

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
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[80-90)	18072	8911	49.31
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[60-70)	23647	11352	48.01
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[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	
<hr/>			
[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)	AfricanAmerican	Female	400
57	14.25		
[60-70)	Hispanic	Female	260
35	13.46		
[70-80)	Hispanic	Male	180
24	13.33		
[60-70)	Other	Female	193
25	12.95		
[80-90)	Asian	Male	31
	12.90		4
[30-40)	AfricanAmerican	Male	494
63	12.75		
[20-30)	AfricanAmerican	Male	173
22	12.72		
[30-40)	Caucasian	Female	1277
161	12.61		
[80-90)	Hispanic	Female	88
11	12.50		
[80-90)	Caucasian	Female	9170
1133	12.36		
[70-80)	AfricanAmerican	Female	2560
314	12.27		
[60-70)	AfricanAmerican	Male	1900
230	12.11		
[40-50)	AfricanAmerican	Male	1283
155	12.08		
[70-80)	Caucasian	Male	10493
1263	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
<hr/>			
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	153	16	9
56.25			
V58	202	37	20
54.05			
V58	197	17	8
47.06			
577	250.6	19	8
42.11			
V58	162	18	7
38.89			
250.11	599	18	7
38.89			
250.6	337	21	8
38.10			
433	250.02	16	6
37.50			
998	250.01	17	6
35.29			
402	424	21	7
33.33			

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

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

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

