APPLICATION SOFTWARE DEVELOPMENT LAB

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ROLL NO: 43

TCR18CS043

CSE, S5

CRITICAL DISEASE MANAGEMENT SYSYTEM (CDMS)

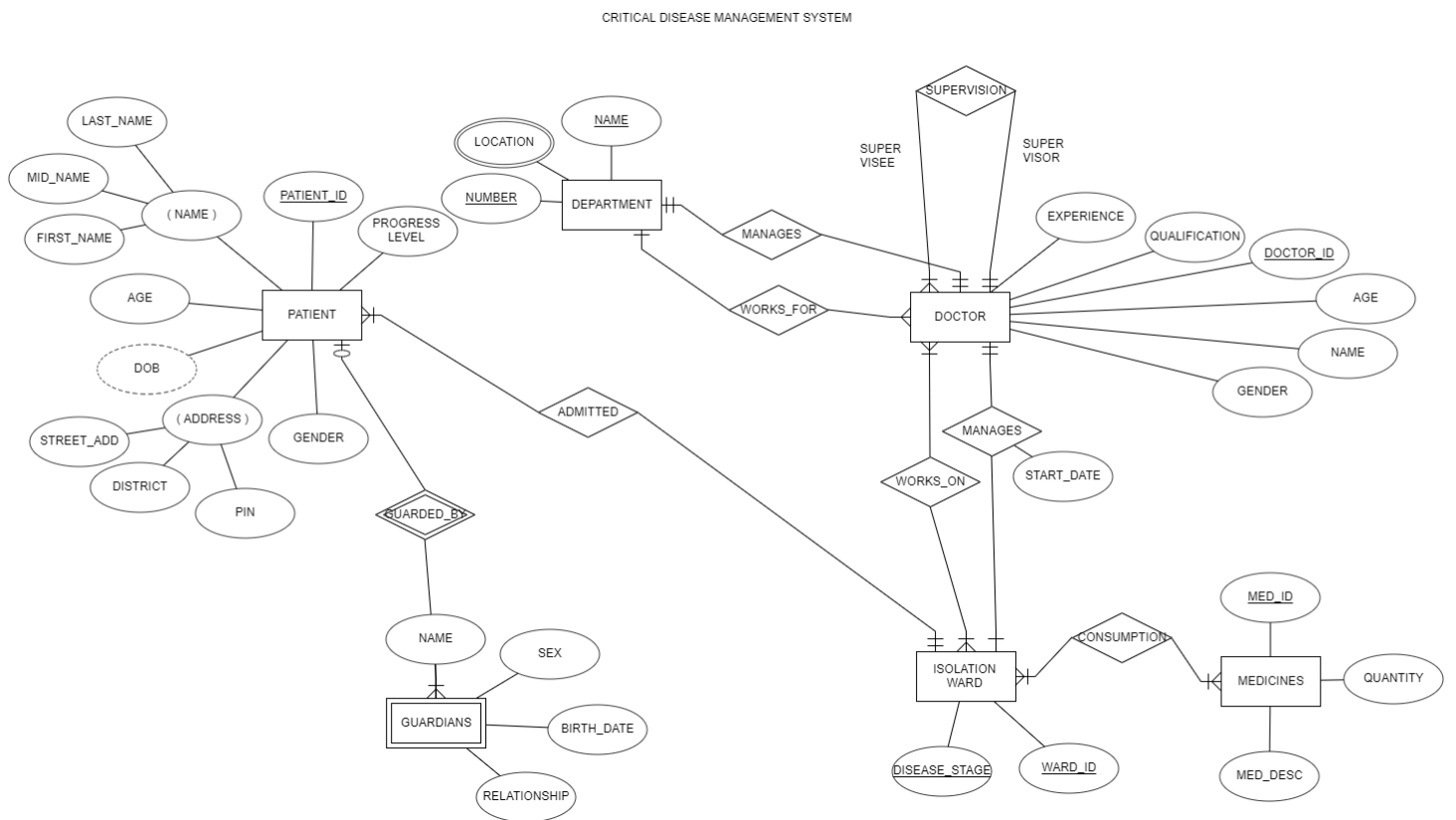## *INTRODUCTION AND REQUIREMENT ANALYSIS*

with lots of deadly and contagious diseases like Nipah and novel corona on the rise an efficient disease management system has become the need of the hour. CDMS aims to tackle down this problem by introducing a meticulous disease control system with emphasis laid on isolating patients and assuring efficient utilization of hospital services.

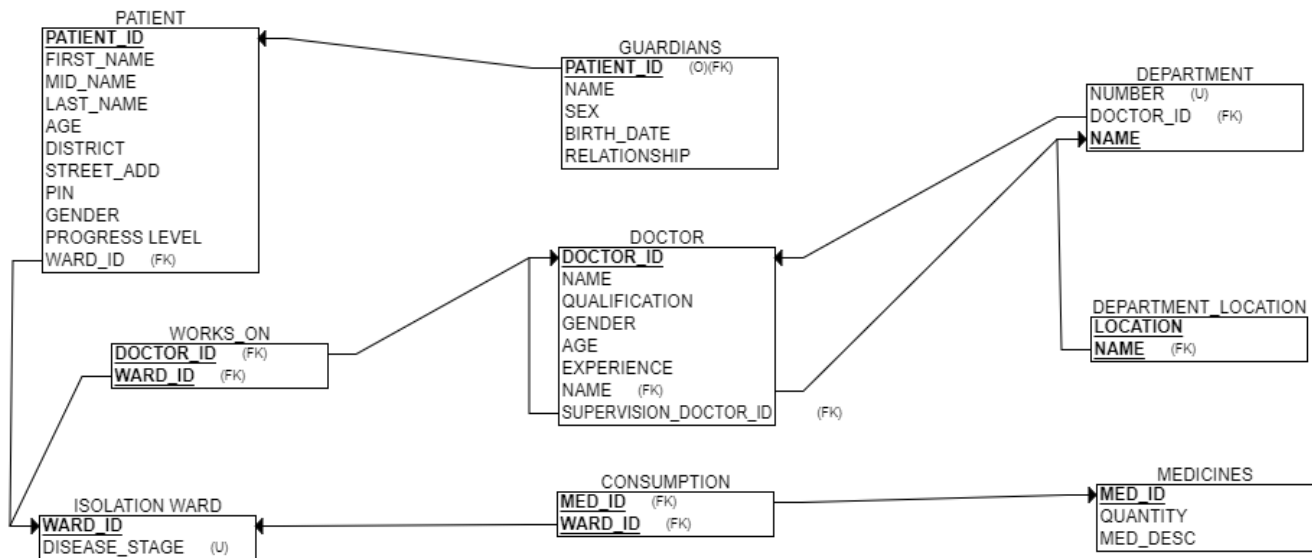*MINIWORLD*: Hospital

DESCRIPTION:

- Hospitals are organized into number of isolation wards each of which has a unique identification number. It will be managed by a particular doctor
- Each patient will be assigned to an isolation ward. The isolation ward is specified by the stage of the disease the patient is going through
- Each doctor is assigned to one department but can work on multiple isolation wards. We keep track of doctors' working hours as well as patients' progress record
- Doctor has to specify name, qualification, gender, birth date
- Patient information involves name ,patient id ,address ,age ,gender
- We keep track of each guardian of patient. Guardian details involves name sex, birth date ,relationship to patient

ER Diagram for CDMS

CRITICAL DISEASE MANAGEMENT SYSTEM

Relational Schema (Relation mapping) for CDMS

CRITICAL DISEASE MANAGEMENT SYSTEM

PATIENT
PATIENT_ID
FIRST_NAME
MID_NAME
LAST_NAME
AGE
DISTRICT
STREET_ADD
PIN
GENDER
PROGRESS LEVEL
WARD_ID   (FK)

GUARDIANS
PATIENT_ID   (O)(FK)
NAME
SEX
BIRTH_DATE
RELATIONSHIP

DEPARTMENT
NUMBER   (U)
DOCTOR_ID   (FK)
NAME

DOCTOR
DOCTOR_ID
NAME
QUALIFICATION
GENDER
AGE
EXPERIENCE
NAME   (FK)
SUPERVISION_DOCTOR_ID   (FK)

WORKS_ON
DOCTOR_ID   (FK)
WARD_ID   (FK)

DEPARTMENT_LOCATION
LOCATION
NAME   (FK)

ISOLATION WARD
WARD_ID
DISEASE_STAGE   (U)

CONSUMPTION
MED_ID   (FK)
WARD_ID   (FK)

MEDICINES
MED_ID
QUANTITY
MED_DESC

NORMALIZATION TO BCNF

Rules for BCNF

For a table to satisfy the Boyce-Codd Normal Form, it should satisfy the following two conditions:

1. It should be in the **Third Normal Form**.
2. And, for any dependency A → B, A should be a **super key**.

Upon observing the Relational Schema for GUARDIANS, DEPARTMENT, DEPARTMENT_LOCATION, CONSUMPTION, MEDICINES, ISOLATION_WARD and WORKS_ON we see that all are in 3NF.

A relation is in third normal form if it holds at least one of the following conditions for every non-trivial function dependency X → Y.

1. X is a super key.
2. Y is a prime attribute, i.e., each element of Y is part of some candidate key.

Since the only functional dependencies in the above tables are that of the primary key it in turn is in 3NF and since primary key is the minimal super key ,it is also in **BCNF**.

PATIENT TABLE

PATIENT_ID	F_NAME	M-NAME	L_NAME	AGE	STREET_ADD	DISTRICT	PIN	GENDER	PROGRESS_LVL	WARD_ID
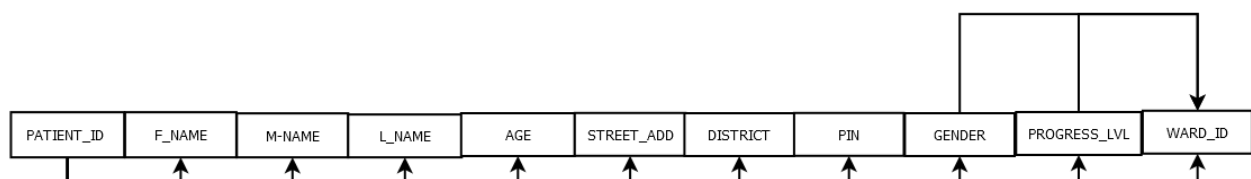
The functional dependencies in this table are:

PATIENT_ID → F_NAME , M_NAME , L_NAME , AGE ,STREET_ADD , DISTRICT , PIN , GENDER , PROGRESS_LEVEL , WARD_ID
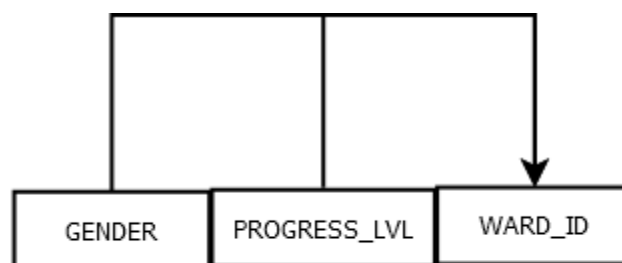
GENDER, PROGRESS_LEVEL → WARD_ID

This Relation Schema is in 2NF since for each non-trivial FD, the LHS is super key or the RHS are not all key attributes .The candidate keys are {PATIENT_ID}.

But the second FD violates definition of 3NF: it is non-trivial, LHS is not a super key, and RHS contain a non-key attribute. Hence it's certainly not in BCNF.

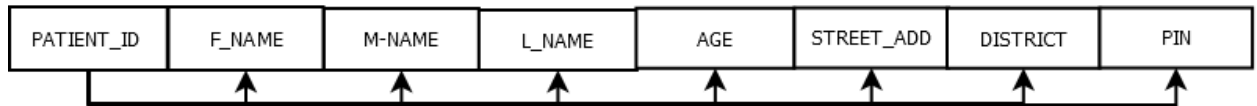To convert it into BCNF we can spit the table into two:

REL [1] = (GENDER, PROGRESS_LEVEL, WARD_ID)

   With FD: PROGRESS_LEVEL, GENDER → WARD_ID with PROGRESS_LEVEL and GENDER as the primary key.

REL [2] = (PATIENT_ID, F_NAME, M_NAME, L_NAME, AGE, STREET_ADD, DISTRICT, PIN)

    With FD: PATIENT_ID → F_NAME, M_NAME, L_NAME, AGE, STREET_ADD, DISTRICT, PIN

PATIENT_ID	F_NAME	M-NAME	L_NAME	AGE	STREET_ADD	DISTRICT	PIN

Now both tables are in BCNF.

DOCTOR TABLE

DOCTOR_ID	NAME	GENDER	EXPERIENCE	AGE	SD_ID	QUALIFICATION
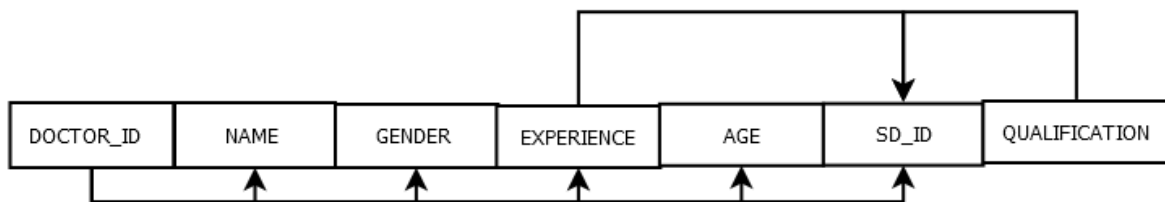
The functional dependencies in this table are :

DOCTOR_ID →NAME ,QUALIFICATION , GENDER ,AGE , EXPERIENCE ,SUPERVISION_DOCTOR_ID
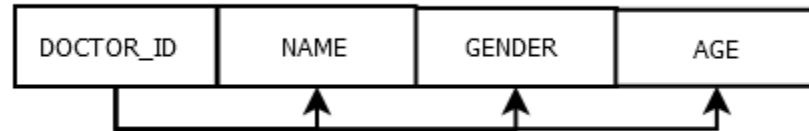
QUALIFICATION , EXPERIENCE →SUPERVISION_DOCTOR_ID

This Relation Schema is in 2NF since for each non-trivial FD, the LHS is super key or the RHS are not all key attributes .The candidate keys are {DOCTOR_ID}.

But the second FD violates definition of 3NF: it is non-trivial, LHS is not a super key, RHS contain a non-key attribute. Hence it's certainly not in BCNF.

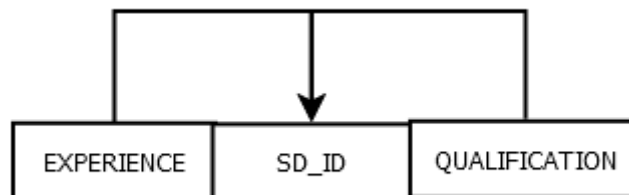To convert it into BCNF we can spit the table into two:

REL[3]=(DOCTOR_ID , NAME ,QUALIFICATION , GENDER ,AGE)

With FD: DOCTOR_ID →NAME, QUALIFICATION , GENDER ,AGE

DOCTOR_ID	NAME	GENDER	AGE

REL[4]=(QUALIFICATION ,EXPERIENCE ,SUPERVISION_DOCTOR_ID)

With FD: QUALIFICATION, EXPERIENCE →SUPERVISION_DOCTOR_ID

EXPERIENCE	SD_ID	QUALIFICATION

REFERENCE:

- FUNDAMENTALS OF DATABASE DESIGN , ELMASRI ,NAVATHE
    1. CHAPTER 7 :DATA MODELLING USING ENTITY RELATIONSHIP MODEL

SOFTWARES USED:

- ERDPLUS
  https://erdplus.com/standalone
- MICROSOFT WORD