PHASE III: LOGICAL DATABASE DESIGN
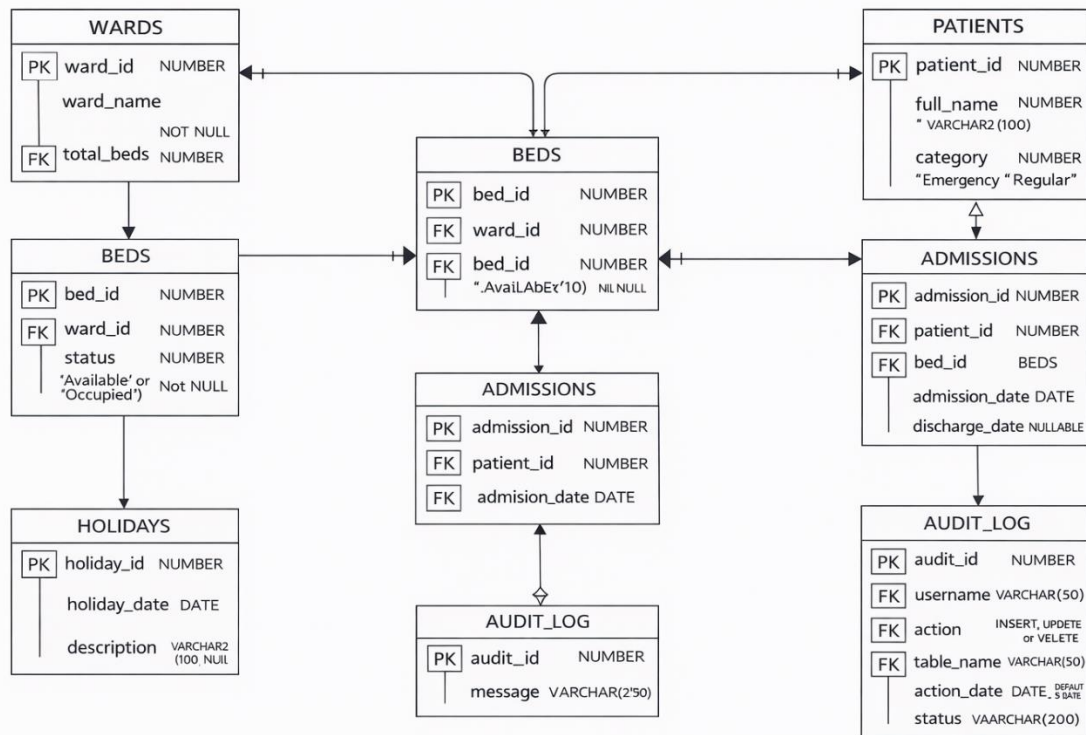

Emergency Response and Bed Availability Tracker - ER Diagram

1. OVERVIEW

This phase focuses on designing a logical data model for the **Emergency Response and Bed Availability Tracker** system. The design is based on the business process defined in Phase II and ensures data accuracy, integrity, and support for analytical reporting. The database is normalized up to **Third Normal Form (3NF)** and prepared for PL/SQL programming and Business Intelligence.

2. IDENTIFIED ENTITIES

The system consists of the following entities:

1. **WARDS** – Stores hospital ward information

2. **BEDS** – Tracks individual beds and their status

3. **PATIENTS** – Stores patient details

4. **ADMISSIONS** – Records patient admissions and discharges

5. **HOLIDAYS** – Stores public holidays for business rule enforcement

6. **AUDIT_LOG** – Records all database actions for auditing and security

3. ENTITY RELATIONSHIPS

- One **WARD** can have many **BEDS** (1:M)

- One **BED** can appear in many **ADMISSIONS** over time (1:M)

- One **PATIENT** can have many **ADMISSIONS** (1:M)

- **ADMISSIONS** links **PATIENTS** and **BEDS**

- **AUDIT_LOG** records actions performed on database tables

- **HOLIDAYS** is independent and used for validation and restriction rules

These relationships are clearly shown in the ER diagram using **crow's foot notation**, with all **primary keys (PK)** and **foreign keys (FK)** properly identified.

4. NORMALIZATION JUSTIFICATION

✔ **First Normal Form (1NF)**

- All tables contain atomic (indivisible) values

- No repeating groups or multi-valued attributes

- Each table has a primary key

✔ **Second Normal Form (2NF)**

- All non-key attributes fully depend on the primary key

- No partial dependency exists in any table

✔ **Third Normal Form (3NF)**

- No transitive dependencies

- Patient data is stored only in PATIENTS

- Ward data is stored only in WARDS

- Admission data is stored only in ADMISSIONS

➢ The database is fully normalized to **3NF**.

5. DATA DICTIONARY

➢ Table: WARDS

Column	Data Type	Constraints	Description
ward_id	NUMBER	PK, NOT NULL	Unique ward identifier
ward_name	VARCHAR2(50)	UNIQUE, NOT NULL	Ward name
total_beds	NUMBER	NOT NULL	Total beds in ward

➢ Table: BEDS

Column	Data Type	Constraints	Description
bed_id	NUMBER	PK, NOT NULL	Unique bed identifier
ward_id	NUMBER	FK → WARDS	Ward reference
status	VARCHAR2(10)	CHECK ('Available', 'Occupied'), NOT NULL	Bed status

➢ Table: PATIENTS

Column	Data Type	Constraints	Description
patient_id	NUMBER	PK, NOT NULL	Unique patient ID
full_name	VARCHAR2(100)	NOT NULL	Patient full name
category	VARCHAR2(20)	CHECK ('Emergency', 'Regular')	Patient type

➢ Table: ADMISSIONS

Column	Data Type	Constraints	Description
admission_id	NUMBER	PK, NOT NULL	Admission record ID
patient_id	NUMBER	FK → PATIENTS	Patient reference
bed_id	NUMBER	FK → BEDS	Bed assigned
admission_date	DATE	NOT NULL	Admission date
discharge_date	DATE	NULL	Discharge date

➢ Table: HOLIDAYS

Column	Data Type	Constraints	Description
holiday_id	NUMBER	PK	Holiday ID
holiday_date	DATE	UNIQUE, NOT NULL	Holiday date
description	VARCHAR2(100)	NOT NULL	Holiday description

➢ Table: AUDIT_LOG

Column	Data Type	Constraints	Description
audit_id	NUMBER	PK	Audit record ID
username	VARCHAR2(50)	NOT NULL	Database user
action	VARCHAR2(20)	NOT NULL	INSERT/UPDATE/DELETE
table_name	VARCHAR2(50)	NOT NULL	Affected table
action_date	DATE	DEFAULT SYSDATE	Action timestamp
status	VARCHAR2(20)	NOT NULL	ALLOWED / DENIED
message	VARCHAR2(200)		Details

6.   BUSINESS INTELLIGENCE CONSIDERATIONS

- **Fact Table:** ADMISSIONS

- **Dimension Tables:** PATIENTS, WARDS, TIME (derived from dates)

- **Analytics Supported:**
    - Bed occupancy rate per ward
    - Emergency vs regular admissions
    - Admission trends by date
    - Ward utilization efficiency