UNIVERSITI TEKNOLOGI MALAYSIA, JOHOR BAHRU

FACULTY OF COMPUTING

SECD2523-08 DATABASE

Phase 2: Database Conceptual Design (ERD)

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1. **_Introduction:_**

In the ever-evolving landscape of healthcare, Ajman University Private Dental Clinic has experienced its fair share of challenges, from navigating the complexities of healthcare during a global pandemic to grappling with payment processing woes. These trials have shown how urgent it is to move past pen and paper processes and into a new era of healthcare management.

This phase of the project involve the Database Conceptual Design which is often represented through DFDs & ERDs. It is a very significant phase as it provides a high-level abstract view of system's entities, relationships between the entities, and the attributes associated with the mentioned entities. Which in turn helps in increasing the understanding of the requirements, ensure the data integrity, confirms that database design is aligned with the user requirement, and sets the foundation for a more detailed logical and physical designs. All of this to ensure the success of the Ajman University Private Dental Clinic New Health Care System.

2. **_Background Study:_**

The COVID-19 epidemic caused previously unheard-of disruptions to the healthcare system. Like many others, the clinic had to make quick adjustments to guarantee the security of its personnel and clients. The manual, paper-based systems that had served the clinic for years suddenly revealed their limitations in a world where contactless interactions and efficient data management became paramount. Difficult obstacles included patient tracking, scheduling modifications, and the requirement for quick access to correct information.
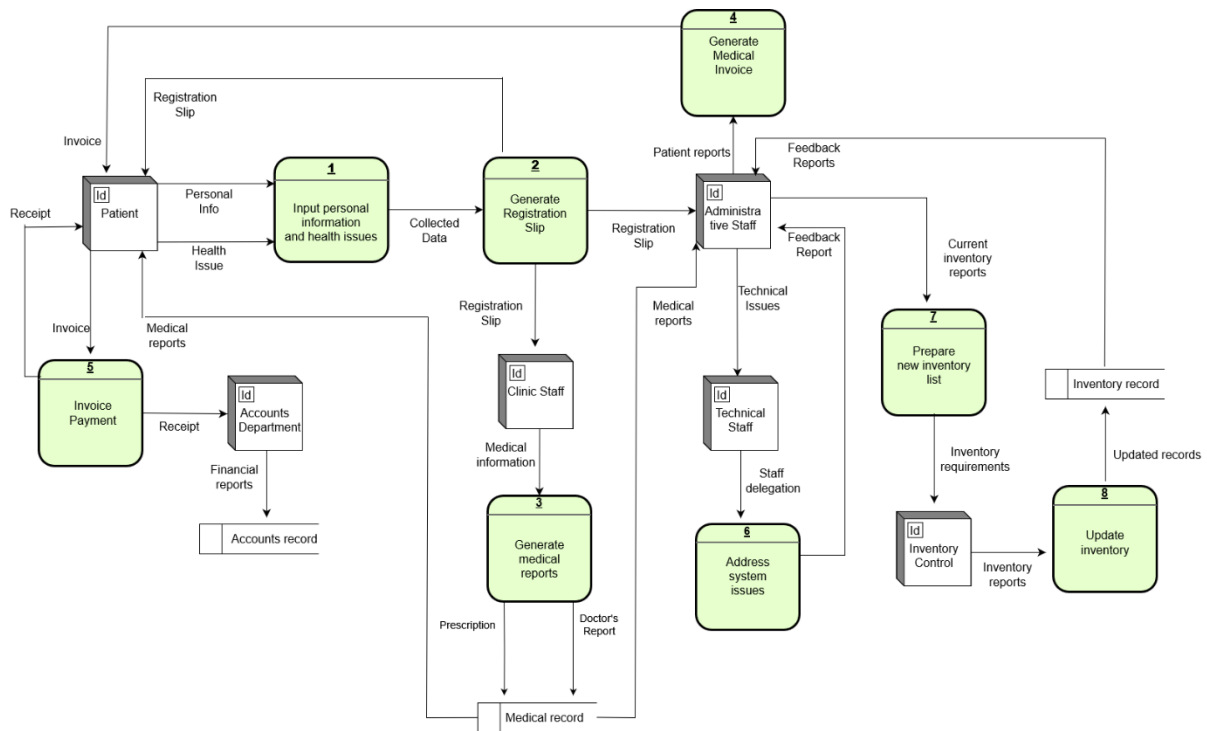
Apart from the obstacles caused by the pandemic, the clinic also faced problems with processing payments. Financial hardship and administrative challenges resulted from delayed reimbursements caused by antiquated billing and payment practices. More accessible payment choices were requested by patients as well, underscoring the significance of a flexible and patient-centered billing strategy.

Ajman University Private Dental Clinic has started a revolutionary journey to improve its healthcare management system after realizing these difficulties. We offer a novel solution that resulted from the clinic's will to advance and provide greater community service. By smoothly transferring from manual techniques to a reliable database-driven system, our project seeks to transform healthcare management. This shift is expected to promote accuracy, efficiency, and unmatched patient care.

This all-inclusive solution is ready to tackle wider problems related to inefficient administration, inaccurate data, and inadequate data analysis capabilities, in addition to the acute concerns brought on by the COVID-19 pandemic. The clinic is putting itself in a position to move with agility and resilience through the future healthcare landscape by adopting a forward-thinking approach. The project imagines a time when advanced technology is easily integrated into healthcare administration, improving patient outcomes and raising the bar for care. In this transformed landscape, the Ajman University Private Dental Clinic will stand as a beacon of innovation and excellence, setting new standards for healthcare providers in the region and beyond.

3. *DFD (to-be):*

- ➤ **Context Diagram:**

> **Level 0 Diagram:**

4 Generate Medical Invoice

Registration Slip

Invoice

Id Patient

Receipt

Personal Info

1 Input personal information and health issues

Collected Data

2 Generate Registration Slip

Registration Slip

Patient reports

Feedback Reports

Id Administrative Staff

Feedback Report

Current inventory reports

Health Issue

Invoice

Medical reports

Registration Slip

Medical reports

Technical Issues

7 Prepare new inventory list

Inventory record

5 Invoice Payment

Receipt

Id Accounts Department

Id Clinic Staff

Id Technical Staff

Updated records

Financial reports

Medical information

Staff delegation

Inventory requirements

8 Update inventory

Accounts record

3 Generate medical reports

6 Address system issues

Id Inventory Control

Inventory reports

Prescription

Doctor's Report

Medical record

4. *Data & Transaction requirement*:

Data and transactional needs are essential for the effective operation of our hospital system. A number of key considerations, such as appointment scheduling, treatment and medical records, inventory management, and billing processes, will be discussed. In addition, we will introduce the main components of a transaction.

4.1. *Proposed business rule:*

➢ **Appointment Scheduling Rule:**

Patients have the ability to schedule appointments, with dentists or hygienists. Each appointment needs to have an identifier date, time. Must be associated with a specific patient. It is important to ensure that there are no overlapping appointments for each patient.

Treatment and Medical Records Rule:

The medical history of each patient along with their treatments and prescribed medications should be properly documented.
All treatments and procedures must be linked to the corresponding patient and the dentist who attended them. It is crucial that all medical records comply with privacy regulations for patients.

➢ **Inventory Management Rule:**

To manage supplies and equipment effectively they should be assigned identifiers along with quantities and reorder thresholds.
Whenever the inventory levels drop below a threshold an automated reorder request should be generated.

➢ **Billing and Payment Rule:**

Invoices need to be generated for every treatment or service provided to patients. The payment records must include details such as payment method used, amount paid, date of payment and the corresponding patient involved. Furthermore, it is essential to process insurance claims while ensuring they are properly linked to the patient records.

4.2. *Proposed data & transactional:*

➢ **Patient Data:**

This includes information like name, contact details, medical history as insurance information. A unique identifier for each patient will facilitate referencing in appointments, treatments, and billing processes.

➢ **Staff Information:**

Information about our dentists, hygienists and administrative staff. Includes their qualifications, schedules, and certifications.

➢ **Appointment Management:**

Identification for each appointment along with the patient's ID, date, time and assigned dentist/hygienist. Updates related to scheduling changes such as rescheduling or cancellations.

➢ **Treatment and Medical Records:**

 identification for each treatment along with the patient's ID and the dentists ID. Also includes the date of the procedure detailed information about it and prescribed medications. Updates regarding treatments and any changes made to records.

➢ **Inventory Management:**

 identification for each inventory item along with its name and quantity. Also includes the reorder threshold to ensure restocking.Transactions related to adding inventory items or updating quantities. Additionally generates reorder requests when.

➢ **Billing and Payment Transactions:**

Identification number for each invoice along with treatment details. Also includes information about payment methods used by patients such as cash or card payments. Payment records include details about the amount paid as the date of payment. Additionally, insurance claim transactions are linked to patients and their treatments.

5. *Database conceptual design:*

   5.1.Conceptual ERD:
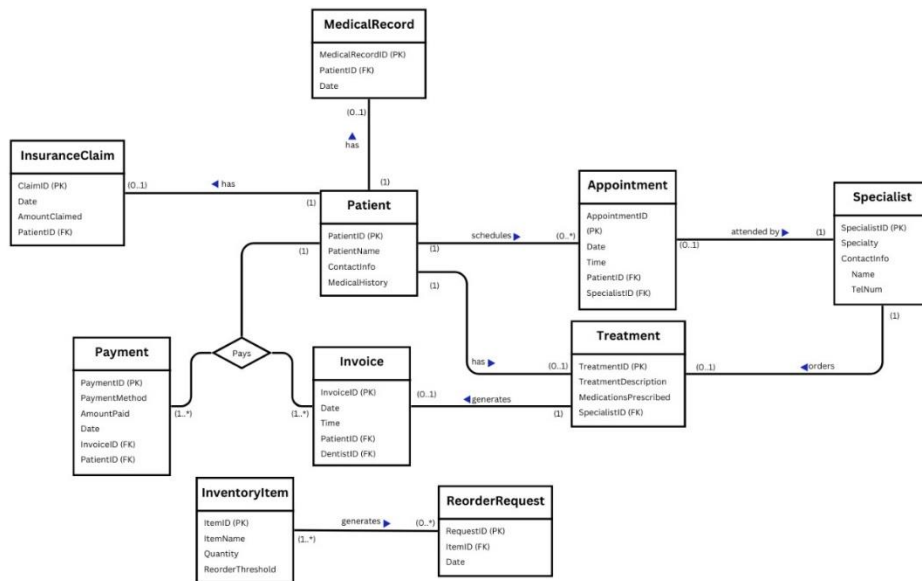
5.2. Enhanced ERD (EERD):
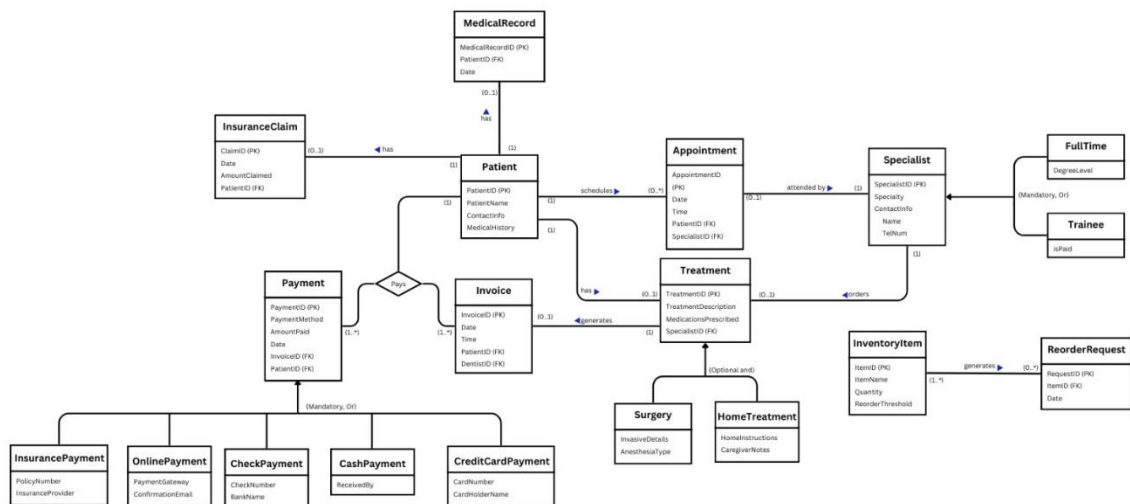
6. _Data dictionary:_

Description of Entities:

Entity	Description

Patient	Stores the data of All patient registered in the clinic
Staff	Stores the data of everyone who works in the clinic
Doctors	Stores the data of All Doctors in the clinic
Appointment	Stores the data of All Appointments of patients
BILL	Stores the details of the bill generated for each patient

Description of Attributes:

➢ **Patient:**

Attribute	Description	Data type	Constraint
P_fname	First name	VARCHAR2(20)	NOT NULL
P_lname	Last name	VARCHAR2(20)	NOT NULL
P_id	Patient's ID	VARCHAR2(10)	PRIMARY KEY
P_gender	Gender	CHAR	NOT NULL
P_BD	Date of birth	DATE	NOT NULL
P_num	Patient's contact number	VARCHAR2(14)	NOT NULL
P_city	City address	VARCHAR2(15)	NOT NULL
P_street	Street address	VARCHAR2(15)	NOT NULL

➢ **Staff:**

Attribute	Description	Data type	Constraint
S_fname	First name	VARCHAR2(20)	NOT NULL
S_lname	Last name	VARCHAR2(20)	NOT NULL

S_id	Staff's ID	VARCHAR2(10)	PRIMARY KEY
S_gender	Gender	CHAR	NOT NULL
S_BD	Date of birth	DATE	NOT NULL
S_num	Staff's contact number	VARCHAR2(14)	NOT NULL
S_city	City address	VARCHAR2(15)	NOT NULL
S_street	Street address	VARCHAR2(15)	NOT NULL
S_qualification	staff's qualification	VARCHAR2(35)	NOT NULL
S_salary	Monthly salary	VARCHAR2(10)	NOT NULL

> **Doctors:**

Attribute	Description	Data type	Constraint
D_fname	First name	VARCHAR2(20)	NOT NULL
D_lname	Last name	VARCHAR2(20)	NOT NULL
D_id	Doctor's ID	VARCHAR2(10)	PRIMARY KEY
D_gender	Gender	CHAR	NOT NULL
D_BD	Date of birth	DATE	NOT NULL
D_num	Doctor's contact number	VARCHAR2(14)	NOT NULL
D_city	City address	VARCHAR2(15)	NOT NULL
D_street	Street address	VARCHAR2(15)	NOT NULL
D_qualification	Doctorf's qualification	VARCHAR2(35)	NOT NULL
D_salary	Monthly salary	VARCHAR2(10)	NOT NULL
S_id	Staff's ID	VARCHAR2(10)	FOREIGN KEY REFERENCE STAFF

> **Appointment:**

Attribute	Description	Data type	Constraint
A_date	Appointment's date	DATE	NOT NULL
A_time	Appointment's time	TIME	NOT NULL

D_id	Doctor's ID	VARCHAR2(10)	FOREIGN KEY REFERENCE DOCTOR
P_id	Patient's ID	VARCHAR2(10)	FOREIGN KEY REFERENCE PATIENT

> **Bill:**

Attribute	Description	Data type	Constraint
Invoice_num	Invoice reference number	VARCHAR2(10)	NOT NULL
Inv_content	Content of the invoice	VARCHAR2(35)	NOT NULL
Total_amount	Total amount to pay	VARCHAR2(15)	NOT NULL
Due_date	Due date to pay	DATE	NOT NULL
P_id	Patient's ID	VARCHAR2(10)	FOREIGN KEY REFERENCE PATIENT

7. *Summary:*

Ajman University Private Dental Clinic's New Health Care System was shaped in large part by the Database Conceptual Design phase. The report addresses challenges related to data accuracy, administration efficiency, and analysis capability while emphasizing data integrity and alignment with user requirements.

Additionally, the report provides a comprehensive reference guide for all database elements through the presentation of the Conceptual ERD, the Enhanced ERD (EERD), & data dictionary. Putting together this proactive database design initiative positions the clinic as an innovative leader, ensuring improved administration processes, enhanced data accuracy, and advanced analytical capabilities for the region and beyond, as well as setting new standards in healthcare for the region and beyond.