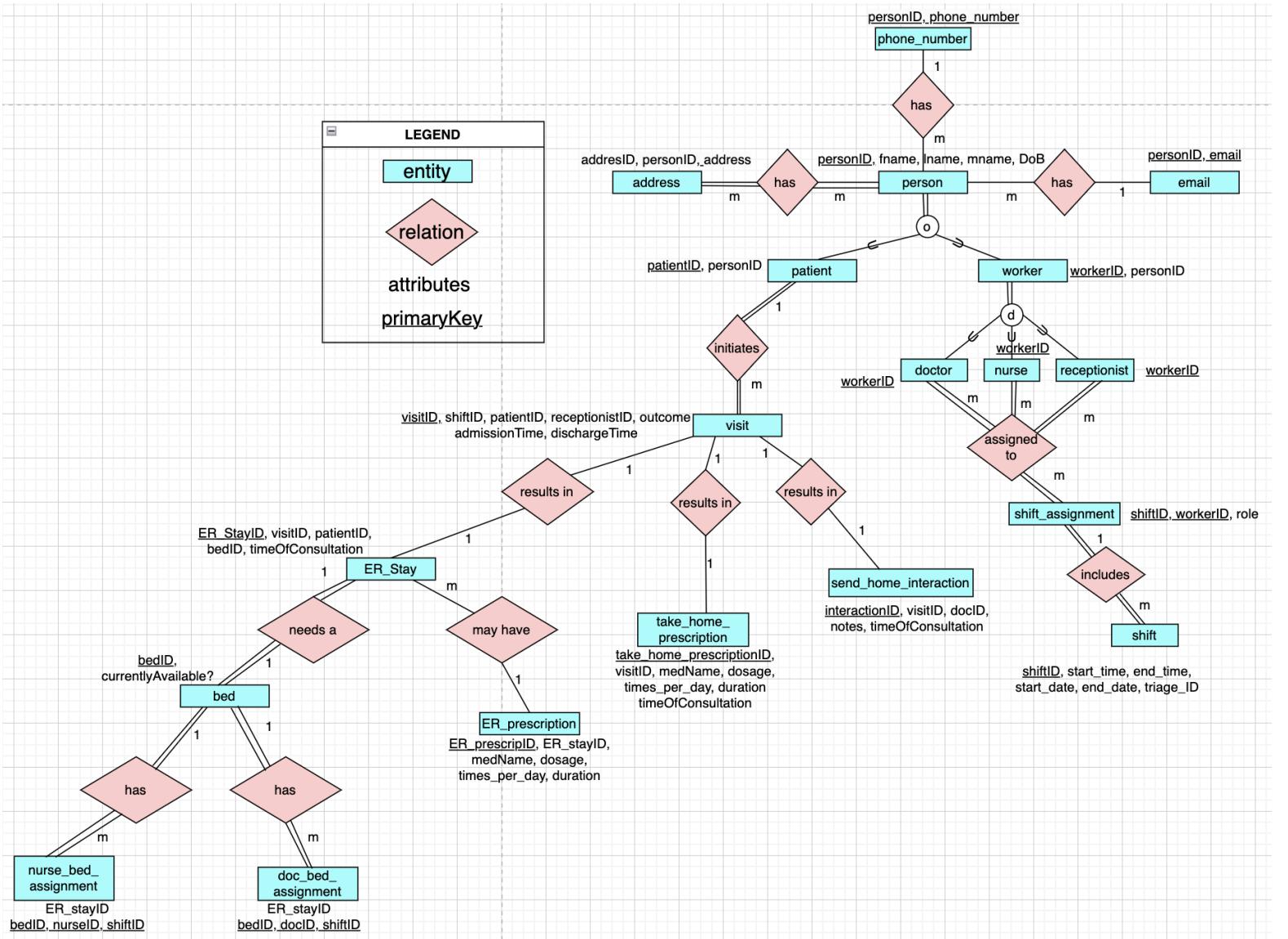


Chase Hurwitz
 Files + Databases Midterm
 March 13, 2025

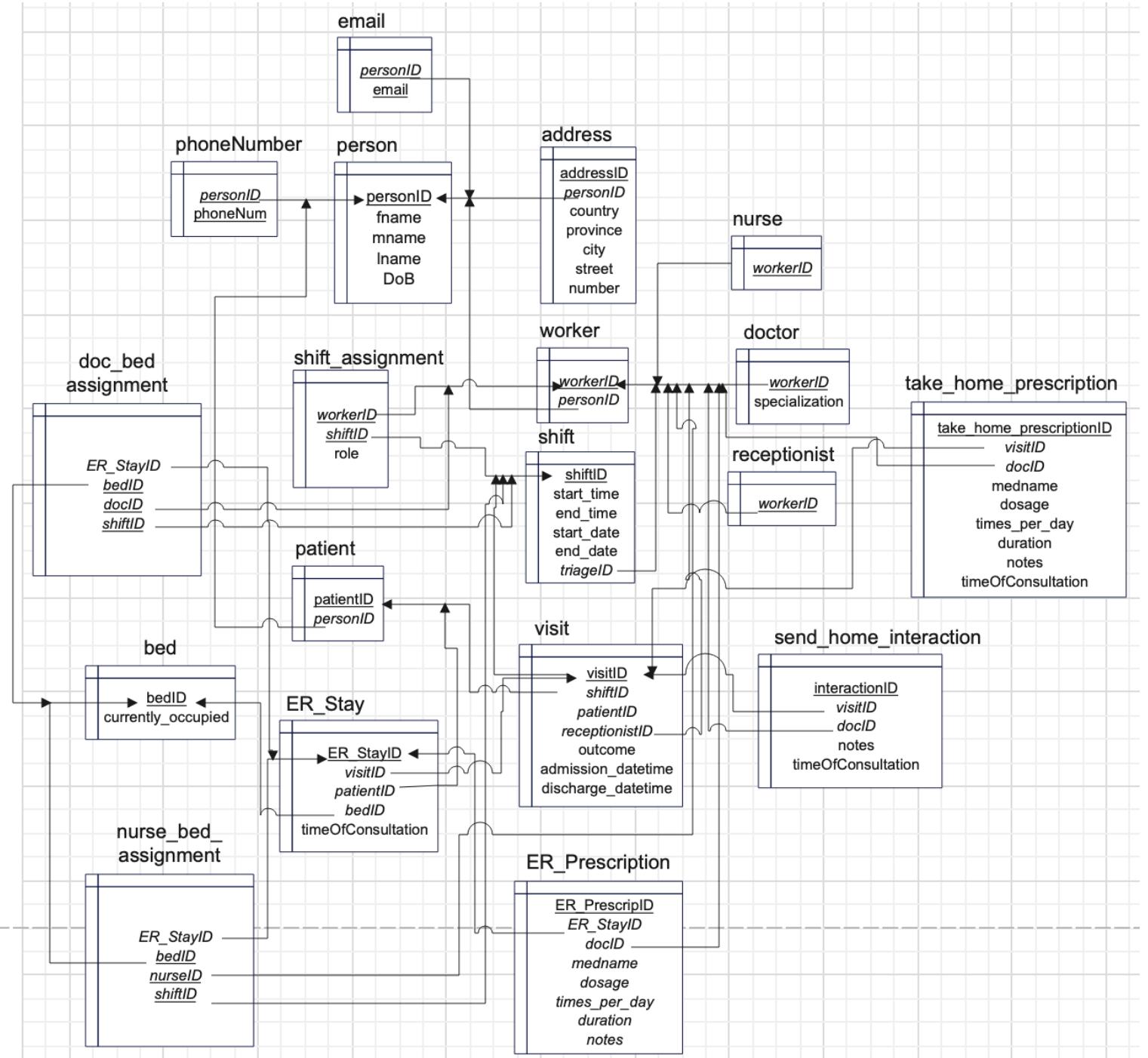
EER Model:



Link to EER Model:

https://drive.google.com/file/d/1GCzDMmdLC_CpT8rz6IiwnAaBveDNQ6gp/view?usp=sharing

Relational Schema:



Catalog:

Relations

| Relation-Name | Number of columns |
|------------------------|-------------------|
| address | 7 |
| bedID | 2 |
| doc_bed_assignment | 4 |
| doctor | 2 |
| email | 2 |
| ER_prescription | 8 |
| ER_Stay | 5 |
| nurse | 1 |
| nurse_bed_assignment | 4 |
| patient | 2 |
| person | 5 |
| phoneNumber | 2 |
| Receptionist | 1 |
| send_home_interaction | 5 |
| shift | 6 |
| shift_assignment | 3 |
| take_home_prescription | 9 |
| visit | 7 |
| worker | 2 |

columns

| col_name | dat-type | belongs-to | Key type | notes |
|-----------|--------------|------------------|--------------------------------------|---|
| personID | int | person | primary | |
| addressID | int | address | primary | |
| personID | int | address | Foreign | address.personID references person.personID |
| personID | int | email | Foreign, composite primary key | email.personID references person.personID |
| email | varchar(255) | email | Composite primary key | |
| personID | int | phoneNumber | Foreign, composite primary key | phoneNumber.personID references person.personID |
| phoneNum | varchar(20) | phoneNumber | Primary | |
| workerID | int | worker | primary | |
| personID | int | worker | foreign | worker.personID references person.personID |
| workerID | int | doctor | Primary, foreign | doctor.workerID references worker.workerID |
| workerID | int | nurse | Primary, foreign | nurse.workerID references worker.workerID |
| workerID | int | receptionist | Primary, foreign | receptionist.workerID references worker.workerID |
| shiftID | int | shift | primary | |
| triageID | int | shift | foreign | shift.triageId references doctor.workerID |
| workerID | int | shift_assignment | Composite Primary, foreign | shift_assignment.workerID references worker.workerID |

| | | | | |
|--------------------------|-----|------------------------|----------------------------|---|
| shiftID | int | shift_assignment | Composite Primary, foreign | shift_assignment.shiftID references shift.shiftID |
| patientID | int | patient | primary | |
| personID | int | patient | foreign | patient.personID references person.personID |
| visitID | int | visit | primary | |
| shiftID | int | visit | foreign | visit.shiftID references shift.shiftID |
| patientID | int | visit | foreign | visit.patientID references patient.patientID |
| receptionistID | int | visit | foreign | visit.receptionistID references worker.workerID |
| interactionID | int | send_home_interaction | primary | |
| visitID | int | send_home_interaction | foreign | send_home_interaction.visitID references visit.visitID |
| docID | int | send_home_interaction | foreign | send_home_interaction.docID references doctor.workerID |
| take_home_prescriptionID | int | take_home_prescription | primary | |
| visitID | int | take_home_prescription | foreign | take_home_prescription.visitID references visit.visitID |
| docID | int | take_home_prescription | foreign | take_home_prescription.docID references doctor.workerID |
| bedID | int | bed | primary | |
| ER_StayID | int | ER_Stay | primary | |
| visitID | int | ER_Stay | foreign | ER_stay.visitID references visit.visitID |
| patientID | int | ER_Stay | foreign | ER_stay.patientID references patient.patientID |

| | | | | |
|--------------------|-----|----------------------|----------------------------|--|
| bedID | int | ER_Stay | foreign | ER_Stay.bedID references bed.bedID |
| ER_Prescription ID | int | ER_Prescription | primary | |
| ER_StayID | int | ER_Prescription | foreign | ER_prescription.ER_StayID references ER_Stay.ER_StayID |
| docID | int | ER_prescription | Foreign | ER_prescription.docID references doctor.workerID |
| ER_StayID | int | nurse_bed_assignment | Foreign | nurse_bed_assignment.ER_Stay ID references ER_Stay.ER_StayID |
| bedID | int | nurse_bed_assignment | Composite Primary, foreign | nurse_bed_assignment.bedID references bed.bedID |
| nurseID | int | nurse_bed_assignment | Composite Primary, foreign | nurse_bed_assignment.nurseID references nurse.workerID |
| shiftID | int | nurse_bed_assignment | Composite Primary, foreign | nurse_bed_assignment.shiftID references shift.shiftID |
| ER_StayID | int | doc_bed_assignment | Foreign | doc_bed_assignment.ER_StayID references ER_Stay.ER_StayID |
| bedID | int | doc_bed_assignment | Composite Primary, foreign | doc_bed_assignment.bedID references bed.bedID |
| docID | int | doc_bed_assignment | Composite Primary, foreign | doc_bed_assignment.nurseID references doctor.workerID |
| shiftID | int | doc_bed_assignment | Composite Primary, foreign | doc_bed_assignment.shiftID references shift.shiftID |

address:

| addressID | personID | country | province | city | Street | hnumber |
|-----------|----------|---------|------------|---------------|-------------|---------|
| 1 | 1 | USA | California | Los Angeles | Sunset Blvd | 115 |
| 2 | 2 | USA | California | San Francisco | Market St | 116 |

FK: address.personID references person.personID

bed:

| bedID | currently_occupied |
|-------|--------------------|
| 1 | 0 |
| 2 | 1 |
| 3 | 0 |

doc_bed_assignment

| ER_StayID | bedID | docID | shiftID |
|-----------|-------|-------|---------|
| 1 | 1 | 11 | 39 |
| 2 | 2 | 12 | 40 |

FK:

doc_bed_assignment.ER_StayID references ER_stay.ER_StayID

doc_bed_assignment.bedID references ER_Stay.bedID

doc_bed_assignment.docID references worker.workerID

doc_bed_assignment.shiftID references shift.shiftID

doctor

| workerID | specialization |
|----------|----------------|
| 11 | Cardiology |
| 12 | Neurology |

FK: doctor.workID references worker.workID

email:

| | personID | email |
|--|----------|-------------------------|
| | 1 | john.doe1@example.com |
| | 1 | test@gmail.com |
| | 2 | jane.smith2@example.com |

FK: email.personID references person.personID

ER_Prescription

| | ER_prescripID | ER_StayID | medName | dosage | times_per_day | duration | notes | docID |
|--|---------------|-----------|-----------|--------|---------------|----------|------------------|-------|
| | 1 | 2 | Aspirin | 500mg | 2 | 5 days | For pain relief | 11 |
| | 2 | 4 | Ibuprofen | 400mg | 3 | 7 days | For inflammation | 12 |

FK: prescription.ER_StayID references ER_Stay.ER_StayID

ER_Stay

| | ER_StayID | visitID | patientID | bedID | timeOfConsultation |
|--|-----------|---------|-----------|-------|---------------------|
| | 1 | 55 | 2 | 1 | 2025-03-01 15:04:57 |
| | 2 | 56 | 3 | 2 | 2025-03-02 12:01:36 |
| | 3 | 57 | 4 | 3 | 2025-03-02 12:40:38 |

FK:

ER_Stay.visitID references visit.visitID

ER_Stay.patientID references patient.patientID

ER_Stay.bedID references bed.bedID

nurse

| | workerID |
|--|----------|
| | 4 |
| | 5 |
| | 6 |

FK: nurse.workerID references worker.workerID

nurse_bed_assignment:

| ER_StayID | bedID | nurseID | shiftID |
|-----------|-------|---------|---------|
| 1 | 1 | 4 | 39 |
| 2 | 2 | 5 | 40 |

FK:

nurse_bed_assignment.ER_StayID references ER_stay.ER_StayID

nurse_bed_assignment.bedID references ER_Stay.bedID

nurse_bed_assignment.nurseID references worker.workerID

nurse_bed_assignment.shiftID references shift.shiftID

patient:

| patientID | personID |
|-----------|----------|
| 1 | 1 |
| 2 | 2 |
| 26 | 3 |

FK: patient.personID references person.personID

person

| personID | fname | lname | mname | DoB |
|----------|-------|-------|---------|------------|
| 1 | John | Doe | William | 1980-05-15 |
| 2 | Jane | Smith | Marie | 1992-02-22 |

phoneNumber

| personID | phoneNum |
|----------|----------|
| 1 | 555-0101 |
| 2 | 555-0102 |

FK: phoneNumber.personID references person.personID

receptionist

| workerID |
|----------|
| 1 |
| 2 |
| 3 |

receptionist.workerID references worker.workerID

send_home_interaction:

| interactionID | visitID | docID | notes | timeOfConsultation |
|---------------|---------|-------|--------------------------------------|---------------------|
| 1 | 78 | 11 | Fever. Just needs sleep | 2025-03-05 23:06:30 |
| 2 | 75 | 12 | referred to specialist at later date | 2025-03-05 19:16:08 |

FK:

send_home_interaction.visitID references visit.visitID

send_home_interaction.docID references worker.workerID

shift

| shiftID | start_time | end_time | start_date | end_date | triageID |
|---------|------------|----------|------------|------------|----------|
| 39 | 08:00:00 | 16:00:00 | 2025-03-01 | 2025-03-01 | 11 |
| 40 | 16:00:00 | 00:00:00 | 2025-03-01 | 2025-03-02 | 12 |
| 41 | 00:00:00 | 08:00:00 | 2025-03-02 | 2025-03-02 | 13 |

shift_assignment

| workerID | shiftID | role |
|----------|---------|--------------|
| 1 | 39 | receptionist |
| 1 | 41 | receptionist |
| 1 | 42 | receptionist |

FK:

shift_assignment.shiftID references shift.shiftID

shift_assignment.workerID references worker.workerID

take_home_prescription

| take_home_prescriptionID | visitID | docID | medName | dosage | times_per_day | duration | notes | timeOfConsultation |
|--------------------------|---------|-------|-------------|--------|---------------|----------|---|---------------------|
| 1 | 54 | 11 | Amoxicillin | 500mg | 3 | 7 days | Take with food to avoid stomach upset | 2025-03-01 08:54:31 |
| 2 | 62 | 12 | Ibuprofen | 200mg | 2 | 5 days | For pain relief, take every 4-6 hours as needed | 2025-03-03 16:42:50 |

FK:

take_home_prescription.visitID references visit.visitID

take_home_prescription.docID references worker.workerID

Visit

| visitID | shiftID | patientID | receptionistID | outcome | admission_datetime | discharge_datetime |
|---------|---------|-----------|----------------|------------------------|---------------------|---------------------|
| 54 | 43 | 1 | 2 | TAKE_HOME_PRESCRIPTION | 2025-03-01 08:15:00 | 2025-03-01 16:45:00 |
| 55 | 50 | 2 | 3 | ER_STAY | 2025-03-01 09:45:00 | 2025-03-01 17:50:00 |

FK:

visit.shiftID references shift.shiftID

visit.patientID references patient.patientID

visit.receptionistID references worker.workerID

worker

| workerID | personID |
|----------|----------|
| 4 | 3 |
| 10 | 4 |

FK: worker.personID references person.personID

Report:

1. Staff Management

Shift Schedule Report

- List of all shifts with assigned receptionists, nurses, and doctors.
- Include shift start and end times.
- Identify the triage doctor for each shift.

The screenshot shows a database query editor with the following details:

SQL Query (Text View):

```
-- get all workers per each shift;
SELECT
    s.shiftID,
    s.start_date,
    s.end_date,
    s.start_time,
    s.end_time,
    p_triaje.fname AS triage_doc_firstname,
    p_triaje.lname AS triage_doc_lastname,
    sa.role,
    p_worker.fname AS worker_firstname,
    p_worker.lname AS worker_lastname
FROM shift s
LEFT JOIN worker triage ON s.triageID = triage.workerID
LEFT JOIN person p_triaje ON triage.personID = p_triaje.personID
LEFT JOIN shift_assignment sa ON s.shiftID = sa.shiftID
LEFT JOIN worker w ON sa.workerID = w.workerID
LEFT JOIN person p_worker ON w.personID = p_worker.personID
ORDER BY s.start_date, s.start_time, sa.role;
```

Result Grid (Table View):

| shiftID | start_date | end_date | start_time | end_time | triage_doc_firstname | triage_doc_lastname | worker_role | worker_firstname | worker_lastname |
|---------|------------|------------|------------|----------|----------------------|---------------------|---------------|------------------|-----------------|
| 39 | 2025-03-01 | 2025-03-01 | 08:00:00 | 16:00:00 | Pamela | Garcia | nurse | Alice | Johnson |
| 39 | 2025-03-01 | 2025-03-01 | 08:00:00 | 16:00:00 | Pamela | Garcia | nurse | Quincy | Martinez |
| 39 | 2025-03-01 | 2025-03-01 | 08:00:00 | 16:00:00 | Pamela | Garcia | receptionist | Rachel | Roberts |
| 39 | 2025-03-01 | 2025-03-01 | 08:00:00 | 16:00:00 | Pamela | Garcia | receptionist | David | Martinez |
| 39 | 2025-03-01 | 2025-03-01 | 08:00:00 | 16:00:00 | Pamela | Garcia | case doctor | Amanda | Hill |
| 39 | 2025-03-01 | 2025-03-01 | 08:00:00 | 16:00:00 | Pamela | Garcia | case doctor | Liam | Jackson |
| 39 | 2025-03-01 | 2025-03-01 | 08:00:00 | 16:00:00 | Pamela | Garcia | triage doctor | Pamela | Garcia |
| 40 | 2025-03-01 | 2025-03-02 | 16:00:00 | 00:00:00 | Amanda | Hill | nurse | Xander | Scott |
| 40 | 2025-03-01 | 2025-03-02 | 16:00:00 | 00:00:00 | Amanda | Hill | nurse | Wendy | Young |
| 40 | 2025-03-01 | 2025-03-02 | 16:00:00 | 00:00:00 | Amanda | Hill | receptionist | David | Martinez |
| 40 | 2025-03-01 | 2025-03-02 | 16:00:00 | 00:00:00 | Amanda | Hill | receptionist | Jack | Anderson |
| 40 | 2025-03-01 | 2025-03-02 | 16:00:00 | 00:00:00 | Amanda | Hill | case doctor | Grace | Wilson |
| 40 | 2025-03-01 | 2025-03-02 | 16:00:00 | 00:00:00 | Amanda | Hill | triage doctor | Amanda | Hill |
| 41 | 2025-03-02 | 2025-03-02 | 00:00:00 | 08:00:00 | Liam | Jackson | nurse | Felix | Adams |
| 41 | 2025-03-02 | 2025-03-02 | 00:00:00 | 08:00:00 | Liam | Jackson | nurse | Benjamin | Green |

Relational Algebra #1:

Let:

- **S** = shift
- **T** = worker (used as the triage doctor)
- **PT** = person (for triage doctor details)
- **SA** = shift_assignment
- **W** = worker (used for the general assignment)
- **PW** = person (for assigned worker details)

1. Join shift with triage worker

$R_1 = S \bowtie (S.\text{triageID} = T.\text{workerID}) T$

2. Join triage worker with person for triage doctor

$R_2 = R_1 \bowtie (T.\text{personID} = PT.\text{personID}) PT$

3. Join shift with shift_assignment

$R_3 = R_2 \bowtie (S.\text{shiftID} = SA.\text{shiftID}) SA$

4. Join shift_assignment with worker for assigned worker

$R_4 = R_3 \bowtie (SA.\text{workerID} = W.\text{workerID}) W$

5. Join that worker with person

$R_5 = R_4 \bowtie (W.\text{personID} = PW.\text{personID}) PW$

6. Project the desired attributes and sort by start_date, start_time, and worker role:

Result = $\tau(S.\text{start_date}, S.\text{start_time}, SA.\text{role}) (\pi(S.\text{shiftID}, S.\text{start_date}, S.\text{end_date}, S.\text{start_time}, S.\text{end_time}, PT.\text{fname}, PT.\text{lname}, SA.\text{role}, PW.\text{fname}, PW.\text{lname}) (R_5))$

Worker Availability Report

- A summary of workers (receptionists, nurses, and doctors) and their assigned shifts.

Find Replace Found match ⏪ ⏩ Q~ visit

```

-- get all workers per each shift:
SELECT
    s.shiftID,
    s.start_date,
    s.end_date,
    s.start_time,
    s.end_time,
    p_triage.fname AS triage_doc_firstname,
    p_triage.lname AS triage_doc_lastname,
    sa.role,
    p_worker.fname AS worker_firstname,
    p_worker.lname AS worker_lastname
FROM shift s
LEFT JOIN worker triage ON s.triageID = triage.workerID
LEFT JOIN person p_triage ON triage.personID = p_triage.personID
LEFT JOIN shift_assignment sa ON s.shiftID = sa.shiftID
LEFT JOIN worker w ON sa.workerID = w.workerID
LEFT JOIN person p_worker ON w.personID = p_worker.personID
ORDER BY s.start_date, s.start_time, sa.role;

```

75% 32:927

Result Grid Filter Rows: Search Export:

| shiftID | start_date | end_date | start_time | end_time | triage_doc_firstname | triage_doc_lastname | worker_role | worker_firstname | worker_lastname |
|---------|------------|------------|------------|----------|----------------------|---------------------|---------------|------------------|-----------------|
| 39 | 2025-03-01 | 2025-03-01 | 08:00:00 | 16:00:00 | Pamela | Garcia | nurse | Alice | Johnson |
| 39 | 2025-03-01 | 2025-03-01 | 08:00:00 | 16:00:00 | Pamela | Garcia | nurse | Quincy | Martinez |
| 39 | 2025-03-01 | 2025-03-01 | 08:00:00 | 16:00:00 | Pamela | Garcia | receptionist | Rachel | Roberts |
| 39 | 2025-03-01 | 2025-03-01 | 08:00:00 | 16:00:00 | Pamela | Garcia | receptionist | David | Martinez |
| 39 | 2025-03-01 | 2025-03-01 | 08:00:00 | 16:00:00 | Pamela | Garcia | case doctor | Amanda | Hill |
| 39 | 2025-03-01 | 2025-03-01 | 08:00:00 | 16:00:00 | Pamela | Garcia | case doctor | Liam | Jackson |
| 39 | 2025-03-01 | 2025-03-01 | 08:00:00 | 16:00:00 | Pamela | Garcia | triage doctor | Pamela | Garcia |
| 40 | 2025-03-01 | 2025-03-02 | 16:00:00 | 00:00:00 | Amanda | Hill | nurse | Xander | Scott |
| 40 | 2025-03-01 | 2025-03-02 | 16:00:00 | 00:00:00 | Amanda | Hill | nurse | Wendy | Young |
| 40 | 2025-03-01 | 2025-03-02 | 16:00:00 | 00:00:00 | Amanda | Hill | receptionist | David | Martinez |
| 40 | 2025-03-01 | 2025-03-02 | 16:00:00 | 00:00:00 | Amanda | Hill | receptionist | Jack | Anderson |
| 40 | 2025-03-01 | 2025-03-02 | 16:00:00 | 00:00:00 | Amanda | Hill | case doctor | Grace | Wilson |
| 40 | 2025-03-01 | 2025-03-02 | 16:00:00 | 00:00:00 | Amanda | Hill | triage doctor | Amanda | Hill |
| 41 | 2025-03-02 | 2025-03-02 | 00:00:00 | 08:00:00 | Liam | Jackson | nurse | Felix | Adams |
| 41 | 2025-03-02 | 2025-03-02 | 00:00:00 | 08:00:00 | Liam | Jackson | nurse | Benjamin | Green |

Result 82

- Identify workers who have no assigned shifts in a given period.

```

947          -- find workers without a shift
948 •      SELECT w.workerID, p.fname, p.lname
949      FROM worker w
950      JOIN person p ON w.personID = p.personID
951      WHERE w.workerID NOT IN (
952          SELECT DISTINCT sa.workerID
953          FROM shift_assignment sa
954          JOIN shift s ON sa.shiftID = s.shiftID
955          WHERE s.start_date BETWEEN '2025-03-01' AND '2025-03-01'
956      );
957
958
959

```

75% 1:957

Result Grid Filter Rows: Search Export:

| | workerID | fname | lname |
|----|----------|--------|-------|
| 10 | Bob | Brown | |
| 15 | Ian | Taylor | |
| 9 | Benjamin | Green | |
| 8 | Felix | Adams | |

Staff workload report

- Number of shifts assigned to each doctor, nurse, and receptionist.

```
959          -- total shifts per worker
960 •      SELECT
961          w.workerID,
962          p.fname,
963          p.lname,
964          CASE
965              WHEN sa.role IN ('case doctor', 'triage doctor') THEN 'doctor'
966              ELSE sa.role
967          END AS role,
968          COUNT(sa.shiftID) AS total_shifts
969      FROM worker w
970      JOIN person p ON w.personID = p.personID
971      LEFT JOIN shift_assignment sa ON w.workerID = sa.workerID
972      LEFT JOIN shift s ON sa.shiftID = s.shiftID
973      WHERE s.start_date BETWEEN '2025-03-01' AND '2025-03-05'
974      GROUP BY w.workerID, p.fname, p.lname, role
975      ORDER BY total_shifts DESC;
976
```

75%

18:967

Result Grid Filter Rows: Search Export:

| workerID | fname | lname | role | total_shifts |
|----------|----------|----------|--------------|--------------|
| 2 | David | Martinez | receptionist | 10 |
| 1 | Rachel | Roberts | receptionist | 9 |
| 3 | Jack | Anderson | receptionist | 9 |
| 4 | Alice | Johnson | nurse | 4 |
| 5 | Quincy | Martinez | nurse | 4 |
| 12 | Amanda | Hill | doctor | 4 |
| 13 | Liam | Jackson | doctor | 4 |
| 6 | Xander | Scott | nurse | 4 |
| 7 | Wendy | Young | nurse | 4 |
| 14 | Grace | Wilson | doctor | 4 |
| 8 | Felix | Adams | nurse | 4 |
| 9 | Benjamin | Green | nurse | 4 |
| 10 | Bob | Brown | nurse | 4 |
| 11 | Pamela | Garcia | doctor | 3 |
| 12 | Amanda | Hill | doctor | 3 |

Result 88

- Total shifts worked per worker within a specific timeframe.

```

978
979          -- shifts within a more specific time frame
980 •   SELECT
981          w.workerID,
982          p.fname,
983          p.lname,
984          CASE
985              WHEN sa.role IN ('case doctor', 'triage doctor') THEN 'doctor'
986              ELSE sa.role
987          END AS role,
988          COUNT(sa.shiftID) AS total_shifts
989
990      FROM worker w
991      JOIN person p ON w.personID = p.personID
992      LEFT JOIN shift_assignment sa ON w.workerID = sa.workerID
993      LEFT JOIN shift s ON sa.shiftID = s.shiftID
994      WHERE s.start_date BETWEEN '2025-03-01' AND '2025-03-02'
995      GROUP BY w.workerID, p.fname, p.lname, role
996      ORDER BY total_shifts DESC;

```

75% 18:987

Result Grid Filter Rows: Search Export:

| | workerID | fname | lname | role | total_shifts | |
|--|----------|----------|----------|--------------|--------------|--|
| | 2 | David | Martinez | receptionist | 4 | |
| | 1 | Rachel | Roberts | receptionist | 3 | |
| | 3 | Jack | Anderson | receptionist | 3 | |
| | 4 | Alice | Johnson | nurse | 2 | |
| | 5 | Quincy | Martinez | nurse | 2 | |
| | 13 | Liam | Jackson | doctor | 2 | |
| | 6 | Xander | Scott | nurse | 2 | |
| | 14 | Grace | Wilson | doctor | 2 | |
| | 11 | Pamela | Garcia | doctor | 1 | |
| | 12 | Amanda | Hill | doctor | 1 | |
| | 7 | Wendy | Young | nurse | 1 | |
| | 12 | Amanda | Hill | doctor | 1 | |
| | 8 | Felix | Adams | nurse | 1 | |
| | 9 | Benjamin | Green | nurse | 1 | |
| | 11 | Pamela | Garcia | doctor | 1 | |

Result 20

- Identify overworked or underutilized workers.

```

997      -- identify underworked and overworked employees
998  ●   SELECT w.workerID, p.fname, p.lname, sa.role, COUNT(sa.shiftID) AS total_shifts,
999      CASE
1000          WHEN COUNT(sa.shiftID) > 5 THEN 'Overworked'
1001          WHEN COUNT(sa.shiftID) < 4 THEN 'Underutilized'
1002          ELSE 'Normal'
1003      END AS workload_status
1004  FROM worker w
1005  JOIN person p ON w.personID = p.personID
1006  LEFT JOIN shift_assignment sa ON w.workerID = sa.workerID
1007  LEFT JOIN shift s ON sa.shiftID = s.shiftID
1008  WHERE s.start_date BETWEEN '2025-03-01' AND '2025-03-05'
1009  GROUP BY w.workerID, p.fname, p.lname, sa.role
1010  ORDER BY total_shifts DESC;
1011
1012

```

75% | 2:997 |

Result Grid Filter Rows: Search Export:

| | workerID | fname | lname | role | total_shifts | workload_status |
|--|----------|----------|----------|---------------|--------------|-----------------|
| | 1 | Rachel | Roberts | receptionist | 9 | Overworked |
| | 3 | Jack | Anderson | receptionist | 9 | Overworked |
| | 4 | Alice | Johnson | nurse | 4 | Normal |
| | 5 | Quincy | Martinez | nurse | 4 | Normal |
| | 12 | Amanda | Hill | case doctor | 4 | Normal |
| | 13 | Liam | Jackson | case doctor | 4 | Normal |
| | 6 | Xander | Scott | nurse | 4 | Normal |
| | 7 | Wendy | Young | nurse | 4 | Normal |
| | 14 | Grace | Wilson | case doctor | 4 | Normal |
| | 8 | Felix | Adams | nurse | 4 | Normal |
| | 9 | Benjamin | Green | nurse | 4 | Normal |
| | 10 | Bob | Brown | nurse | 4 | Normal |
| | 11 | Pamela | Garcia | triage doctor | 3 | Underutilized |
| | 12 | Amanda | Hill | triage doctor | 3 | Underutilized |
| | 11 | Pamela | Garcia | case doctor | 3 | Underutilized |

2. Patient Management Report

Patient Admissions

- List of all patients admitted during a given period.
- Include the receptionist who admitted each patient
- Identify whether the patient was sent home, prescribed medication, or stayed in the ER.

```
1008 -- 2. Patient Management Report
1009 -- Patient Management Report: Patient Admissions
1010 • SELECT
1011     v.visitID,
1012     p.fname AS patient_fname,
1013     p.lname AS patient_lname,
1014     r.fname AS receptionist_fname,
1015     r.lname AS receptionist_lname,
1016     v.admission_datetime,
1017     v.discharge_datetime,
1018     v.outcome
1019 FROM visit v
1020 JOIN patient pt ON v.patientID = pt.patientID
1021 JOIN person p ON pt.personID = p.personID
1022 JOIN worker w ON v.receptionistID = w.workerID
1023 JOIN person r ON w.personID = r.personID
1024 WHERE v.admission_datetime BETWEEN '2025-03-01' AND '2025-03-05'
1025 ORDER BY v.admission_datetime;
1026
1027
```

Result Grid Filter Rows: Search Export:

| visitID | patient_fname | patient_lname | receptionist_fname | receptionist_lname | admission_datetime | discharge_datetime | outcome |
|---------|---------------|---------------|--------------------|--------------------|---------------------|---------------------|------------------------|
| 54 | John | Doe | David | Martinez | 2025-03-01 08:15:00 | 2025-03-01 16:45:00 | TAKE_HOME_PRESCRIPTION |
| 55 | Jane | Smith | Jack | Anderson | 2025-03-01 09:45:00 | 2025-03-01 17:50:00 | ER_STAY |
| 56 | Charlie | Davis | Jack | Anderson | 2025-03-02 10:10:00 | 2025-03-02 18:20:00 | ER_STAY |
| 57 | Eva | Lopez | Rachel | Roberts | 2025-03-02 11:20:00 | 2025-03-02 19:45:00 | ER_STAY |
| 58 | Frank | Miller | Rachel | Roberts | 2025-03-02 12:05:00 | 2025-03-02 20:30:00 | SEND_HOME_INTERACTION |
| 59 | Grace | Wilson | Jack | Anderson | 2025-03-02 13:30:00 | 2025-03-02 21:55:00 | ER_STAY |

Relational Algebra #2

Let:

- **V** = visit
- **PT** = patient
- **P** = person (for patient details)
- **W** = worker (for receptionist)
- **R** = person (for receptionist details)

1. Select visits in the given period

$$R_1 = \sigma(\text{admission_datetime} \geq '2025-03-01' \wedge \text{admission_datetime} \leq '2025-03-05')(V)$$

2. Join visits with patients

$R_2 = R_1 \bowtie (V.patientID = PT.patientID)PT$

3. Join patients with person

$R_3 = R_2 \bowtie (PT.personID = P.personID)P$

4. Join visits with worker to get receptionistID

$R_4 = R_3 \bowtie (V.receptionistID = W.workerID) W$

5. Join worker with person to get receptionist names

$R_5 = R_4 \bowtie (W.personID = R.personID)R$

6. Project the desired attributes and sort by admission_datetime

Result = $\tau(\text{admission_datetime})(\pi(V.visitID, P.fname, P.lname, R.fname, R.lname, V.admission_datetime, V.discharge_datetime, V.outcome)(R_5))$

ER Bed Occupancy

- List supervising nurses for each occupied bed

```
1038     -- 2. Patient Management Report: Nurse assignment
1039 •  SELECT
1040         b.bedID,
1041         p.patientID,
1042         per.fname AS patient_fname,
1043         per.lname AS patient_lname,
1044         w.workerID AS nurseID,
1045         nurse_per.fname AS nurse_fname,
1046         nurse_per.lname AS nurse_lname
1047     FROM bed b
1048     JOIN ER_Stay er ON b.bedID = er.bedID
1049     JOIN patient p ON er.patientID = p.patientID
1050     JOIN person per ON p.personID = per.personID
1051     JOIN nurse_bed_assignment nba ON er.ER_StayID = nba.ER_StayID
1052     JOIN worker w ON nba.nurseID = w.workerID
1053     JOIN person nurse_per ON w.personID = nurse_per.personID
1054 WHERE b.currently_occupied = TRUE;
1055
```

75% | 45:1050

| Result Grid | | | | | | | |
|-------------|-------|-----------|---------------|---------------|----------|-------------|-------------|
| | bedID | patientID | patient_fname | patient_lname | nurseID | nurse_fname | nurse_lname |
| 2 | 3 | Charlie | Davis | 5 | Quincy | Martinez | |
| 6 | 13 | Victor | Walker | 9 | Benjamin | Green | |
| 7 | 16 | Clara | King | 10 | Bob | Brown | |
| 10 | 11 | Tina | Rodriguez | 6 | Xander | Scott | |
| 11 | 14 | Yvonne | Adams | 7 | Wendy | Young | |
| 13 | 25 | Monique | Collins | 9 | Benjamin | Green | |

- Track occupied and available beds in the ER.

```
1034
1035 -- 2. Patient Management Report: Bed Occupancy
1036 • select * from bed;
1037
```

1038
75% | 1:1034

Result Grid Filter Rows: Search Edit: Export

| | bedID | currently_occupied |
|----|-------|--------------------|
| 1 | 0 | |
| 2 | 1 | |
| 3 | 0 | |
| 4 | 0 | |
| 5 | 0 | |
| 6 | 1 | |
| 7 | 1 | |
| 8 | 0 | |
| 9 | 0 | |
| 10 | 1 | |
| 11 | 1 | |
| 12 | 0 | |
| 13 | 1 | |
| 14 | 1 | |
| 15 | 0 | |

- Identify patients currently assigned to beds and their case doctors.

```
1056 -- 2. Patient Management: Doctor assignment  
1057 •   SELECT  
1058     b.bedID,  
1059     p.patientID,  
1060     per.fname AS patient_fname,  
1061     per.lname AS patient_lname,  
1062     w.workerID AS doctorID,  
1063     doc_per.fname AS doctor_fname,  
1064     doc_per.lname AS doctor_lname  
1065   FROM bed b  
1066   JOIN ER_Stay er ON b.bedID = er.bedID  
1067   JOIN patient p ON er.patientID = p.patientID  
1068   JOIN person per ON p.personID = per.personID  
1069   JOIN doc_bed_assignment dba ON er.ER_StayID = dba.ER_StayID  
1070   JOIN worker w ON dba.docID = w.workerID  
1071   JOIN person doc_per ON w.personID = doc_per.personID  
1072 WHERE b.currently_occupied = TRUE;  
1073
```

| Patient Record Analysis | | | | | | |
|-------------------------|------------|-----------------------|-----------|-------------------|-----------------|------------------------------|
| Patient Demographics | | Medical History | | | Treatment Plan | |
| Index | Patient ID | First Name | Last Name | Diagnosis | Medication | Notes |
| 1 | 1 | Alice | Johnson | Hypertension | ACE Inhibitors | Controlled blood pressure |
| 2 | 2 | Charlie | Davis | Diabetes | Sulfonylureas | Better glucose control |
| 3 | 3 | Victor | Walker | Chronic Pain | Narcotics | Relief from pain |
| 4 | 4 | Clara | King | Osteoporosis | Bisphosphonates | Strengthening bones |
| 5 | 5 | Tina | Rodriguez | Obesity | Orlistat | Weight loss support |
| 6 | 6 | Yvonne | Adams | Hypothyroidism | Levothyroxine | Normalizing thyroid function |
| 7 | 7 | Monique | Collins | Depression | Citalopram | Improving mood |
| 8 | 8 | Overall Health Status | | Treatment Summary | | |
| 9 | 9 | Patient Satisfaction | | Next Steps | | |
| 10 | 10 | Conclusion | | Final Notes | | |

Medication Prescription Report

- List of all medications prescribed to patients.
- Include dosage, frequency, and duration.
- Identify the prescribing doctor

```

1076
1077     visitID,
1078     docID,
1079     medName,
1080     dosage,
1081     times_per_day,
1082     duration,
1083     notes,
1084     'take_home_prescription' AS prescription_type
1085 FROM take_home_prescription
1086 UNION ALL
1087
1088     ER_Stay.visitID, -- Join ER_Stay to get the visitID
1089     ER_prescription.docID,
1090     ER_prescription.medName,
1091     ER_prescription.dosage,
1092     ER_prescription.times_per_day,
1093     ER_prescription.duration,
1094     ER_prescription.notes,
1095     'ER_prescription' AS prescription_type
1096 FROM ER_prescription
1097 JOIN ER_Stay ON ER_prescription.ER_StayID = ER_Stay.ER_StayID;
1098 --- ---
1099
1100 -- administering_nurse

```

50% | 43:1095 |

Result Grid Filter Rows: Search Export:

| visitID | ... | medName | dosage | times_per_day | duration | notes | prescription_type |
|---------|-----|-------------|--------|---------------|----------|---|------------------------|
| 54 | 11 | Amoxicillin | 500mg | 3 | 7 days | Take with food to avoid stomach upset | take_home_prescription |
| 56 | 11 | Aspirin | 500mg | 2 | 5 days | For pain relief | ER_prescription |
| 62 | 12 | Ibuprofen | 200mg | 2 | 5 days | For pain relief, take every 4-6 hours as needed | take_home_prescription |

- Identify the administering nurse

```

-- --
1077     -- administering nurse
1078 • SELECT
1079     erp.medName,
1080     erp.dosage,
1081     erp.times_per_day,
1082     erp.duration,
1083     erp.notes,
1084     nurse.workerID AS administering_nurse_ID,
1085     nurse_per.fname AS nurse_fname,
1086     nurse_per.lname AS nurse_lname
1087 FROM ER_prescription erp
1088 JOIN ER_Stay ers ON erp.ER_StayID = ers.ER_StayID
1089 JOIN nurse_bed_assignment nba ON ers.ER_StayID = nba.ER_StayID
1090 JOIN shift s ON nba.shiftID = s.shiftID -- Ensures nurse was working during the ER stay
1091 JOIN worker nurse ON nba.nurseID = nurse.workerID
1092 JOIN person nurse_per ON nurse.personID = nurse_per.personID;
1093
1094

```

75% | 38:1075 |

Result Grid Filter Rows: Search Export:

| medName | dosage | times_per_day | duration | notes | administering_nurse_ID | nurse_fname | nurse_lname |
|-------------|--------|---------------|----------|------------------------|------------------------|-------------|-------------|
| Paracetamol | 500mg | 4 | 3 days | For fever reduction | 10 | Bob | Brown |
| Amoxicillin | 250mg | 2 | 10 days | Antibiotic treatment | 9 | Benjamin | Green |
| Omeprazole | 20mg | 1 | 7 days | For stomach ulcers | 8 | Felix | Adams |
| Ibuprofen | 400mg | 3 | 7 days | For inflammation | 7 | Wendy | Young |
| Loperamide | 2mg | 2 | 4 days | For diarrhea treatment | 7 | Wendy | Young |
| Aspirin | 500mg | 2 | 5 days | For pain relief | 5 | Quincy | Martinez |
| Cetirizine | 10mg | 1 | 5 days | For allergic reactions | 5 | Quincy | Martinez |

Relational Algebra #3

Let:

- $\text{ERP} = \text{ER_prescription}$
- $\text{ERS} = \text{ER_Stay}$
- $\text{NBA} = \text{nurse_bed_assignment}$
- $\text{S} = \text{shift}$
- $\text{W} = \text{worker}$
- $\text{P} = \text{person}$

1. Join ER_prescription and ER_Stay

$$R_1 = \text{ERP} \bowtie (\text{ERP.ER_StayID} = \text{ERS.ER_StayID}) \text{ ERS}$$

2. Join ER_Stay and nurse_bed_assignment

$$R_2 = R_1 \bowtie (\text{ERS.ER_StayID} = \text{NBA.ER_StayID}) \text{ NBA}$$

3. Join nurse_bed_assignment with shift

$$R_3 = R_2 \bowtie (\text{NBA.shiftID} = \text{S.shiftID}) \text{ S}$$

4. Join nurse_bed_assignment and worker

$$R_4 = R_3 \bowtie (\text{NBA.workerID} = \text{worker.workerID}) \text{ W}$$

5. Join worker and person

$$R_5 = R_4 \bowtie (\text{W.personID} = \text{P.personID}) \text{ P}$$

6. Project

$$\text{Result} = \pi(\text{ERP.medname}, \text{ERP.dosage}, \text{ERP.times_per_day}, \text{ERP.duration}, \text{ERP.notes}, \text{W.workerID}, \text{nurse.fname}, \text{nurse.lname})(R_5)$$

3. Performance & Quality Control Reports

Patient Treatment Time Report

- Time taken from patient admission to triage doctor consultation.

```
1094 -- 3. Performance & Quality Control Reports
1095 -- 3. Pefomarncce & Quality Control Reports: Patient Treatment Time Report
1096 -- time between admission and consultation
1097 • SELECT
1098     v.visitID,
1099     p.fname AS patient_fname,
1100     p.lname AS patient_lname,
1101     v.admission_datetime,
1102     COALESCE(shi.timeOfConsultation, thp.timeOfConsultation, er.timeOfConsultation) AS triage_consultation_time,
1103     TIMEDIFF(
1104         COALESCE(shi.timeOfConsultation, thp.timeOfConsultation, er.timeOfConsultation),
1105         v.admission_datetime
1106     ) AS time_to_consultation
1107 FROM visit v
1108 JOIN patient pt ON v.patientID = pt.patientID
1109 JOIN person p ON pt.personID = p.personID
1110 LEFT JOIN send_home_interaction shi ON v.visitID = shi.visitID
1111 LEFT JOIN take_home_prescription thp ON v.visitID = thp.visitID
1112 LEFT JOIN ER_stay er ON v.visitID = er.visitID
1113 WHERE v.admission_datetime BETWEEN '2025-03-01' AND '2025-03-05';
1114
1115
```

75% 44:1094

Result Grid Filter Rows: Search Export:

| visitID | patient_fname | patient_lname | admission_datetime | triage_consultation_time | time_to_consultation | |
|---------|---------------|---------------|---------------------|--------------------------|----------------------|--|
| 54 | John | Doe | 2025-03-01 08:15:00 | 2025-03-01 08:54:31 | 00:39:31 | |
| 55 | Jane | Smith | 2025-03-01 09:45:00 | 2025-03-01 15:04:57 | 05:19:57 | |
| 56 | Charlie | Davis | 2025-03-02 10:10:00 | 2025-03-02 12:01:36 | 01:51:36 | |
| 57 | Eva | Lopez | 2025-03-02 11:20:00 | 2025-03-02 12:40:38 | 01:20:38 | |
| 58 | Frank | Miller | 2025-03-02 12:05:00 | 2025-03-02 14:59:44 | 02:54:44 | |

- Average time

```
1115 -- 3. Pefomarncce & Quality Control Reports: Patient Treatment Time Report
1116 -- time between admission and consultation
1117 • SELECT
1118     AVG(TIMESTAMPDIFF(MINUTE, v.admission_datetime, v.discharge_datetime)) AS avg_time_in_ER_minutes
1119     FROM visit v
1120     WHERE v.admission_datetime BETWEEN '2025-03-01' AND '2025-03-05';
1121
1122
```

75% 1:1122

Result Grid Filter Rows: Search Export:

| |
|------------------------|
| avg_time_in_ER_minutes |
| 363.4375 |

Doctor & Nurse Efficiency

- Number of patients seen by each doctor and nurse per shift.

```
1122      -- 3. Performance & Quality Control Reports: Doctor & Nurse Efficiency
1123      -- Number of patients seen by each doctor and nurse per shift.
1124 •  SELECT
1125      sa.shiftID,
1126      w.workerID,
1127      p.fname AS worker_fname,
1128      p.lname AS worker_lname,
1129      sa.role,
1130      COUNT(DISTINCT v.visitID) AS patients_seen
1131  FROM shift_assignment sa
1132  JOIN worker w ON sa.workerID = w.workerID
1133  JOIN person p ON w.personID = p.personID
1134  JOIN shift s ON sa.shiftID = s.shiftID
1135  JOIN visit v
1136    ON v.admission_datetime BETWEEN
1137        STR_TO_DATE(CONCAT(s.start_date, ' ', s.start_time), '%Y-%m-%d %H:
1138        AND
1139        STR_TO_DATE(CONCAT(s.end_date, ' ', s.end_time), '%Y-%m-%d %H:%i:%
1140  WHERE sa.role IN ('Nurse', 'Case Doctor', 'Triage Doctor')
1141  GROUP BY sa.shiftID, w.workerID, p.fname, p.lname, sa.role
1142  ORDER BY sa.shiftID, patients_seen DESC;
1143
```

75% | 29:1127 |

Result Grid



Filter Rows:



Search

Export:



| shiftID | workerID | worker_fname | worker_... | role | patients_seen |
|---------|----------|--------------|------------|---------------|---------------|
| 44 | 8 | Felix | Adams | nurse | 1 |
| 48 | 8 | Felix | Adams | nurse | 2 |
| 51 | 8 | Felix | Adams | nurse | 3 |
| 42 | 10 | Bob | Brown | nurse | 4 |
| 45 | 10 | Bob | Brown | nurse | 3 |
| 49 | 10 | Bob | Brown | nurse | 2 |
| 52 | 10 | Bob | Brown | nurse | 7 |
| 39 | 11 | Pamela | Garcia | triage doctor | 2 |
| 44 | 11 | Pamela | Garcia | triage doctor | 1 |
| 46 | 11 | Pamela | Garcia | case doctor | 1 |
| 49 | 11 | Pamela | Garcia | triage doctor | 2 |
| 51 | 11 | Pamela | Garcia | case doctor | 3 |

Results 1-100

- Identify workload distribution among staff members.

```

1145      -- Identify workload distribution among staff members.
1146 • SELECT
1147      w.workerID,
1148      p.fname AS first_name,
1149      p.lname AS last_name,
1150      sa.role,
1151      COUNT(sa.shiftID) AS total_shifts
1152  FROM worker w
1153  JOIN person p ON w.personID = p.personID
1154  LEFT JOIN shift_assignment sa ON w.workerID = sa.workerID
1155  LEFT JOIN shift s ON sa.shiftID = s.shiftID
1156  GROUP BY w.workerID, p.fname, p.lname, sa.role
1157  ORDER BY total_shifts DESC;
1158
1159

```

75% 28:1157 |

Result Grid Filter Rows: Search Export:

| | workerID | first_name | last_name | role | total_shifts | |
|--|----------|------------|-----------|--------------|--------------|--|
| | 2 | David | Martinez | receptionist | 13 | |
| | 1 | Rachel | Roberts | receptionist | 13 | |
| | 3 | Jack | Anderson | receptionist | 12 | |
| | 4 | Alice | Johnson | nurse | 6 | |
| | 5 | Quincy | Martinez | nurse | 6 | |
| | 6 | Xander | Scott | nurse | 6 | |

Relational Algebra #4

Let:

- **W** = worker
- **P** = person
- **SA** = shift_assignment
- **S** = shift

1. Join worker and person

$$R_1 = W \bowtie (W.\text{personID} = P.\text{personID}) P$$

2. Left Outer Join with shift_assignment

$R_2 = R_1 \bowtie (W.\text{workerID} = SA.\text{workerID}) SA$

3. Left Outer Join with shift

$R_3 = R_2 \bowtie (SA.\text{shiftID} = S.\text{shiftID}) S$

4. Group and Aggregate and sort

Result = $\tau(\text{total_shifts DESC}) (\gamma_{\text{workerID}}, P.\text{fname}, P.\text{lname}, SA.\text{role}; \text{COUNT}(SA.\text{shiftID}) \rightarrow \text{total_shifts}) (R_3)$

ER Utilization

- Number of patients treated in the ER over a given period.

```
1159      -- 3. Performance & Quality Control Reports: ER Utilization
1160      -- Number of patients treated in the ER over a given period.
1161 •   SELECT COUNT(*) AS total_patients_treated
1162     FROM visit
1163     WHERE admission_datetime BETWEEN '2025-03-01' AND '2025-03-05';
1164
```

75% 11:1162 |

Result Grid Filter Rows: Search Export:

| total_patients_trea... |
|------------------------|
| 16 |

- Breakdown of cases by severity (sent home vs. admitted).

```

1165      -- Breakdown of cases by severity (sent home vs. admitted).
1166  ●  SELECT
1167      'Sent Home' AS case_outcome, COUNT(sh.visitID) AS total_cases
1168  FROM send_home_interaction sh
1169  WHERE sh.timeOfConsultation BETWEEN '2025-03-01' AND '2025-03-07'
1170
1171  UNION ALL
1172
1173  SELECT
1174      'Admitted' AS case_outcome, COUNT(er.visitID) AS total_cases
1175  FROM er_stay er
1176  WHERE er.timeOfConsultation BETWEEN '2025-03-01' AND '2025-03-07'
1177
1178  UNION ALL
1179
1180  SELECT
1181      'Prescribed Medication' AS case_outcome, COUNT(tp.visitID) AS total_cases
1182  FROM take_home_prescription tp
1183  WHERE tp.timeOfConsultation BETWEEN '2025-03-01' AND '2025-03-07';
1184

```

75% | 16:1175 |

Result Grid Filter Rows: Search Export:

| case_outcome | total_cases |
|-----------------------|-------------|
| Sent Home | 6 |
| Admitted | 13 |
| Prescribed Medication | 8 |

- Peak hours/days for patient visits.

```

1185  ●  -- Peak hours for patient visits.
1186  ●  SELECT
1187      HOUR(admission_datetime) AS hour_of_day,
1188      COUNT(*) AS patient_count
1189  FROM visit
1190  WHERE admission_datetime BETWEEN '2025-03-01' AND '2025-03-07'
1191  GROUP BY hour_of_day
1192  ORDER BY patient_count DESC;
1193

```

75% | 1:1185 |

Result Grid Filter Rows: Search Export:

| hour_of_day | patient_count |
|-------------|---------------|
| 9 | 3 |
| 8 | 2 |
| 10 | 2 |
| 11 | 2 |
| 13 | 2 |

```
1194      -- Peak days for patient visits.  
1195 •   SELECT  
1196         DATE(admission_datetime) AS visit_date,  
1197         COUNT(*) AS patient_count  
1198     FROM visit  
1199     WHERE admission_datetime BETWEEN '2025-03-01' AND '2025-03-07'  
1200     GROUP BY visit_date  
1201     ORDER BY patient_count DESC;  
1202  
1203
```

75% 29:1201 |

Result Grid Filter Rows: Search Export:

| visit_date | patient_count |
|------------|---------------|
| 2025-03-05 | 11 |
| 2025-03-03 | 5 |
| 2025-03-04 | 5 |
| 2025-03-02 | 4 |
| 2025-03-01 | 2 |

4. Contact & Administrative Reports

Worker Contact Report

- List of all workers with their phone numbers, email addresses, and home addresses.

```
1203      -- 4. Contact & Administrative Reports
1204      -- 4. Contact & Administrative Reports: Worker Contact Report
1205  •  SELECT
1206      w.workerID,
1207      p.fname,
1208      p.lname,
1209      pn.phoneNum AS phone, |
1210      e.email AS email,
1211      CONCAT(a.hnumber, ' ', a.Street, ' ', a.city, ' ', a.province, ' ', a.country) AS address
1212  FROM worker w
1213  JOIN person p ON w.personID = p.personID
1214  LEFT JOIN phoneNumber pn ON p.personID = pn.personID
1215  LEFT JOIN email e ON p.personID = e.personID
1216  LEFT JOIN address a ON p.personID = a.personID
1217  ORDER BY p.lname, p.fname;
1218
1219
```

The screenshot shows a database query results grid titled "Result Grid". The columns are labeled: workerID, fname, lname, phone, email, and address. The data includes five rows of worker information with their corresponding contact details and addresses.

| | workerID | fname | lname | phone | email | address |
|--|----------|--------|----------|----------|---------------------------|---|
| | 8 | Felix | Adams | 555-0134 | fred.garcia34@example.com | 148 Swanston St, Melbourne, Victoria, Australia |
| | 3 | Jack | Anderson | 555-0112 | jackson.lee12@example.com | 126 Saint Denis, Montreal, Quebec, Canada |
| | 10 | Bob | Brown | 555-0104 | bob.white4@example.com | 118 6th St, Austin, Texas, USA |
| | 10 | Bob | Brown | 555-0104 | bob.white4@example.com | 159 Sendlinger Str., Munich, Bavaria, Germany |
| | 11 | Pamela | Garcia | 555-0118 | paul.wright18@example.com | 132 Deansgate, Manchester, England, UK |

- Patient emergency contact list

```
1219      -- 4. Contact & Administrative Reports: Emergency Contact List
1220  •  SELECT
1221      p.personID,
1222      p.fname,
1223      p.lname,
1224      pn.phoneNum AS phone,
1225      e.email AS email,
1226      CONCAT(a.hnumber, ' ', a.Street, ' ', a.city, ' ', a.province, ' ', a.country) AS address
1227  FROM person p
1228  JOIN patient pt ON p.personID = pt.personID  -- Ensures only patients are included
1229  LEFT JOIN phoneNumber pn ON p.personID = pn.personID
1230  LEFT JOIN email e ON p.personID = e.personID
1231  LEFT JOIN address a ON p.personID = a.personID
1232  ORDER BY p.lname, p.fname;
1233
1234
1235
1236
```

The screenshot shows a database query results grid titled "Result Grid". The columns are labeled: personID, fname, lname, phone, email, and address. The data includes five rows of patient emergency contact information with their corresponding contact details and addresses.

| | personID | fname | lname | phone | email | address |
|--|----------|--------|--------|----------|------------------------------|---|
| | 27 | Yvonne | Adams | 555-0127 | yara.lopez27@example.com | 141 Smith St, Brooklyn, New York, USA |
| | 33 | Ella | Baker | 555-0133 | emily.russell33@example.com | 147 Pitt St, Sydney, New South Wales, Australia |
| | 4 | Bob | Brown | 555-0104 | bob.white4@example.com | 118 6th St, Austin, Texas, USA |
| | 4 | Bob | Brown | 555-0104 | bob.white4@example.com | 159 Sendlinger Str., Munich, Bavaria, Germany |
| | 36 | Harry | Carter | 555-0136 | hannah.johnson36@example.com | 150 Bold St, Liverpool, England, UK |

Relational Algebra #5

Let:

- P = person
- Pt = patient
- PN = phoneNumber
- E = email
- A = address

1. Select only patients by joining person with patient:

$$R_1 = P \bowtie (P.personID = Pt.personID) Pt$$

2. Left join with phoneNumber:

$$R_2 = R_1 \bowtie (P.personID = PN.personID) PN$$

3. Left join with email:

$$R_3 = R_2 \bowtie (P.personID = E.personID) E$$

4. Left join with address:

$$R_4 = R_3 \bowtie (P.personID = A.personID) A$$

5. Project and concatenate and sort

Result = $\tau_{P.lname, P.fname} (\text{Result}) (\pi_{P.personID, P.fname, P.lname, PN.phoneNum AS phone, E.email AS email, address = CONCAT(A.hnumber, ', ', A.Street, ', ', A.city, ', ', A.province, ', ', A.country)} (\text{R}_4))$