

Hospital Readmission Analysis Report

1. Executive Summary

- The current hospital-wide readmission rate remains high, reaching 47.7%, largely due to long-term returns. Among these, the most early 30-day readmissions are concentrated within young adults aged 20-30, among minority populations (Hispanic and African American groups), and elderly patients bearing chronic disease burdens.
- SQL-Driven Readmission Trends and High-Risk Cohort Analysis Clinically, the diagnosis code V58--aftercare encounters--is the strongest predictor of readmission and frequently appears in high-risk combinations. Operationally, longer length of stay, more emergency admissions, and higher overall utilization are consistently associated with a high likelihood of readmission.
- The outstanding factor is metabolic instability: patients with high glucose values, abnormal A1C, and lack of adherence to diabetes medication are at disproportionately higher risk for readmission. Some of the extreme rates arise due to small sample sizes, so the identified patterns need to be interpreted with appropriate caution.
- Overall, findings point to demographic, clinical, and utilization factors predicting readmission, hence the need to implement targeted interventions around chronic disease management, care transitions, and monitoring of high-risk patients.

2. Readmission Analysis

2.1 Hospital-wide Readmission Rate

Greater than 30 days

SELECT

CAST(SUM(CASE WHEN readmitted_flag = '<30' OR readmitted_flag = '>30' THEN 1 ELSE 0 END) AS DECIMAL) * 100 / COUNT(*) AS
ReadmissionRate

FROM fact.visits

Output :

ReadmissionRate

47.72440363197

Less than 30 days

```
SELECT
  CAST(SUM(CASE WHEN readmitted_flag = '<30' THEN 1 ELSE 0 END) AS
DECIMAL) * 100 / COUNT(*) AS ReadmissionRate
FROM fact.visits
```

ReadmissionRate

11.35694180794

Insights: The hospital's overall readmission rate of 47.72% is considerably higher than national benchmarks, and for readmission before 30 days is 11.35%

2.2 Readmission by age group

Greater than 30

Output

age_group	total_visits	readmissions	readmission_rate_percent
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[70-80)	27328	13553	49.59
[80-90)	18072	8911	49.31
[60-70)	23647	11352	48.01

[20-30)	1742	822	47.19
[40-50)	10123	4698	46.41
[50-60)	18172	8372	46.07
[30-40)	3944	1762	44.68
[90-100)	3034	1249	41.17
[10-20)	715	287	40.14
[0-10)	162	30	18.52

Less than 30 days

```

SELECT
  a.age_group,
  COUNT(*) AS total_visits,
  SUM(CASE WHEN f.readmitted_flag = '<30' THEN 1 ELSE 0 END) AS readmissions,
  CAST(
    SUM(CASE WHEN f.readmitted_flag = '<30' THEN 1 ELSE 0 END) * 100.0
    / COUNT(*)
    AS DECIMAL(10,2)
  ) AS readmission_rate_percent
FROM fact.visits f
JOIN dim.age a
  ON f.age_key = a.age_key
GROUP BY a.age_group
ORDER BY readmission_rate_percent DESC;

```

age_group	total_visits	readmissions	readmission_rate_percent
[20-30)	1742	269	15.44
[80-90)	18072	2198	12.16
[70-80)	27328	3243	11.87
[90-100)	3034	350	11.54
[30-40)	3944	454	11.51
[60-70)	23647	2694	11.39
[40-50)	10123	1088	10.75
[50-60)	18172	1803	9.92
[10-20)	715	43	6.01

[0-10)	162	3	1.85
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INSIGHTS: Young adults (20–30) have unexpectedly high early readmission, possibly due to:

- **Non-adherence**
- **Lack of aftercare due to work**
- **Lifestyle-related chronic conditions**

2.3 Readmission before 30 days by age, gender, and race

```
SELECT
    a.age_group,
    r.race,
    g.gender,
    COUNT(*) AS total_visits,
    SUM(CASE WHEN f.readmitted_flag = '<30'
THEN 1 ELSE 0 END) AS readmissions,
    CAST(
        SUM(CASE WHEN f.readmitted_flag = '<30'
THEN 1 ELSE 0 END) * 100.0
        / COUNT(*) AS DECIMAL(10,2)
    ) AS readmission_rate_percent
FROM fact.visits f
JOIN dim.age a
    ON f.age_key = a.age_key
JOIN dim.race r
    ON f.race_key = r.race_key
JOIN dim.gender g
```

ON f.gender_key = g.gender_key

GROUP BY

a.age_group,

r.race,

g.gender

ORDER BY

readmission_rate_percent DESC,

total_visits DESC;

age_group	race	gender	total_visits	readmissions	readmission_rate_percent
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[90-100)	Hispanic	Male	10		
6	60.00				
[10-20)	Other	Female	4		
1	25.00				
[80-90)	Hispanic	Male	58		
13	22.41				
[20-30)	Caucasian	Female	680		
146	21.47				
[70-80)	Asian	Male	94		
17	18.09				
[60-70)	Asian	Male	88		
14	15.91				
[40-50)	Hispanic	Male	193		
30	15.54				
[30-40)	Other	Female	53		
8	15.09				

[20-30) 57	AfricanAmerican	Female	400
14.25			
[60-70) 35	Hispanic	Female	260
13.46			
[70-80) 24	Hispanic	Male	180
13.33			
[60-70) 25	Other	Female	193
12.95			
[80-90) 12.90	Asian	Male	31 4
[30-40) 63	AfricanAmerican	Male	494
12.75			
[20-30) 22	AfricanAmerican	Male	173
12.72			
[30-40) 161	Caucasian	Female	1277
12.61			
[80-90) 11	Hispanic	Female	88
12.50			
[80-90) 1133	Caucasian	Female	9170
12.36			
[70-80) 314	AfricanAmerican	Female	2560
12.27			
[60-70) 230	AfricanAmerican	Male	1900
12.11			
[40-50) 155	AfricanAmerican	Male	1283
12.08			
[70-80) 1263	Caucasian	Male	10493
12.04			

Insights:

Hispanic males in multiple age bands show elevated risk (15–22%).

African American males 40–70 also show persistent high rates (12–15%).

Young Caucasian females (20–30) show **21.47% early readmission**

Some extreme rates occur due to **very small sample sizes** ($n < 20$).

However, across larger groups:

- **Minority males (Hispanic, African American)** show consistently higher risk.
- **Young females (20–30)** show notable early readmission.

3. Clinical Diagnosis Pattern

3.1 Top Primary Diagnoses driving Readmission

```
SELECT
TOP 10
    d1.diagnosis_code AS primary_diagnosis,
    COUNT(*) AS total_cases,
    SUM(CASE WHEN f.readmitted_flag = '<30' THEN 1 ELSE 0 END) AS readmissions,
    CAST(
        SUM(CASE WHEN f.readmitted_flag = '<30' THEN 1 ELSE 0 END) * 100.0
        / COUNT(*) AS DECIMAL(10,2)
    ) AS readmission_rate_percent
FROM fact.visits f
JOIN dim.diagnosis d1 ON f.diagnosis1_key = d1.diagnosis_key
```

GROUP BY d1.diagnosis_code

HAVING COUNT(*) > 20

ORDER BY readmission_rate_percent DESC;

primary_diagnosis	total_cases	readmissions	readmission_rate_percent

V58	232	96	41.38
281	21	7	33.33
338	21	7	33.33
204	25	8	32.00
250.43	27	8	29.63
586	22	6	27.27
250.41	97	26	26.80
340	45	11	24.44
567	63	15	23.81
250.42	95	22	23.16

Insights:

- Diagnosis Code **V58** has the highest readmission rate

3.2 Top Diagnosis Pairs (*diag_1* × *diag_2*)

```
SELECT TOP 10
    d1.diagnosis_code AS primary_diag,
    d2.diagnosis_code AS secondary_diag,
    COUNT(*) AS total_cases,
    SUM(CASE WHEN f.readmitted_flag = '<30' THEN 1 ELSE 0 END) AS
readmissions,
    CAST(
        SUM(CASE WHEN f.readmitted_flag = '<30' THEN 1 ELSE 0 END) * 100.0
        / COUNT(*) AS DECIMAL(10,2)
    ) AS readmission_rate_percent
FROM fact.visits f
JOIN dim.diagnosis d1 ON f.diagnosis1_key = d1.diagnosis_key
JOIN dim.diagnosis d2 ON f.diagnosis2_key = d2.diagnosis_key
GROUP BY d1.diagnosis_code, d2.diagnosis_code
HAVING COUNT(*) > 15
ORDER BY readmission_rate_percent DESC;
```

primary_diag	secondary_diag
total_cases	readmissions readmission_rate_percent

V58 56.25	153	16	9
V58 54.05	202	37	20
V58 47.06	197	17	8
577 42.11	250.6	19	8
V58 38.89	162	18	7
250.11 38.89	599	18	7
250.6 38.10	337	21	8
433 37.50	250.02	16	6
998 35.29	250.01	17	6
402 33.33	424	21	7

V58 combined with conditions like **153**, **202**, **197** shows extremely high early return probability.

4. Hospital Utilization Patterns

4.1 Readmission Rate by Length of Stay in Hospital

```

SELECT time_in_hospital,
COUNT(*) AS total_visits,
SUM(CASE WHEN f.readmitted_flag = '<30' THEN 1 ELSE 0 END) AS READMISSIONS,
CAST(
    SUM(CASE WHEN f.readmitted_flag = '<30' THEN 1 ELSE 0 END) * 100.0
    / COUNT(*) AS DECIMAL(10,2)
) AS readmission_rate
FROM fact.visits f
GROUP BY time_in_hospital
ORDER BY time_in_hospital

```

time_in_hospital total_visits READMISSIONS readmission_rate

1	14870	1247	8.39
2	18054	1830	10.14
3	18674	2027	10.85
4	14647	1757	12.00
5	10534	1292	12.27
6	7916	1001	12.65
7	6159	813	13.20
8	4605	663	14.40
9	3186	437	13.72
10	2477	359	14.49
11	1936	208	10.74
12	1529	210	13.73
13	1257	154	12.25
14	1095	147	13.42

Insights:

- LOS 1–4 days → 8–12% readmission
- LOS 10 days → peak **14.49%**
- LOS beyond 10 days fluctuates around 12–14%.
- Longer stays signal more complex clinical conditions.

4.2 Emergency Visits vs Readmission

```

SELECT
    f.number_emergency,
    COUNT(*) AS total_visits,

```

```

SUM(CASE WHEN f.readmitted_flag = '<30' THEN 1 ELSE 0 END) AS readmissions,
CAST(
    SUM(CASE WHEN f.readmitted_flag = '<30' THEN 1 ELSE 0 END) * 100.0
    / COUNT(*) AS DECIMAL(10,2)
) AS readmission_rate
FROM fact.visits f
GROUP BY f.number_emergency
ORDER BY f.number_emergency DESC;

```

number_emergency total_visits readmissions readmission_rate

76	2	0	0.00
64	2	2	100.00
63	2	0	0.00
54	2	0	0.00
46	2	0	0.00
42	1	0	0.00
37	1	0	0.00
29	1	0	0.00
28	1	1	100.00
25	2	0	0.00
24	1	0	0.00
22	6	3	50.00
21	2	1	50.00
20	4	2	50.00
19	4	2	50.00
18	6	1	16.67
16	6	3	50.00
15	5	2	40.00
14	4	0	0.00
13	15	5	33.33
12	11	2	18.18
11	27	6	22.22
10	40	14	35.00
9	38	13	34.21
8	56	18	32.14
7	86	21	24.42
6	109	27	24.77
5	227	53	23.35
4	422	126	29.86
3	801	161	20.10
2	2255	421	18.67

1	8306	1200	14.45
0	94492	10061	10.65

Insights :

Even one emergency visit increases early readmission risk by ~4 percentage points.

Frequent emergency utilization is a strong clinical instability marker.

Extremely high readmission percentages in high-visit categories are driven by small denominators.

4.3 Total Utilization Score and Readmission

utilization_score = num_lab + num_procedures + num_medications

```

SELECT
  (f.num_lab_procedures
   + f.num_procedures
   + f.num_medications) AS utilization_score,

  COUNT(*) AS total_visits,

  SUM(CASE WHEN f.readmitted_flag = '<30' THEN 1 ELSE 0 END) AS readmissions,

  CAST(
    SUM(CASE WHEN f.readmitted_flag = '<30' THEN 1 ELSE 0 END) * 100.0
    / COUNT(*) AS DECIMAL(10,2)
  ) AS readmission_rate
FROM fact.visits f
GROUP BY
  (f.num_lab_procedures
   + f.num_procedures
   + f.num_medications)
ORDER BY utilization_score DESC;

```

utilization_score	total_visits	readmissions	readmission_rate
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179	1	0	0.00
170	1	0	0.00
168	1	0	0.00

163	1	1	100.00
162	2	1	50.00
160	1	0	0.00
159	4	1	25.00
157	4	0	0.00
156	4	0	0.00
155	1	0	0.00
154	2	0	0.00
153	3	1	33.33

Insights :

High utilization indicates complex, multi-system patients. Some extremely high scores show 100% readmission due to tiny patient counts.

5. High Risk Cohort

5.1 Diabetic Medication

```

SELECT
  m.diabetes_med_flag AS diabetes_med_status,
  COUNT(*) AS total_visits,

  SUM(CASE WHEN f.readmitted_flag = '<30' THEN 1 END) AS total_readmissions,

  CAST(
    SUM(CASE WHEN f.readmitted_flag = '<30' THEN 1 END) * 100.0 /
    COUNT(*) AS DECIMAL(10,2)
  ) AS readmission_rate_percent

FROM fact.visits f
JOIN dim.medication_flags m
  ON m.medication_flag_key = f.medication_flag_key

GROUP BY m.diabetes_med_flag
ORDER BY readmission_rate_percent DESC;

```

diabetes_med_status	total_visits	total_readmissions	readmission_rate_percent
No	131	17	12.98
Yes	186	20	10.75

No	131	17	12.98
Yes	186	20	10.75

Insights:

- Patients not on diabetes meds have higher readmission.
- This suggests under-treatment or poor compliance.

Max Glucose Serum Flag

```

SELECT
  m.max_glu_serum AS glucose_flag,
  COUNT(*) AS total_visits,

  SUM(CASE WHEN f.readmitted_flag = '<30' THEN 1 END) AS readmissions,

  CAST(
    SUM(CASE WHEN f.readmitted_flag = '<30' THEN 1 END) * 100.0 /
    COUNT(*) AS DECIMAL(10,2)
  ) AS readmission_rate_percent

FROM fact.visits f
JOIN dim.medication_flags m
  ON m.medication_flag_key = f.medication_flag_key

GROUP BY m.max_glu_serum
ORDER BY readmission_rate_percent DESC;

```

glucose_flag	total_visits	readmissions	readmission_rate_percent
>200	74	9	12.16
>300	140	17	12.14
Norm	103	11	10.68

Insights:

- Hyperglycemia is associated with elevated readmission risk.
- Difference is modest (12–12.5% vs 10.6%), indicating:
Short-term glucose spikes matter but are not the strongest predictor.

High-Risk Cohort Combining ALL Three: DiabetesMed × Glucose × A1C

```
SELECT
    m.diabetes_med_flag,
    m.max_glu_serum,
    m.A1Cresult,

    COUNT(*) AS total_visits,
    SUM(CASE WHEN f.readmitted_flag IN ('<30','>30') THEN 1 END) AS
readmissions,

    CAST(
        SUM(CASE WHEN f.readmitted_flag IN ('<30','>30') THEN 1 END) *
100.0 /
        COUNT(*) AS DECIMAL(10,2)
    ) AS readmission_rate_percent

FROM fact.visits f
JOIN dim.medication_flags m
    ON m.medication_flag_key = f.medication_flag_key

GROUP BY
    m.diabetes_med_flag,
    m.max_glu_serum,
    m.A1Cresult

ORDER BY readmission_rate_percent DESC;

diabetes_med_flag max_glu_serum      A1Cresult
total_visits readmissions readmission_rate_percent
```

No	>200	Norm	9
5	55.56		
No	>300	>7	4
1	25.00		
Yes	Norm	>7	17
4	23.53		
No	Norm	Norm	20
3	15.00		
Yes	>200	>8	24
3	12.50		
Yes	>300	>8	80
10	12.50		
No	Norm	>8	16
2	12.50		
No	>300	>8	43
5	11.63		
Yes	>200	>7	11
1	9.09		
Yes	>300	>7	11
1	9.09		
Yes	Norm	>8	14
1	7.14		
No	Norm	>7	16
1	6.25		
No	>200	>7	9
NULL	NULL		
No	>200	>8	13
NULL	NULL		
No	>300	Norm	1
NULL	NULL		
Yes	Norm	Norm	20
NULL	NULL		
Yes	>300	Norm	1
NULL	NULL		
Yes	>200	Norm	8
NULL	NULL		

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Insights

Highest-risk combinations:

- No meds + Glucose >200 + A1C Normal → 55.56%
- Yes meds + Glucose >300 + A1C >7 → 12.50%
- Yes meds + Glucose Normal + A1C >7 → 23.53%

Interpretation

- The highest-risk categories have very small sample sizes — interpret cautiously.
- But a clear pattern emerges:

Multi-factor metabolic instability → highest readmission probability

Key drivers:

- Uncontrolled A1C (>7 or >8)
- High glucose (>200 or >300)
- Absence of diabetes medication when metabolic markers are high

