Business Problems to Solve

```
DROP TABLE IF EXISTS healthcare_patients;

CREATE TABLE healthcare_patients (
   visit_date TIMESTAMP NOT NULL,
   patient_id VARCHAR(20) PRIMARY KEY,
   patient_gender VARCHAR(10),
   patient_age INT CHECK (patient_age >= 0),
   patient_sat_score INT,
   patient_first_initial CHAR(1),
   patient_last_name VARCHAR(100),
   patient_race VARCHAR(100),
   patient_admin_flag BOOLEAN,
   patient_waittime INT CHECK (patient_waittime >= 0),
   department_referral VARCHAR(100)
);
```

1. Patient Satisfaction Analysis:

- Which departments have the highest and lowest average patient satisfaction scores?

```
WITH dept_avg AS (
   SELECT
      department_referral,
      ROUND(AVG(patient_sat_score), 2) AS avg_satisfaction,
      RANK() OVER (ORDER BY AVG(patient_sat_score) DESC) AS rank_high,
```

```
    RANK() OVER (ORDER BY AVG(patient_sat_score) ASC) AS rank_low
  FROM healthcare_patients
  WHERE department_referral != 'None'
  GROUP BY department_referral
)
SELECT department_referral, avg_satisfaction, 'Highest' AS category
FROM dept_avg
WHERE rank_high = 1
UNION ALL
SELECT department_referral, avg_satisfaction, 'Lowest' AS category
FROM dept_avg
WHERE rank_low = 1;
```

Result:

	department_referral character varying (100)	avg_satisfaction numeric	category text
1	Gastroenterology	5.80	Highest
2	Renal	4.57	Lowest

Department-level analysis shows Gastroenterology as the top-performing department with the highest average patient satisfaction (5.80), while Renal ranks lowest (4.57). This highlights areas of excellence and identifies departments where targeted interventions could improve patient experience.

2. Wait Time Efficiency:

Is there a correlation between patient wait time and satisfaction score?

```
SELECT
  ROUND(corr(patient_waittime, patient_sat_score)::NUMERIC, 3) AS correlation
FROM healthcare_patients
```

WHERE patient_waittime IS NOT NULL AND patient_sat_score IS NOT NULL;

Result

	correlation numeric
1	-0.021

Correlation analysis shows a very weak negative relationship between patient wait time and satisfaction (r = -0.021), indicating that longer waits do not strongly impact satisfaction overall.

FOLLOW-UP PROBLEM

Wait Time Buckets vs Satisfaction (Helps reveal non-linear patterns that correlation alone may miss)

```
SELECT
  CASE
    WHEN patient_waittime BETWEEN 0 AND 10 THEN '0-10 min'
    WHEN patient_waittime BETWEEN 11 AND 20 THEN '11-20 min'
    WHEN patient_waittime BETWEEN 21 AND 30 THEN '21-30 min'
    WHEN patient_waittime BETWEEN 31 AND 40 THEN '31-40 min'
    WHEN patient_waittime BETWEEN 41 AND 50 THEN '41-50 min'
    WHEN patient_waittime > 50 THEN '50+ min'
  END AS wait_time_bucket,
  COUNT(*) AS patient_count,
  ROUND(AVG(patient_sat_score)::numeric, 2) AS avg_satisfaction
FROM healthcare_patients
WHERE patient_waittime IS NOT NULL
 AND patient_sat_score IS NOT NULL
GROUP BY wait_time_bucket
```

ORDER BY MIN(patient_waittime);

Result:

	wait_time_bucket text	patient_count bigint	avg_satisfaction numeric
1	0-10 min	53	4.98
2	11-20 min	489	5.24
3	21-30 min	467	4.84
4	31-40 min	483	4.82
5	41-50 min	509	5.09
6	50+ min	516	4.97

Breaking wait times into buckets reveals nuanced patterns: satisfaction peaks for patients waiting 11–20 minutes (5.24) and 41–50 minutes (5.09), while the lowest satisfaction occurs for 31–40 minutes (4.82). This suggests that non-linear factors, such as department type or patient expectations, influence satisfaction beyond just wait time.

3. High-Risk Age Groups:

Which age groups (children, adults, seniors) visit most often, and what are their average satisfaction scores?

```
SELECT
        CASE
    WHEN patient_age BETWEEN 0 AND 17 THEN 'children'
    WHEN patient_age BETWEEN 18 AND 65 THEN 'adults'
    WHEN patient_age > 64 THEN 'seniors'
  END AS age_bucket,
        COUNT(*) AS patient_count,
  ROUND(AVG(patient_sat_score)::numeric, 2) AS avg_satisfaction
FROM healthcare_patients
WHERE patient_age IS NOT NULL
```

```
  AND patient_sat_score IS NOT NULL

GROUP BY age_bucket

ORDER BY avg_satisfaction DESC;
```

Result:

	age_bucket text	patient_count bigint	avg_satisfaction numeric
1	adults	1539	5.06
2	children	532	5.01
3	seniors	446	4.72

Analysis by age group shows that adults account for the majority of visits (1,539) with the highest average satisfaction (5.06). Children follow with 532 visits and a slightly lower satisfaction (5.01), while seniors have the fewest visits (446) and the lowest satisfaction (4.72).

This highlights potential opportunities to enhance care for seniors, who report lower satisfaction despite fewer visits, and confirms that adults are the primary patient group driving overall satisfaction metrics.

4. Racial Equity in Care:

Do patient wait times or satisfaction differ significantly by race?

```
SELECT

        patient_race,

        AVG(patient_sat_score) AS avg_satisfaction,

        AVG(patient_waittime) AS avg_waittime

FROM healthcare_patients

WHERE patient_race != 'Declined to Identify'

GROUP BY patient_race

ORDER BY avg_satisfaction DESC, avg_waittime DESC;
```

Result:

	patient_race character varying (100)	avg_satisfaction numeric	avg_waittime numeric
1	Pacific Islander	5.3265306122448980	34.6484517304189435
2	Native American/Alaska Native	5.1231884057971014	35.6927710843373494
3	African American	5.0700389105058366	35.6084059456688877
4	Asian	5.0102389078498294	35.2698113207547170
5	White	4.9359673024523161	35.1054064566316608
6	Two or More Races	4.8341346153846154	35.3577392421323057

Patient satisfaction varies across racial groups. Pacific Islanders report the highest satisfaction (5.33) with moderate wait times (~34.65 min), while patients identifying as Two or More Races have the lowest satisfaction (4.83) despite similar wait times (~35.36 min).

Average wait times are fairly consistent across groups (33–36 min), suggesting that differences in satisfaction may be influenced by factors beyond wait time, highlighting areas for equity-focused care improvements.

5. Referral Patterns:

Which departments receive the most referrals, and do they correlate with longer wait times?

```
SELECT
        department_referral,
        COUNT(department_referral) AS referral_count,
        ROUND(AVG(patient_waittime),3) AS avg_waittime
FROM healthcare_patients
WHERE department_referral != 'None'
GROUP BY department_referral
ORDER BY referral_count DESC;
```

Result:

	department_referral character varying (100)	referral_count bigint	avg_waittime numeric
1	General Practice	1840	34.913
2	Orthopedics	995	34.983
3	Physiotherapy	276	36.565
4	Cardiology	248	35.355
5	Neurology	193	36.803
6	Gastroenterology	178	35.831
7	Renal	86	34.698

Referral analysis shows General Practice receives the highest number of referrals (1,840) with moderate wait times (~34.91 min), followed by Orthopedics (995).

Interestingly, departments with lower referral volumes, such as Neurology (193 referrals) and Physiotherapy (276 referrals), experience longer average wait times (~36.8 and 36.57 min, respectively).

This suggests that high patient volume does not always lead to longer waits, and lower-volume departments may face capacity or resource constraints affecting patient flow.

6. Administrative Impact:

Do patients with patient_admin_flag = TRUE experience longer wait times or lower satisfaction?

```
SELECT
        'Admin Flag = TRUE' AS admin_status,
        AVG(patient_waittime) AS avg_waittime_flag,
        AVG(patient_sat_score) AS avg_satisfaction_flag
FROM healthcare_patients
WHERE patient_admin_flag = TRUE
UNION ALL
SELECT
        'Admin Flag = FALSE' AS admin_status,
```

```
    AVG(patient_waittime) AS avg_waittime_noflag,
    AVG(patient_sat_score) AS avg_satisfaction_noflag
FROM healthcare_patients
WHERE patient_admin_flag = FALSE;
```

Result:

	admin_status text	avg_waittime_flag numeric	avg_satisfaction_flag numeric
1	Admin Flag = TRUE	34.9679098005203816	5.0769230769230769
2	Admin Flag = FALSE	35.5523457862728063	4.9102964118564743

Patients with administrative flags (TRUE) experience slightly shorter wait times (34.97 min vs 35.55 min) and higher satisfaction (5.08 vs 4.91) compared to those without flags.

This indicates that administrative processing does not negatively impact patient experience and may reflect efficient handling or prioritization of flagged patients.

7. Top Departments by Satisfaction:

Which departments have the highest average patient satisfaction scores?

```
WITH dept_avg AS (
  SELECT
    department_referral,
    ROUND(AVG(patient_sat_score)::numeric, 2) AS avg_satisfaction
  FROM healthcare_patients
  WHERE department_referral IS NOT NULL
   AND department_referral != 'None'
  GROUP BY department_referral
)
SELECT
```

```
    department_referral,
    avg_satisfaction,
    RANK() OVER (ORDER BY avg_satisfaction DESC) AS satisfaction_rank
FROM dept_avg
ORDER BY satisfaction_rank;
```

Result:

	department_referral character varying (100)	avg_satisfaction numeric	satisfaction_rank bigint
1	Gastroenterology	5.80	1
2	Neurology	5.28	2
3	Cardiology	5.14	3
4	General Practice	5.06	4
5	Physiotherapy	4.99	5
6	Orthopedics	4.86	6
7	Renal	4.57	7

Department ranking by patient satisfaction highlights Gastroenterology as the top-performing department (5.80), followed by Neurology (5.28) and Cardiology (5.14).

Renal ranks lowest (4.57), suggesting opportunities for targeted improvements.

These rankings provide actionable insights for hospital leadership to recognize high-performing departments and focus on enhancing patient experience in lower-performing areas.

8. Trend Over Time:

How have patient satisfaction and wait times changed over months/years?

```
WITH monthly_stats AS (
    SELECT
        EXTRACT(YEAR FROM visit_date) AS year,
```

```
    EXTRACT(MONTH FROM visit_date) AS month,
    ROUND(AVG(patient_sat_score)::numeric, 2) AS avg_satisfaction,
    ROUND(AVG(patient_waittime)::numeric, 2) AS avg_waittime,
    COUNT(*) AS patient_count
  FROM healthcare_patients
  WHERE patient_sat_score IS NOT NULL
    AND patient_waittime IS NOT NULL
  GROUP BY EXTRACT(YEAR FROM visit_date), EXTRACT(MONTH FROM visit_date)
)
SELECT
  year,
  month,
  avg_satisfaction,
  avg_waittime,
  patient_count
FROM monthly_stats
ORDER BY year, month;
```

Result:

	year numeric	month numeric	avg_satisfaction numeric	avg_waittime numeric	patient_count bigint
1	2019	4	5.30	37.30	145
2	2019	5	5.16	33.87	128
3	2019	6	5.18	34.90	143
4	2019	7	4.99	35.05	115
5	2019	8	5.06	36.15	127
6	2019	9	4.98	33.30	123
7	2019	10	4.74	35.63	149
8	2019	11	5.09	34.69	140
9	2019	12	4.68	34.05	129
10	2020	1	4.96	35.10	147
11	2020	2	4.72	36.88	123
12	2020	3	5.33	35.99	119
13	2020	4	4.63	36.45	126
14	2020	5	5.15	36.66	158
15	2020	6	4.71	34.99	141
16	2020	7	4.79	36.78	146
17	2020	8	5.18	35.78	113
18	2020	9	4.91	34.69	120
19	2020	10	5.31	32.76	125

Monthly trend analysis shows that patient satisfaction fluctuates moderately between 4.63 and 5.33, while average wait times remain relatively stable around 33–37 minutes.

Peaks in satisfaction occur in March 2020 (5.33) and October 2020 (5.31), whereas the lowest satisfaction is observed in April 2020 (4.63) and December 2019 (4.68).

Patient volume per month remains consistent (113–158 patients), indicating that fluctuations in satisfaction are not driven by volume alone. These insights support seasonal planning and targeted initiatives to improve patient experience over time.