



Healthcare Cost, Efficiency & Outcome Dashboard

HEALTHCARE – INPATIENT HOSPITAL SERVICES

Section B | Group G-11

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Context & Problem Statement

SECTOR CONTEXT

Hospitals must balance high-quality patient care with financial sustainability and operational efficiency. Rising treatment costs and varying lengths of stay create financial pressure and resource strain.

PROBLEM STATEMENT

Treatment costs and length of stay vary significantly across severity levels, admission types, age groups, and payment categories. Hospitals lack a consolidated analytical view to identify key drivers.



PROJECT OBJECTIVE

To identify major clinical and operational cost drivers and support data-driven decision-making for better resource utilization and financial sustainability.

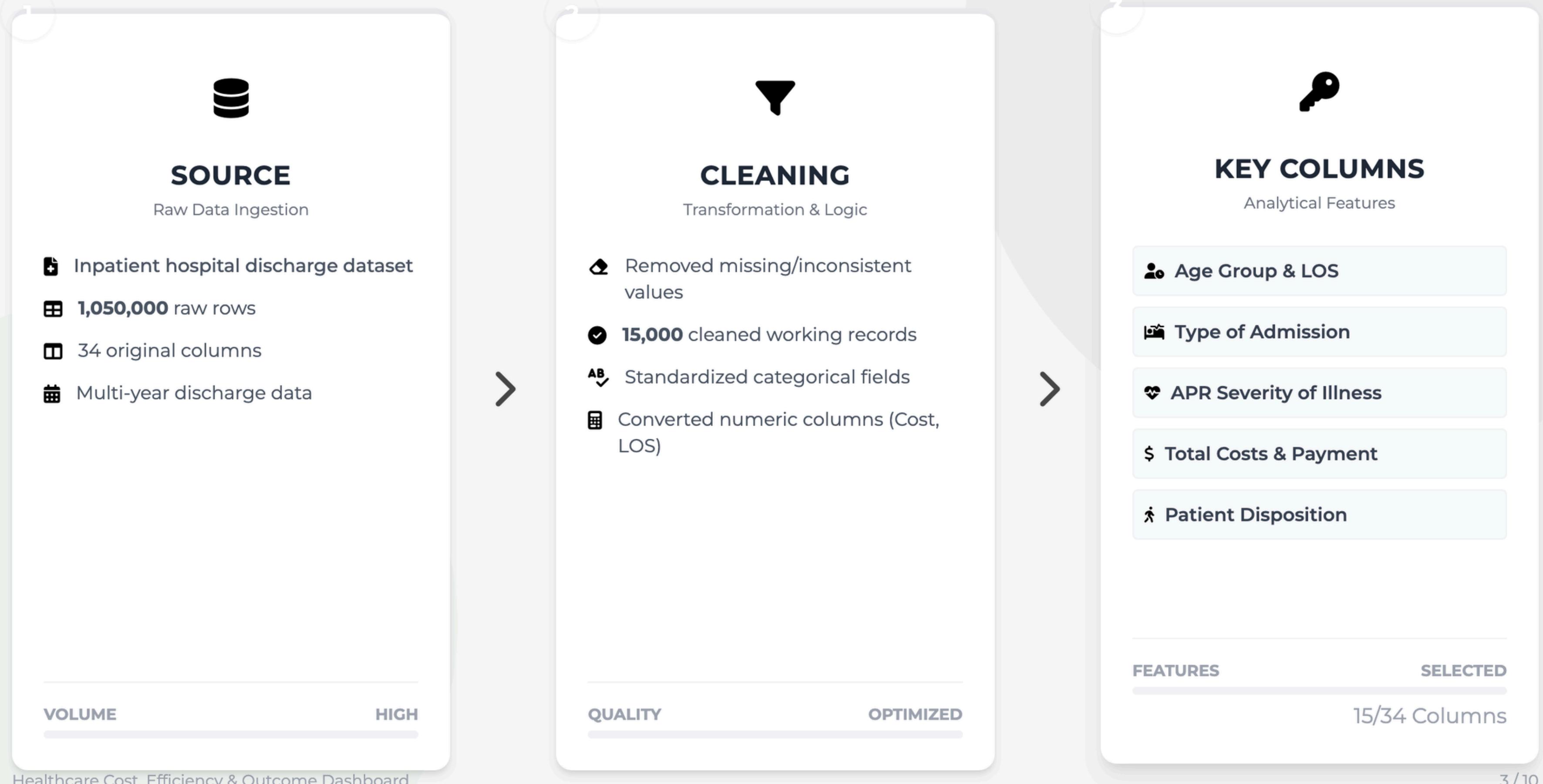
DRIVERS

DECISIONS

SUSTAINABILITY

Data Engineering

Source to Sink Pipeline



KPI & Metrics Framework

Performance Indicators



VOLUME

Total Cases

11965

Cleaned Records



EFFICIENCY

Avg. LOS

5.87 Days

Length of Stay



DIRECT COST

Treat. Cost

\$30,358

Avg per Case



FINANCIAL

Cost to Hospital

\$25,576

Avg per Patient



QUALITY

Survival Rate

96.4%

Outcome Metric

Operational Pressure

High volume strains bed capacity and staff allocation resources.

Throughput Efficiency

Extended LOS reduces bed turnover and increases wait times.

Revenue Structure

Total billing affects reimbursement and payer mix stability.

Financial Burden

Direct medical costs impact profit margins per case.

Quality of Care

Primary indicator of clinical effectiveness and safety.

Key Insights (EDA)

Exploratory Analysis Findings

Severity Cost Impact



Extreme severity cases cost **4-5x more** than minor cases, driving disproportionate resource consumption.

Age Demographics



Older age groups (50+) demonstrate consistently **longer stays** due to comorbidities and recovery complexities.

Clinical Outcomes



Patient survival rate remains strong at **~96%**, indicating high quality of care despite operational pressures.

Admission Type



Emergency and trauma admissions significantly increase both **treatment cost** and length of stay compared to electives.

Payment Mix



Medicare and Medicaid dominate the payment landscape, influencing reimbursement structures and profitability.

Cost Concentration



Significant cost concentration exists in specific **high-severity clusters**, suggesting targeted intervention opportunities.

Advanced Analysis

Root Cause & Drivers

ANALYSIS DIMENSIONS



KEY DRIVER

Severity Levels

APR Severity Classification

Minor

Moderate

Major

Extreme



INTAKE

Admission Type

Entry Point Categorization

Emergency

Elective

Newborn

Trauma



DEMOGRAPHICS

Age Groups

Patient Segmentation

0-17

18-29

30-49

50-69

70+



FINANCIAL

Payment Type

Payer Mix Analysis

Medicare

Medicaid

Private

Self-Pay

ROOT CAUSE FINDINGS



Primary Cost Drivers

Severity + Emergency admissions act as a multiplier. High severity cases admitted via emergency cost **4-5x more** than standard admissions due to intensive resource use.



LOS Pressure Points

Older Demographics (50+) are the root cause of bed turnover bottlenecks. Complex comorbidities in this group extend Length of Stay by **~30%** vs average.



Financial Stability

Payment Mix vulnerability. High reliance on fixed-rate payers (Medicare/Medicaid) constrains margins, especially when coupled with high-cost severity cases.

Dashboard Walkthrough

Executive & Operational Views

Executive View

Strategic KPI Monitoring

TOTAL VOLUME
11965

↑ 2.4% vs last month

AVG LOS
5.87 Days

↑ 0.3% vs target

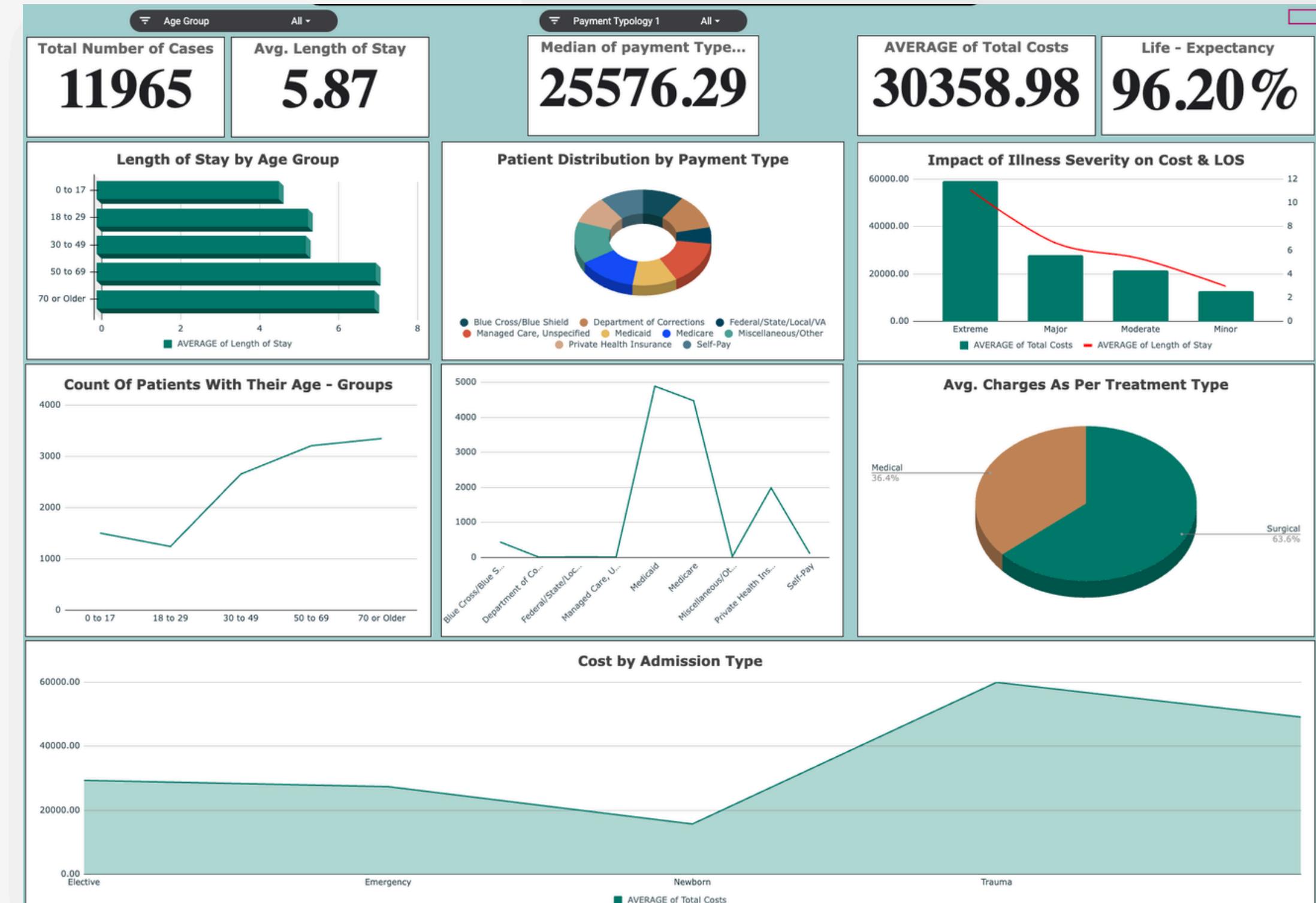
SURVIVAL RATE
96.4%

Stable trend

"The Executive View provides a high-level pulse check on hospital performance, highlighting critical deviations."

Operational View

Interactive Drill-Down Analysis



Recommendations

Strategic Action Plan



Cost-Control Protocols

Implement strict resource utilization guidelines for **extreme severity** cases to reduce variability.



Optimize Emergency Triage

Streamline admission workflows for high-volume emergency intakes to minimize initial **LOS bottlenecks**.



Age-Based Discharge Planning

Initiate early discharge planning for **50+ age groups** with integrated post-acute care coordination.



Monitor High-Cost Clusters

Establish real-time alerts for diagnosis clusters showing anomalous **cost-to-charge ratios**.



Reimbursement Strategy

Leverage severity data to renegotiate commercial payer contracts and improve **case mix index** documentation.



Impact & Value

Business Case & Benefits

POTENTIAL IMPACT

5–
10%

LOS
REDUCTION

Optimizing discharge workflows for high-severity cases directly impacts bed turnover.



Improved Bed Utilization

Higher throughput capacity



Targeted Cost Mgmt

Focus on high-cost drivers



Better Forecasting

Data-driven resource planning



Stronger Governance

Standardized care protocols

Why Approve?



Clear Cost Visibility

Uncovers hidden inefficiencies in severity-adjusted treatment paths that traditional reports miss.



Actionable Insights

Moves beyond "what happened" to "why it happened" with root cause segmentation.



Interactive Support

Empowers department heads to explore their own data slices for localized decision making.

Limitations & Next Steps



Project Limitations



Sample Dataset Scope

Analysis limited to 15,000 cleaned records from the original 1.05M dataset, potentially affecting the granularity of rare condition insights.



No Predictive Modeling

Current scope focuses on descriptive and diagnostic analytics. Future cost predictions are not currently implemented.



Limited Time-Series

Seasonal trends and longitudinal patient tracking are constrained by the multi-year aggregate nature of the discharge data.



Future Roadmap



LOS Forecasting Model

Predictive ML model for bed planning



Profitability Analysis

Diagnosis-level margin assessment



Multi-Hospital Benchmarking

Comparative performance metrics



Real-Time Integration

Live EHR data pipeline implementation