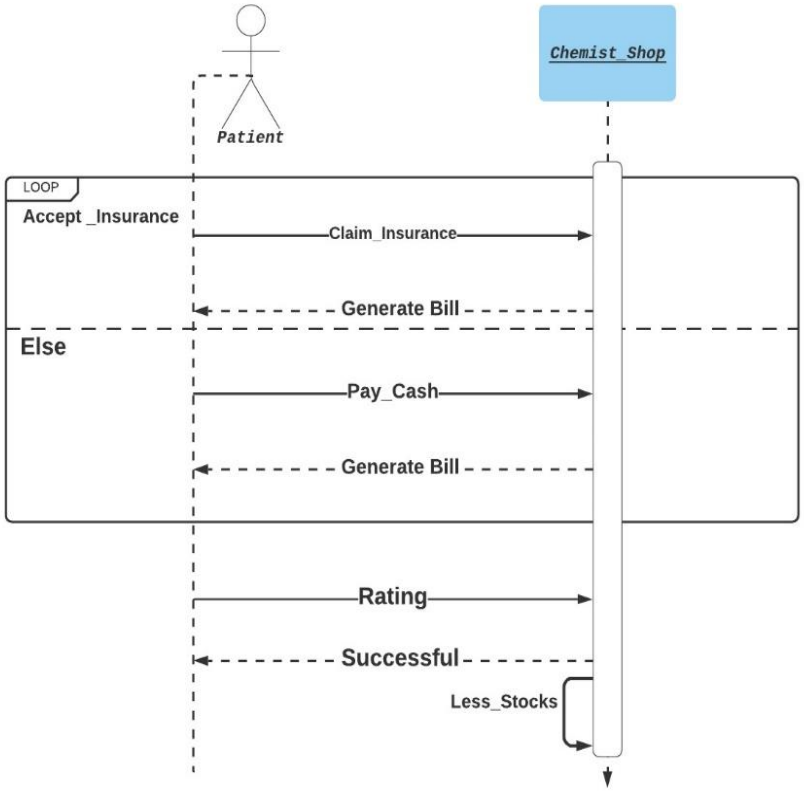
Use Case Name	**Patient, Chemist_shop, Clinic and Exercise**
Description	Patient can book their medicine in two ways online and offline. In online - patient can book their prescribed medicine using online where chemist shop delivers their medicines door to door. In offline - patient can manually go to chemist shop and buy prescribed medicine. Next comes about payment where payment is done in two ways - health insurance and pay cash. If a patient has a health insurance, he can claim insurance and get generated bill, if not patient should pay in cash. Patient will have to do regular exercise if it is prescribed by a doctor to stay healthy.
Primary Actor	Patient
Secondary Actor	Chemist shop, Clinic, Exercise
Pre-Condition	• Buy medicine from online or offline • Insurance or cash.
Post Condition	• Door delivery or walk in. • Generate medical bill.
Use of DBs	Redis and MongoDB



3.4 Use Case 4:

Use Case Name	Patient, Chemist_shop
Description	Payment is done in two ways - insurance and pay cash. If a patient has a health insurance, he can claim insurance with a chemist as well as clinic after the payment they will get generated bill, if not patient should pay in cash. Patient give rating to chemist shop so that it helps other users. If there is less stock of medicine in chemist shop, will get immediate alert.
Primary Actor	Patient
Secondary Actor	Chemist shop
Pre-Condition	• Claiming insurance or paying cash. • Rating chemist shop. • Less stock.
Post Condition	• Conformation bill for the payment. • Alter message.

Use of DBs	Redis and MongoDB



4. Database

In this MediTrack aiding app project, we are using 3 NoSQL databases. NoSQL databases are widely used because of the most 5 various features like Veracity, Volume, Value, Velocity and Variety. NoSQL databases are simple, elastic scaling, no joins, no schema, and integrated caching facility.

Here is the brief description about the MongoDB NoSQL database and why are we using that database in this project.

4.1 MongoDB

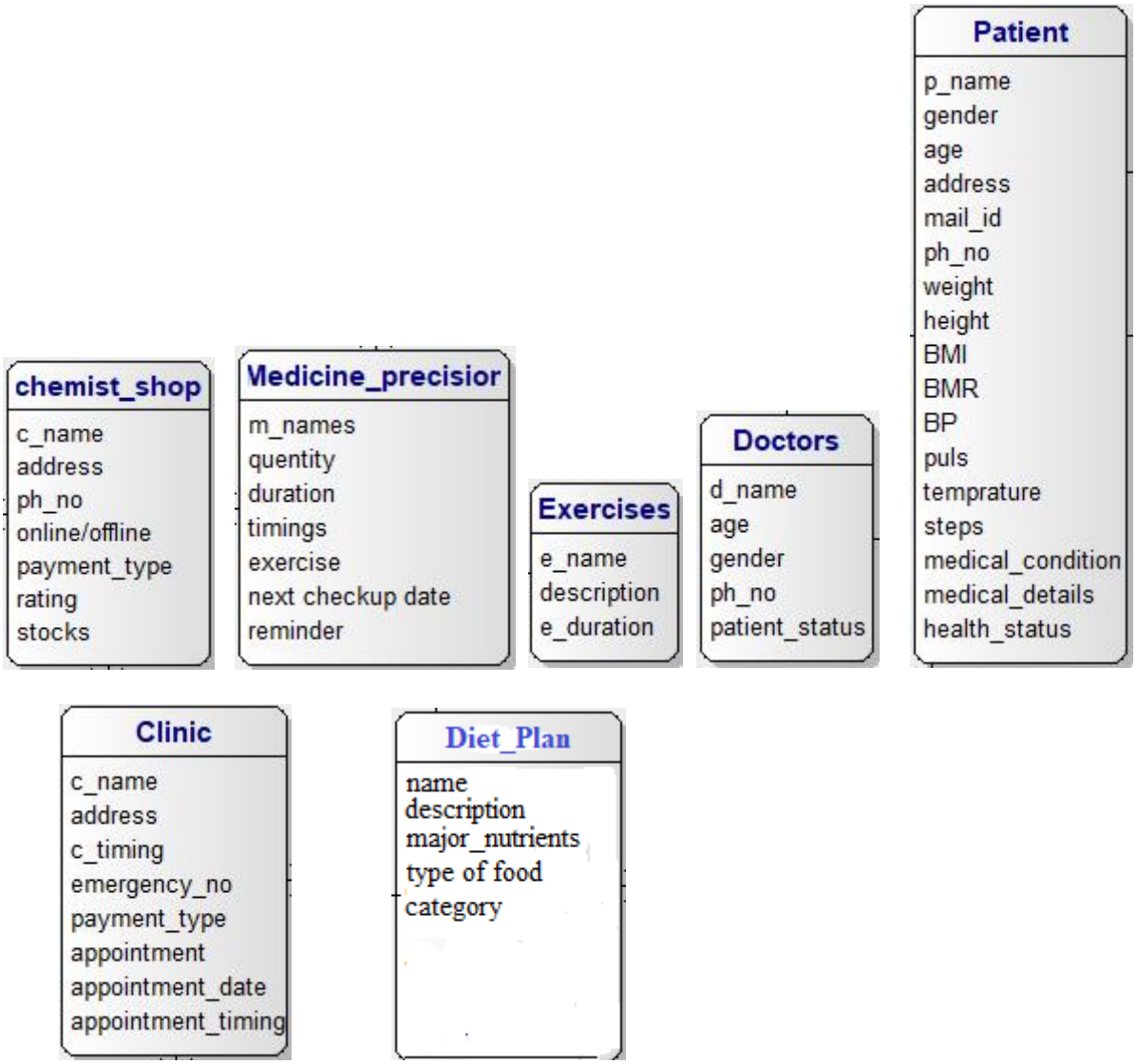
MongoDB is also called Document oriented database. This database has high performance, strong-consistency and easy scalability. MongoDB is used for the complex projects because of Horizontal Scalability or

Sharding feature which can store the data records across multiple machines, which can indeed help in the demand of the data growth. MongoDB is used by companies like Uber, CircleCI, Lyft, TravelPerk, MIT etc.

MongoDB consists of Collections, Documents and Fields (which are Tables, Rows and Columns in RDBMS). Data stores in the form of documents which are JSON style data structures in this database. MongoDB has replica set which is a group of mongoDB processes that maintain the same data set. This replica set provides data redundancy and increase data availability by having multiple copies of data across multiple servers. Additional copies of data can be maintained in replica sets for disaster recovery, reporting or backup.

CRUD operations in MongoDB

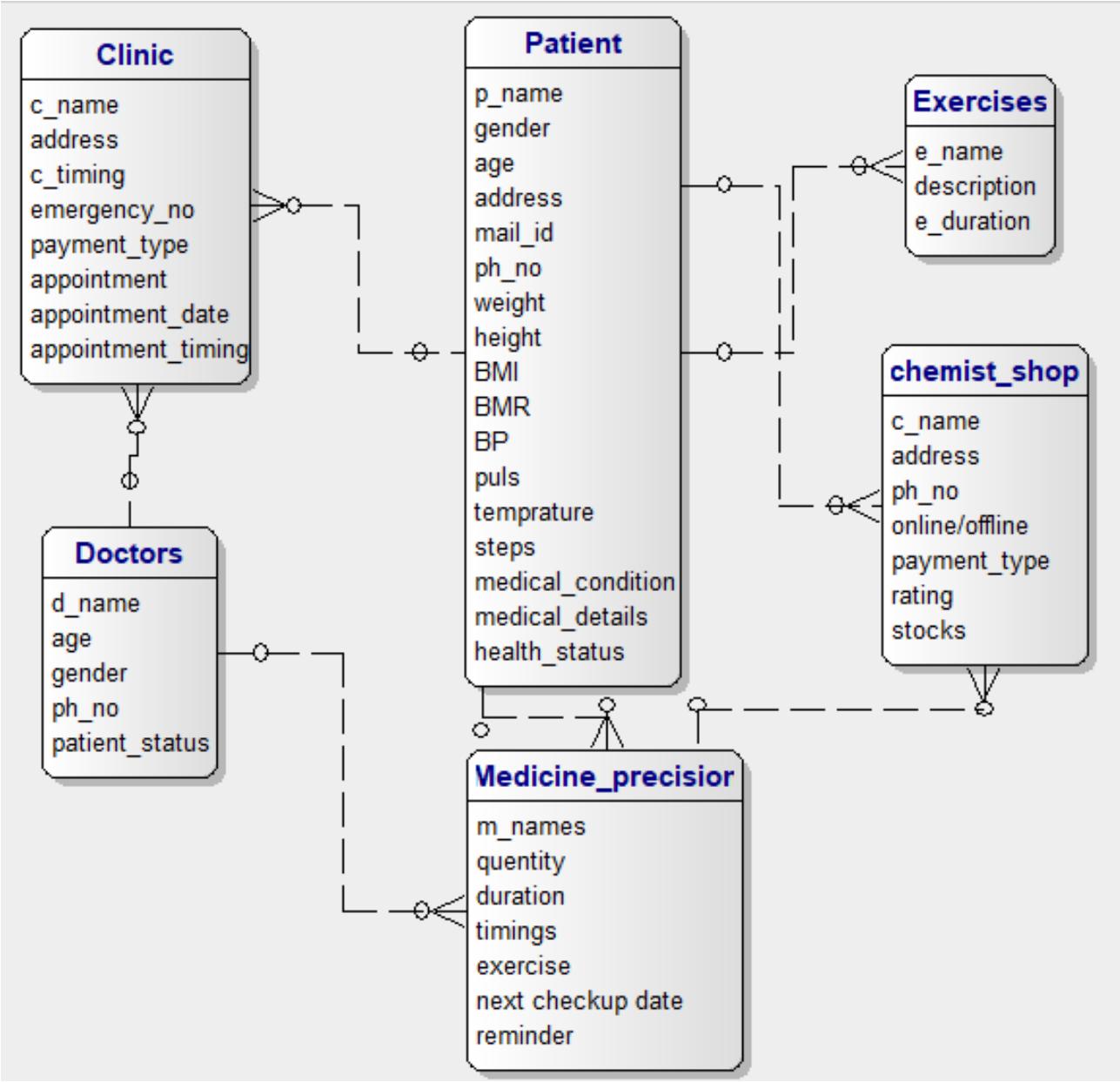
- ✓ Create - is used to create new documents to a collection. Insert is used to create collections
- ✓ Read - is used to retrieve documents from a collection
- ✓ Update - is used to modify the existing documents in a collection
- ✓ Delete - is used to delete documents from the collection



5. Data Model

5.1 MongoDB (Document data model)

MongoDB holds the general information of all the entities since it is ideal for holding large sets of data. The details such as collections, data inside the collections and data types are shown in this section. MongoDB holds the data in the detailed manner in each collection. Here the database name is MediTrack and has several collections, and entities stored as documents.



6. Implementation

After data modelling in the database, with detailed structure, it was necessary to implement the same. In order to form the hybrid data-model by using the cross-platform data-models, we used the CRUD operations. The details of the implementation are explained further.

6.1 Implementation of MongoDB Data Model:

6.1.1 Patient

db.Patient.find()
{ "_id" : ObjectId("5eaa290b8c1c4665b4e7cf17"),
"p_name" : "Max Loewe", "p_ID" : "001", "reg_no" : "1", "gender" : "male", "Insurance Type" : "AOK", "age" : "42", "address" : "Ansbacher Strasse 49", "mail_id" : "MaxLoewe@gmail.com", "pati_phno" : "0421 17 00 04", "weight" : "75", "height" : "5.2", "BMI" : "21.5", "BMR" : "620", "BP" : "100/80", "pulse" : "80", "temprature" : "90 C", "steps" : "4000", "medical_condition" : "N/A", "medical_details" : "no problem", "health_status" : "normal", "ex_type" : "1" }

{ "_id" : ObjectId("5eaa2abd8c1c4665b4e7cf19"), "p_name" : "Ines Engel", "p_ID" : "002", "gender" : "female", "age" : "28", "address" : "Knesebeckstraße 78", "mail_id" : "InesEngel@gmail.us", "pati_phno" : "09646 89 71 69", "weight" : "60", "height" : "5", "BMI" : "18", "BMR" : "750", "BP" : "140/90", "pulse" : "95", "temprature" : "110 C", "steps" : "840", "medical_condition" : "high fever", "medical_details" : "high bp and headache", "health_status" : "critical", "ex_type" : "2", "Insurance Type" : "TK", "reg_no" : "2" }

{ "_id" : ObjectId("5eaa2b9d8c1c4665b4e7cf1a"), "p_name" : "John Meier", "p_ID" : "003", "gender" : "male", "age" : "32", "address" : "Los-Angeles-Platz 5", "mail_id" : "johnMeier@gmail.com", "pati_phno" : "036605 40 57", "weight" : "70", "height" : "6", "BMI" : "20", "BMR" : "550", "BP" : "130/85", "pulse" : "75", "temprature" : "98 C", "steps" : "2546", "medical_condition" : "fever", "medical_details" : "stomach pain and body pain", "health_status" : "midpoint", "ex_type" : "3", "Insurance Type" : "Private", "reg_no" : "3" }

{ "_id" : ObjectId("5eaa2c1a8c1c4665b4e7cf1b"), "p_name" : "Stefanie Wannemaker", "p_ID" : "004", "gender" : "female", "age" : "25", "address" : "Pasewalker Straße 87", "mail_id" : "StefanieWannemaker@gmail.com", "pati_phno" : "07303 89 99 41", "weight" : "55", "height" : "5", "BMI" : "21", "BMR" : "520", "BP" : "90/80", "pulse" : "70", "temprature" : "80 C", "steps" : "5200", "medical_condition" : "tiredness", "medical_details" : "food infection", "health_status" : "midpoint", "ex_type" : "4", "Insurance Type" : "TK", "reg_no" : "4" }

{ "_id" : ObjectId("5eaa2ca28c1c4665b4e7cf1c"), "p_name" : "Marco Frey", "p_ID" : "005", "gender" : "male", "age" : "23", "address" : "Knesebeckstrasse 23", "mail_id" : "MarcoFrey@gmail.com", "pati_phno" : "04106 88 46 91", "weight" : "81", "height" : "5.9", "BMI" : "25", "BMR" : "651", "BP" : "105/98", "pulse" : "99", "temprature" : "101 C", "steps" : "3450", "medical_condition" : "lung disease", "medical_details" : "breathing and pain problem", "health_status" : "critical", "ex_type" : "5", "Insurance Type" : "TK", "reg_no" : "5" }

{ "_id" : ObjectId("5eaa2d2b8c1c4665b4e7cf1d"), "p_name" : "Philipp Kuester", "p_ID" : "006", "gender" : "male", "age" : "23", "address" : "Kantstraße 85", "mail_id" : "PhilippKuester@gmail.com", "pati_phno" : "03723 14 91 20", "weight" : "75", "height" : "5.6", "BMI" : "", "BMR" : "", "BP" : "", "pulse" : "", "temprature" : "", "steps" : "", "medical_condition" : "", "medical_details" : "", "health_status" : "normal", "ex_type" : "6", "Insurance Type" : "AOK", "reg_no" : "6" }

{ "_id" : ObjectId("5eaa2d9d8c1c4665b4e7cf1e"), "p_name" : "Lena Werner", "p_ID" : "007", "gender" : "female", "age" : "67", "address" : "Alt Reinickendorf 63", "mail_id" : "LenaWerner@gmail.com", "pati_phno" : "08272 76 03 21", "weight" : "64", "height" : "5.1", "BMI" : "25", "BMR" : "700", "BP" : "120/80", "pulse" : "", "temprature" : "", "steps" : "", "medical_condition" : "", "medical_details" : "", "health_status" : "midpoint", "ex_type" : "7", "Insurance Type" : "AOK", "reg_no" : "7" }

{ "_id" : ObjectId("5eab38c9898d09cd96a973ec"), "p_name" : "Rakesh", "p_ID" : "008", "gender" : "male", "age" : "35", "address" : "Albert Fritz 55", "mail_id" : "Rakesh@gmail.com", "pati_phno" : "1254789654", "weight" : "69", "height" : "4.8", "BMI" : "18.4", "BMR" : "400", "BP" : "105/98", "pulse" : "99", "temprature" : "95 C", "steps" : "2500", "medical_condition" : "lung disease", "medical_details" : "lung cancer", "health_status" : "mid point ", "ex_type" : "8", "Insurance Type" : "Private", "reg_no" : "8" }

{ "_id" : ObjectId("5eab39aa898d09cd96a973ed"), "p_name" : "Wannemaker", "p_ID" : "009", "gender" : "male", "age" : "41", "address" : "Mess Platz 54", "mail_id" : "Wannemaker@gmail.com", "pati_phno" : "2351014766", "weight" : "72", "height" : "6.2", "BMI" : "22.5", "BMR" : "800", "BP" : "100/80", "pulse" : "85", "temprature" : "101 C", "steps" : "3450", "medical_condition" : "heartdisease", "medical_details" : "heartattack", "health_status" : "critical", "ex_type" : "9", "Insurance Type" : "AOK", "reg_no" : "9" }

6.1.2 Clinic

{ "_id" : ObjectId("5eaa2e468c1c4665b4e7cf1f"), "c_name" : "clinic1", "reg_no" : "1", "d_ID" : "DR1", "d_specialization" : "cardiologists", "address" : "Ansbacher Strasse 57", "c_timing" : "9:00 AM-9:00 PM", "emergency_no" : "8024568", "payment_type" : "insurance", "appointment" : "yes", "appointment_date" : "08-01-2020", "appointment_timing" : "11:00 AM", "Insurance Type" : "AOK" }

{ "_id" : ObjectId("5eaa2e9f8c1c4665b4e7cf20"), "c_name" : "clinic2", "address" : "Feldstrasse 75", "c_timing" : "8:00 AM-6:00 PM", "emergency_no" : "80654789", "payment_type" : "cash", "appointment" : "no", "appointment_date" : "N/A", "appointment_timing" : "N/A", "Insurance Type" : "Private", "reg_no" : "2", "d_ID" : "DR2", "d_specialization" : "family physician" }

{ "_id" : ObjectId("5eaa2efb8c1c4665b4e7cf21"), "c_name" : "clinic3", "address" : "Brandenburgische Strasse 19", "c_timing" : "8:00 AM-8:00 PM", "emergency_no" : "8034978", "payment_type" : "insurance", "appointment" : "yes", "appointment_date" : "05-02-2020", "appointment_timing" : "7:00 PM", "Insurance Type" : "AOK", "reg_no" : "3", "d_ID" : "DR3", "d_specialization" : "plastic surgeons" }

{ "_id" : ObjectId("5eaa2f338c1c4665b4e7cf22"), "c_name" : "clinic4", "address" : "Feldstrasse 78", "c_timing" : "6:00 AM-6:00 AM", "emergency_no" : "13546824", "payment_type" : "insurance", "appointment" : "yes", "appointment_date" : "05-10-2020", "appointment_timing" : "8:00 PM", "Insurance Type" : "TK", "reg_no" : "4", "d_ID" : "DR4", "d_specialization" : "cardiologists" }

{ "_id" : ObjectId("5eaa2f7d8c1c4665b4e7cf23"), "c_name" : "clinic5", "address" : "Gubener Str. 48", "c_timing" : "9:00 AM-9:00 PM", "emergency_no" : "123654879", "payment_type" : "cash", "appointment" :

"no", "appointment_date" : "N/A", "appointment_timing" : "N/A", "Insurance Type" : "Private", "reg_no" : "5", "d_ID" : "DR5", "d_specialization" : "family physician" }

{ "_id" : ObjectId("5eaa2fc08c1c4665b4e7cf24"), "c_name" : "clinic6", "address" : "Luetzowplatz 72", "c_timing" : "9:00 AM-9:00 PM", "emergency_no" : "987655432", "payment_type" : "cash", "appointment" : "no", "appointment_date" : "N/A", "appointment_timing" : "N/A", "Insurance Type" : "AOK", "reg_no" : "6", "d_ID" : "DR6", "d_specialization" : "physiotherapy" }

{ "_id" : ObjectId("5eaa2ffd8c1c4665b4e7cf25"), "c_name" : "clinic7", "address" : "Leipziger Strasse 12", "c_timing" : "6:00 AM-6:00 AM", "emergency_no" : "9765432098", "payment_type" : "insurance", "appointment" : "yes", "appointment_timing" : "8:00 PM", "appointment_date" : "06-05-2020", "Insurance Type" : "TK", "reg_no" : "7", "d_ID" : "DR7", "d_specialization" : "plastic surgeons" }

{ "_id" : ObjectId("5eaa37b88c1c4665b4e7cf27"), "c_name" : "clinic8", "address" : "Paul-Nevermann-Platz 92", "c_timing" : "8:00 AM-6:00 PM", "emergency_no" : "1768904563", "payment_type" : "insurance", "appointment" : "yes", "appointment_date" : "10-05-2020", "appointment_timing" : "10:00 AM", "Insurance Type" : "AOK", "reg_no" : "8", "d_ID" : "DR8", "d_specialization" : "heart specialist" }

{ "_id" : ObjectId("5eaa38068c1c4665b4e7cf28"), "c_name" : "clinic9", "address" : "Güntzelstrasse 3", "c_timing" : "8:00 AM-6:00 PM", "emergency_no" : "1765489033", "payment_type" : "cash", "appointment" : "no", "appointment_date" : "16-05-2020", "appointment_timing" : "N/A", "Insurance Type" : "TK", "reg_no" : "9", "d_ID" : "DR9", "d_specialization" : "ENT" }

6.1.3 Doctors

{ "_id" : ObjectId("5eaa393c8c1c4665b4e7cf2a"), "d_name" : "Kristian Rothschild", "d_ID" : "DR1", "p_ID" : "009", "age" : "45", "gender" : "male", "ph_no" : "039000 50 41", "d_specialization" : "cardiologists", "patient_status" : "critical", "pati_phno" : "2351014766" }

{ "_id" : ObjectId("5eaa39948c1c4665b4e7cf2b"), "d_name" : "Jörg Schäfer", "P_id" : "007", "age" : "52", "gender" : "male", "ph_no" : "0721 73 18 99", "d_specialization" : "family physician", "patient_status" : "normal", "pati_phno" : "08272 76 03 21", "p_ID" : "007", "d_ID" : "DR2" }

{ "_id" : ObjectId("5eaa39c88c1c4665b4e7cf2c"), "d_name" : "Katrin Gersten", "P_id" : "003", "age" : "40", "gender" : "female", "ph_no" : "05377 83 87 48", "d_specialization" : "plastic surgeons", "patient_status" : "normal", "pati_phno" : "036605 40 57", "p_ID" : "003", "d_ID" : "DR3" }

{ "_id" : ObjectId("5eaa3a018c1c4665b4e7cf2d"), "d_name" : "Marco Dreher", "P_id" : "002", "age" : "65", "gender" : "male", "ph_no" : "06706 86 30 71", "d_specialization" : "cardiologists", "patient_status" : "mid point", "pati_phno" : "09646 89 71 69", "p_ID" : "002", "d_ID" : "DR4" }

{ "_id" : ObjectId("5eaa3a328c1c4665b4e7cf2e"), "d_name" : "Torsten Kuefer", "P_id" : "006", "age" : "62", "gender" : "male", "ph_no" : "05909 13 87 33", "d_specialization" : "family physician", "patient_status" : "mid point", "pati_phno" : "03723 14 91 20", "p_ID" : "006", "d_ID" : "DR5" }

{ "_id" : ObjectId("5eaa3a778c1c4665b4e7cf2f"), "d_name" : "Dieter Fuchs", "p_ID" : "005", "age" : "41", "gender" : "male", "ph_no" : "02743 70 45 71", "d_specialization" : "physiotherapy", "patient_status" : "mid point", "pati_phno" : "04106 88 46 91", "d_ID" : "DR6" }

{ "_id" : ObjectId("5eaa3aa78c1c4665b4e7cf30"), "d_name" : "Tobias Daecher", "p_ID" : "008", "age" : "44", "gender" : "male", "ph_no" : "04651 77 65 02", "d_specialization" : "plastic surgeons", "patient_status" : "normal", "pati_phno" : "1254789654", "d_ID" : "DR7" }

{ "_id" : ObjectId("5eaa3ad98c1c4665b4e7cf31"), "d_name" : "Christin Beike", "p_ID" : "004", "age" : "47", "gender" : "female", "ph_no" : "03583 90 77 45", "d_specialization" : "heart specialist", "patient_status" : "critical", "pati_phno" : "07303 89 99 41", "d_ID" : "DR8" }

{ "_id" : ObjectId("5eaa3b048c1c4665b4e7cf32"), "d_name" : "Nadine Walter", "age" : "30", "gender" : "female", "ph_no" : "04882 54 91 60", "d_specialization" : "ENT", "patient_status" : "mid point", "d_ID" : "DR9" }

{ "_id" : ObjectId("5eaa3b3a8c1c4665b4e7cf33"), "d_name" : "Doreen Baier", "age" : "51", "gender" : "female", "ph_no" : "09542 36 57 86", "d_specialization" : "Dentist", "patient_status" : "critical", "d_ID" : "DR10" }

6.1.4 Chemist

{ "_id" : ObjectId("5eaa3bf88c1c4665b4e7cf34"), "c_name" : "apotheke1", "address" : "Romerstrasse 1,69115,Heidelberg", "ph_no" : "06754 18 29 59", "payment_type" : "insurance/cash", "online/offline" : "offline", "rating" : "6.2", "stocks" : "sufficient" }

{ "_id" : ObjectId("5eaa3c2a8c1c4665b4e7cf35"), "c_name" : "apotheke2", "address" : "Sofienstrasse 11,69115,Heidelberg", "ph_no" : "089 74 40 04", "payment_type" : "insurance/cash", "online/offline" : "offline", "rating" : "8.2", "stocks" : "low" }

{ "_id" : ObjectId("5eaa3c658c1c4665b4e7cf36"), "c_name" : "apotheke3", "address" : "Kepelstrasse 15,69120,Heidelberg", "ph_no" : "09209 12 20 59", "payment_type" : "cash", "online/offline" : "online/offline", "rating" : "7", "stocks" : "sufficient" }

{ "_id" : ObjectId("5eaa3c9e8c1c4665b4e7cf37"), "c_name" : "apotheke4", "address" : "Bahnhofstrasse 36,69115,Heidelberg", "ph_no" : "06554 70 80 71", "payment_type" : "cash", "online/offline" : "offline", "rating" : "6", "stocks" : "low" }

{ "_id" : ObjectId("5eaa3cee8c1c4665b4e7cf38"), "c_name" : "apotheke5", "address" : "Prager Str 49, 82294 Oberschweinbach", "ph_no" : "06861 58 13 47", "payment_type" : "insurance/cash", "online/offline" : "offline", "rating" : "8.5", "stocks" : "sufficient" }

{ "_id" : ObjectId("5eaa3d498c1c4665b4e7cf3a"), "c_name" : "apotheke6", "address" : "Luetzowplatz 81, 54533 Schwarzenborn", "ph_no" : "08331 78 11 14", "payment_type" : "cash", "online/offline" : "offline", "rating" : "8", "stocks" : "sufficient" }

{ "_id" : ObjectId("5eaa3d9b8c1c4665b4e7cf3b"), "c_name" : "apotheke7", "address" : "Kastanienallee 5, 26579 Baltrum", "ph_no" : "02302 25 79 05", "payment_type" : "cash", "online/offline" : "online/offline", "rating" : "6.4", "stocks" : "low" }

{ "_id" : ObjectId("5eaa3dd88c1c4665b4e7cf3c"), "c_name" : "apotheke8", "address" : "26579 Baltrum, 39621 Kalbe", "ph_no" : "02191 10 17 22", "payment_type" : "insurance/cash", "online/offline" : "offline", "rating" : "6", "stocks" : "low" }

{ "_id" : ObjectId("5eaa3e1a8c1c4665b4e7cf3d"), "c_name" : "apotheke9", "address" : "Eschenweg 35, 07306 Saalfeld", "ph_no" : "06381 96 75 38", "payment_type" : "cash", "online/offline" : "online/offline", "rating" : "8", "stocks" : "sufficient" }

{ "_id" : ObjectId("5eaa3e638c1c4665b4e7cf3e"), "c_name" : "apotheke10", "address" : "Chausseestr. 86, 17345 Woldegk", "ph_no" : "03963 27 95 65", "payment_type" : "cash", "online/offline" : "online/offline", "rating" : "7.4", "stocks" : "low" }

6.1.5 Exercise

{ "_id" : ObjectId("5eab42b5898d09cd96a973fc"), "e_name" : "push ups", "major_nutrients" : "VitaminB,VitaminC", "description" : "Best for chest exercise", "e_duration" : "30 min", "ex_type" : "1" }

{ "_id" : ObjectId("5eab42ce898d09cd96a973fd"), "e_name" : "running", "description" : "good for body", "e_duration" : "1 hour", "ex_type" : "2", "major_nutrients" : "VitaminB12" }

{ "_id" : ObjectId("5eab42f9898d09cd96a973fe"), "e_name" : "Pull-up", "description" : "exercise for the back", "e_duration" : "20 min", "ex_type" : "3", "major_nutrients" : "Omega-3s" }

{ "_id" : ObjectId("5eab4318898d09cd96a973ff"), "e_name" : "side bridge", "description" : "Best for waist", "e_duration" : "40 min", "ex_type" : "4", "major_nutrients" : "High Proteins" }

{ "_id" : ObjectId("5eab4363898d09cd96a97400"), "e_name" : "walking", "description" : "make body fit", "e_duration" : "2 hour", "ex_type" : "5", "major_nutrients" : "Iron,calcium" }

{ "_id" : ObjectId("5eab4383898d09cd96a97401"), "e_name" : "Swimming", "description" : "good for heart", "e_duration" : "30 min", "ex_type" : "6", "major_nutrients" : "VitaminB,VitaminC" }

{ "_id" : ObjectId("5eab43a0898d09cd96a97402"), "e_name" : "biking", "description" : "good for muscle strength ", "e_duration" : "30 min", "ex_type" : "7", "major_nutrients" : "VitaminB12" }

{ "_id" : ObjectId("5eab43be898d09cd96a97403"), "e_name" : "dancing", "description" : "body flexibility", "e_duration" : "1 hour", "ex_type" : "8", "major_nutrients" : "Omega-3s" }

{ "_id" : ObjectId("5eab4401898d09cd96a97404"), "e_name" : "yoga", "description" : "stay healthy", "e_duration" : "2 hours", "ex_type" : "9", "major_nutrients" : "Iron,calcium" }

7. Implementation of User Stories & Queries

7.1 MongoDB Queries

- ✓ Collecting the exercise name for the patient with the prescrided doctor name

```
db.Patient.aggregate([
{$lookup:{from:"Exercise",
        localField:"ex_type",
        foreignField:"ex_type",
```

```
        as:"temp"}},
    {$unwind: {path: "$temp"}},
    {$project:{ "_id":0, "p_name":1, "p_ID":1, e_name:"$temp.e_name"}},
    {$lookup:{from:"Doctors",
        localField:"p_ID",
        foreignField:"p_ID",
        as:"temp"}},
    {$unwind: {path: "$temp"}},
    {$project:{"p_name":1,"e_name":1,d_name:"$temp.d_name"}}
    ])
```

```
> db.Patient.aggregate([
... {$lookup:{from:"Exercise",
...             localField:"ex_type",
...             foreignField:"ex_type",
...             as:"temp"}},
... {$unwind: {path: "$temp"}},
... {$project:{ "_id":0, "p_name":1, "p_ID":1, e_name:"$temp.e_name"}},
... {$lookup:{from:"Doctors",
...             localField:"p_ID",
...             foreignField:"p_ID",
...             as:"temp"}},
... {$unwind: {path: "$temp"}},
... {$project:{"p_name":1,"e_name":1,d_name:"$temp.d_name"}}
... ])
{ "p_name" : "Ines Engel", "e_name" : "running", "d_name" : "Marco Dreher" }
{ "p_name" : "John Meier", "e_name" : "Pull-up", "d_name" : "Katrin Gersten" }
{ "p_name" : "Stefanie Wannemaker", "e_name" : "side bridge", "d_name" : "Christin Beike" }
{ "p_name" : "Marco Frey", "e_name" : "walking", "d_name" : "Dieter Fuchs" }
{ "p_name" : "Philipp Kuester", "e_name" : "Swimming", "d_name" : "Torsten Kuefer" }
{ "p_name" : "Lena Werner", "e_name" : "biking", "d_name" : "Jörg Schäfer" }
{ "p_name" : "Rakesh", "e_name" : "dancing", "d_name" : "Tobias Daecher" }
{ "p_name" : "Wannemaker", "e_name" : "yoga", "d_name" : "Kristian Rothschild" }
>
```

✓ Patient searches for the Clinic accepting AOK insurance and also with the Doctors who are cardiologists

```
db.Patient.aggregate([
{$lookup:{from:"Clinic",
        localField:"reg_no",
        foreignField:"reg_no",
        as:"temp1"}},
        {$unwind: {path: "$temp1"}},
                {$project:{ "_id":0, "p_name":1, "p_ID":1, c_name:"$temp1.c_name",
emergency_no:"$temp1.emergency_no", "Insurance Type":1, reg_no:"$temp1.reg_no"}},
{$lookup:{from:"Doctors",
        localField:"p_ID",
        foreignField:"p_ID",
        as:"temp1"}},
{$unwind: {path: "$temp1"}},
```

{$project:{"p_name":1,"p_ID":1,"c_name":1,"reg_no":1,"Insurance Type":1,d_specialization:"$temp1.d_specialization"}},
{$match: {d_specialization:"cardiologists"}}
])

```
> db.Patient.aggregate([
... {$lookup:{from:"Clinic",
...             localField:"reg_no",
...             foreignField:"reg_no",
...             as:"temp1"}},
...             {$unwind: {path: "$temp1"}},
... {$project:{ "_id":0, "p_name":1, "p_ID":1, c_name:"$temp1.c_name", emergency_no:"$temp1.emergency_no", "Insurance Type":1, reg_no:"$temp1.reg_no"}},
... {$lookup:{from:"Doctors",
...             localField:"p_ID",
...             foreignField:"p_ID",
...             as:"temp1"}},
... {$unwind: {path: "$temp1"}},
... {$project:{"p_name":1,"p_ID":1,"c_name":1,"reg_no":1,"Insurance Type":1,d_specialization:"$temp1.d_specialization"}},
... {$match: {d_specialization:"cardiologists"}}
... ])
{ "p_name" : "Ines Engel", "p_ID" : "002", "Insurance Type" : "TK", "c_name" : "clinic2", "reg_no" : "2", "d_specialization" : "cardiologists" }
{ "p_name" : "Wannemaker", "p_ID" : "009", "Insurance Type" : "AOK", "c_name" : "clinic9", "reg_no" : "9", "d_specialization" : "cardiologists" }
>
```

- ✓ Doctors retriving checkup data from Patient table

db.Doctors.aggregate([
{$match: {gender: "male"}},
{
$lookup:
{from:"Patient",
localField:"p_ID",
foreignField:"p_ID",
as:"gender_info"
}},

{$project:{"_id":0,"gender_info":1}} ,
{$unwind: {path: "$gender_info"}},
{$project:{BP:"$gender_info.BP",Pulse:"$gender_info.pulse",Health_Status:"$gender_info.health_status"}},
{$match: {Health_Status:"critical"}}
])

```
> db.Doctors.aggregate([
... {$match: {gender: "male"}},
... {
...         $lookup:
...             {from:"Patient",
...              localField:"p_ID",
...              foreignField:"p_ID",
...              as:"gender_info"
... }},
...
... {$project:{"_id":0,"gender_info":1}} ,
... {$unwind: {path: "$gender_info"}},
... {$project:{BP:"$gender_info.BP",Pulse:"$gender_info.pulse",Health_Status:"$gender_info.health_status"}},
... {$match: {Health_Status:"critical"}}
... ])
{ "BP" : "100/80", "Pulse" : "85", "Health_Status" : "critical" }
{ "BP" : "140/90", "Pulse" : "95", "Health_Status" : "critical" }
{ "BP" : "105/98", "Pulse" : "99", "Health_Status" : "critical" }
>
```

- ✓ Doctor searches for appointment date and timing, if the appointment is “yes”

```
db.Doctors.aggregate([
{
     $lookup:
        {from:"Clinic",
         localField:"d_ID",
         foreignField:"d_ID",
         as:"temp3"
                    }},
 {$project:{"_id":0,"temp3":1}},
{$unwind: {path: "$temp3"}},
{$project:{c_name:"$temp3.c_name",appointment_date:"$temp3.appointment_date",appointment_timing:"$temp3.appointment_timing",appointment:"$temp3.appointment"}},
{$match: {appointment:"yes"}}
])
```

```
> db.Doctors.aggregate([
... {
...         $lookup:
...             {from:"Clinic",
...              localField:"d_ID",
...              foreignField:"d_ID",
...              as:"temp3"
... }},
...  {$project:{"_id":0,"temp3":1}},
... {$unwind: {path: "$temp3"}},
... {$project:{c_name:"$temp3.c_name",appointment_date:"$temp3.appointment_date",appointment_timing:"$temp3.appointment_timing",appointment:"$temp3.appointment"}},
... {$match: {appointment:"yes"}}
... ])
{ "c_name" : "clinic1", "appointment_date" : "08-01-2020", "appointment_timing" : "11:00 AM", "appointment" : "yes" }
{ "c_name" : "clinic3", "appointment_date" : "05-02-2020", "appointment_timing" : "7:00 PM", "appointment" : "yes" }
{ "c_name" : "clinic4", "appointment_date" : "05-10-2020", "appointment_timing" : "8:00 PM", "appointment" : "yes" }
{ "c_name" : "clinic7", "appointment_date" : "06-05-2020", "appointment_timing" : "8:00 PM", "appointment" : "yes" }
{ "c_name" : "clinic8", "appointment_date" : "10-05-2020", "appointment_timing" : "10:00 AM", "appointment" : "yes" }
>
```

- ✓ Searching for the major nutrients to consume for the appropriate exercise

```
db.Exercise.aggregate([
```

```
{
    $lookup:
      {from:"Diet Plan",
       localField:"category",
       foreignField:"category",
       as:"FitnessInfo"}},
        {$project:{"_id":0,"e_name":1,"major_nutrients":1,ex_type:"$FitnessInfo.ex_type"}}
])
```

```
> db.Exercise.aggregate([
... {
...         $lookup:
...             {from:"Diet Plan",
...              localField:"category",
...              foreignField:"category",
...              as:"FitnessInfo"}},
... {$project:{"_id":0,"e_name":1,"major_nutrients":1,ex_type:"$FitnessInfo.ex_type"}}
... ])
{ "e_name" : "push ups", "major_nutrients" : "VitaminB,VitaminC", "ex_type" : [ ] }
{ "e_name" : "running", "major_nutrients" : "VitaminB12", "ex_type" : [ ] }
{ "e_name" : "Pull-up", "major_nutrients" : "Omega-3s", "ex_type" : [ ] }
{ "e_name" : "side bridge", "major_nutrients" : "High Proteins", "ex_type" : [ ] }
{ "e_name" : "walking", "major_nutrients" : "Iron,calcium", "ex_type" : [ ] }
{ "e_name" : "Swimming", "major_nutrients" : "VitaminB,VitaminC", "ex_type" : [ ] }
{ "e_name" : "biking", "major_nutrients" : "VitaminB12", "ex_type" : [ ] }
{ "e_name" : "dancing", "major_nutrients" : "Omega-3s", "ex_type" : [ ] }
{ "e_name" : "yoga", "major_nutrients" : "Iron,calcium", "ex_type" : [ ] }
>
```

- ✓ Joining doctors data with patients

```
db.Doctors.aggregate([
{
    $lookup:
      {from:"Patient",
       localField:"pati_phno",
       foreignField:"pati_phno",
       as:"Vinayak_phno"
}
}])
```

```
> db.Doctors.aggregate([
... {
...         $lookup:
...             {from:"Patient",
...              localField:"pati_phno",
...              foreignField:"pati_phno",
...              as:"Vinayak_phno"
... }
... }])
{ "_id" : ObjectId("5eaa393c8c1c4665b4e7cf2a"), "d_name" : "Kristian Rothschild", "d_ID" : "DR1", "p_ID" : "009", "age" : "45", "gender" : "male", "ph_no" : "039000 50 41",
 "d_specialization" : "cardiologists", "patient_status" : "critical", "pati_phno" : "2351014766", "Vinayak_phno" : [ { "_id" : ObjectId("5eab39aa898d09cd96a973ed"), "p_name
" : "Wannemaker", "p_ID" : "009", "gender" : "male", "age" : "41", "address" : "Mess Platz 54", "mail_id" : "Wannemaker@gmail.com", "pati_phno" : "2351014766", "weight" : "
72", "height" : "6.2", "BMI" : "22.5", "BMR" : "800", "BP" : "100/80", "pulse" : "85", "temprature" : "101 C", "steps" : "3450", "medical_condition" : "heartdisease", "medi
cal_details" : "heartattack", "health_status" : "critical", "ex_type" : "9", "Insurance Type" : "AOK", "reg_no" : "9" } ] }
{ "_id" : ObjectId("5eaa39948c1c4665b4e7cf2b"), "d_name" : "Jörg Schäfer", "P_id" : "007", "age" : "52", "gender" : "male", "ph_no" : "0721 73 18 99", "d_specialization" :
"family physician", "patient_status" : "normal", "pati_phno" : "08272 76 03 21", "p_ID" : "007", "d_ID" : "DR2", "Vinayak_phno" : [ { "_id" : ObjectId("5eaa2d9d8c1c4665b4e7
cf1e"), "p_name" : "Lena Werner", "p_ID" : "007", "gender" : "female", "age" : "67", "address" : "Alt Reinickendorf 63", "mail_id" : "LenaWerner@gmail.com", "pati_phno" : "
08272 76 03 21", "weight" : "64", "height" : "5.1", "BMI" : "25", "BMR" : "700", "BP" : "120/80", "pulse" : "", "temprature" : "", "steps" : "", "medical_condition" : "", "
medical_details" : "", "health_status" : "midpoint", "ex_type" : "7", "Insurance Type" : "AOK", "reg_no" : "7" } ] }
{ "_id" : ObjectId("5eaa39c88c1c4665b4e7cf2c"), "d_name" : "Katrin Gersten", "P_id" : "003", "age" : "40", "gender" : "female", "ph_no" : "05377 83 87 48", "d_specializatio
n" : "plastic surgeons", "patient_status" : "normal", "pati_phno" : "036605 40 57", "p_ID" : "003", "d_ID" : "DR3", "Vinayak_phno" : [ { "_id" : ObjectId("5eaa2b9d8c1c4665b
4e7cf1a"), "p_name" : "John Meier", "p_ID" : "003", "gender" : "male", "age" : "32", "address" : "Los-Angeles-Platz 5", "mail_id" : "johnMeier@gmail.com", "pati_phno" : "03
6605 40 57", "weight" : "70", "height" : "6", "BMI" : "20", "BMR" : "550", "BP" : "130/85", "pulse" : "75", "temprature" : "98 C", "steps" : "2546", "medical_condition" : "
fever", "medical_details" : "stomach pain and body pain", "health_status" : "midpoint", "ex_type" : "3", "Insurance Type" : "Private", "reg_no" : "3" } ] }
{ "_id" : ObjectId("5eaa3a018c1c4665b4e7cf2d"), "d_name" : "Marco Dreher", "P_id" : "002", "age" : "65", "gender" : "male", "ph_no" : "06706 86 30 71", "d_specialization" :
 "cardiologists", "patient_status" : "mid point", "pati_phno" : "09646 89 71 69", "p_ID" : "002", "d_ID" : "DR4", "Vinayak_phno" : [ { "_id" : ObjectId("5eaa2abd8c1c4665b4e
7cf19"), "p_name" : "Ines Engel", "p_ID" : "002", "gender" : "female", "age" : "28", "address" : "Knesebeckstraße 78", "mail_id" : "InesEngel@gmail.us", "pati_phno" : "0964
6 89 71 69", "weight" : "60", "height" : "5", "BMI" : "18", "BMR" : "750", "BP" : "140/90", "pulse" : "95", "temprature" : "110 C", "steps" : "840", "medical_condition" : "
high fever", "medical_details" : "high bp and headache", "health_status" : "critical", "ex_type" : "2", "Insurance Type" : "TK", "reg_no" : "2" } ] }
{ "_id" : ObjectId("5eaa3a328c1c4665b4e7cf2e"), "d_name" : "Torsten Kuefer", "P_id" : "006", "age" : "62", "gender" : "male", "ph_no" : "05909 13 87 33", "d_specialization"
: "family physician", "patient_status" : "mid point", "pati_phno" : "03723 14 91 20", "p_ID" : "006", "d_ID" : "DR5", "Vinayak_phno" : [ { "_id" : ObjectId("5eaa2d2b8c1c46
65b4e7cf1d"), "p_name" : "Philipp Kuester", "p_ID" : "006", "gender" : "male", "age" : "23", "address" : "Kantstraße 85", "mail_id" : "PhilippKuester@gmail.com", "pati_phno
" : "03723 14 91 20", "weight" : "75", "height" : "5.6", "BMI" : "", "BMR" : "", "BP" : "", "pulse" : "", "temprature" : "", "steps" : "", "medical_condition" : "", "medica
l_details" : "", "health_status" : "normal", "ex_type" : "6", "Insurance Type" : "AOK", "reg_no" : "6" } ] }
{ "_id" : ObjectId("5eaa3a778c1c4665b4e7cf2f"), "d_name" : "Dieter Fuchs", "p_ID" : "005", "age" : "41", "gender" : "male", "ph_no" : "02743 70 45 71", "d_specialization" :
 "physiotherapy", "patient_status" : "mid point", "pati_phno" : "04106 88 46 91", "d_ID" : "DR6", "Vinayak_phno" : [ { "_id" : ObjectId("5eaa2ca28c1c4665b4e7cf1c"), "p_name
" : "Marco Frey", "p_ID" : "005", "gender" : "male", "age" : "23", "address" : "Knesebeckstrasse 23", "mail_id" : "MarcoFrey@gmail.com", "pati_phno" : "04106 88 46 91", "we
ight" : "81", "height" : "5.9", "BMI" : "25", "BMR" : "651", "BP" : "105/98", "pulse" : "99", "temprature" : "101 C", "steps" : "3450", "medical_condition" : "lung disease"
, "medical_details" : "breathing and pain problem", "health_status" : "critical", "ex_type" : "5", "Insurance Type" : "TK", "reg_no" : "5" } ] }
{ "_id" : ObjectId("5eaa3aa78c1c4665b4e7cf30"), "d_name" : "Tobias Daecher", "p_ID" : "008", "age" : "44", "gender" : "male", "ph_no" : "04651 77 65 02", "d_specialization"
: "plastic surgeons", "patient_status" : "normal", "pati_phno" : "1254789654", "d_ID" : "DR7", "Vinayak_phno" : [ { "_id" : ObjectId("5eab38c9898d09cd96a973ec"), "p_name"
: "Rakesh", "p_ID" : "008", "gender" : "male", "age" : "35", "address" : "Albert Fritz 55", "mail_id" : "Rakesh@gmail.com", "pati_phno" : "1254789654", "weight" : "69", "he
ight" : "4.8", "BMI" : "18.4", "BMR" : "400", "BP" : "105/98", "pulse" : "99", "temprature" : "95 C", "steps" : "2500", "medical_condition" : "lung disease", "medical_detai
ls" : "lung cancer", "health_status" : "mid point ", "ex_type" : "8", "Insurance Type" : "Private", "reg_no" : "8" } ] }
{ "_id" : ObjectId("5eaa3ad98c1c4665b4e7cf31"), "d_name" : "Christin Beike", "p_ID" : "004", "age" : "47", "gender" : "female", "ph_no" : "03583 90 77 45", "d_specializatio
n" : "heart specialist", "patient_status" : "critical", "pati_phno" : "07303 89 99 41", "d_ID" : "DR8", "Vinayak_phno" : [ { "_id" : ObjectId("5eaa2c1a8c1c4665b4e7cf1b"), "
p_name" : "Stefanie Wannemaker", "p_ID" : "004", "gender" : "female", "age" : "25", "address" : "Pasewalker Straße 87", "mail_id" : "StefanieWannemaker@gmail.com", "pati_ph
no" : "07303 89 99 41", "weight" : "55", "height" : "5", "BMI" : "21", "BMR" : "520", "BP" : "90/80", "pulse" : "70", "temprature" : "80 C", "steps" : "5200", "medical_cond
ition" : "tiredness", "medical_details" : "food infection", "health_status" : "midpoint", "ex_type" : "4", "Insurance Type" : "TK", "reg_no" : "4" } ] }
{ "_id" : ObjectId("5eaa3b048c1c4665b4e7cf32"), "d_name" : "Nadine Walter", "age" : "30", "gender" : "female", "ph_no" : "04882 54 91 60", "d_specialization" : "ENT", "pati
ent_status" : "mid point", "d_ID" : "DR9", "Vinayak_phno" : [ ] }
{ "_id" : ObjectId("5eaa3b3a8c1c4665b4e7cf33"), "d_name" : "Doreen Baier", "age" : "51", "gender" : "female", "ph_no" : "09542 36 57 86", "d_specialization" : "Dentist", "p
atient_status" : "critical", "d_ID" : "DR10", "Vinayak_phno" : [ ] }
>
```

- ✓ Finding Chemist according to the rating

  db.Chemist.find({rating:{$lt:"7"}})

```
> db.Chemist.find({rating:{$lt:"7"}})
{ "_id" : ObjectId("5eaa3bf88c1c4665b4e7cf34"), "c_name" : "apotheke1", "address" : "Romerstrasse 1,69115,Heidelberg", "ph_no" : "06754 18 29 59", "payment_type" : "insuran
ce/cash", "online/offline" : "offline", "rating" : "6.2", "stocks" : "sufficient" }
{ "_id" : ObjectId("5eaa3c9e8c1c4665b4e7cf37"), "c_name" : "apotheke4", "address" : "Bahnhofstrasse 36,69115,Heidelberg", "ph_no" : "06554 70 80 71", "payment_type" : "cash
", "online/offline" : "offline", "rating" : "6", "stocks" : "low" }
{ "_id" : ObjectId("5eaa3d9b8c1c4665b4e7cf3b"), "c_name" : "apotheke7", "address" : "Kastanienallee 5, 26579 Baltrum", "ph_no" : "02302 25 79 05", "payment_type" : "cash",
"online/offline" : "online/offline", "rating" : "6.4", "stocks" : "low" }
{ "_id" : ObjectId("5eaa3dd88c1c4665b4e7cf3c"), "c_name" : "apotheke8", "address" : "26579 Baltrum, 39621 Kalbe", "ph_no" : "02191 10 17 22", "payment_type" : "insurance/ca
sh", "online/offline" : "offline", "rating" : "6", "stocks" : "low" }
>
```

- ✓ Finding Patient with the name

  db.Patient.find({p_name:{$eq:"Max Loewe"}})

```
> db.Patient.find({p_name:{$eq:"Max Loewe"}})
{ "_id" : ObjectId("5eaa290b8c1c4665b4e7cf17"), "p_name" : "Max Loewe", "p_ID" : "001", "reg_no" : "1", "gender" : "male", "Insurance Type" : "AOK", "age" : "42", "address"
 : "Ansbacher Strasse 49", "mail_id" : "MaxLoewe@gmail.com", "pati_phno" : "0421 17 00 04", "weight" : "75", "height" : "5.2", "BMI" : "21.5", "BMR" : "620", "BP" : "100/80
", "pulse" : "80", "temprature" : "90 C", "steps" : "4000", "medical_condition" : "N/A", "medical_details" : "no problem", "health_status" : "normal", "ex_type" : "1" }
>
```

Below is some examples where any user (patient, doctor or chemist) can be able to find the data from any collection. Here we are showing in “limit”, so that it would be easy for the user to fetch the data

- ✓ db.Patient.find().limit(3)

```
> db.Patient.find().limit(3)
{ "_id" : ObjectId("5eaa290b8c1c4665b4e7cf17"), "p_name" : "Max Loewe", "p_ID" : "001", "reg_no" : "1", "gender" : "male", "Insurance Type" : "AOK", "age" : "42", "address"
 : "Ansbacher Strasse 49", "mail_id" : "MaxLoewe@gmail.com", "pati_phno" : "0421 17 00 04", "weight" : "75", "height" : "5.2", "BMI" : "21.5", "BMR" : "620", "BP" : "100/80
", "pulse" : "80", "temprature" : "90 C", "steps" : "4000", "medical_condition" : "N/A", "medical_details" : "no problem", "health_status" : "normal", "ex_type" : "1" }
{ "_id" : ObjectId("5eaa2abd8c1c4665b4e7cf19"), "p_name" : "Ines Engel", "p_ID" : "002", "gender" : "female", "age" : "28", "address" : "Knesebeckstraße 78", "mail_id" : "I
nesEngel@gmail.us", "pati_phno" : "09646 89 71 69", "weight" : "60", "height" : "5", "BMI" : "18", "BMR" : "750", "BP" : "140/90", "pulse" : "95", "temprature" : "110 C", "
steps" : "840", "medical_condition" : "high fever", "medical_details" : "high bp and headache", "health_status" : "critical", "ex_type" : "2", "Insurance Type" : "TK", "reg
_no" : "2" }
{ "_id" : ObjectId("5eaa2b9d8c1c4665b4e7cf1a"), "p_name" : "John Meier", "p_ID" : "003", "gender" : "male", "age" : "32", "address" : "Los-Angeles-Platz 5", "mail_id" : "jo
hnMeier@gmail.com", "pati_phno" : "036605 40 57", "weight" : "70", "height" : "6", "BMI" : "20", "BMR" : "550", "BP" : "130/85", "pulse" : "75", "temprature" : "98 C", "ste
ps" : "2546", "medical_condition" : "fever", "medical_details" : "stomach pain and body pain", "health_status" : "midpoint", "ex_type" : "3", "Insurance Type" : "Private",
"reg_no" : "3" }
>
```

- ✓ db.Clinic.find({appointment:"yes"}).limit(3)

```
> db.Clinic.find({appointment:"yes"}).limit(3)
{ "_id" : ObjectId("5eaa2e468c1c4665b4e7cf1f"), "c_name" : "clinic1", "reg_no" : "1", "d_ID" : "DR1", "d_specialization" : "cardiologists", "address" : "Ansbacher Strasse 5
7", "c_timing" : "9:00 AM-9:00 PM", "emergency_no" : "8024568", "payment_type" : "insurance", "appointment" : "yes", "appointment_date" : "08-01-2020", "appointment_timing"
 : "11:00 AM", "Insurance Type" : "AOK" }
{ "_id" : ObjectId("5eaa2efb8c1c4665b4e7cf21"), "c_name" : "clinic3", "address" : "Brandenburgische Strasse 19", "c_timing" : "8:00 AM-8:00 PM", "emergency_no" : "8034978",
 "payment_type" : "insurance", "appointment" : "yes", "appointment_date" : "05-02-2020", "appointment_timing" : "7:00 PM", "Insurance Type" : "AOK", "reg_no" : "3", "d_ID"
: "DR3", "d_specialization" : "plastic surgeons" }
{ "_id" : ObjectId("5eaa2f338c1c4665b4e7cf22"), "c_name" : "clinic4", "address" : "Feldstrasse 78", "c_timing" : "6:00 AM-6:00 AM", "emergency_no" : "13546824", "payment_ty
pe" : "insurance", "appointment" : "yes", "appointment_date" : "05-10-2020", "appointment_timing" : "8:00 PM", "Insurance Type" : "TK", "reg_no" : "4", "d_ID" : "DR4", "d_s
pecialization" : "cardiologists" }
>
```

- ✓ db.Doctors.find({d_specialization:"cardiologists"}).limit(5)

```
> db.Doctors.find({d_specialization:"cardiologists"}).limit(5)
{ "_id" : ObjectId("5eaa393c8c1c4665b4e7cf2a"), "d_name" : "Kristian Rothschild", "d_ID" : "DR1", "p_ID" : "009", "age" : "45", "gender" : "male", "ph_no" : "039000 50 41",
"d_specialization" : "cardiologists", "patient_status" : "critical", "pati_phno" : "2351014766" }
{ "_id" : ObjectId("5eaa3a018c1c4665b4e7cf2d"), "d_name" : "Marco Dreher", "P_id" : "002", "age" : "65", "gender" : "male", "ph_no" : "06706 86 30 71", "d_specialization" :
"cardiologists", "patient_status" : "mid point", "pati_phno" : "09646 89 71 69", "p_ID" : "002", "d_ID" : "DR4" }
>
```

- ✓ db.Chemist.find({stocks:"low"}).limit(10)

```
> db.Chemist.find({stocks:"low"}).limit(10)
{ "_id" : ObjectId("5eaa3c2a8c1c4665b4e7cf35"), "c_name" : "apotheke2", "address" : "Sofienstrasse 11,69115,Heidelberg", "ph_no" : "089 74 40 04", "payment_type" : "insuran
ce/cash", "online/offline" : "offline", "rating" : "8.2", "stocks" : "low" }
{ "_id" : ObjectId("5eaa3c9e8c1c4665b4e7cf37"), "c_name" : "apotheke4", "address" : "Bahnhofstrasse 36,69115,Heidelberg", "ph_no" : "06554 70 80 71", "payment_type" : "cash
", "online/offline" : "offline", "rating" : "6", "stocks" : "low" }
{ "_id" : ObjectId("5eaa3d9b8c1c4665b4e7cf3b"), "c_name" : "apotheke7", "address" : "Kastanienallee 5, 26579 Baltrum", "ph_no" : "02302 25 79 05", "payment_type" : "cash",
"online/offline" : "online/offline", "rating" : "6.4", "stocks" : "low" }
{ "_id" : ObjectId("5eaa3dd88c1c4665b4e7cf3c"), "c_name" : "apotheke8", "address" : "26579 Baltrum, 39621 Kalbe", "ph_no" : "02191 10 17 22", "payment_type" : "insurance/ca
sh", "online/offline" : "offline", "rating" : "6", "stocks" : "low" }
{ "_id" : ObjectId("5eaa3e638c1c4665b4e7cf3e"), "c_name" : "apotheke10", "address" : "Chausseestr. 86, 17345 Woldegk", "ph_no" : "03963 27 95 65", "payment_type" : "cash",
"online/offline" : "online/offline", "rating" : "7.4", "stocks" : "low" }
>
```

Below is the codes using “skip” function

- ✓ db.Patient.find({gender:"male"}).skip(3)

```
> db.Patient.find({gender:"male"}).skip(3)
{ "_id" : ObjectId("5eaa2d2b8c1c4665b4e7cf1d"), "p_name" : "Philipp Kuester", "p_ID" : "006", "gender" : "male", "age" : "23", "address" : "Kantstraße 85", "mail_id" : "Phi
lippKuester@gmail.com", "pati_phno" : "03723 14 91 20", "weight" : "75", "height" : "5.6", "BMI" : "", "BMR" : "", "BP" : "", "pulse" : "", "temprature" : "", "steps" : "",
"medical_condition" : "", "medical_details" : "", "health_status" : "normal", "ex_type" : "6", "Insurance Type" : "AOK", "reg_no" : "6" }
{ "_id" : ObjectId("5eab38c9898d09cd96a973ec"), "p_name" : "Rakesh", "p_ID" : "008", "gender" : "male", "age" : "35", "address" : "Albert Fritz 55", "mail_id" : "Rakesh@gma
il.com", "pati_phno" : "1254789654", "weight" : "69", "height" : "4.8", "BMI" : "18.4", "BMR" : "400", "BP" : "105/98", "pulse" : "99", "temprature" : "95 C", "steps" : "25
00", "medical_condition" : "lung disease", "medical_details" : "lung cancer", "health_status" : "mid point ", "ex_type" : "8", "Insurance Type" : "Private", "reg_no" : "8"
}
{ "_id" : ObjectId("5eab39aa898d09cd96a973ed"), "p_name" : "Wannemaker", "p_ID" : "009", "gender" : "male", "age" : "41", "address" : "Mess Platz 54", "mail_id" : "Wannemak
er@gmail.com", "pati_phno" : "2351014766", "weight" : "72", "height" : "6.2", "BMI" : "22.5", "BMR" : "800", "BP" : "100/80", "pulse" : "85", "temprature" : "101 C", "steps
" : "3450", "medical_condition" : "heartdisease", "medical_details" : "heartattack", "health_status" : "critical", "ex_type" : "9", "Insurance Type" : "AOK", "reg_no" : "9"
}
>
```

- ✓ db.Clinic.find({appointment:"yes"}).skip(3)

```
> db.Clinic.find({appointment:"yes"}).skip(3)
{ "_id" : ObjectId("5eaa2ffd8c1c4665b4e7cf25"), "c_name" : "clinic7", "address" : "Leipziger Strasse 12", "c_timing" : "6:00 AM-6:00 AM", "emergency_no" : "9765432098", "pa
yment_type" : "insurance", "appointment" : "yes", "appointment_timing" : "8:00 PM", "appointment_date" : "06-05-2020", "Insurance Type" : "TK", "reg_no" : "7", "d_ID" : "DR
7", "d_specialization" : "plastic surgeons" }
{ "_id" : ObjectId("5eaa37b88c1c4665b4e7cf27"), "c_name" : "clinic8", "address" : "Paul-Nevermann-Platz 92", "c_timing" : "8:00 AM-6:00 PM", "emergency_no" : "1768904563",
"payment_type" : "insurance", "appointment" : "yes", "appointment_date" : "10-05-2020", "appointment_timing" : "10:00 AM", "Insurance Type" : "AOK", "reg_no" : "8", "d_ID"
: "DR8", "d_specialization" : "heart specialist" }
>
```

8. Citations

- R. Angles. A comparison of current graph database models. In *Proceedings of the 28th IEEE International Conference on Data Engineering Workshops (ICDEW)*, pages 171--177, April 2012.
- A. M. Alashqur, S. Y. W. Su, and H. Lam. Oql: a query language for manipulating object-oriented databases. In *Proceedings of the 15th international conference on Very large data bases*, VLDB '89, pages 433--442, San Francisco, CA, USA, 1989. Morgan Kaufmann Publishers Inc.
- R. Angles and C. Gutierrez. Survey of graph database models. ACM Comput. Surv., 40(1):1--39, 2008.
- K Chodorow - 2013 - books.google.com
- 2015 13th International Conference on Engineering of Modern Electric Systems (EMES)
- Brewer, E., "CAP twelve years later: How the "rules" have changed," Computer, vol.45, no.2, pp.23,29, Feb. 2012. doi: 10.1109/MC.2012.37.
- Codd. E. F. 1970. A relational model of data for large shared data banks. Communications of ACM 13, 6 (June 1970), 377--387. doi=10.1145/362384.362685.
- Mahgoub A, Wood P, Medoff A, Mitra S, Meyer F, Chaterji S and Bagchi S SOPHIA Proceedings of the 2019 USENIX Conference on Usenix Annual Technical Conference, (223-239)