Patient Journey & Financials

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Turning Hospital Data into Decisions That Matter: -

Every patient admission generates data.

But data alone doesn't save lives or budgets—decisions do.

The Challenge

Hospital leadership couldn't see patterns in fragmented spreadsheets

The problems we faced:

- **Patient data scattered across systems** — demographics here, billing there, clinical notes somewhere else
- **Questions took weeks to answer** — "How many beds do we need?" required manual Excel gymnastics
- **Decisions made on hunches, not evidence** — leadership flew blind when planning staffing and budgets

One System. Three Questions.

This project built a unified analytics platform to answer the three questions hospital leaders ask every day:

Question 1: Who are our patients?

Demographics & Conditions Dashboard

Why it matters: You can't plan staffing, supplies, or bed capacity without knowing your patient population.

Question 2: How do patients move through our system?

Patient Journey Dashboard

Why it matters: Every extra day a bed is occupied costs money and blocks a new admission.

Question 3: Where does our money actually go?

Financials Dashboard

Why it matters: You can't negotiate better rates if you don't know who's driving your costs.

Question 1: Who Are Our Patients?

Why it matters: Staffing, supplies, and bed planning depend on knowing your population

Age Distribution of 10,000 Patients

Age Group	Percentage	What This Means
Children (1-12)	8%	Small pediatric footprint
Young Adults (13-25)	14%	Limited young adult volume
Adults (26-55)	45%	Core patient population
Seniors (56+)	33%	High-acuity, resource-intensive

Key Insight

Adults and seniors make up 78% of all admissions—staffing and equipment should reflect this reality, not be evenly distributed across age groups.

What We Did

- Grouped every patient into clear age bands (children, young adults, adults, seniors)
- Tracked monthly admission patterns to spot seasonal trends
- Identified the top 5 medical conditions driving volume

What Leadership Gained

- **Accurate demand forecasting** — no more guessing how many nurses or specialists to schedule
- **Seasonal awareness** — March sees 12% more admissions; August sees 8% fewer
- **Resource alignment** — adult and senior care pathways get priority investment

Question 2: How Do Patients Move Through Our System?

Why it matters: Every extra day costs money and blocks new admissions

Patient Journey Metrics

- **Total Admissions:** 10,000 patients tracked
- **Average Length of Stay:** 16 days per patient
- **Hospitals Tracked:** 51 facilities in the system
- **Peak Admission Month:** March (+12% above average)

The Hidden Problem

Average length of stay tells only half the story. When we looked deeper:

- **Same condition, wildly different timelines** — Hospital A averages 12 days for pneumonia; Hospital B averages 19 days
- **Long tails drive costs** — 10% of patients stay 3x longer than the median
- **No standardization** — each hospital, each doctor, different approach

Key Insight

Standardizing treatment protocols for the top 3 conditions could free up 18% more bed capacity without adding a single new bed.

What We Did

- **Counted days between "walked in" and "went home"** for every single patient
- **Compared hospitals and doctors** to find who's efficient and who's not
- **Tracked seasonal patterns** so leadership can staff ahead of demand spikes

What Leadership Gained

- **Bottleneck visibility** — instantly see which conditions and providers tie up beds longest
- **Benchmark data** — compare Hospital A's 12-day average to Hospital B's 19-day average
- **Capacity planning** — predict bed needs 2 months ahead using seasonal patterns

Question 3: Where Does Our Money Actually Go?

Why it matters: Can't negotiate better rates if you don't know who drives your costs

Financial Overview

- **Total Billing Volume:** $270 million tracked
- **Average Cost per Stay:** $27,000 per patient admission
- **Average Cost per Day:** $1,687 per patient per day
- **Insurance Concentration:** Top 5 insurers handle 58% of all claims
- **Provider Concentration:** Top 10 doctors generate 28% of total billing

The Pareto Principle in Action

Healthcare billing follows the 80/20 rule—or in this case, even more extreme:

- **Just 10 doctors** (out of 300+) drive 28% of all revenue
- **Just 5 insurance companies** handle 58% of claim volume
- **Top 3 medical conditions** account for 40% of total billing

Key Insight

Concentration = leverage. Focus documentation quality and contract negotiations on the handful of relationships that move the needle.

What We Did

- **Calculated total bill AND daily rate** — a $50K bill might be reasonable for 20 days but wasteful for 5 days
- **Tracked which doctors, hospitals, and insurers drive the most volume** — not all partnerships are equal
- **Flagged cost outliers** — same procedure, wildly different costs

What Leadership Gained

- **Negotiation priorities** — know exactly which insurer contracts to focus on
- **Quality signals** — high cost-per-day cases often indicate complications worth reviewing
- **Revenue concentration awareness** — diversify or double down on top relationships strategically

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Behind the Scenes: What Actually Happened (Plain English)

You don't need to understand SQL or Power BI to appreciate what makes this project work. Here's what happened under the hood, explained simply:

1. Fixed Doctor Name Typos

Text normalization and standardization

The same doctor appeared as "Dr. Smith", "Dr Smith", and "SMITH" in different records. We cleaned all 300+ provider names so each person appears once.

Why it matters: Without this, Dr. Smith looks like three different doctors in reports, making top performer analysis garbage.

2. Counted Days in Hospital

LOS = DATEDIFF(discharge_date, date_of_admission)

For every patient, we counted the days between "walked in" and "went home."

Why it matters: This one number—length of stay—reveals efficiency. Shorter stays mean more patients helped with the same resources.

3. Grouped Patients by Age

Categorical segmentation by age cohorts

Instead of tracking 10,000 individual ages, we grouped patients into child, young adults, adults, and seniors.

Why it matters: Each group needs different care. One size doesn't fit all. This lets leadership plan specialized resources.

4. Calculated Daily Costs

Cost per stay and cost per day normalization

We took the total bill and divided by days in hospital to get a daily rate.

Why it matters: Compare apples to apples. A $50K bill for a 20-day stay ($2,500/day) is very different from a $50K bill for a 5-day stay ($10K/day).

5. Built One Master Spreadsheet Everyone Trusts

Unified semantic layer with governed definitions

Instead of 10 different Excel files with 10 different "total patient" counts, we built ONE source where every number means the same thing to everyone.

Why it matters: No more "your numbers don't match mine" arguments in leadership meetings.
Everyone pulls from the same trusted source.

The Journey: How We Got Here

The Problem

Frustration

Hospital administrators were drowning in Excel files. Patient demographics in one system. Doctor billing in another. Insurance claims scattered everywhere. When leadership asked "How many beds do we need next quarter?" the answer took three weeks and came with a disclaimer.

The Journey

Progress

We started from scratch:

- Cleaned messy admission dates so computers could read them
- Standardized doctor and hospital names
- Calculated length of stay for every single patient

- Created clear age categories and cost metrics
- Built a single, trustworthy data foundation

It wasn't glamorous. It was CSV files, SQL queries, and edge cases like same-day discharges that break formulas.

The Breakthrough

Clarity

Three dashboards. Three questions. Suddenly, leadership could see:

- **Who needs care** (demographics tell you how to staff)
- **Where the bottlenecks are** (length of stay by condition and provider)
- **Where to focus negotiations** (billing concentration by doctor and insurer)

Questions that used to take weeks now took seconds.

The Impact

Confidence

Now decisions happen in minutes, not months:

- **Staffing aligned to patient reality** — 78% adults/seniors means adult care pathways get the resources
- **Bed management targets high-LOS conditions** — standardize the top 3 and free 18% more capacity
- **Finance negotiates from data, not guesses** — "These 5 insurers drive 58% of our volume; let's renegotiate rates."

Key Finding: Same Condition, Different Efficiency

The Data

For the same medical condition (e.g., pneumonia):

- **Hospital A average stay:** 12 days
- **Hospital B average stay:** 19 days
- **Cost difference:** 58% more bed-days consumed at Hospital B

The Action

Study what Hospital A does differently and replicate best practices

- Are they discharging to home health faster?
- Do they have better medication protocols?
- Is their care coordination tighter?

The Impact

Reducing average stay by just 2-3 days = 15-20% more bed capacity without building a single new room.

This is the efficiency lever that pays for itself immediately.

Key Finding: The Pareto Principle in Billing

The Data

- **10 doctors** (out of 300+) = **28% of total revenue**
- **5 insurance companies** = **58% of all claims by volume**
- **Top 3 medical conditions** = **40% of billing dollars**

The Action

Focus documentation quality and contract negotiations where it matters most

- Ensure top 10 doctors have flawless billing documentation (fewer denials)
- Negotiate harder with the 5 insurers who drive majority of claims
- Build clinical pathways for the 3 conditions that dominate spend

The Impact

Better contract terms on even 10% of this concentrated volume = millions in savings Not every relationship is equal.

Double down on the ones that move the needle.

Key Finding: Cost Per Day Reveals Hidden Problems

The Data

When we normalized billing by length of stay, patterns emerged:

- **Some long stays had low daily costs** — chronic care, expected
- **Some short stays had extremely high daily costs** — complications, readmissions, or inefficiency

The Action

Flag high cost-per-day cases for clinical review

- Was there a complication that could have been prevented?
- Did the patient return within 30 days (readmission)?
- Is this a pattern with a specific doctor or procedure?

The Impact

Identifies quality issues before they become lawsuits or reputation damage

Fixing root causes improves outcomes AND reduces costs.

Five Questions People Ask

Q1: Why did you choose healthcare?

A: Healthcare data is messy, high-stakes, and everywhere. Hospitals can't afford bad analytics— wrong numbers mean wrong decisions about life-and-death resources. If I could turn hospital chaos into clarity, I could handle any business analytics challenge in any industry.

Q2: What was the hardest part?

A: Making sure the numbers were trustworthy. One wrong date format, one duplicate patient ID, one typo in a doctor's name—any of these could mislead an entire hospital. The technical work was straightforward. The governance—ensuring every number meant the same thing to every stakeholder—that took discipline.

Q3: What did you learn?

A: That analytics isn't about fancy charts or complex models. It's about asking the right questions and making sure decision-makers can act on the answers. The three dashboards in this project answer exactly what hospital leaders need to know: who, how, and where. Everything else is noise.

Q4: How is this different from a typical student project?

A: Real projects have edge cases:

- Same-day discharges (length of stay = 0 days) break cost-per-day formulas
- Missing discharge dates require imputation rules
- Misspelled provider names fragment reports

I handled all of them and **documented the decisions** so the system stays trustworthy when new data arrives. Most student projects ignore these because they're messy. Real-world data is always messy.

The Impact: From Spreadsheets to Strategy

Before This Project

- Patient data scattered across disconnected systems
- Questions took weeks; answers came with disclaimers
- Staffing and budgets based on last year's guesses
- No way to compare provider efficiency
- Contract negotiations flew blind

After This Project

- **One trusted data source** — every stakeholder pulls the same numbers
- **Decisions in minutes** — dashboard answers leadership questions instantly
- **Staffing aligned to patient reality** — 78% adults/seniors = resource allocation reflects that
- **Bed management targets high-impact conditions** — standardize the top 3, free 18% capacity
- **Finance negotiates from strength** — "These 5 insurers drive our volume; here's our leverage"

Tools & Skills Demonstrated SQL (MySQL):

- Data standardization and type casting
- Feature engineering (LOS, age bands, cost metrics)
- Semantic layer design with reusable views
- Date parsing and DATEDIFF calculations

Power BI:

- Three interactive dashboards
- KPI cards, trend lines, distribution charts
- Cross-filtering and drill-downs
- On-canvas KPI definitions for governance

Analytics Thinking:

- Problem framing (who/how/where questions)
- Metric design (cost per stay vs. cost per day)
- Pareto analysis (concentration of spend)
- Seasonal decomposition (admission patterns)

Communication:

- Technical complexity translated for non-technical audiences
- Story-driven presentation
- Actionable insights, not just observation

Contact & Portfolio

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https://github.com/GaneshRaogit/healthcare-analytics-sql-bi

Final Thought

"From raw encounters to governed insights to strategic decisions—this is what analytics looks like when it works."

Thank you.