

PROJECT PHASE 1

Team 18

Mini-World Description - Medi-Fit

Personalized Care, Perfectly Fit for You.

The mini-world revolves around a **personalized** healthcare management system focused on providing **tailored treatments** based on a user's comprehensive medical profile. It encompasses a central database where detailed information such as patient IDs, medical history, genetic background, previous surgeries, and a detailed table of diseases, treatments, and medications is stored.

This system aims to make healthcare more efficient and personalized, addressing the unique needs of each patient by leveraging their medical and genetic data.

Purpose of the Database

The primary purpose of the database is to enable healthcare professionals to identify and recommend the most appropriate and customized treatment plans for patients. By analysing a patient's medical history, **genetic predispositions, and past treatments, healthcare providers can design personalized care strategies.**

This reduces the risk of adverse reactions, improves treatment effectiveness, and ensures that the care provided aligns with the individual's unique health needs. The database also serves as a tool for medical research, allowing the study of trends and the development of better treatment protocols.

Users of the Database

Main Users of the Database:

1. **Healthcare Providers** (Doctors, specialists, medical staff)
 - o Access patient information
 - o **Design personalized treatment plans**
2. **Patients**
 - o **View their medical records**
 - o **Ensure consistent care across different medical facilities**
 - o Stay informed about their health
3. **Medical Researchers**
 - o **Study correlations** between genetic information, diseases, and treatments
 - o Advance personalized medicine

What Users Will Do with the Database:

1. Healthcare Providers:

- o Analyse patient records **to identify patterns**
- o Recommend **personalized treatment plans**
- o **Make accurate diagnoses** based on detailed health history

2. Patients:

- o Track and update their medical information
- o Understand treatment plans
- o **Maintain consistent health data** across different providers

3. Researchers:

- o Conduct studies on treatment effectiveness
- o Analyse **genetic trends**
- o Develop new, personalized healthcare solutions

Database requirements

STRONG ENTITY	ATTRIBUTES
1. USER	<ul style="list-style-type: none">• UserID (primarykey)• Name (composite) - (Firstname, Lastname)• Gender (can be null)• Date of Birth (composite) - (Date, Month, Year)• Age(derived)• Weight (must be in kg)• Blood Group (cannot be null, in standard measurement)• Height (must be in cm)• BMI (derived)• Geographical Location
2. TEST REPORTS	<ul style="list-style-type: none">• (UserID, TreatmentID, TestID) primary key• Time of test (Date)(composite)• Test type (eg : MRI, CT etc.)• Test report (Description)• Org. / Lab (test given by)• Doctor / practitioner on consultation (cannot be null)
3. DISEASE/ISSUE	<ul style="list-style-type: none">• DiseaseID(primary key)• Pathogens associated(multi-valued)• Triggering environment (Notes)• Severity (scale of 1 - 10) (from

	<ul style="list-style-type: none"> name) Symptoms (Multivalued) Communicability (Cannot be null) 												
4. PRESCRIBED TREATMENTS	<ul style="list-style-type: none"> (DiseaseID) primarykey Source of prescription (cannot be null) TYPE OF TREATMENT - SUBCLASSES (disjoint subclasses) Description of treatment <table border="1"> <thead> <tr> <th>Type</th><th>Attributes</th></tr> </thead> <tbody> <tr> <td>Homeopathy</td><td> <ul style="list-style-type: none"> Time required for cure Expense </td></tr> <tr> <td>Allopathy</td><td> <ul style="list-style-type: none"> Time required for cure Expense </td></tr> <tr> <td>Ayurveda</td><td> <ul style="list-style-type: none"> Practitioner Time Expense </td></tr> <tr> <td>Chiropratic</td><td> <ul style="list-style-type: none"> Time Expense </td></tr> <tr> <td>TCM</td><td> <ul style="list-style-type: none"> Practitioner Time expense </td></tr> </tbody> </table>	Type	Attributes	Homeopathy	<ul style="list-style-type: none"> Time required for cure Expense 	Allopathy	<ul style="list-style-type: none"> Time required for cure Expense 	Ayurveda	<ul style="list-style-type: none"> Practitioner Time Expense 	Chiropratic	<ul style="list-style-type: none"> Time Expense 	TCM	<ul style="list-style-type: none"> Practitioner Time expense
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5. MEDICATION	<ul style="list-style-type: none"> (DiseaseID) primary key Type of treatment Subclass based on type of treatment(disjoint) <p>ATTRIBUTES OF EACH SUBCLASS</p> <ul style="list-style-type: none"> ❖ Medication ID(candidate key 1)-primary ❖ Medication name(candidate key2) ❖ Side effects (multi-valued) ❖ Food restriction conditions ❖ Drug - Drug interaction checker list(multi-valued)(e.g. - drugs to avoid when this medication is taken) 												

WEAK ENTITY	ATTRIBUTES
1. MEDICAL HISTORY	<ul style="list-style-type: none"> UserID (from USER) foreign key Allergies (multi-valued) Any genetic/ hereditary characteristics (multi-valued)
2. UNDERGOING TREATMENTS	<ul style="list-style-type: none"> (UserID) foreign key (TreatmentID) partial key DiseaseID Associated hospital/ org. Doctor under consultation

	<ul style="list-style-type: none"> • Status(ongoing / completed) • Description • Age of the patient (when treatment has started)
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ASSUMPTIONS:

- 1) Every disease is assigned to a unique identifier called DiseaseID. And every user of the database (if stores his/her medical history) will be assigned a unique identifier called UserID.
- 2) A disease can be treated by different type of treatments , presently we consider it to be Homeopathy / Allopathy/Ayurveda/ Chiropractic/TCM. Each type will be assigned a TreatmentID (1, 2, 3... respectively)
- 3) A treatment can be treated by several medicines and these are uniquely identified by a MedicationID (unique to every medicine)
- 4) Severity of a disease is associated with the disease and is supposed to be consistent with the world . We assume that there exists a scale (1- 10) for each disease unique to it(It might get updated as treatments arise for it. E.g. COVID -19)

5) For Emergency contacts, every ward (USER) must have a min 1 guardian or family and max 3

Similarly one User can act as a guardian or POC only for max three wards

- 6) Every test report will be assigned a test ID(incremental in nature), based on the user and treatment ID. The treatment ID will be evident from the test ID.
- 7) Every MedicationID / Medication name uniquely identifies the medication(e.g. MedicationID – 13406, XYZ’s Saridon 5mg)

Relationship types of degree 2:

Relation Entity 1	Relation Entity 2	Relationship	Participation constraint
USER	MEDICAL HISTORY	HAS(Identifying)	(0, 1) for user (1,1) for Medical History CR – 1:1
USER	UNDERGOING TREATMENTS	UNDERGOES(identifyi ng)	(0, N) for USER (1,1) for Undergoin g Treatment s CR – 1:1
USER	DISEASE	HAS	(0, N) for User (0, N) for

			Disease CR – M:N
USER (Ward)	USER (family member/ Guardian)	(Self referencing) -related	(1, 3) for Ward (0, 3) for Guardian CR – 3:3
USER	TEST REPORTS	related	(0, N) for User (1,1) for Test Reports CR – 1:N

Relationship types of degree 3:

Relation Entity 1	Relation Entity 2	Relation Entity 3	Relation Entity 4	Relationship	Participation constraint
USER	DISEASE	PRESCRIBED TREATMENTS	MEDICATION	With, Requires, requires	A:B:C:D (0,N) – USER (1,N) – DISEASE (1,N) – P. TREATMENTS (0,N) – MEDICATION

Points to note:

1) The relation maps an user to a disease and suggests treatments and medication based on it. This is how the constraints work

- 1 USER – 1 DISEASE – 1 PRESCRIBED t – Can have as many medications and may be none (Allopathy can suggest multiple medications but Chiropractors don't)

- 1 USER – 1 DISEASE - 1 MEDICATION – Only one medication can be used for multiple treatments(at max the number of treatment types), but it has to be for atleast 1 treatment (Based on defn. Of Medication Entity)

- 1 USER – 1 PRESCRIBED t – 1 MEDICATION – A user may use a particular treatment and medicine for min 1 but any number of diseases (eg – cold, cough, etc all may use paracetamol)

- 1 DISEASE – 1 PRESCRIBED t – 1 MEDICATION – Can be associated to any/no users.

FUNCTIONAL REQUIREMENTS:

1. Retrieval:

(a) Selection Queries:

These queries are used to retrieve complete tuples from the database based on some condition.

Retrieve all users who have the blood group 'O+'.

Retrieve all users who are currently undergoing treatment

Retrieve details of all users who have undergone an MRI test in the last year.

(b) Projection Queries:

These queries allow users to search for specific attributes in the database.

Retrieve the names and geographic locations of all users with blood group 'A-'.

Retrieve the disease names and symptoms for diseases treated using Allopathy.

c) Aggregate Function Queries:

These queries calculate values like the sum, maximum, or average.

Find the average BMI of all users.

Find the average expense of cancer treatments in the database

Find the maximum severity of diseases in the system

Find the total number of ongoing treatments in the system.

d) Search Queries:

These queries perform partial text match searches.

Search for all users with the first name starting with 'Jo'.

Search for all test reports related to 'CT'.

Search for diseases whose symptoms contain the word 'cough'.

(e) Analysis Queries:

These reports are generated by combining and analyzing multiple entities.

Example 1:

Find the number of users who are currently undergoing treatments for diseases with a severity score greater than 7.

Find the number of patients undergoing Allopathy treatments in the last year.

2. Modification:

(a) Insert Data:

Insert a new user into the USER table. With a new UserID and without violating entity constraints – Must have Blood Group.

Insert a new disease in the DISEASE table .With a new DiseaseID and the info if it is communicable or not (Attribute – Communicability) must be mentioned.

(b) Update Data:

Update the weight of a user. Update the status of a treatment from 'ongoing' to 'completed'.

(c) Delete Data:

Delete all records of a **discontinue/banned medication** from the medication table and inform all users using that medication (trigger).