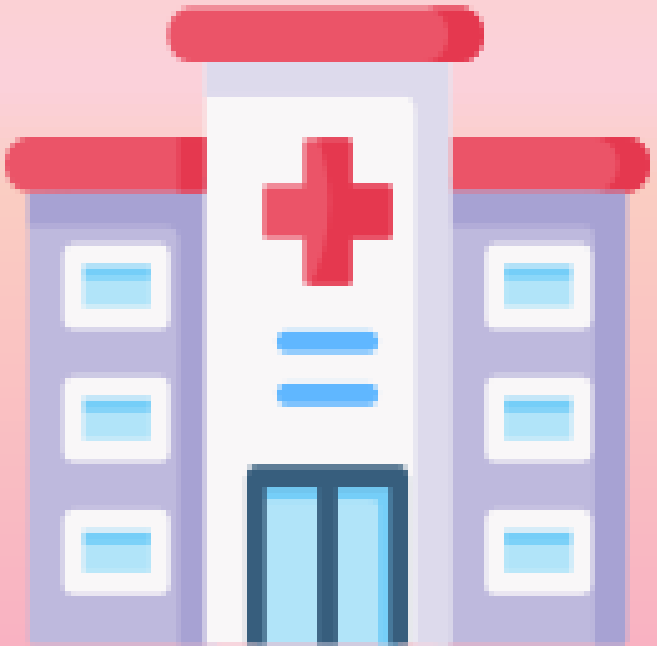
HEALTHCARE FINANCIAL ANALYTICS



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Internship Organization: INFOSYS

INTRODUCTION & OBJECTIVE

- The healthcare sector is evolving rapidly, requiring actionable insights from financial dashboards to optimize costs, revenue, and patient outcomes.
- Develop an interactive Power BI dashboard for analyzing healthcare financial data.
- Perform detailed financial analysis on metrics like billing amount, medication cost, treatment costs, and room charges.
- Create Key Performance Indicators (KPIs) to measure key metrics and identify cost optimization opportunities.
- Enable stakeholders to visualize trends, track performance, and make data-driven decisions.

TOOLS AND TECHNOLOGY

- **Tools Used**
- **Power BI**: A leading tool for data visualization and analytics, enabling the creation of interactive dashboards and meaningful insights.
- **Data Sources**
- **Healthcare Visits Data**:
  - Patient information.
  - Procedures and treatments performed.
  - Departmental operations and financial data.
- **Functions Utilized**
- **Power Query**: Used for cleaning, transforming, and preparing the dataset for analysis.
- **DAX (Data Analysis Expressions)**: Implemented for advanced calculations and dynamic measures such as total billing, medication costs, and patient satisfaction scores.
- **Visualizations**: Designed for insights into financial metrics, geographical billing trends, and departmental performance.

Healthcare financial Dashboard

City: All

State: All

Go to Dark Mode

Billing Amount

£4M

Average Billing Amount per Visit **£851**

Medical Cost

£546K

Average Medication Cost **£109**

Treatment Cost

£3M

Average Treatment Cost **£526**

Total Insurance

£2M

Average Insurance Coverage **£456**

Out-of-Pocket

£2M

Average Out-of-Pocket **£403**

Room Charges

1M

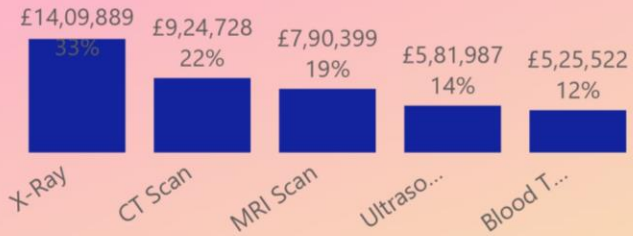
Average Room Charge **£212**

City

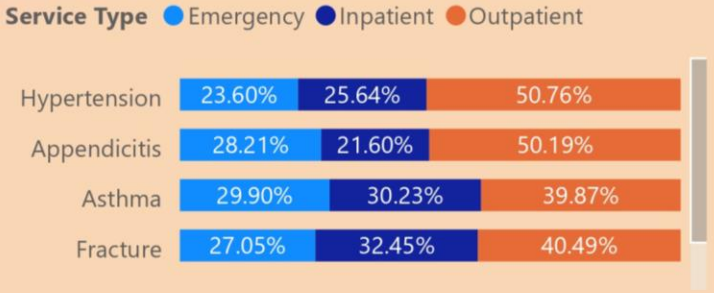
State

Total Billing Amount by State

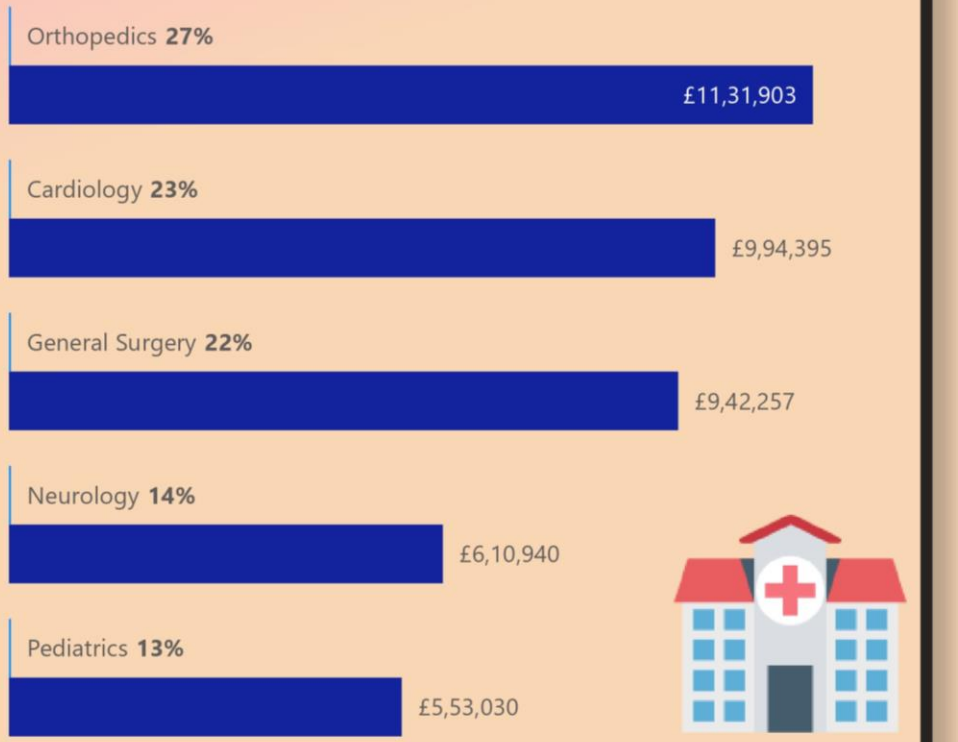
Total Billing Amount by Procedure



Total Billing Amount by Diagnosis and Service Type



Total Billing Amount by Department



Healthcare financial Dashboard

City: All | State: All

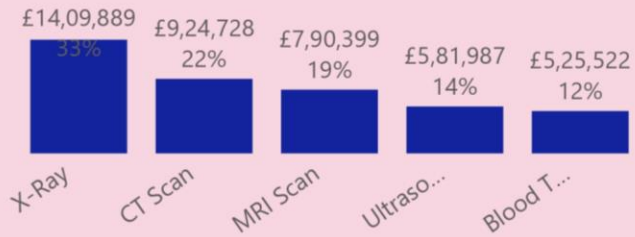
Go to Light Mode

Billing Amount	Medical Cost	Treatment Cost	Total Insurance	Out-of-Pocket	Room Charges
£4M	£546K	£3M	£2M	£2M	1M
Average Billing Amount per Visit **£851**	Average Medication Cost **£109**	Average Treatment Cost **£526**	Average Insurance Coverage **£456**	Average Out-of-Pocket **£403**	Average Room Charge **£212**

City | State

Total Billing Amount by City

Total Billing Amount by Procedure

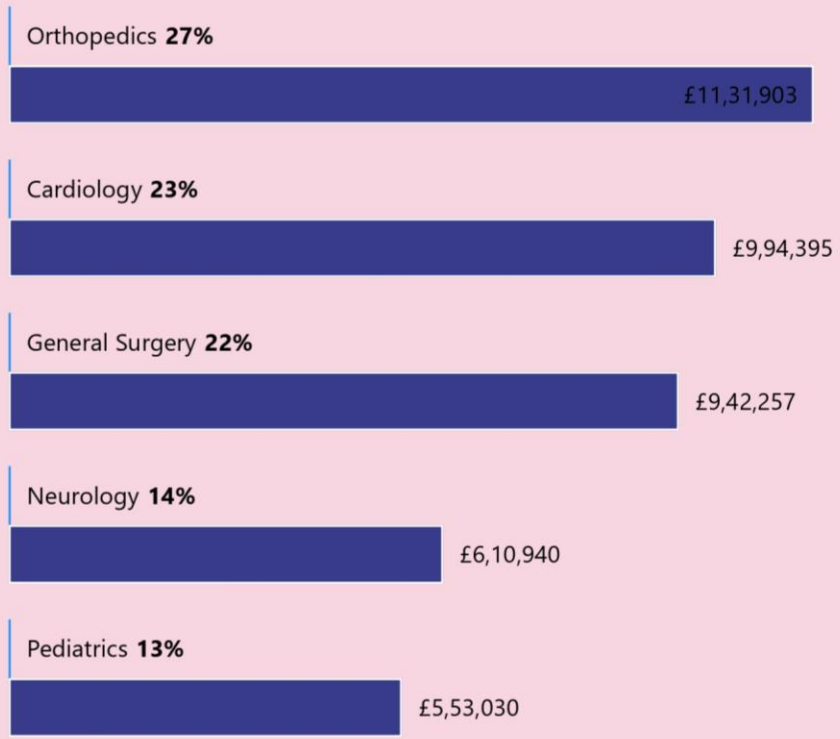


Total Billing Amount by Diagnosis and Service Type

Service Type Emergency | Inpatient | Outpatient

	Emergency	Inpatient	Outpatient
Hypertension	23.60%	25.64%	50.76%
Appendicitis	28.21%	21.60%	50.19%
Asthma	29.90%	30.23%	39.87%
Fracture	27.05%	32.45%	40.49%

Total Billing Amount by Department



Healthcare financial Dashboard

City: All

State: All

Home

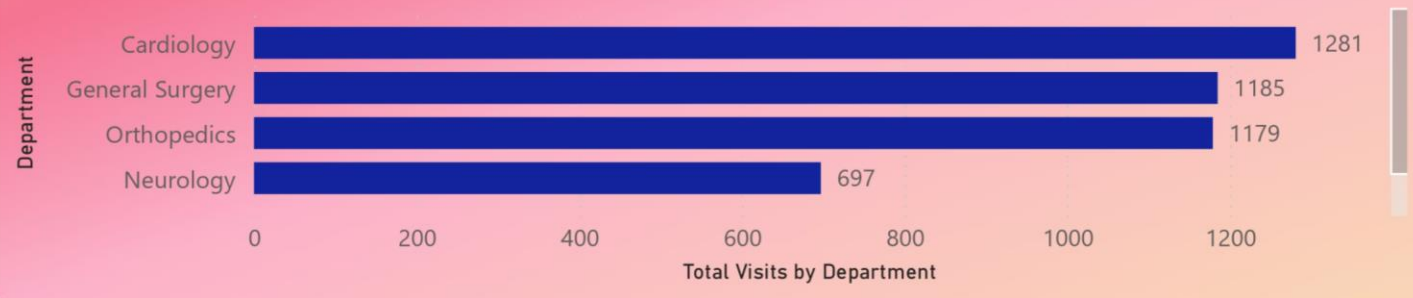
Total Emergency Visits

1929

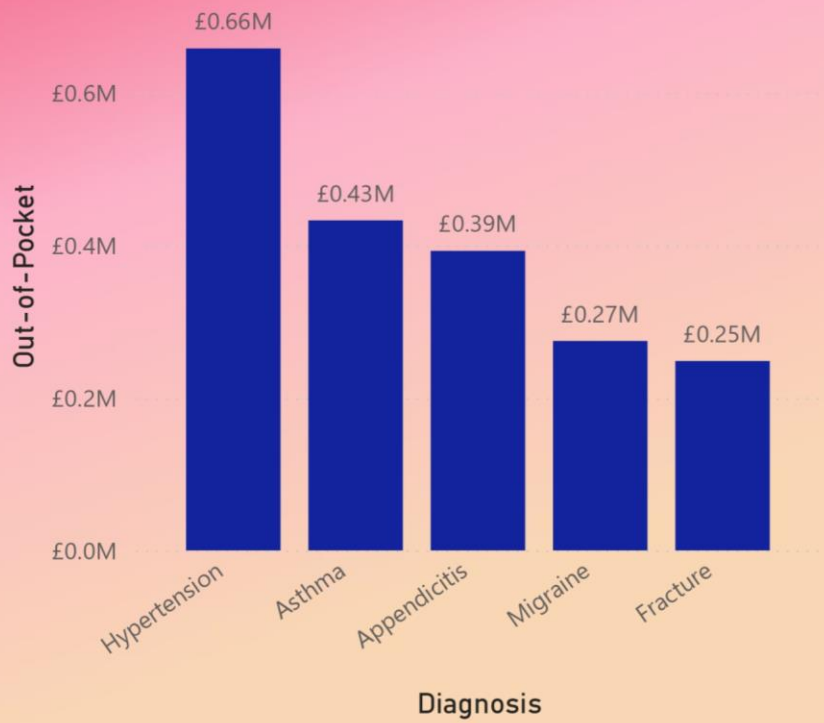
Total visits

5000

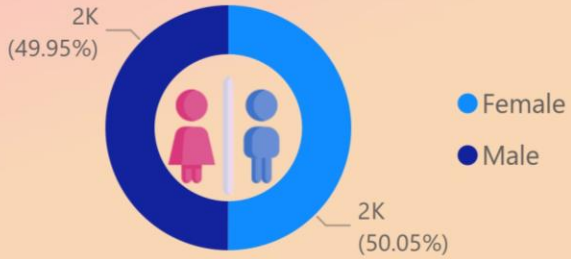
Total Visits by Department by Department



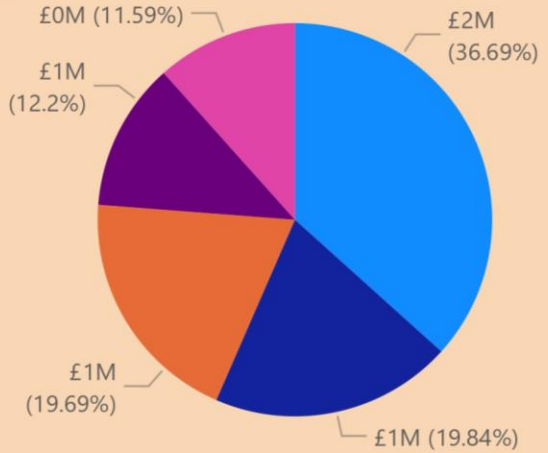
Out-of-Pocket by Diagnosis



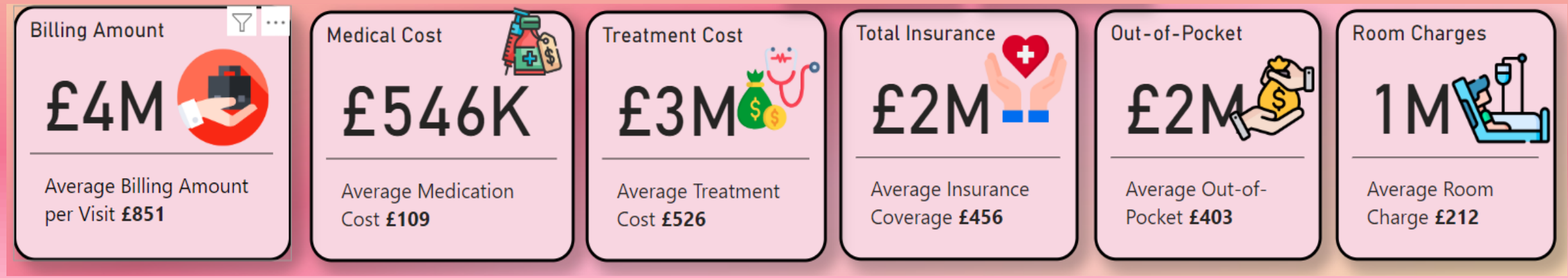
Total Patients by Gender



Total Billing Amount by Diagnosis



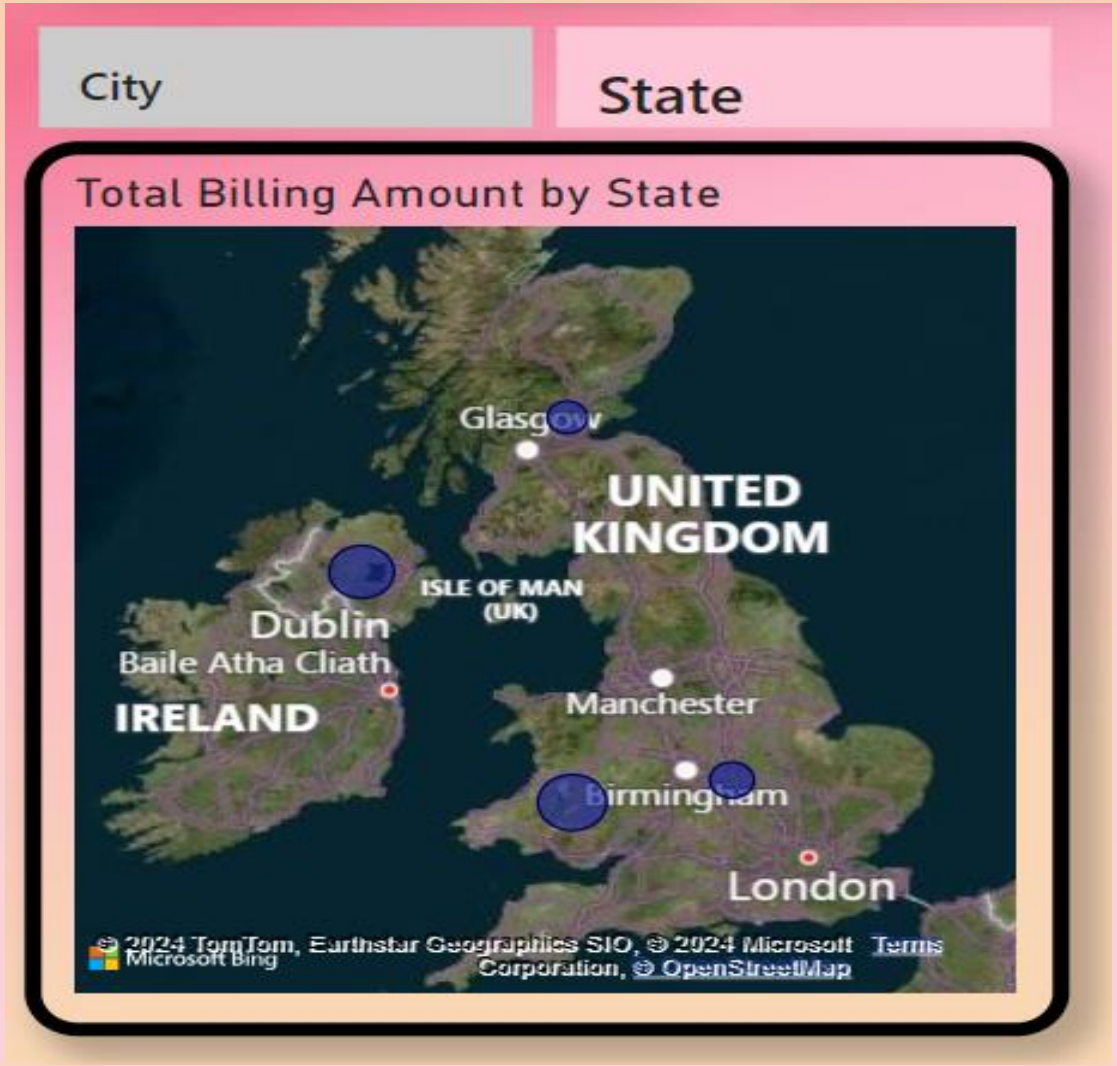
HEALTHCARE FINANCIAL OVERVIEW: KEY METRICS AND INSIGHTS



1. **Billing Amount**: The total billing amount is £4M, with an average billing amount per visit of £851, reflecting the revenue generated from patient services.
2. **Medical Cost**: The total expenditure on medications is £546K, averaging £109 per patient, which highlights pharmaceutical expenses.
3. **Treatment Cost**: Treatment costs amount to £3M, with an average of £526 per treatment, showing the direct cost of medical procedures.
4. **Total Insurance**: Insurance covers £2M in total, with an average insurance coverage of £456 per patient, indicating the role of insurance in mitigating patient expenses.
5. **Out-of-Pocket**: Patients paid £2M out-of-pocket, with an average expense of £403, highlighting uninsured or partially insured costs.
6. **Room Charges**: Room charges amount to £1M, with an average cost of £212 per stay, pointing to the financial impact of patient hospitalization.

- These metrics collectively provide insights into financial allocations, patient contributions, and the efficiency of healthcare services.

GEOGRAPHICAL ANALYSIS OF TOTAL BILLING AMOUNT BY STATE

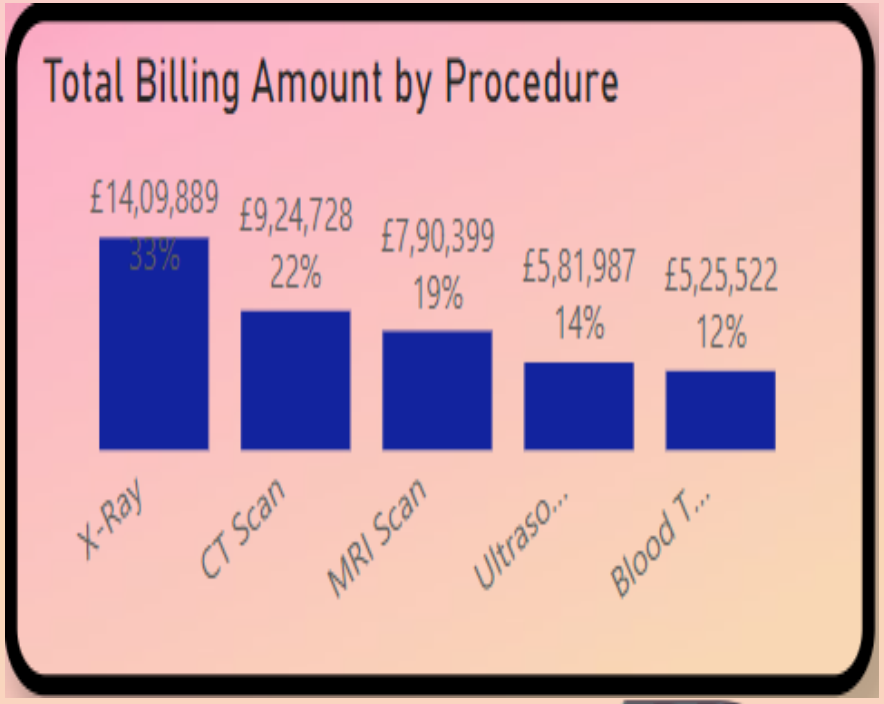


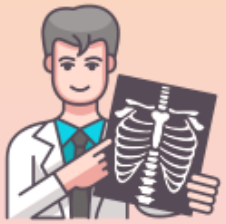
- This Power BI visualization maps the total billing amount by state across the United Kingdom and Ireland. The larger the bubble size on the map, the higher the billing amount for that state. It provides a clear geographical breakdown, helping stakeholders quickly identify regions contributing significantly to the healthcare revenue. For instance, key cities such as London, Manchester, and Dublin show considerable billing activity, indicating higher patient volume or cost-intensive healthcare services in these areas.
- This map allows for focused regional analysis, enabling decision-makers to allocate resources efficiently, optimize operations, and explore opportunities for cost reduction or revenue enhancement in underperforming states.
- It also aids in identifying patterns, such as whether urban centers consistently drive higher billing amounts.

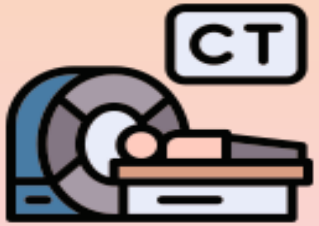
GEOGRAPHICAL ANALYSIS OF TOTAL BILLING AMOUNT BY CITY

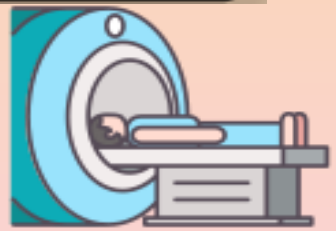
- This visualization illustrates the total billing amounts generated across various cities in the United Kingdom and Ireland. Each city's contribution is depicted by the size of the bubble, allowing for a clear comparison of billing volumes at a granular urban level. Prominent cities such as London, Manchester, Birmingham, and Glasgow stand out with larger bubbles, indicating higher healthcare billing activities in these areas.
- This map helps identify urban centers driving significant revenue, highlighting regions with higher patient activity or costly treatments. Such insights are crucial for tailoring city-specific strategies, like enhancing healthcare infrastructure, streamlining billing processes, or addressing disparities in service demand. It also aids in identifying potential cities for expansion or investment based on billing trends.

TOTAL BILLING AMOUNT BY PROCEDURE - INSIGHTS ON DIAGNOSTIC REVENUE



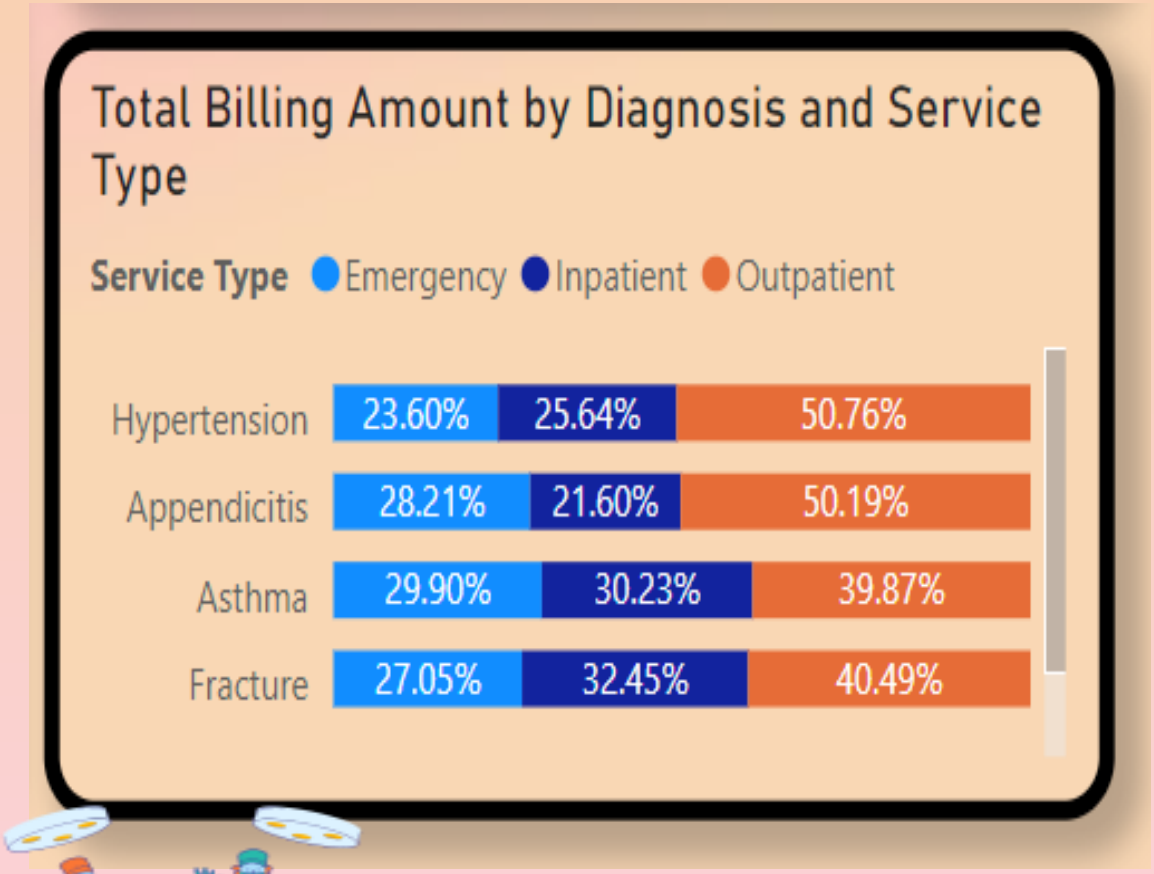






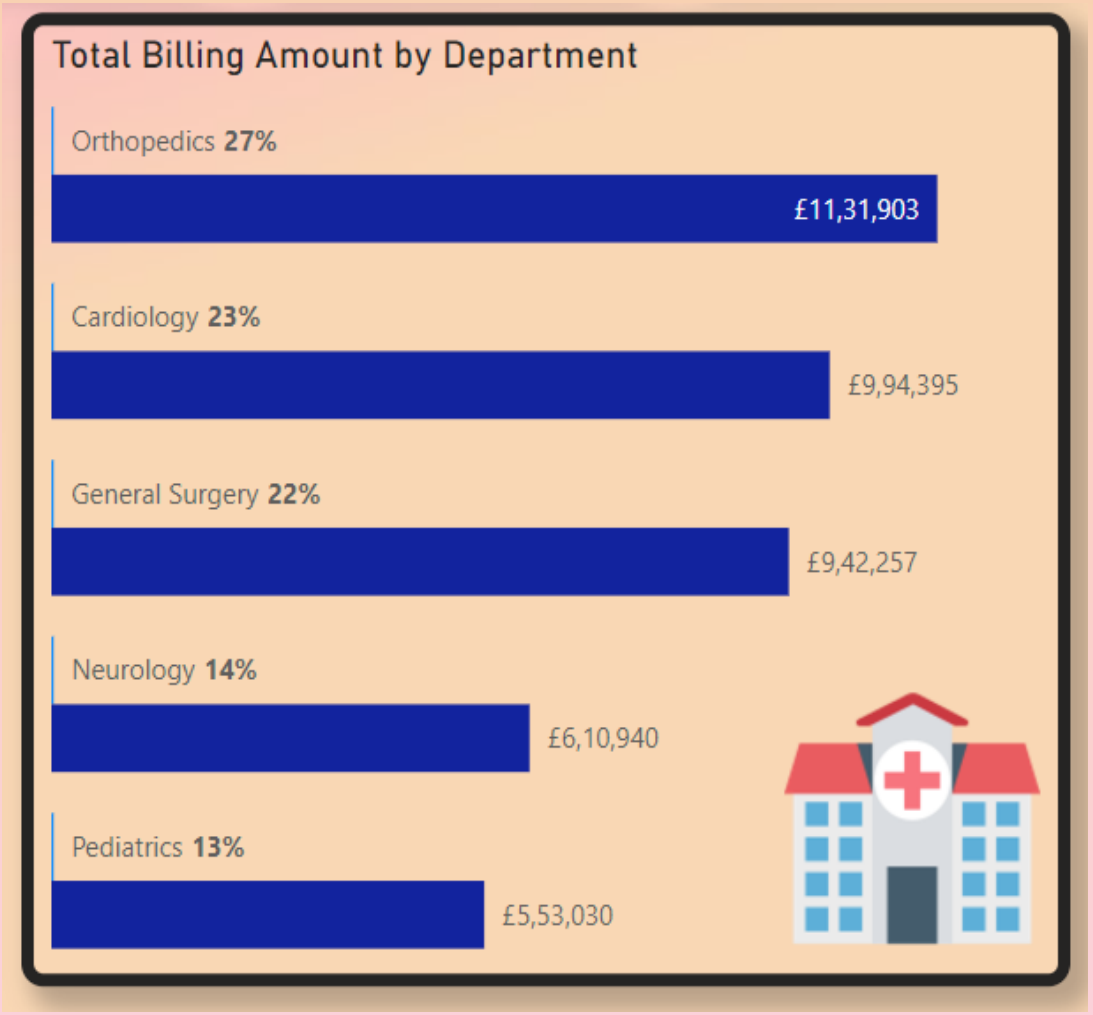
- This bar chart highlights the contribution of five key medical procedures to the total billing amount, measured both as percentages and absolute figures.
- Imaging plays a critical role in healthcare, accounting for 88% of total billing and underscoring its importance in accurate and timely diagnostics. X-rays dominate due to their affordability and versatility, while higher-cost CT and MRI scans justify their expense with essential roles in complex cases. This data highlights opportunities for cost optimization and strategic investments, particularly in high-contributing procedures like X-rays and CT scans, to enhance efficiency, service delivery, and revenue.
- *X-rays (33%, £14,09,889) dominate billing due to their frequent application across various diagnostics, while CT scans (22%, £9,24,728) and MRI scans (19%, £7,90,399) contribute significantly due to their use in complex cases. Ultrasounds (14%, £5,81,987) are widely performed but have a lower per-procedure cost, limiting their billing impact. Blood tests (12%, £5,25,522) are routine and low-cost, making them the smallest contributor. These trends highlight the balance between frequency, cost, and diagnostic value in healthcare billing.*

BILLING DISTRIBUTION BY SERVICE TYPE FOR KEY DIAGNOSES

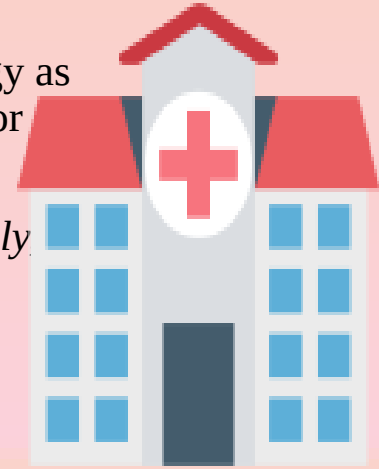


- This visualization showcases the distribution of total billing amounts across different service types (Emergency, Inpatient, and Outpatient) for four key diagnoses: Hypertension, Appendicitis, Asthma, and Fractures. The data is represented as horizontal stacked bars, allowing for a clear comparison of service type contributions for each diagnosis.
- This visualization shows the distribution of billing amounts across Emergency, Inpatient, and Outpatient services for Hypertension, Appendicitis, Asthma, and Fractures. Outpatient services dominate for Hypertension (50.76%) and Appendicitis (50.19%), reflecting their role in ongoing management and follow-ups. Asthma has a more balanced split, with significant Emergency (29.90%) and Inpatient (30.23%) billing due to acute exacerbations. Fractures show a high proportion of Inpatient services (32.45%) for surgical treatment and recovery.
- *Overall, the data highlights the essential role of outpatient services and the critical need for Emergency and Inpatient care in acute cases.*

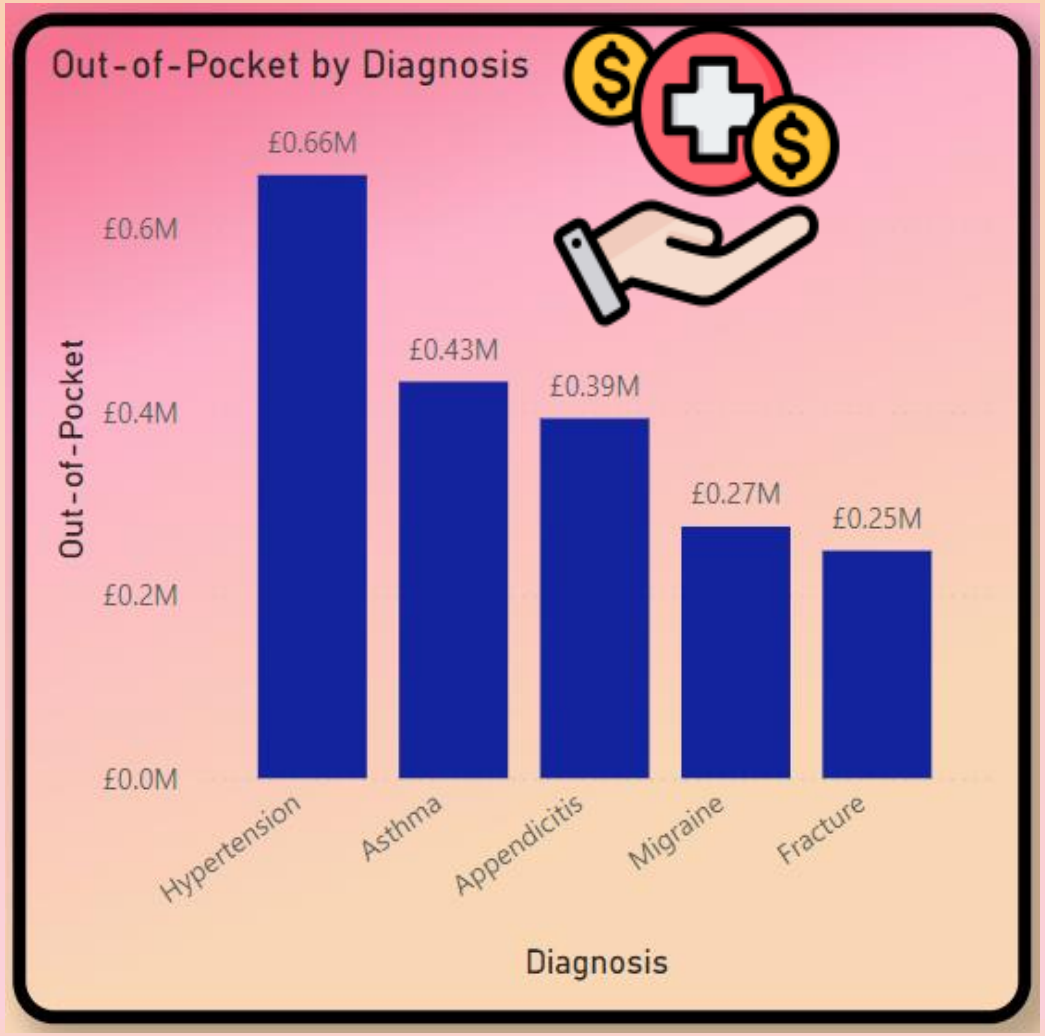
TOTAL BILLING AMOUNT BY DEPARTMENT: DATA ANALYSIS

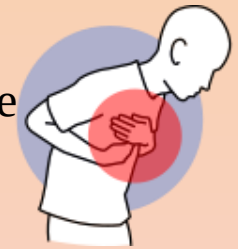


- This horizontal bar chart depicts the contribution of five major hospital departments to the total billing amounts, both as percentages and absolute figures. Orthopedics leads (27%, £11,31,903) due to high-cost surgeries for fractures and joint conditions.
- Cardiology follows closely (23%, £9,94,395), driven by diagnostic procedures and heart treatments. General Surgery (22%, £9,42,257) reflects a steady demand for routine and emergency surgeries. Neurology (14%, £6,10,940) has a smaller share, with high-cost diagnostics like MRIs. Pediatrics (13%, £5,53,030) contributes the least, with less complex and lower-cost interventions.
- This visualization highlights Orthopedics and Cardiology as the primary revenue drivers, emphasizing the demand for advanced surgical care and heart-related treatments.
- *The data can help hospitals allocate resources effectively prioritize infrastructure investment, and optimize department-specific operations to meet patient needs efficiently.*



OUT-OF-POCKET EXPENSES BY DIAGNOSIS: KEY INSIGHTS



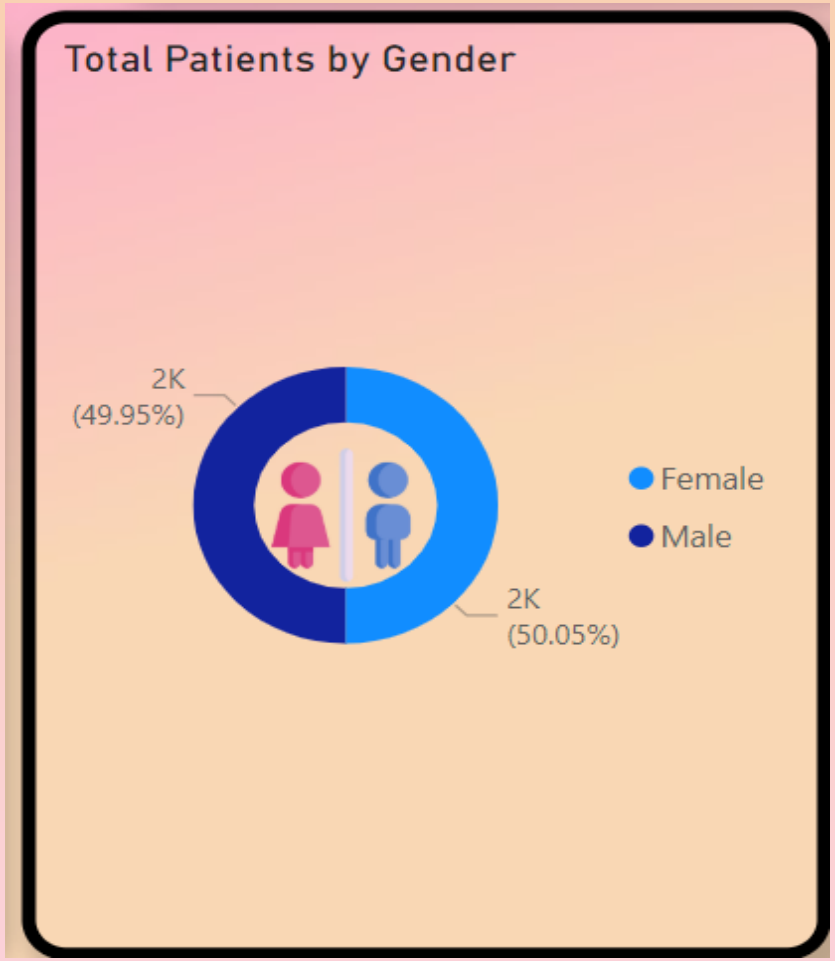


- This bar chart displays the **out-of-pocket expenses incurred by patients** for different medical diagnoses. The diagnoses include **Hypertension, Asthma, Appendicitis, Migraine, and Fracture.**

- Out-of-pocket expenses by diagnosis chart reveals important insights into the financial burden of different health conditions. Hypertension and asthma incur the highest costs, with £0.66M and £0.43M, respectively, likely due to the ongoing nature of these conditions, requiring long-term medication, frequent doctor visits, and regular monitoring. Appendicitis, at £0.39M, involves substantial one-time expenses related to surgery and recovery, while conditions like migraines (£0.27M) and fractures (£0.25M) show lower costs, suggesting less frequent treatments or lower-cost interventions.

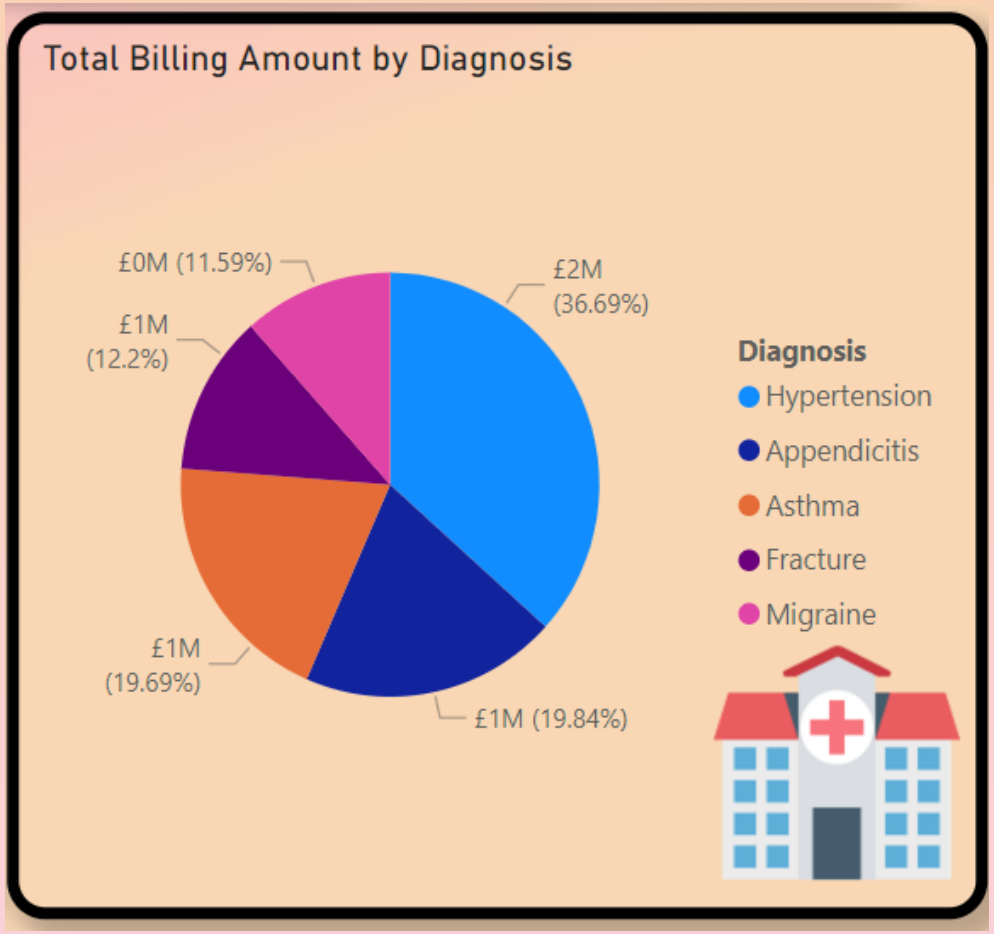
- *The analysis highlights that chronic conditions create a greater financial burden, and targeted initiatives or insurance models to subsidize the management of these diseases could help alleviate patient expenses.*

PATIENT GENDER DISTRIBUTION AND IMPLICATIONS FOR HEALTHCARE



- This pie chart illustrates the **distribution of patients by gender**, with a nearly equal split between **Male (50.05%)** and **Female (49.95%).**
- pie chart on patient gender distribution shows a nearly equal representation of Male (50.05%) and Female (49.95%) patients, indicating gender parity in healthcare utilization.
- This balance suggests that healthcare access and utilization are equally distributed between genders within this dataset. However, while the data reflects equitable access, further analysis of gender-specific health issues could uncover hidden disparities.
- There is also an opportunity to develop gender-targeted wellness programs or screening initiatives to address potential differences in health needs or risks between males and females.

TOTAL BILLING AMOUNT BY DIAGNOSIS: ANALYTICAL INSIGHTS

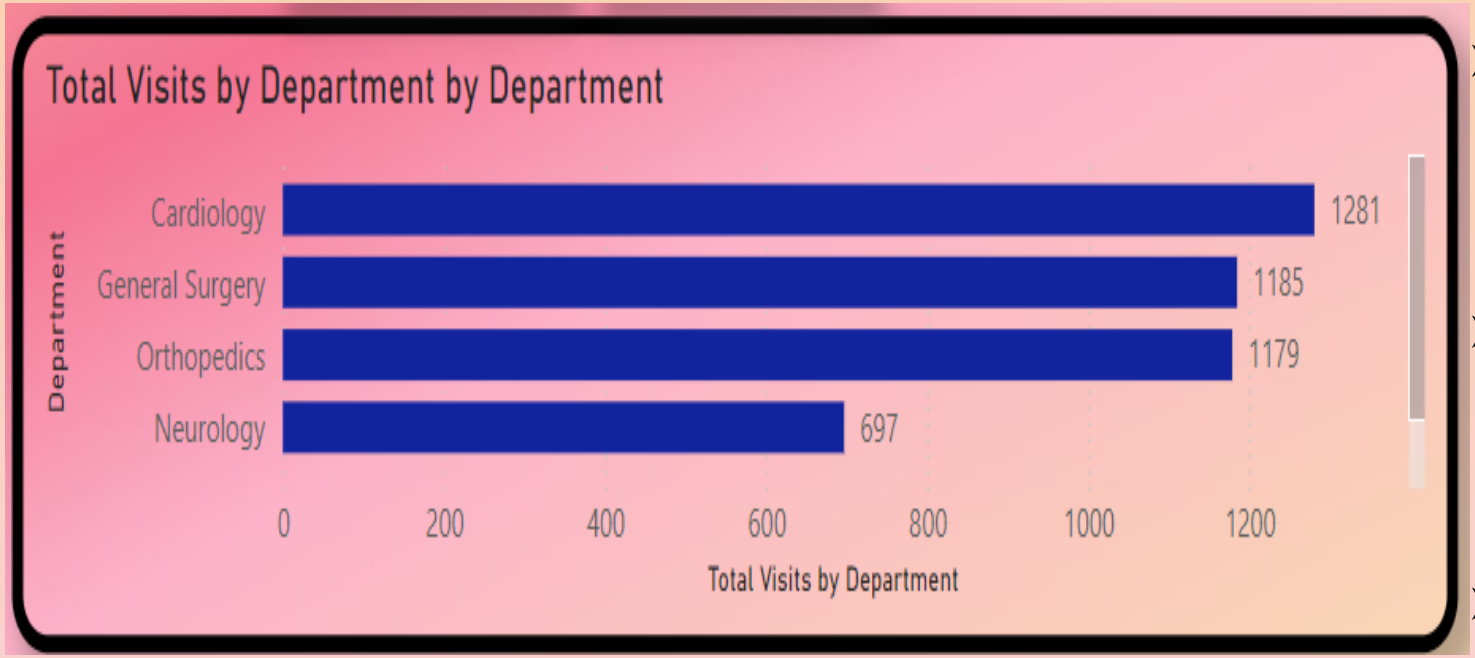


- Total billing amounts by diagnosis reveals that **Hypertension** (36.69%, £2M) is the largest contributor, reflecting the high costs of long-term management, including regular treatments and consultations.
- **Asthma** (19.84%, £1M) follows, with ongoing medication and check-ups adding to the financial burden. **Appendicitis** (19.69%, £1M) incurs significant costs due to surgery and post-operative care. **Fractures** (12.2%, £0.7M) involve moderate diagnostic and treatment costs, while **Migraines** (11.59%, £0.6M) reflect lower-cost, short-term treatments like casts and physiotherapy. Chronic conditions like hypertension and asthma together account for over 50% of the total billing, highlighting their long-term financial impact.
- Although fractures and migraines contribute less to the total, they still impose significant costs for certain patient groups. This analysis suggests that focusing on early intervention and efficient management strategies, particularly for chronic conditions, could reduce overall healthcare costs.
- Additionally, optimizing treatment for acute conditions like fractures and appendicitis may alleviate financial pressure on both healthcare systems and patients.

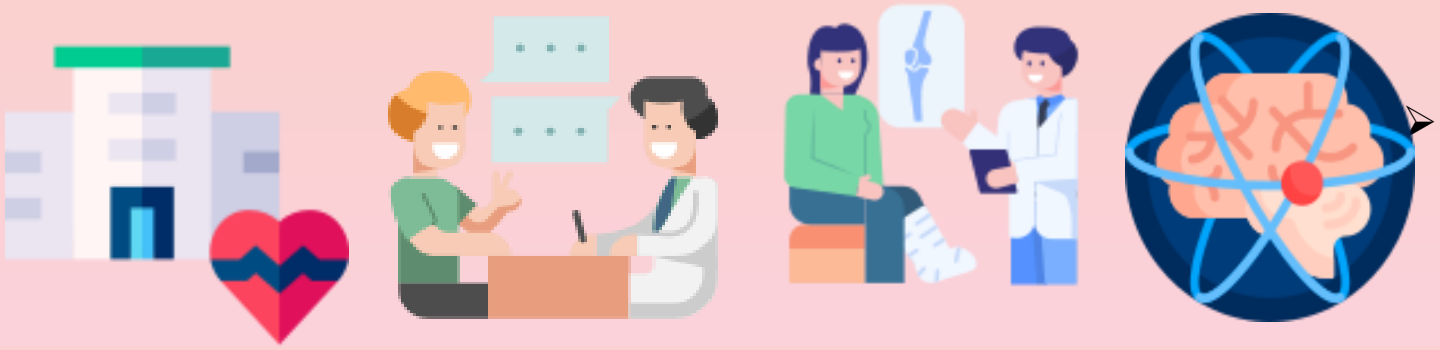
FINANCIAL AND OPERATIONAL IMPACT OF EMERGENCY VISITS

- Out of 5,000 total visits, 1,929 are emergency visits, making up 38.58%. Emergency visits are more costly due to the need for urgent care, specialized staff, and resources.
- With nearly 40% of visits being emergency-related, it's crucial to assess their financial impact. Analyzing these costs versus non-emergency visits can reveal areas for cost containment.
- Improving preventative care and offering alternative urgent care options could reduce emergency visit frequency, leading to savings and more efficient resource use.
- *This highlights the need for effective management of emergency visits from both financial and operational perspectives.*

DEPARTMENTAL VISIT ANALYSIS: INSIGHTS FOR FINANCIAL AND STRATEGIC PLANNING



- This horizontal bar chart, titled **"Total Visits by Department,"** compares patient visits across four departments: Cardiology (1281 visits), General Surgery (1185 visits), Orthopedics (1179 visits), and Neurology (697 visits).
- Cardiology, with the highest visits, likely demands greater resource allocation and significantly contributes to revenue, while Neurology, with the lowest visits, may require strategic efforts to boost patient flow. High-traffic departments like
- Cardiology may face operational strain, impacting efficiency and patient satisfaction, highlighting the need for potential infrastructure or resource expansion.
- *The data provides valuable insights for resource planning, revenue analysis, and growth opportunities, aiding in financial and strategic decision-making.*



DAX CALCULATIONS

- **SUM()**: Adds up the values in a column.
- **SUMX()**: Performs row-wise calculations and sums up the results.
- **AVERAGE()**: Computes the average of a column.
- **DIVIDE()**: Safely performs division, handling errors like division by zero.
- **CALCULATE()**: Changes the context of a calculation (e.g., removing filters or adding new ones).
- **ALL()**: Removes filters from a table or column, ensuring calculations are done over the entire data.
- **IF()**: Evaluates a condition and returns one value if true and another if false.
- **FORMAT()**: Converts values into text based on a specified format.
- **YEAR(), MONTH(), WEEKDAY()**: Extracts specific components from a date (e.g., year, month, day of the week).
- These DAX functions work together to create a robust analytical model that provides deep insights into the dataset, allowing for effective visualizations and decision-making based on the data.

DAX CALCULATIONS

- Total Medication Cost = SUM(visits[Medication Cost])…….Adds up all medication costs.
- Total insurance cost = SUM(visits[Insurance Coverage])
- Total Room Charges = SUMX(visits, visits[Room Charges(daily rate)] * visits[Length of stay]) …….Iterates row-by-row to calculate room charges based on length of stay.
- Out-of-Pocket = [Total Billing Amount] - [Total insurance cost]
- Total Billing Amount = SUM(visits[Medication Cost])+SUM(visits[Treatment Cost])+[Total Room Charges]
- Total Treatment Cost = SUM(visits[Treatment Cost])
- Total Patients = DISTINCTCOUNT(visits[Patient ID])…… This is a DAX function that counts the number of distinct (unique) values in a given column.
- Total Room Charges = SUMX(visits,visits[Room Charges(daily rate)] * [Length of stay])

SUMX is an iterator function, which means it performs row-wise calculations before summing up the results. Unlike SUM(), which directly sums values in a column, SUMX allows you to specify a calculation to be performed for each row.

DAX MEASURES FOR KEY AVERAGES AND METRICS IN PATIENT VISITS

```
Average Insurance Coverage = AVERAGE(visits[Insurance Coverage])
Average length of Stay = AVERAGEA(visits[Length of Stay])
Average Medication Cost = AVERAGE(visits[Medication Cost])
Average Patient Satisfaction Score = AVERAGE('visits'[Patient Satisfaction Score])
Average Treatment Cost = AVERAGE(visits[Treatment Cost])
Average Billing Amount per Visit = DIVIDE( [Total Billing Amount],[Total Patients])
Average Out-of-Pocket = DIVIDE([Out-of-Pocket], [Total Patients] )
Average Room Charge = DIVIDE([Total Room Charges], [Total Patients] )
```

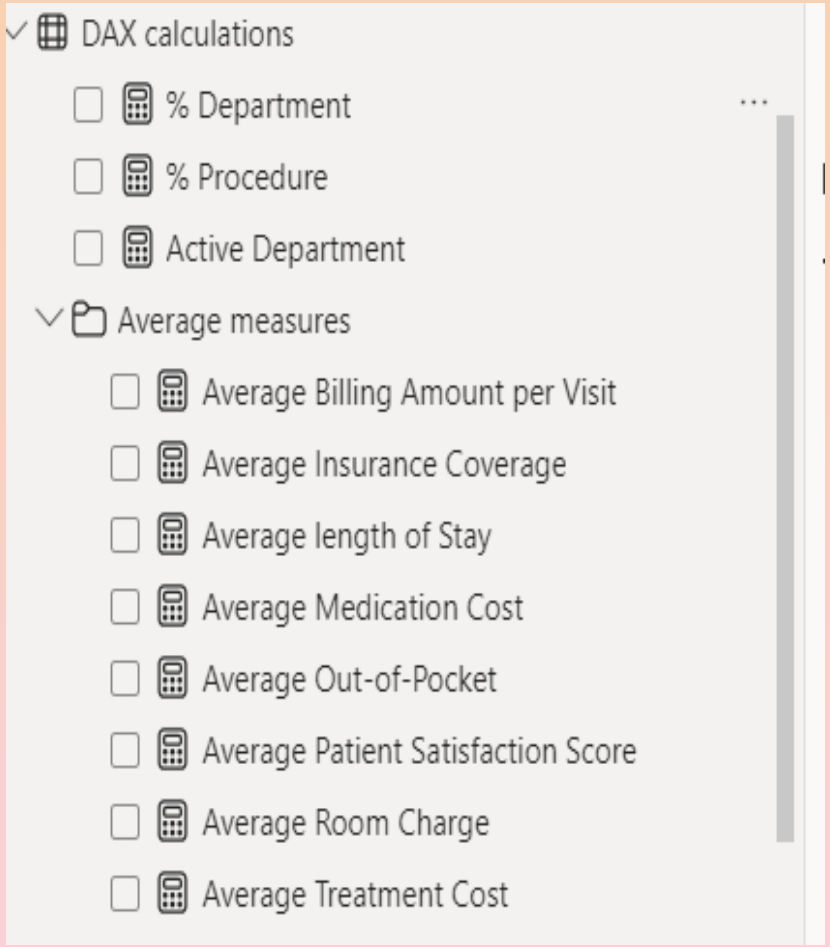
The DIVIDE function in DAX is a specialized function for performing division operations. It is particularly useful in scenarios where division by zero might occur, as it provides built-in error handling.

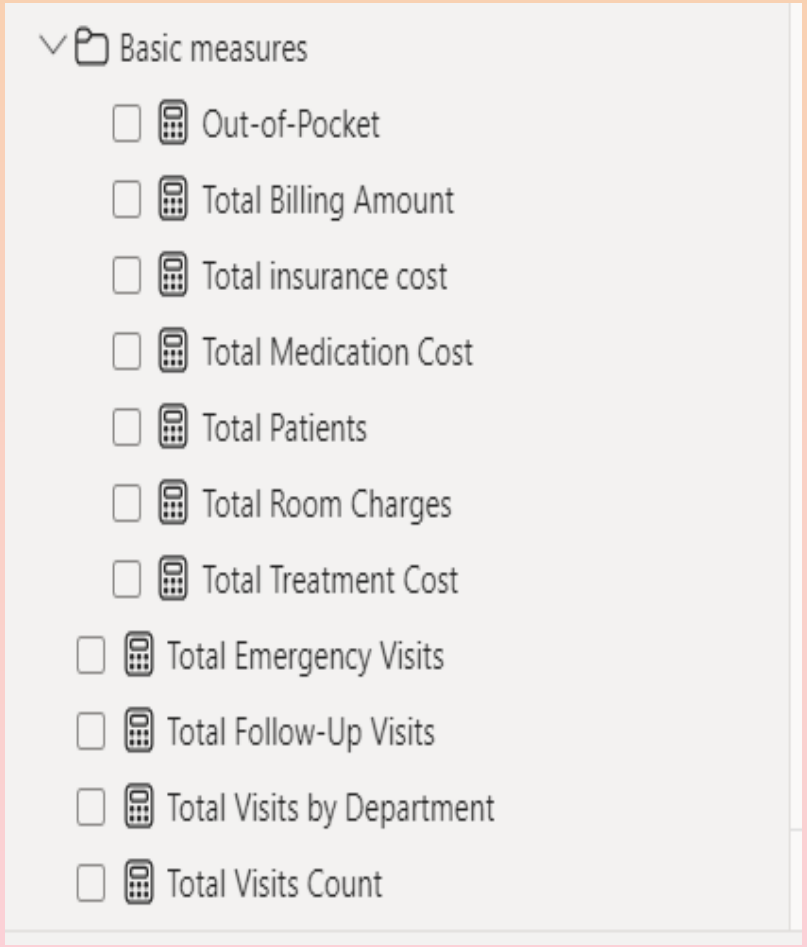
ESSENTIAL DAX FUNCTIONS FOR METRICS CALCULATION AND CONTEXT HANDLING

- % Department = DIVIDE([Total Billing Amount], CALCULATE([Total Billing Amount], ALL(departments[Department])))
- % Procedure = DIVIDE([Total Billing Amount],CALCULATE([Total Billing Amount],ALL(procedures[Procedure])))
- Active Department = SELECTEDVALUE(departments[Department])

- *DIVIDE function is used to perform division in DAX with built-in error handling.*
- *CALCULATE function evaluates an expression in a modified filter context.*
- *SELECTEDVALUE function retrieves the single value of a column in the current context.*

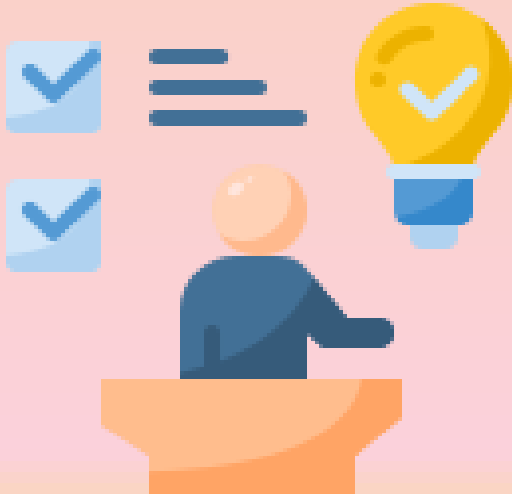
DAX CALCULATIONS





CONCLUSION

- This report identifies key drivers of healthcare costs and revenue.
- High-billing departments like orthopedics and procedures like x-rays warrant a closer look to streamline costs.
- The significant out-of-pocket expenses for common conditions suggest a need for enhanced insurance coverage or cost-sharing measures.
- The equal gender distribution and high volume of emergency visits highlight the need for efficient emergency care management.
- Additionally, geographic billing data can guide resource allocation to underserved areas.
- This dashboard provides a robust framework for financial planning, operational improvements, and strategic decision-making in healthcare systems.



SUGGESTIONS

- **Optimize High-Cost Areas:** Focus on high-billing procedures like X-rays and CT scans, and evaluate cost-reduction opportunities in Orthopaedics and Cardiology departments, which drive the most revenue.
- **Address Out-of-Pocket Expenses:** Work with insurance providers to expand coverage for conditions with significant out-of-pocket costs, such as hypertension, asthma, and appendicitis.
- **Improve Emergency Care Efficiency:** Streamline workflows in emergency services, where a significant number of visits occur, to improve cost-efficiency and patient care.
- **Leverage Geographic Insights:** Analyze billing by city/state to identify regions with high costs and implement cost-control measures in underserved areas.
- **Gender-Specific Insights:** Investigate potential disparities in healthcare access and costs between genders and consider targeted interventions.
- **Monitor Visit Trends:** Track high-visit departments like Cardiology and General Surgery to predict demand and optimize resource allocation.
- **Enhance Reporting with Comparative Metrics:** Compare costs and revenue per visit with industry benchmarks to identify inefficiencies and improvement areas.
- **Patient-Centric Strategies:** Offer financial assistance, payment plans, or discounts for patients facing high out-of-pocket expenses.


THANK
YOU!