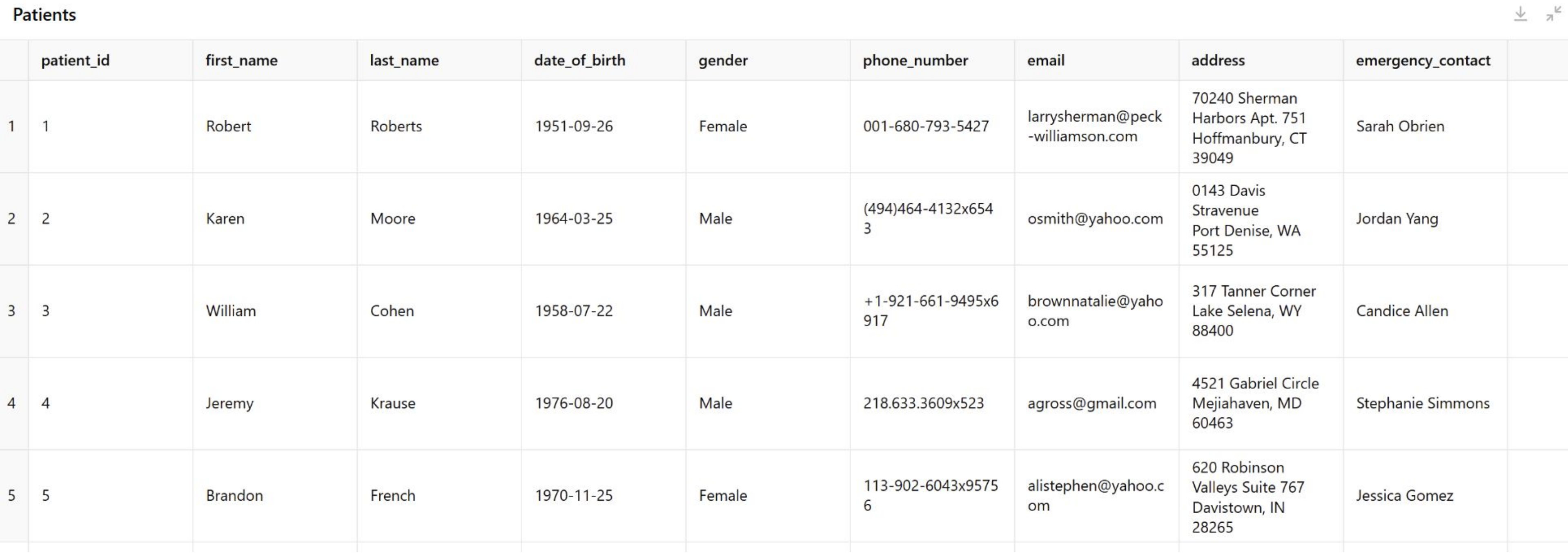
CSC116 Database

A database is an electronically stored, systematic collection of data that can include words, numbers, images, videos, and other types of files.

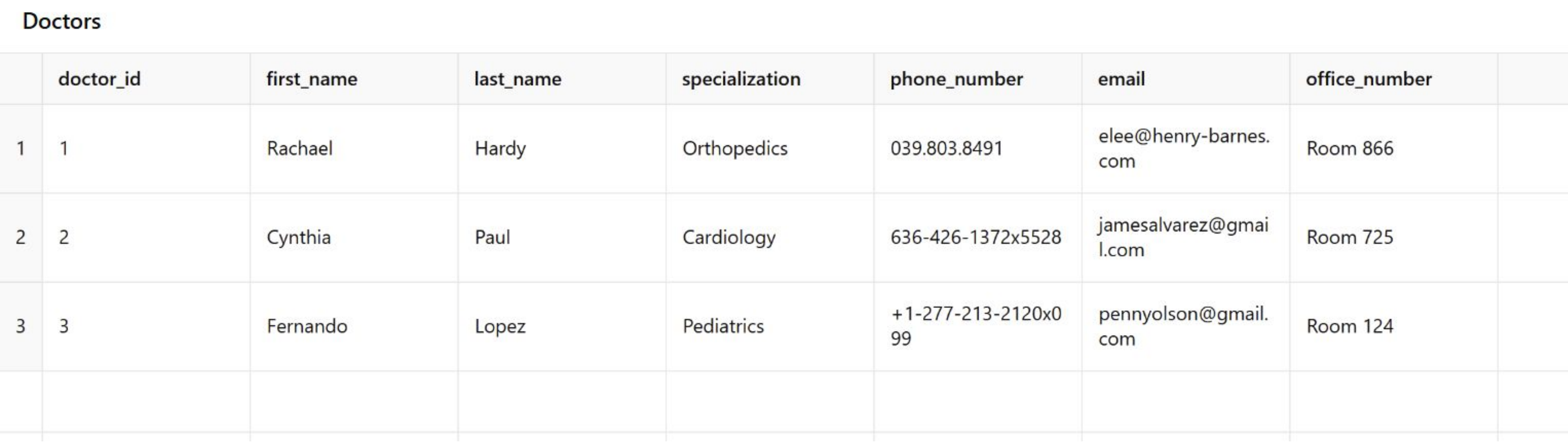
Column Name	Data Type	Description
`patient_id`	INT (PRIMARY KEY)	Unique ID for the patient
`first_name`	VARCHAR(50)	Patient's first name
`last_name`	VARCHAR(50)	Patient's last name
`date_of_birth`	DATE	Patient's date of birth
`gender`	VARCHAR(10)	Gender of the patient
`phone_number`	VARCHAR(15)	Contact phone number
`email`	VARCHAR(100)	Email address
`address`	VARCHAR(255)	Home address
`emergency_contact`	VARCHAR(100)	Emergency contact person



Patients

	patient_id	first_name	last_name	date_of_birth	gender	phone_number	email	address	emergency_contact
1	1	Robert	Roberts	1951-09-26	Female	001-680-793-5427	larrysherman@peck-williamson.com	70240 Sherman Harbors Apt. 751 Hoffmanbury, CT 39049	Sarah Obrien
2	2	Karen	Moore	1964-03-25	Male	(494)464-4132x6543	osmith@yahoo.com	0143 Davis Stravenue Port Denise, WA 55125	Jordan Yang
3	3	William	Cohen	1958-07-22	Male	+1-921-661-9495x6917	brownnatalie@yahoo.com	317 Tanner Corner Lake Selena, WY 88400	Candice Allen
4	4	Jeremy	Krause	1976-08-20	Male	218.633.3609x523	agross@gmail.com	4521 Gabriel Circle Mejiahaven, MD 60463	Stephanie Simmons
5	5	Brandon	French	1970-11-25	Female	113-902-6043x95756	alistephen@yahoo.com	620 Robinson Valleys Suite 767 Davistown, IN 28265	Jessica Gomez

Column Name	Data Type	Description
`doctor_id`	INT (PRIMARY KEY)	Unique ID for the doctor
`first_name`	VARCHAR(50)	Doctor's first name
`last_name`	VARCHAR(50)	Doctor's last name
`specialization`	VARCHAR(100)	Medical specialization
`phone_number`	VARCHAR(15)	Contact phone number
`email`	VARCHAR(100)	Email address
`office_number`	VARCHAR(20)	Office room number



Doctors

	doctor_id	first_name	last_name	specialization	phone_number	email	office_number
1	1	Rachael	Hardy	Orthopedics	039.803.8491	elee@henry-barnes.com	Room 866
2	2	Cynthia	Paul	Cardiology	636-426-1372x5528	jamesalvarez@gmail.com	Room 725
3	3	Fernando	Lopez	Pediatrics	+1-277-213-2120x099	pennyolson@gmail.com	Room 124

Column Name	Data Type	Description
`appointment_id`	INT (PRIMARY KEY)	Unique ID for the appointment
`patient_id`	INT (FOREIGN KEY)	References `Patients(patient_id)`
`doctor_id`	INT (FOREIGN KEY)	References `Doctors(doctor_id)`
`appointment_date`	DATETIME	Date and time of the appointment
`reason`	VARCHAR(255)	Reason for the visit
`status`	VARCHAR(20)	Status of the appointment (Scheduled, Completed, Canceled)

Appointments

	appointment_id	patient_id	doctor_id	appointment_date	reason	status
1	1	3	2	2025-01-24 18:33:19	Consultation	Completed
2	2	5	1	2025-01-26 22:59:58	Check-up	Completed
3	3	5	1	2025-01-27 02:54:06	Emergency	Canceled
4	4	4	2	2025-01-07 22:21:14	Follow-up	Completed
5	5	3	3	2025-01-25 21:46:34	Emergency	Scheduled

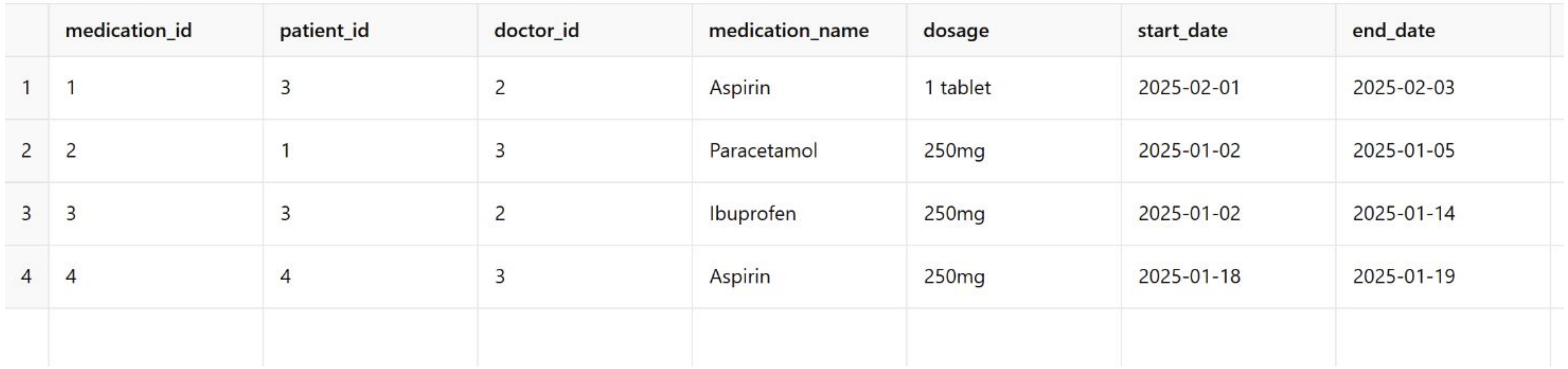
Column Name	Data Type	Description
`hospitalization_id`	INT (PRIMARY KEY)	Unique ID for the hospitalization
`patient_id`	INT (FOREIGN KEY)	References `Patients(patient_id)`
`doctor_id`	INT (FOREIGN KEY)	References `Doctors(doctor_id)`
`admission_date`	DATE	Date of admission
`discharge_date`	DATE	Date of discharge (nullable if ongoing)
`room_number`	VARCHAR(10)	Assigned room number
`diagnosis`	VARCHAR(255)	Initial diagnosis
`treatment`	TEXT	Treatment details

Hospitalizations

	hospitalization_id	patient_id	doctor_id	admission_date	discharge_date	room_number	diagnosis	treatment
1	1	2	1	2025-01-06		Room 499	Hypertension	Loss among laugh easy best pay spend name.
2	2	2	2	2025-01-01		Room 362	Migraine	Wear center then explain provide.
3	3	4	3	2025-01-11		Room 211	Migraine	Almost stock term might society fact.

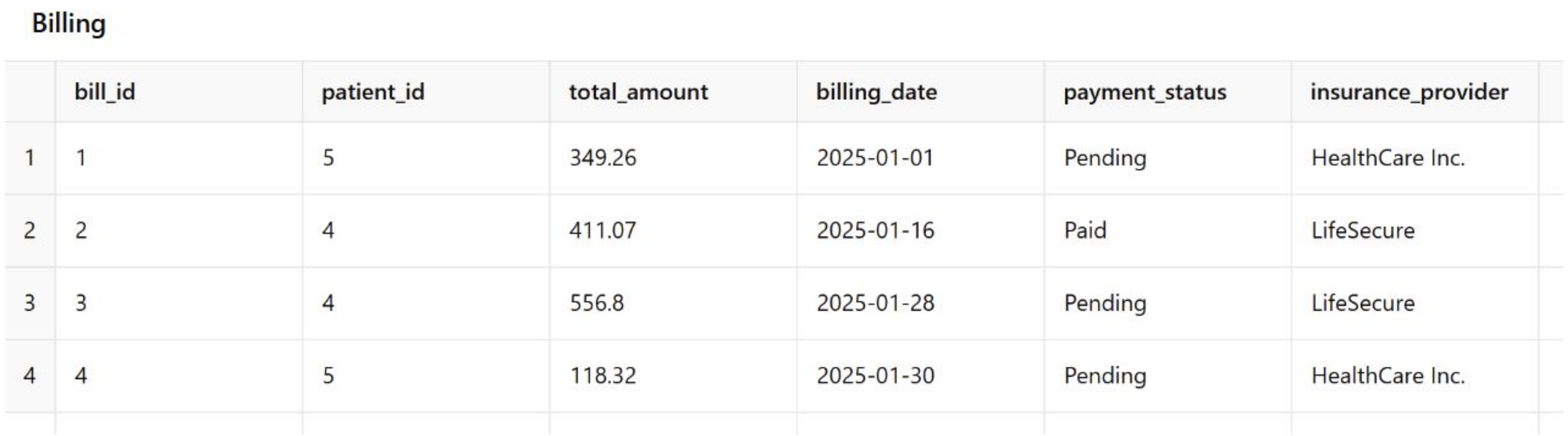
Column Name	Data Type	Description
`medication_id`	INT (PRIMARY KEY)	Unique ID for the medication
`patient_id`	INT (FOREIGN KEY)	References `Patients(patient_id)`
`doctor_id`	INT (FOREIGN KEY)	References `Doctors(doctor_id)`
`medication_name`	VARCHAR(100)	Name of the prescribed medication
`dosage`	VARCHAR(50)	Dosage instructions
`start_date`	DATE	Start date of the medication
`end_date`	DATE	End date of the medication

Medications



	medication_id	patient_id	doctor_id	medication_name	dosage	start_date	end_date
1	1	3	2	Aspirin	1 tablet	2025-02-01	2025-02-03
2	2	1	3	Paracetamol	250mg	2025-01-02	2025-01-05
3	3	3	2	Ibuprofen	250mg	2025-01-02	2025-01-14
4	4	4	3	Aspirin	250mg	2025-01-18	2025-01-19

Column Name	Data Type	Description
`bill_id`	INT (PRIMARY KEY)	Unique ID for the bill
`patient_id`	INT (FOREIGN KEY)	References `Patients(patient_id)`
`total_amount`	DECIMAL(10, 2)	Total amount due
`billing_date`	DATE	Date of billing
`payment_status`	VARCHAR(20)	Status of payment (Paid, Pending, Overdue)
`insurance_provider`	VARCHAR(100)	Insurance company name (if applicable)



Billing

	bill_id	patient_id	total_amount	billing_date	payment_status	insurance_provider
1	1	5	349.26	2025-01-01	Pending	HealthCare Inc.
2	2	4	411.07	2025-01-16	Paid	LifeSecure
3	3	4	556.8	2025-01-28	Pending	LifeSecure
4	4	5	118.32	2025-01-30	Pending	HealthCare Inc.

```
-- Create Patients table

CREATE TABLE Patients (
    patient_id INT AUTO_INCREMENT PRIMARY KEY,
    first_name VARCHAR(50) NOT NULL,
    last_name VARCHAR(50) NOT NULL,
    date_of_birth DATE NOT NULL,
    gender VARCHAR(10),
    phone_number VARCHAR(15),
    email VARCHAR(100),
    address VARCHAR(255),
    emergency_contact VARCHAR(100)
);
```

```
CREATE TABLE Doctors (
    doctor_id INT AUTO_INCREMENT
PRIMARY KEY,
    first_name VARCHAR(50) NOT NULL,
    last_name VARCHAR(50) NOT NULL,
    specialization VARCHAR(100),
    phone_number VARCHAR(15),
    email VARCHAR(100),
    office_number VARCHAR(20)
);
```

SQL

SQL is a standard language for storing, manipulating and retrieving data in databases.

Query
Delete
Insert
Update

Query

https://www.w3schools.com/sql/trysql.asp?filename=trysql_select_all

```
select * from patients;

select * from docters;

select  patient_id, gender, email from
patients;
```

Question 1: Query appointment table shows the reason, appointment_id, patient_id

DISTINCT

Question 2:

```
SELECT DISTINCT medication_name, dosage
FROM medications;

SELECT DISTINCT medication_name
FROM medications;
```

Where

```sql
SELECT * FROM Customers
WHERE Country='Mexico';
```

```sql
SELECT * FROM Customers
WHERE Country='Mexico' or Country='USA';
```

Question 3:

I want to know all the female patients.

AND, OR, NOT

```sql
SELECT * FROM Customers
WHERE NOT Country = 'Spain';
```

```sql
SELECT * FROM Customers
WHERE Country='Mexico' or Country='USA';
```

Question 4:

I want to know a female patient and her emergence contact named Jordan Yang.

IN

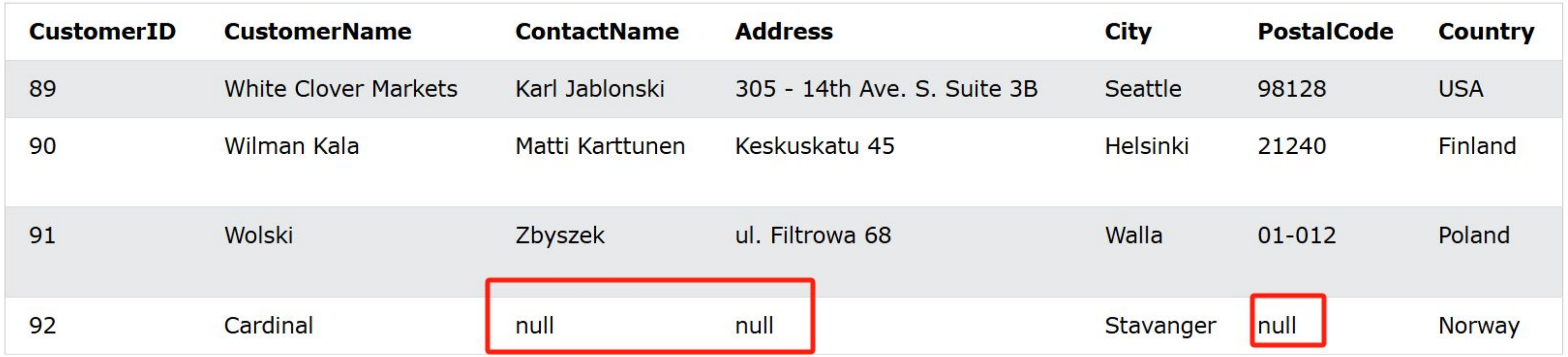
```
SELECT * FROM Appointments
WHERE status IN ('canceled', 'completed');


Where status='canceled' or statu='completed' ;
```

Insert

```sql
INSERT INTO table_name (column1, column2, column3,
...)
VALUES (value1, value2, value3, ...);
```

```sql
INSERT INTO table_name
VALUES (value1, value2, value3, ...);
```

```sql
INSERT INTO Customers (CustomerName, City, Country)
VALUES ('Cardinal', 'Stavanger', 'Norway');
```



CustomerID	CustomerName	ContactName	Address	City	PostalCode	Country
89	White Clover Markets	Karl Jablonski	305 - 14th Ave. S. Suite 3B	Seattle	98128	USA
90	Wilman Kala	Matti Karttunen	Keskuskatu 45	Helsinki	21240	Finland
91	Wolski	Zbyszek	ul. Filtrowa 68	Walla	01-012	Poland
92	Cardinal	null	null	Stavanger	null	Norway

Delete All Records

It is possible to delete all rows in a table without deleting the table. This means that the table structure, attributes, and indexes will be intact:

```
DELETE FROM table_name;
```

```
DELETE FROM Customers WHERE CustomerName='Alfreds Futterkiste';
```

Question 5:

I want to delete a patient whose email equals to ‘agross@gmail.com’

Update

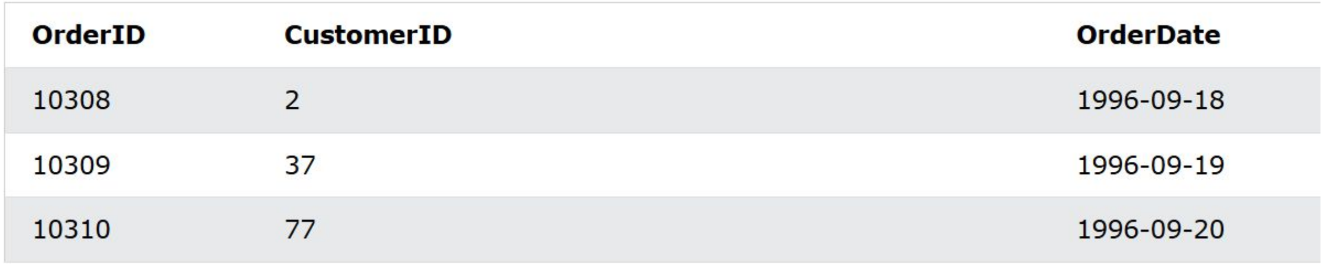
```sql
UPDATE Customers

SET ContactName = 'Alfred Schmidt', City=
'Frankfurt'

WHERE CustomerID = 1;
```

Question 6:

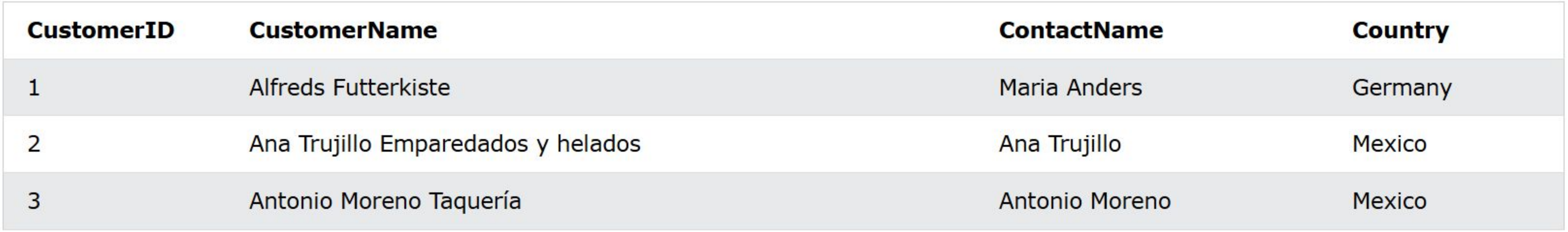
I want to update a patient whose email equals to ‘agross@gmail.com’, his first name actually is Kevin

SQL **JOIN**

A `JOIN` clause is used to combine rows from two or more tables, based on a related column between them.



OrderID	CustomerID	OrderDate
10308	2	1996-09-18
10309	37	1996-09-19
10310	77	1996-09-20



CustomerID	CustomerName	ContactName	Country
1	Alfreds Futterkiste	Maria Anders	Germany
2	Ana Trujillo Emparedados y helados	Ana Trujillo	Mexico
3	Antonio Moreno Taquería	Antonio Moreno	Mexico

```
SELECT Orders.OrderID, Customers.CustomerName,
Orders.OrderDate

FROM Orders INNER JOIN Customers ON
Orders.CustomerID=Customers.CustomerID;
```

OrderID	CustomerName	OrderDate
10308	Ana Trujillo Emparedados y helados	9/18/1996

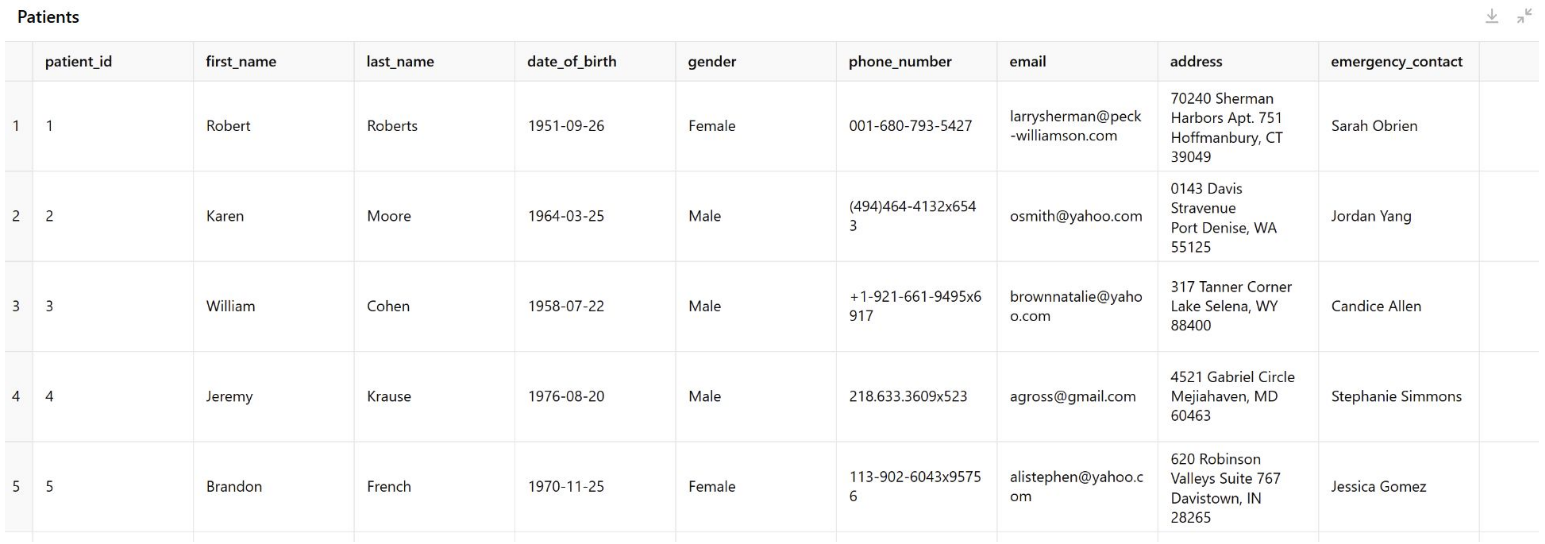
Database Types

Relational Databases (RDBMS):

- Use structured tables with rows and columns.
- Support SQL (Structured Query Language) for data management.
- **Examples:** MySQL, Oracle Database, Microsoft SQL Server.

NoSQL Databases:

- Designed for unstructured or semi-structured data.
- Include different models like document, key-value, column-family, and graph.
- **Examples:**
  - **Document:** MongoDB, CouchDB.
  - **Key-Value:** Redis, DynamoDB.
  - **Column-Family:** Cassandra, HBase.
  - **Graph:** Neo4j, ArangoDB.



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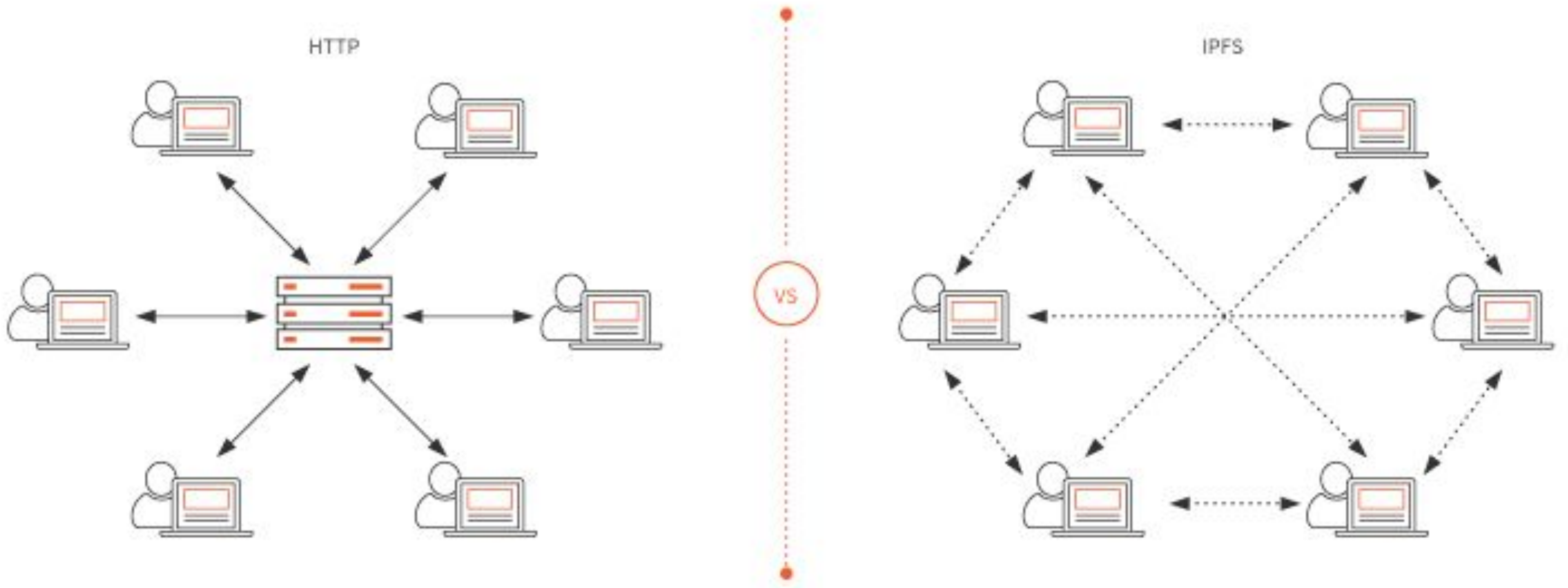
3	3	William	Cohen	1958-07-22	Male	+1-921-661-9495x6917	brownnatalie@yahoo.com	317 Tanner Corner Lake Selena, WY 88400	Candice Allen
4	4	Jeremy	Krause	1976-08-20	Male	218.633.3609x523	agross@gmail.com	4521 Gabriel Circle Mejiahaven, MD 60463	Stephanie Simmons
5	5	Brandon	French	1970-11-25	Female	113-902-6043x95756	alistephen@yahoo.com	620 Robinson Valleys Suite 767 Davistown, IN 28265	Jessica Gomez

Name: Jack
Age: 25
Condition: Cold

Name: Li Si
Age: 30
Condition: High Blood Pressure
Allergies: Penicillin

Decentralized Database IPFS



Security problems in Databases

- **Authentication & Authorization:** Passwords, biometrics, role-based access (e.g., nurses accessing only their patients’ records).
- **Encryption:** Scrambling data (e.g., SSL for online forms).
- **Backups & Recovery:** Regular backups to prevent data loss.
- **Audits:** Tracking access logs to detect breaches.

Thanks