MID-TERM ASSIGNMENT REPORT

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HUTECH

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A. Introduction

Health is the cornerstone of human well-being, and the global COVID-19 pandemic has magnified the indispensable role of healthcare systems in ensuring societal resilience. As a Vietnamese citizen deeply concerned about the state of healthcare in my country, I am inspired to contribute positively to its advancement. In light of my background as an IT student, I firmly believe that harnessing technology to establish a comprehensive Hospital Information System (HIS) for a private hospital in Vietnam can revolutionize healthcare delivery, enhance patient outcomes, and catalyze progress in the realm of public health. A Glimpse into the Significance of Healthcare Systems

The realm of healthcare stands as a beacon of hope, nurturing the physical, mental, and emotional well-being of individuals. However, the pandemic-induced disruptions have unveiled the fragilities within existing healthcare infrastructures, necessitating the adoption of innovative solutions to bolster the resilience and efficacy of healthcare delivery systems. A pertinent avenue for such innovation lies in the development and implementation of sophisticated Hospital Information System (HIS) frameworks, which serve as the digital backbone of modern healthcare facilities. The Imperative for Technological Advancements in Vietnamese Healthcare

Vietnam, a nation rich in cultural heritage and economic potential, stands at a critical juncture wherein advancements in healthcare infrastructure can propel the nation towards a brighter future. By integrating cutting-edge IT solutions into the fabric of healthcare provision, Vietnamese hospitals can transcend conventional limitations and usher in an era of streamlined operations, enhanced patient care, and optimized resource utilization. Against this backdrop of transformative possibilities, the conception and implementation of a bespoke Hospital Information System (HIS) emerge as a strategic imperative for private hospitals in Vietnam seeking to elevate their standards of care.

Deconstructing the Attributes of a Comprehensive Hospital Information System:

1. Patient Information Management

In the digital landscape of modern healthcare, the effective management of patient information stands as a linchpin in delivering personalized and efficient care. A robust HIS should encompass features that facilitate the secure storage, seamless updating, and rapid retrieval of comprehensive patient data. From basic personal details such as name, contact information, and insurance particulars to intricate medical histories and treatment plans, the HIS should serve as a centralized repository of patient information, ensuring continuity of care and informed decision-making by healthcare providers.

2. Patient Record Management

Beyond mere information storage, a proficient HIS must excel in the management of patient records, encapsulating intricate details of medical histories, diagnoses, treatment modalities, and test results. The seamless integration of these facets not only empowers healthcare professionals with a holistic view of a patient's health status but also plays a pivotal role in enhancing clinical decision-making and prognostic accuracy. Moreover, stringent adherence to data privacy regulations ensures the sanctity and confidentiality of patient information, bolstering trust and compliance within the healthcare ecosystem.

3. Appointment Management

Efficient appointment scheduling lies at the crux of operational excellence within healthcare facilities, streamlining patient flow, optimizing resource allocation, and enhancing patient satisfaction. A sophisticated HIS should incorporate features that enable seamless appointment booking, doctor-patient coordination, and clinic resource management. By automating the appointment process and offering real-time visibility into clinic schedules and availability, the HIS harmonizes the interplay between patients and healthcare providers, fostering a conducive environment for quality care delivery.

4. Financial Management

The financial dimensions of healthcare operations demand meticulous oversight and transparency to ensure sustainability and accountability. A comprehensive HIS should encompass functionalities that facilitate the seamless management of invoicing, payment processing, and cost analysis related to medical services. By tracking treatment costs, prescription expenses, and service reimbursements, the HIS empowers hospital administrators to optimize revenue streams, mitigate financial leakages, and uphold fiscal prudence in the delivery of healthcare services. 5. Human Resource Management (HRM)

Central to the efficacy of any healthcare institution are its dedicated cadre of healthcare professionals, including doctors, nurses, and administrative staff. An adept HIS should feature robust HR management modules that encompass staff rostering, timekeeping, payroll processing, and training certifications. By centralizing employee data, streamlining workforce scheduling, and monitoring professional development requirements, the HIS serves as a catalyst for workforce optimization, staff satisfaction, and organizational efficiency. Advancing Healthcare Through Technological Innovation: A Case for a Private Hospital in Vietnam

In the context of the Vietnamese healthcare landscape, private hospitals occupy a pivotal position in catering to the diverse healthcare needs of the populace. By embracing technological innovation through the adoption of a tailored Hospital Information System, private hospitals in Vietnam can engender a paradigm shift in healthcare delivery, aligning with global best practices and enhancing the quality of care offered to patients. The potential benefits of a customized HIS for a private hospital in Vietnam are multifaceted and span across operational efficiency, patient engagement, clinical decision support, regulatory compliance, and financial sustainability.

B. Identify Entities

I. Patient:

Stores patient information, including personal details and insurance.

- Attributes:

+ patient_id (Primary Key): Unique identifier for each patient.

+ first_name: First name of the patient.

+ last_name: Last name of the patient.

+ dob: Date of birth of the patient.

+ gender: Gender of the patient.

+ address: Address of the patient.

+ phone: Phone number of the patient.

+ insurance_info: Insurance information of the patient.

II. Appointment:

Manages appointments for patients, linking them to specific doctors.

- Attributes:

+ appointment_id (Primary Key): Unique identifier for each appointment.

+ patient_id (Foreign Key referencing Patient): Identifier of the patient for the appointment.

+ doctor_id (Foreign Key referencing Doctor): Identifier of the doctor for the appointment.

+ appointment_date: Date and time of the appointment.

+ status: Status of the appointment (e.g., scheduled, canceled).

III. Billing:

Handles billing and invoicing for healthcare services provided to patients.

- Attributes:

+ billing_id (Primary Key): Unique identifier for each billing record.

+ patient_id (Foreign Key referencing Patient): Identifier of the patient associated with the billing.

+ amount: Amount billed.

+ billing_date: Date of billing.

IV. Doctor:

Stores information about doctors.

- Attributes:

+ doctor_id (Primary Key): Unique identifier for each doctor.

+ doctor_name: Name of the doctor.

+ specialty: Medical specialty of the doctor.

+ contact_number: Contact number of the doctor.

V. Department:

Represents hospital departments.

- Attributes:

+ department_id (Primary Key): Unique identifier for each department.

+ department_name: Name of the department.

+ location: Location of the department.

VI. Medical Staff

Stores information about the medical staff, including doctors and nurses.

- Attributes:

+ medical_staff_id: Unique identifier for each medical staff member.

+ staff_type: Indicates if the staff member is a doctor or a nurse.

+ staff_name: Name of the medical staff member.

+ specialization: Area of medical expertise/specialty.

+ contact_number: Contact number of the medical staff member.

+ department_id: Identifier of the department where the medical staff member works.

C. Identify Relationships and Cardinality

The relationships include:

Patient-Appointment (Many-to-One): A patient can have multiple appointments.

Appointment-Doctor (Many-to-One): An appointment is associated with one doctor.

Patient-Billing (One-to-Many): A patient can have multiple billing records.

Doctor-Department (Many-to-One): A doctor belongs to one department

Medical Staff-Appointment (Many-to-One):Each appointment is associated with one medical staff member (doctor or nurse) responsible for patient care.

Billing-Doctor (One-to-Many): Each billing record is associated with one specific doctor who provided the healthcare service that generated the billing. This indicates that one doctor can be linked to multiple billing records, reflecting the services they have provided to different patients.

D. Draw ERD
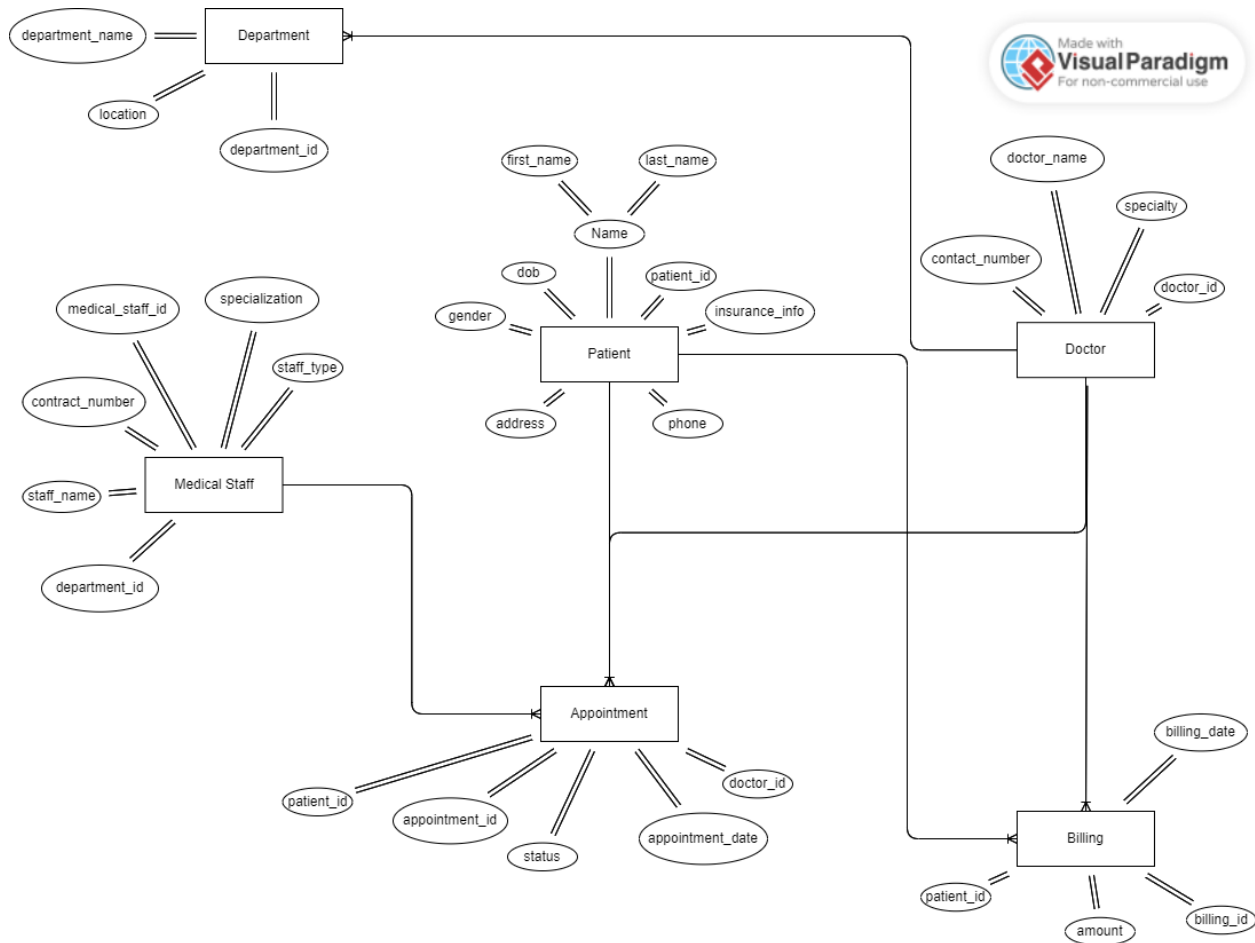
In this ERD:

1. Patient to Appointment:

- Description: A patient can schedule multiple appointments with different doctors for various health needs. Each appointment is associated with a single patient.

- Cardinality:

+ One Patient can have Many Appointments

+ One Appointment is linked to One Patient

2. Appointment to Doctor:

- Description: Each medical appointment is allocated to one specific doctor who will be responsible for treating the patient during that appointment.

- Cardinality:

+ One Appointment is assigned to One Doctor

+ One Doctor can be associated with Many Appointments

3. Patient and Billing:

- Description: Over the course of healthcare services, a patient may accumulate multiple billing records for various treatments or services received.

- Cardinality:

+ One Patient can have Many Billing Records

+ Each Billing Record is linked to One Patient

4. Doctor to Department:

- Description: Doctors specialize in specific medical fields and are assigned to work within a particular department of the healthcare facility.

- Cardinality:

+ One Doctor is affiliated with One Department

+ One Department can include Many Doctors

5. Medical Staff-Appointment (Many-to-One):

- Description: Each appointment is associated with one medical staff member (doctor or nurse) responsible for patient care.

- Cardinality:

+ One Appointment is assigned to One Medical Staff member

+ One Medical Staff member can be linked to Many Appointments

E. Convert ERD to RD

- Patient (patient_id, first_name, last_name, dob, gender, address, phone, insurance_info)

+ PK: patient_id

- Appointment (appointment_id, patient_id, doctor_id, appointment_date, status)

+ PK: appointment_id

+ FK: patient_id (Referencing Patient)

+ FK: doctor_id (Referencing Doctor)

- Billing (billing_id, patient_id, amount, billing_date)

+ PK: billing_id

+ FK: patient_id (Referencing Patient)

- Doctor (doctor_id, doctor_name, specialty, contact_number)

+ PK: doctor_id

- Department (department_id, department_name, location)

+ PK: department_id

- Medical Staff (medical_staff_id, staff_type, staff_name, specialization, contact_number, department_id)

+PK: medical_staff_id

+FK: department_id
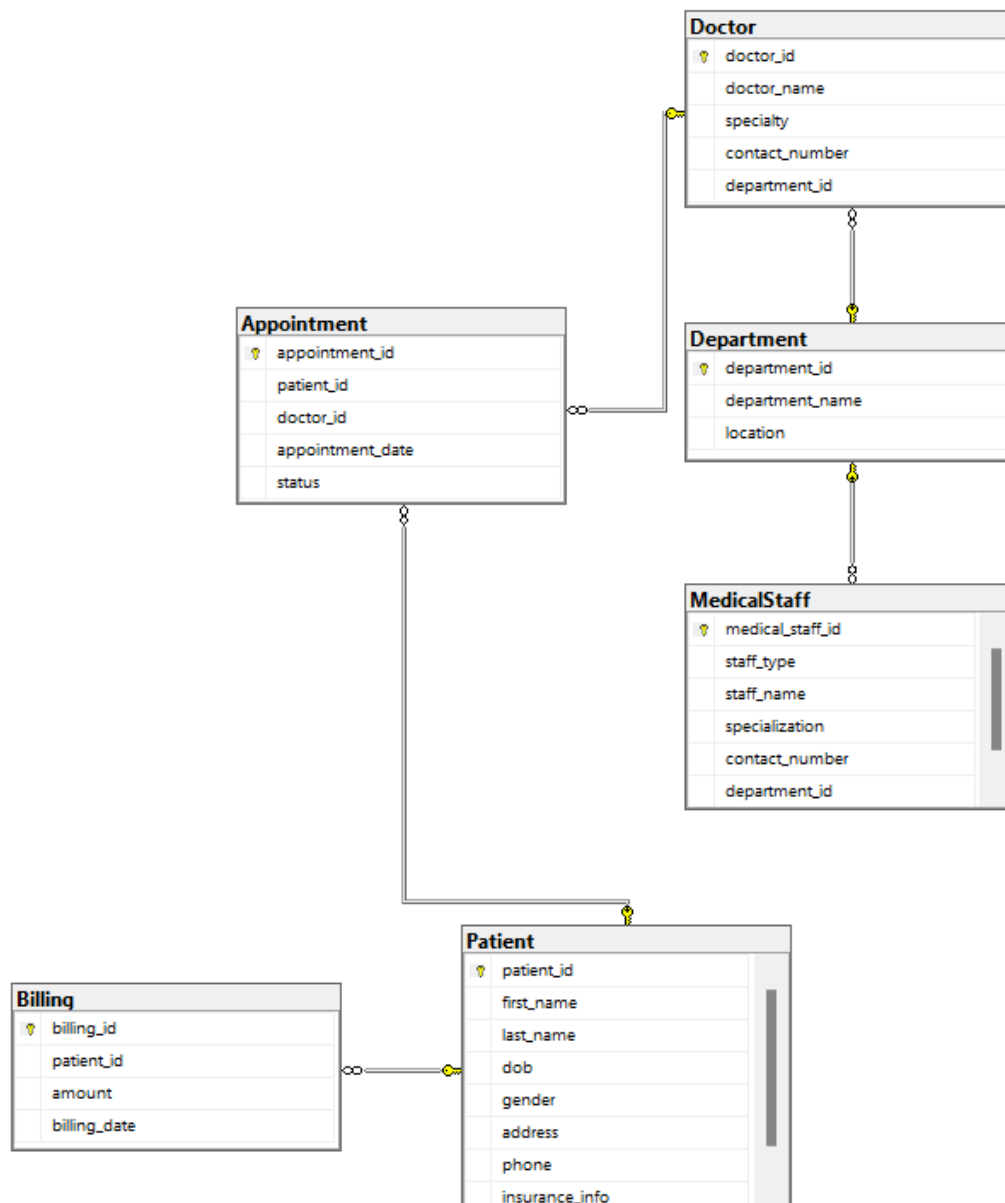
F. Create relevant relations (tables) with appropriate data types

CREATE TABLE Patient (

  patient_id INT PRIMARY KEY,

```sql
    first_name VARCHAR(50),

    last_name VARCHAR(50),

    dob DATE,

    gender CHAR(1),

    address VARCHAR(100),

    phone VARCHAR(15),

    insurance_info VARCHAR(100)

);


CREATE TABLE Department (

    department_id INT PRIMARY KEY,

    department_name VARCHAR(50),

    location VARCHAR(100)

);


CREATE TABLE Doctor (

    doctor_id INT PRIMARY KEY,

    doctor_name VARCHAR(100),

    specialty VARCHAR(50),

    contact_number VARCHAR(15),
```

```sql
    department_id INT,

    FOREIGN KEY (department_id) REFERENCES Department(department_id)

);


CREATE TABLE Appointment (

    appointment_id INT PRIMARY KEY,

    patient_id INT,

    doctor_id INT,

    appointment_date DATETIME,

    status VARCHAR(20),

    FOREIGN KEY (patient_id) REFERENCES Patient(patient_id),

    FOREIGN KEY (doctor_id) REFERENCES Doctor(doctor_id)

);


CREATE TABLE Billing (

    billing_id INT PRIMARY KEY,

    patient_id INT,

    amount DECIMAL(10, 2),

    billing_date DATE,
```

```sql
    FOREIGN KEY (patient_id) REFERENCES Patient(patient_id)

);


CREATE TABLE MedicalStaff (

    medical_staff_id INT PRIMARY KEY,

    staff_type VARCHAR(20),

    staff_name VARCHAR(100),

    specialization VARCHAR(50),

    contact_number VARCHAR(15),

    department_id INT,

    FOREIGN KEY (department_id) REFERENCES Department(department_id)

);

INSERT INTO Patient (patient_id, first_name, last_name, dob, gender, address, phone, insurance_info)

VALUES

    (1, 'John', 'Doe', '1990-05-15', 'M', '123 Main St', '555-123-4567', 'ABC Insurance'),

    (2, 'Jane', 'Smith', '1985-08-20', 'F', '456 Elm Ave', '555-987-6543', 'XYZ Insurance'),

    (3, 'Michael', 'Johnson', '1978-03-10', 'M', '789 Oak Rd', '555-555-1234', 'PQR Insurance'),
```

```sql
    (4, 'Emily', 'Brown', '2000-11-05', 'F', '567 Pine Ln', '555-222-3333', 'LMN Insurance'),

    (5, 'David', 'Lee', '1995-02-28', 'M', '321 Cedar Blvd', '555-888-9999', 'DEF Insurance');

INSERT INTO Department (department_id, department_name, location)

VALUES

    (1, 'Cardiology', 'Main Building, 3rd Floor'),

    (2, 'Pediatrics', 'Children Wing, 2nd Floor'),

    (3, 'Dermatology', 'East Wing, Ground Floor'),

    (4, 'Radiology', 'West Wing, Basement'),

    (5, 'Oncology', 'South Wing, 4th Floor');


INSERT INTO Doctor (doctor_id, doctor_name, specialty, contact_number, department_id)

VALUES

    (101, 'Dr. Smith', 'Cardiology', '555-111-2222', 1),

    (102, 'Dr. Johnson', 'Pediatrics', '555-333-4444', 2),

    (103, 'Dr. Brown', 'Orthopedics', '555-555-6666', 1),

    (104, 'Dr. Lee', 'Dermatology', '555-777-8888', 3),

    (105, 'Dr. White', 'Neurology', '555-999-0000', 2);


INSERT INTO Appointment (appointment_id, patient_id, doctor_id, appointment_date, status)

VALUES
```

(101, 1, 101, '2024-06-20 10:00:00', 'Scheduled'),

(102, 2, 102, '2024-06-22 14:30:00', 'Canceled'),

(103, 3, 103, '2024-06-25 11:15:00', 'Scheduled'),

(104, 4, 101, '2024-06-28 09:45:00', 'Scheduled'),

(105, 5, 102, '2024-06-30 16:00:00', 'Scheduled');

INSERT INTO Billing (billing_id, patient_id, amount, billing_date)

VALUES

(201, 1, 150.00, '2024-06-21'),

(202, 2, 200.50, '2024-06-23'),

(203, 3, 75.20, '2024-06-26'),

(204, 4, 300.75, '2024-06-29'),

(205, 5, 50.00, '2024-07-01');

INSERT INTO MedicalStaff (medical_staff_id, staff_type, staff_name, specialization, contact_number, department_id)

VALUES

(501, 'Doctor', 'Dr. Adams', 'Cardiology', '555-123-4567', 1),

(502, 'Doctor', 'Dr. Martinez', 'Pediatrics', '555-987-6543', 2),

(503, 'Nurse', 'Nurse Johnson', 'Pediatrics', '555-555-1234', 2),

(504, 'Doctor', 'Dr. Clark', 'Dermatology', '555-222-3333', 3),

(505, 'Nurse', 'Nurse White', 'Dermatology', '555-888-9999', 3);

G. Produce sample record

This program run by Microsoft SQL Sever Management Studio 20

1. Simple Query (Select All Records):

Retrieve all records from the Patient table:

SELECT * FROM Patient;

	patient_id	first_name	last_name	dob	gender	address	phone	insurance_info
1	1	John	Doe	1990-05-15	M	123 Main St	555-123-4567	ABC Insurance
2	2	Jane	Smith	1985-08-20	F	456 Elm Ave	555-987-6543	XYZ Insurance
3	3	Michael	Johnson	1978-03-10	M	789 Oak Rd	555-555-1234	PQR Insurance
4	4	Emily	Brown	2000-11-05	F	567 Pine Ln	555-222-3333	LMN Insurance
5	5	David	Lee	1995-02-28	M	321 Cedar Blvd	555-888-9999	DEF Insurance

2. Query for Sorting Results (Sort Doctors by Name):

Retrieve doctors from the Doctor table, sorted alphabetically by name:

SELECT * FROM Doctor ORDER BY doctor_name;

	doctor_id	doctor_name	specialty	contact_number	department_id
1	103	Dr. Brown	Orthopedics	555-555-6666	1
2	102	Dr. Johnson	Pediatrics	555-333-4444	2
3	104	Dr. Lee	Dermatology	555-777-8888	3
4	101	Dr. Smith	Cardiology	555-111-2222	1
5	105	Dr. White	Neurology	555-999-0000	2

3. Aggregate Function (Total Billing Amount):

Calculate the total billing amount for all patients:

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SELECT SUM(amount) AS total_billing_amount FROM Billing;

	total_billing_amount
1	776.45

4. Subquery (Retrieve Patients with Appointments):

Retrieve patients who have scheduled appointments:

SELECT * FROM Patient WHERE patient_id IN (SELECT DISTINCT patient_id FROM Appointment);

	patient_id	first_name	last_name	dob	gender	address	phone	insurance_info
1	1	John	Doe	1990-05-15	M	123 Main St	555-123-4567	ABC Insurance
2	2	Jane	Smith	1985-08-20	F	456 Elm Ave	555-987-6543	XYZ Insurance
3	3	Michael	Johnson	1978-03-10	M	789 Oak Rd	555-555-1234	PQR Insurance
4	4	Emily	Brown	2000-11-05	F	567 Pine Ln	555-222-3333	LMN Insurance
5	5	David	Lee	1995-02-28	M	321 Cedar Blvd	555-888-9999	DEF Insurance

5. Query to Alter Existing Tables (Add Column to Patient Table):

Add a new column email to the Patient table:

ALTER TABLE Patient ADD email VARCHAR(100);

Commands completed successfully.

H. Conclusion

In conclusion, the endeavor to develop and implement a Hospital Information System (HIS) tailored for a private hospital in Vietnam represents a pivotal step towards enhancing healthcare delivery, patient care, and overall health outcomes. This comprehensive system, driven by the integration of advanced technology and data management practices, has the potential to revolutionize the healthcare landscape in Vietnam by streamlining processes, optimizing resource utilization, improving decision-making, and ultimately enhancing the quality of care provided to patients.

The significance of healthcare cannot be overstated, especially in light of the ongoing COVID-19 pandemic that has underscored the critical importance of robust and efficient healthcare systems. As a concerned Vietnamese citizen and an IT student with a passion for leveraging technology for social good, I am committed to contributing to the advancement of healthcare in Vietnam through the development and deployment of a sophisticated HIS that aligns with the specific needs and challenges of the local healthcare sector.

The attributes of an effective HIS discussed in this report encompass various key components essential for the efficient management and delivery of healthcare services. From patient information management and record-keeping to appointment scheduling, financial management, and human resource oversight, each aspect plays a crucial role in ensuring the smooth operation of a healthcare facility and the delivery of high-quality care to patients.

By delving into the intricacies of HIS development and implementation, we have identified and defined key entities such as Patients, Appointments, Billing, Doctors, Departments, and Medical Staff, elucidating their relationships and cardinalities within the system. This foundational understanding serves as the backbone for structuring a robust and agile database that can effectively store, manage, and retrieve critical healthcare information with precision and efficiency.

The conversion of the Entity-Relationship Diagram (ERD) into a Relational Database (RD) is a critical technical aspect of designing the HIS, where the creation of pertinent tables with appropriate data types ensures data integrity, accuracy, and adherence to industry standards. The meticulous design of the database schema, accompanied by the insertion of sample records and the execution of various SQL queries, exemplifies how the HIS can be utilized to manage patient data, facilitate appointments, handle billing, and oversee medical staff operations within the hospital environment.

The sample records and queries demonstrate the practical application and functionality of the designed HIS, showcasing how it can be leveraged to streamline administrative tasks, monitor patient interactions, analyze financial data, and optimize resource allocation. Through the integration of technology and database management practices, healthcare providers can harness

the power of data-driven insights to make informed decisions, improve operational efficiency, and enhance the overall patient experience.

The utilization of SQL queries within Microsoft SQL Server Management Studio highlights the versatility and scalability of database management systems in handling large volumes of healthcare data and processing complex queries efficiently. By embracing digital transformation and incorporating modern technologies into healthcare operations, organizations can unlock new opportunities for innovation, collaboration, and improved patient outcomes.

In conclusion, the deployment of a tailored HIS for a private hospital in Vietnam signifies a transformative shift towards a more data-driven, patient-centric, and efficient healthcare system. Through the strategic integration of technology, data management best practices, and collaborative efforts among healthcare stakeholders, we can pave the way for a brighter and healthier future for the Vietnamese population. As a proactive member of the community and a dedicated advocate for leveraging technology for social impact, I am enthusiastic about the potential of the HIS project to drive positive change and contribute to the advancement of healthcare services in Vietnam and beyond.