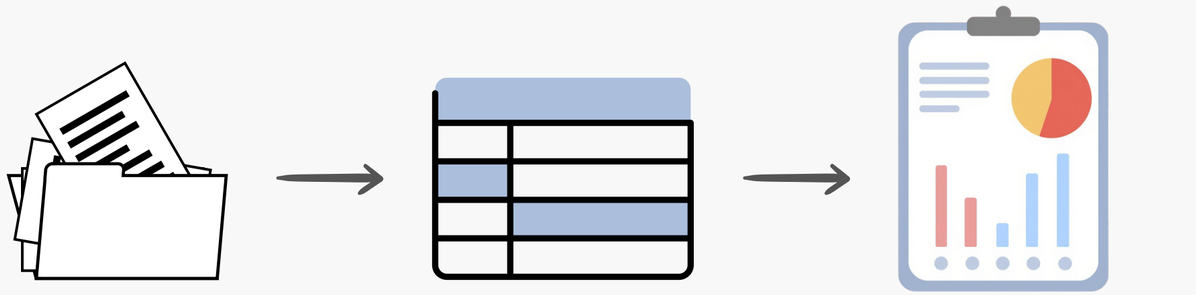
DIABETIC PATIENT READMISSION ANALYSIS

HEALTHCARE



Data Preparation → Data Analysis → Data Visualization

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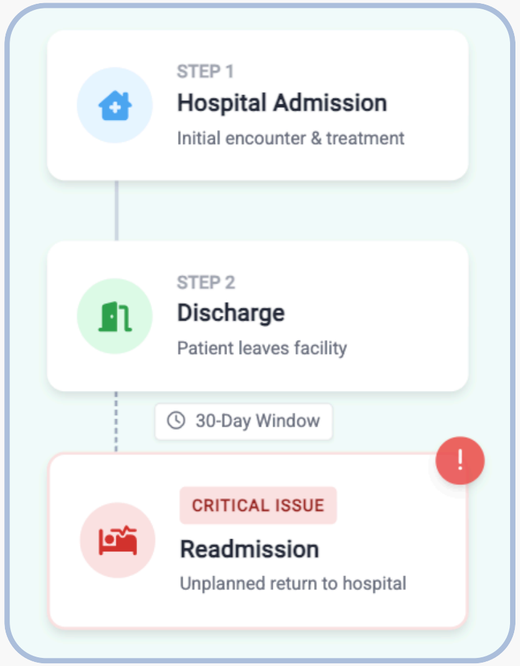
CONTEXT & PROBLEM STATEMENT

CONTEXT

> 30-day readmissions indicate significant gaps in care quality.
> Each readmission costs approximately **$11,000** per encounter.
> High rates increase financial burden and bed congestion.

Decision Maker: Hospital Administrator / Clinical Operations Head



CORE QUESTION

Which clinical, operational, and discharge factors are driving 30-day readmissions and financial loss?

OBJECTIVE

To identify actionable risk drivers that reduce readmission rate and associated cost.

30-Day Readmission Rate

13.20%

The percentage of failure. A 13.20% rate implies about 13 out of 100 patients return within a month, triggering financial penalties.

DATA ENGINEERING

DATA SOURCE

Diabetes 130-US Hospitals Dataset (1999–2008)

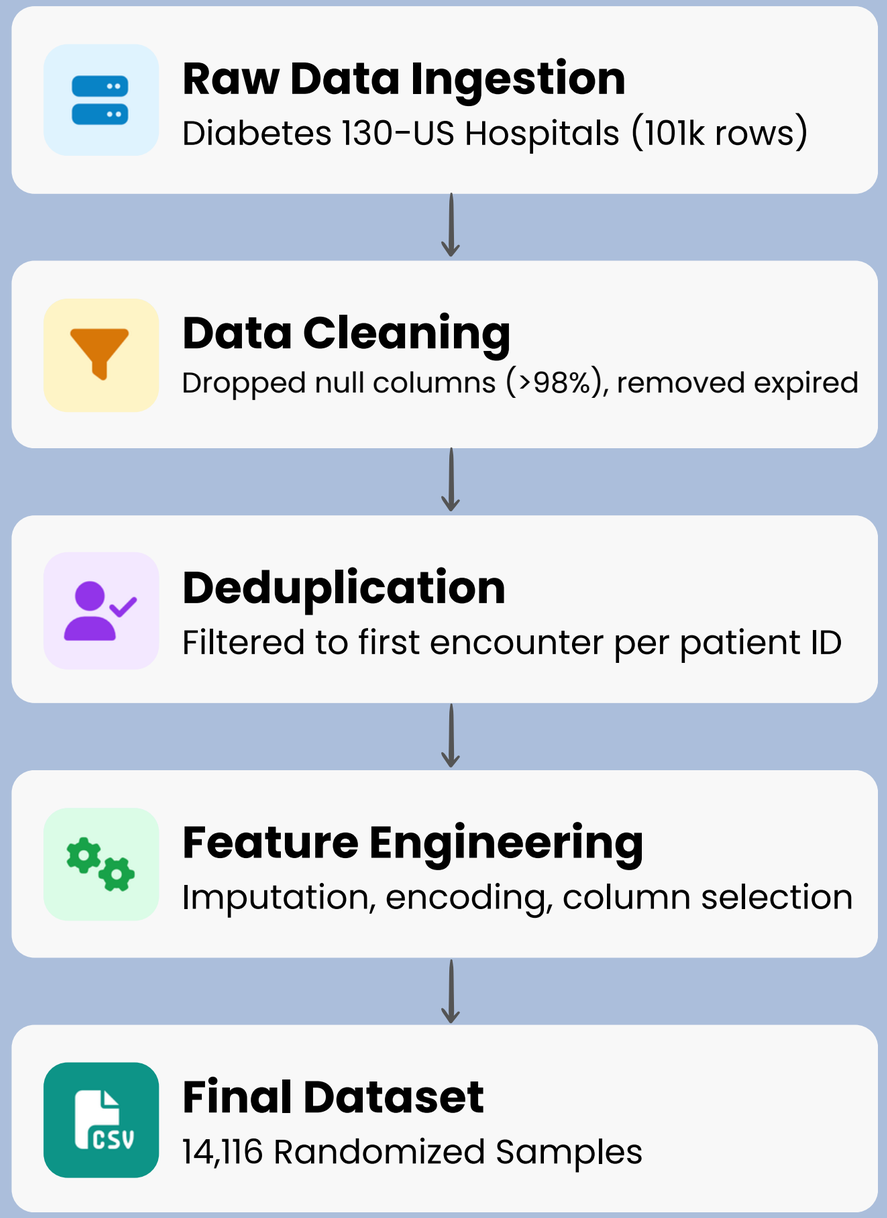
ORIGINAL VOLUME		FINAL DATASET
~101,000	→	**14,116**
Total Rows		Rows

MAJOR DATA ISSUES FIXED

- ✗ Dropped weight (>98% null) & payer_code (>40% null)
- ✗ Removed 21 irrelevant columns
- ✗ Removed expired / hospice patients, invalid gender rows
- ✓ Kept only first encounter per patient (deduplication)
- ✓ Imputed missing race & specialty values

KEY COLUMNS

`readmission` `time_in_hospital` `admission_type` `A1C_None` `age` `race` `max_glu_serum`



KPI & METRICS FRAMEWORK

Baseline performance indicators derived from historical clinical data

TOTAL PATIENTS ANALYSED

14,116

> Unique records post-deduplication

30-DAY READMISSION RATE

13.20%

> Target: **Reduce**

UNTESTED RATE (A1C NONE)

83.13%

> Patients discharged without HbA1c test

TOTAL ESTIMATED COST

$20,493,000

> Assumption: **$11,000** per readmission

KEY INSIGHTS (EDA)

1. Emergency Admissions Drive Cost

> Emergency Readmission Rate: **14.13%**
> Cost Contribution: **$12.28M**

2. Medication Instability = Higher Risk

"Change during stay signals instability"

Stable	Changed
12.18%	**14.34%**

3. Length of Stay Increases Risk

> Stay **≥ 7 days** → Readmission climbs to **16–20%**

4. SNF Discharges Are Critical Risk

Other/Transfer: **23.06%**
SNF: **17.98%**
Home: **10.51%**

5. Diabetes: High Risk + Short Stay

READMIT	AVG LOS *
13.5%	**3.6d**

→ *Possible premature discharge*

6. Elderly Patients = High Utilizers

Patients in **70–90 age** bracket drive **upward** trend.

**LOS = Length of Stay*

ADVANCED ANALYSIS

CONDITION GROUP	READMISSION RATE	TOTAL COST IMPACT	AVG LENGTH OF STAY
Diabetes Highest Risk Group	13.50% High	$0.91M	3.62 days Shortest
Circulatory Cardiovascular	13.33%	$6.18M Max Cost	4.09 days
Respiratory	12.27% Lowest	$2.64M	4.19 days
Other Mixed Conditions	13.34%	$10.75M Cumulative	4.59 days

Financial Impact Driver

Circulatory cases drive the **highest** specific cost burden ($6.18M), despite having a **moderate** length of stay.

The Efficiency Paradox

Diabetics are discharged the **fastest** (3.62 days) yet return at the **highest** rate (13.50%), suggesting **premature** discharge.

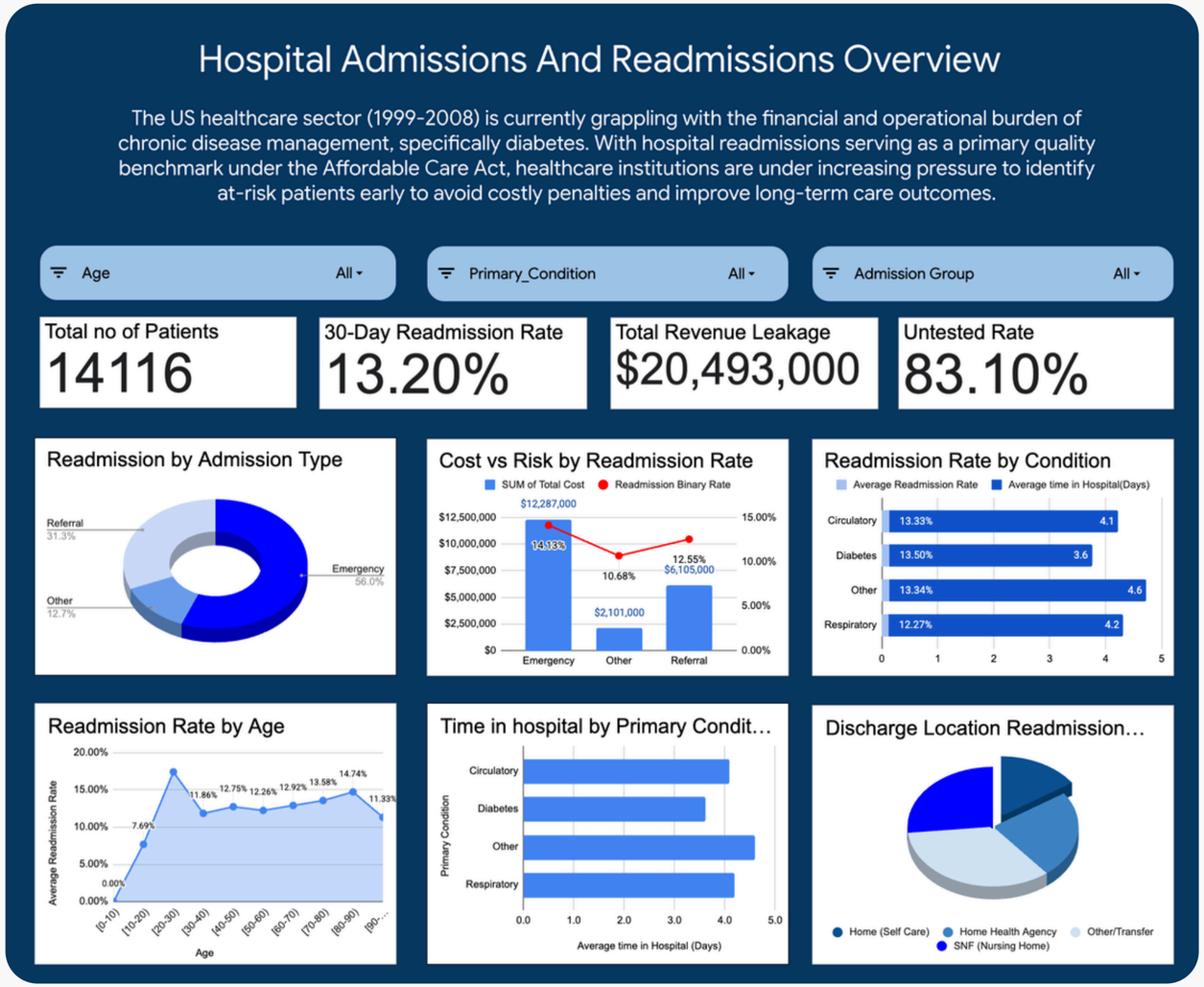
Treatment Stability Risk

Medication **instability** increases readmission risk, showing treatment consistency is **critical**.

Post-Discharge Impact

Discharge location predicts readmission better than diagnosis, emphasizing the role of **post-hospital support**.

DASHBOARD WALKTHROUGH



Executive View

Top-level KPI monitoring for instant status checks.

✓ Readmission Rate	13.20%
✓ Total Financial Cost	$20.5M
✓ Untested Rate (Gap)	83%

Operational Insights & Cost Drivers

- **Primary Cost Drivers**: Circulatory conditions are the dominant financial burden, accounting for **$7.8M** of the total estimated readmission cost, followed closely by Diabetes.
- **Critical Pathways**: Emergency admissions are the highest-risk entry point with a **14.1%** readmission rate, indicating a need to strengthen emergency discharge protocols.
- **Length of Stay Warning**: Stay duration is a major predictor. **60%** of patients hospitalized for longer than 4.5 days are readmitted, suggesting premature discharge or complex unresolved issues.
- **Process Gaps**: Operational failures are evident in the **83.1%** A1C testing gap. Addressing this and targeting the **7.2%** identified ‘High-Risk’ patients are immediate intervention opportunities.

RECOMMENDATIONS

Mandatory A1C Testing

Implement a "hard-stop" rule at discharge requiring recent A1C results.

Target: Fix 83% Untested Rate

ER Case Manager Deployment

Assign dedicated discharge coordinators in the ER to manage high-frequency visitors.

Reduce ER Bounce-backs

SNF "Warm Handoff" Protocol

Standardize data-sharing and medication summaries prior to facility transfer.

Mitigate Transfer Risk

48-Hour Medication Follow-up

Auto-flag patients with "Unstable" or "Changed" medication status for priority nurse callback.

Target: Med Instability

Geriatric Care Pathway

Mandatory social worker review for all patients >70 years old prior to discharge.

Target: High Utilizers (>70)

IMPACT & VALUE

Projected financial and operational benefits of implementation.

FINANCIAL PROJECTION

If →

CURRENT RATE		TARGET RATE
13.2%	→	10%

then

ESTIMATED ANNUAL SAVINGS

~$5M

Potential Annual Savings
from Avoided 30 days Readmission

OPERATIONAL BENEFITS

Reduced Bed Congestion

Lowering readmissions frees up capacity for acute care and elective procedures.

Improved Emergency Discharge Quality

Emergency pathway drives highest cost ($12.28M) Dedicated discharge controls reduce bounce-backs.

Standardized Chronic Monitoring

Closing the 83.1% A1C testing gap strengthens diabetes stabilization before discharge.

LIMITATIONS & NEXT STEPS

LIMITATIONS

Historical Dataset (1999–2008)
Data covers 1999–2008. Current medical protocols and readmission penalties have evolved significantly since this period.

Missing Clinical Variables
Weight and BMI data were dropped due to >98% null values, removing a critical obesity-related risk factor from the analysis.

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FUTURE ROADMAP

Predictive ML risk scoring

Real-time EMR (Electronic Medical Record)integration

External validation on current hospital data