Project Title

Hospital Records Data Analysis using SQL

Project Description

- **Analysis of multi-year hospital encounter data to uncover trends in patient services, financial coverage gaps, and readmission risks.**
- **Insights on dominant/dormant service types, high-cost procedures, and age-specific diagnoses.**
- **Equipped hospital management with actionable metrics for strategic planning and resource allocation.**

Goals

- Identify yearly trends in hospital encounters and service utilization.
- Assess financial coverage, billing patterns, and high-cost procedure drivers.
- Analyze patient behavior, readmission risks, and diagnosis trends across age groups.

Tables

encounters
patients
organizations
procedures
payers

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patients	Id	Primary Key. Unique Identifier of the patient.
patients	BirthDate	The date (YYYY-MM-DD) the patient was born.
patients	DeathDate	The date (YYYY-MM-DD) the patient died.
patients	Prefix	Name prefix, such asÂ Mr.,Â Mrs.,Â Dr., etc.
patients	First	First name of the patient.
patients	Middle	Middle name of the patient.
patients	Last	Last or surname of the patient.
patients	Suffix	Name suffix, such asÂ PhD,Â MD,Â JD, etc.
patients	Maiden	Maiden name of the patient.
patients	Marital	Marital Status.Â MÂ is married,Â SÂ is single.
patients	Race	Description of the patient's primary race.
patients	Ethnicity	Description of the patient's primary ethnicity.
patients	Gender	Gender.Â MÂ is male,Â FÂ is female.
patients	BirthPlace	Name of the town where the patient was born.
patients	Address	Patient's street address without commas or newlines.
patients	City	Patient's address city.
patients	State	Patient's address state.
patients	County	Patient's address county.
patients	FIPS County Code	Patient's FIPS county code.
patients	Zip	Patient's zip code.
patients	Lat	Latitude of Patient's address.

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organizations	Id	Primary key of the Organization.
organizations	Name	Name of the Organization.
organizations	Address	Organization's street address without commas or newlines.
organizations	City	Street address city.
organizations	State	Street address state abbreviation.
organizations	Zip	Street address zip or postal code.
organizations	Lat	Latitude of Organization's address.
organizations	Lon	Longitude of Organization's address.

procedures		Patient procedure data including surgeries.
procedures	Start	The date and time (iso8601 UTC Date (yyyy-MM-dd'T'HH:mm'Z')) the procedure was performed
procedures	Stop	The date and time (iso8601 UTC Date (yyyy-MM-dd'T'HH:mm'Z')) the procedure was completed, if applicable
procedures	Patient	Foreign key to the Patient.
procedures	Encounter	Foreign key to the Encounter where the procedure was performed.
procedures	Code	Procedure code from SNOMED-CT
procedures	Description	Description of the procedure.
procedures	Base_Cost	The line item cost of the procedure.
procedures	ReasonCode	Diagnosis code from SNOMED-CT specifying why this procedure was performed
procedures	ReasonDescription	Description of the reason code.

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encounters		Patient encounter data
encounters	Id	Primary Key. Unique Identifier of the encounter.
encounters	Start	The date and time (iso8601 UTC Date (yyyy-MM-dd'T'HH:mm'Z')) the encounter started
encounters	Stop	The date and time (iso8601 UTC Date (yyyy-MM-dd'T'HH:mm'Z')) the encounter concluded
encounters	Patient	Foreign key to the Patient.
encounters	Organization	Foreign key to the Organization.
encounters		Foreign key to the Payer.
encounters	EncounterClass	The class of the encounter, such asÂ ambulatory,Â emergency,Â inpatient,Â wellness, orÂ urgentcare
encounters	Code	Encounter code from SNOMED-CT
encounters	Description	Description of the type of encounter.
encounters	Base_Encounter_Cost	The base cost of the encounter,Â notÂ including any line item costs related to medications, immunizations, procedures, or other services.
encounters	Total_Claim_Cost	The total cost of the encounter, including all line items.
encounters	Payer_Coverage	The amount of cost covered by the Payer.
encounters	ReasonCode	Diagnosis code from SNOMED-CT,Â only ifÂ this encounter targeted a specific condition.
encounters	ReasonDescription	Description of the reason code.

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payers	Id	Primary key of the Payer (e.g. Insurance).
payers	Name	Name of the Payer.
payers	Address	Payer's street address without commas or newlines.
payers	City	Street address city.
payers	State_Headquartered	Street address state abbreviation.
payers	Zip	Street address zip or postal code.
payers	Phone	Payer's phone number.

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Summary

I began with a basic exploration to understand patient flow and service utilization—looking at how frequently patients visited, yearly patient volumes, and whether the hospital served more long-stay or short-stay cases.

I also examined the classes of encounters (e.g. emergency, ambulatory, intensive care) and counted the number of distinct patients admitted per quarter and per year.

Next, I shifted focus to financial trends and payer coverage insights: determining the proportion of encounters without payer coverage, identifying the most frequently performed procedures and their average base cost, and listing the top 10 procedures by highest average base cost along with their frequency.

Finally, I explored patient behavior and risk patterns—counting patients readmitted within 30 days, identifying those with the highest readmission counts, and for each pataient, capturing their first and latest encounter dates along with the days between them.

I also analyzed the number of encounters per patient by encounter class, identified the latest encounter and associated procedure for each patient, and determined the most common diagnosis per age group.ion risks, and diagnosis trends across age groups.

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INSIGHTS

- The hospital functions primarily as an outpatient-centered facility, focusing on planned and routine care rather than acute emergency or extended inpatient stays.
- The lack of significant year-over-year change suggests a stable patient base and steady service demand.
- No major public health crises, demographic shifts, or policy changes have dramatically altered the service mix.
- Lower emergency volumes could means that effective primary care and preventive care in the community reducing emergencies or patients rely on other nearby facilities for acute incidents.
- Lower inpatient percentage indicates that hospital has more short-duration care episodes (tests, consultations, minor treatments) thus potentially lower overhead but also lower per-patient revenue compared to inpatient stays. High percentage of short stay patients supports the encounter class distribution.
- There are 17389 re-admissions within a month, some patients show extremely high usage of a single service type—for example, one patient recorded 786 ambulatory visits but no inpatient stays. The regular patients should be provided with additional facilities.
- 48% of encounters have no payer coverage. This is an alarming situation for hospital.
- Patients with large numbers across multiple classes may have complex health needs requiring varied hospital services.

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INSIGHTS

- There are 48.7 % encounters with no billing. This situation poses a serious concern for the hospital's financial sustainability, as revenue is significantly below potential.
- To address this, analysis on costliest procedure revealed that these high-cost procedures are typically intensive care treatments (e.g., ICU) and often involve extended patient stays lasting weeks or even months. However, since earlier findings showed that over 95% of patients spend less than 24 hours in the hospital, it is unsurprising that such intensive, long-duration procedures are relatively rare.
- The proportion of admitted patients has remained relatively consistent over the years, indicating a stable service mix. This suggests there may be an opportunity to expand capacity in high-value areas such as emergency and ICU care, as these services typically generate higher revenue per case. Targeted outreach or service enhancements in these departments could help the hospital strengthen its financial position while continuing to serve its community.
- The regular patient base is dominated by Maternity patients in their 30s–40s (predictable, recurring visits), Chronic care and wellness assessment patients in their 50s–60s and Palliative care patients aged 70+.
- The hospital has no patients in age below 30.