Columbia Asia Hospital – Patient & Revenue Analytics

INTRODUCTION

Columbia Asia Hospital is a multi-specialty healthcare provider with a 300-bed capacity, catering to a broad and diverse patient base.
Data Scope
 The analysis is based on 9,216 patient visits recorded between 2019 and 2020, covering:
- Patient demographics such as age, gender, and race
- Operational metrics including wait times and department referrals
- Financial performance indicators like revenue per visit and billing patterns
- Patient satisfaction scores and feedback trends

Key Challenges Identified
- Average patient wait time stands at 35.25 minutes, with Neurology experiencing the longest delays at 36.8 minutes
- Overall patient satisfaction is moderate at 5.9 out of 10, with notably lower scores among teenage patients (5.77) and Asian male patients in the Renal department (3.17)
- Revenue is heavily concentrated in General Practice, contributing nearly 80 percent of total revenue, highlighting underutilized potential across other departments
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Database Schema

Hospital_Visits

- patient_id (Primary identifier)
- Doctor ID (Foreign key)
- visit_date
- Total Bill
- Appointment Fees
- patient_wait time
- Satisfaction Score

Doctor_Dim

- Doctor ID (Primary Key)
- Doctor Name
- Department / Referral

Date_Dim

- date
- month
- quarter
- year

Relationships

- Doctor_Dim[Doctor ID] → Hospital_Visits[Doctor ID] (One-to-Many)
- Date_Dim[date] → Hospital_Visits[visit_date] (One-to-Many)
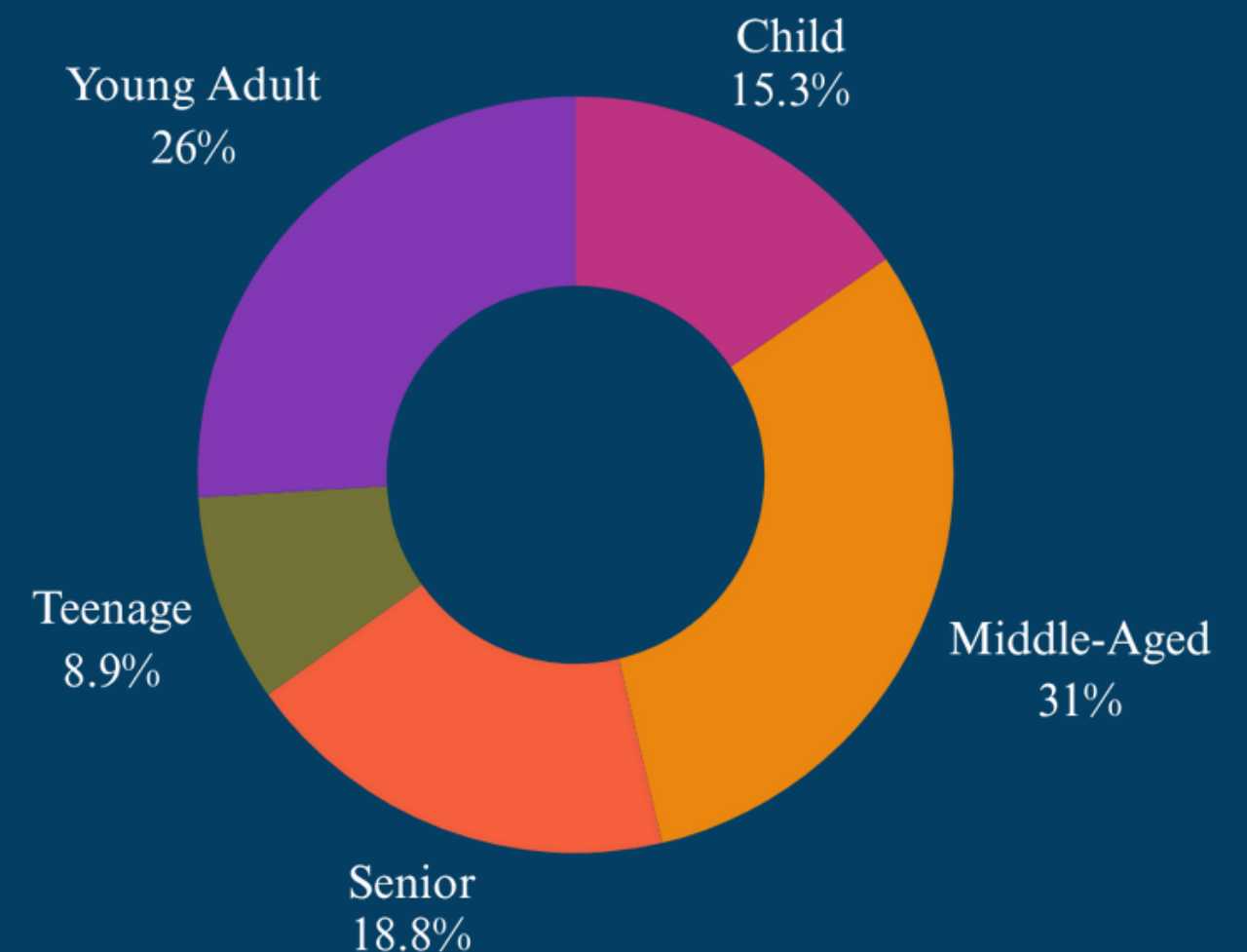
Data Overview

- The dataset contains hospital patient visit records
- Each row represents one patient visit
- Data includes patient, doctor, billing, and service details
- Doctor information is linked using a unique doctor ID
- Billing data includes total bill and appointment fees
- Service quality is measured using waiting time and satisfaction score
- Date information is used to analyze visits over time
- The data supports doctor-wise and department-wise analysis
- The dataset is structured to allow interactive filtering using slicers

OBJECTIVES

- Identify the highest revenue-generating departments and assess drivers of performance
- Reduce average patient wait times by 10 percent through operational improvements
- Improve overall patient satisfaction scores to a target of 6.5
- Optimize service delivery for middle-aged patient groups based on usage and outcomes
- Address racial disparities in care quality and patient experience
- Rebalance staffing levels across shifts to match patient demand
- Design and implement targeted discount programs to improve access and utilization
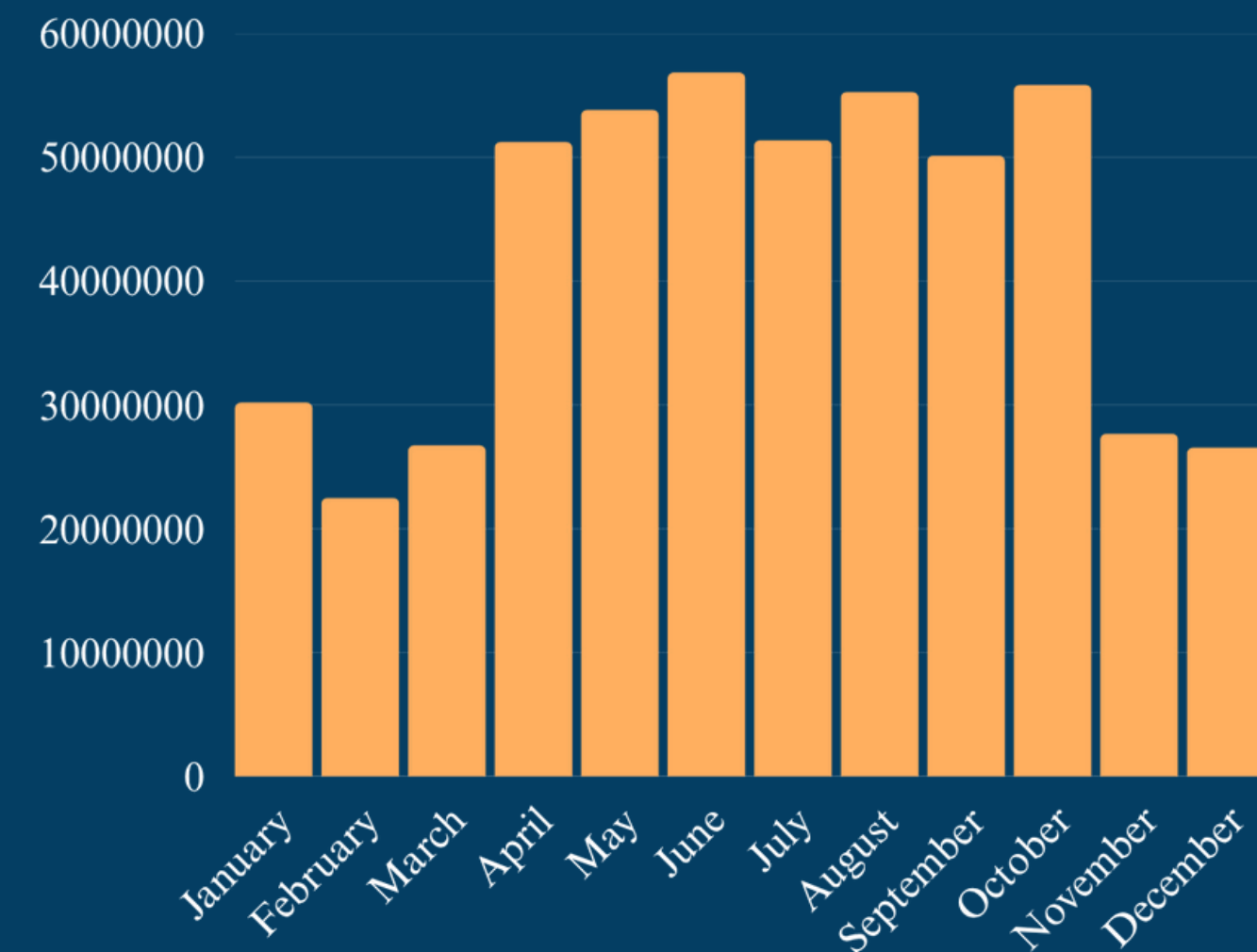-

PATIENTS BY AGE GROUP

- Middle-aged patients form the largest segment, accounting for 31 percent of visits (2,848 patients)
- Young adults represent the second-largest group at 26 percent (2,386 patients)
- Teenagers are the most underserved segment, comprising only 9 percent of visits (819 patients)
- Recommendations
- Introduce structured chronic disease management programs tailored to middle-aged patients
- Launch targeted teen health awareness and preventive care campaigns to improve engagement.
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BILL BY MONTH

○ August 2020 recorded the highest revenue at ₹5.3 crore from 527 patient visits

○ February 2020 saw the lowest revenue at ₹4.2 crore with 428 visits

○ Monthly revenue remained relatively stable, ranging between ₹4.6 crore and ₹5.3 crore

○ Recommendations

○ Introduce seasonal promotions during low-revenue months to boost patient volumes

○ Launch annual wellness packages to smooth cash flow and reduce revenue volatility
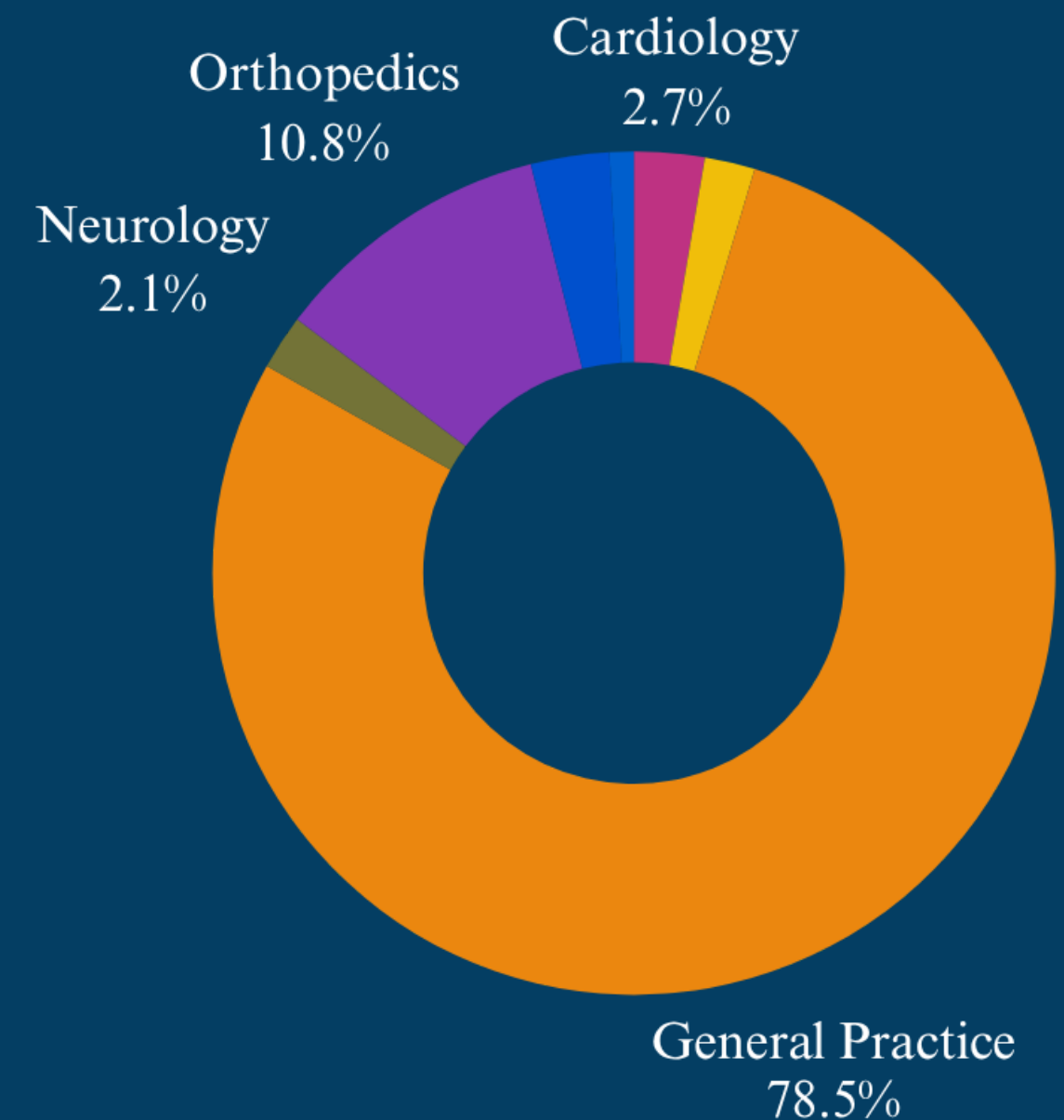
○

NUMBER OF VISIT BY GENDER

- The patient mix shows a near-even gender split, with 51 percent male and 49 percent female representation
- Male patients dominate Orthopedics, particularly within the middle-aged segment (162 males versus 147 females)
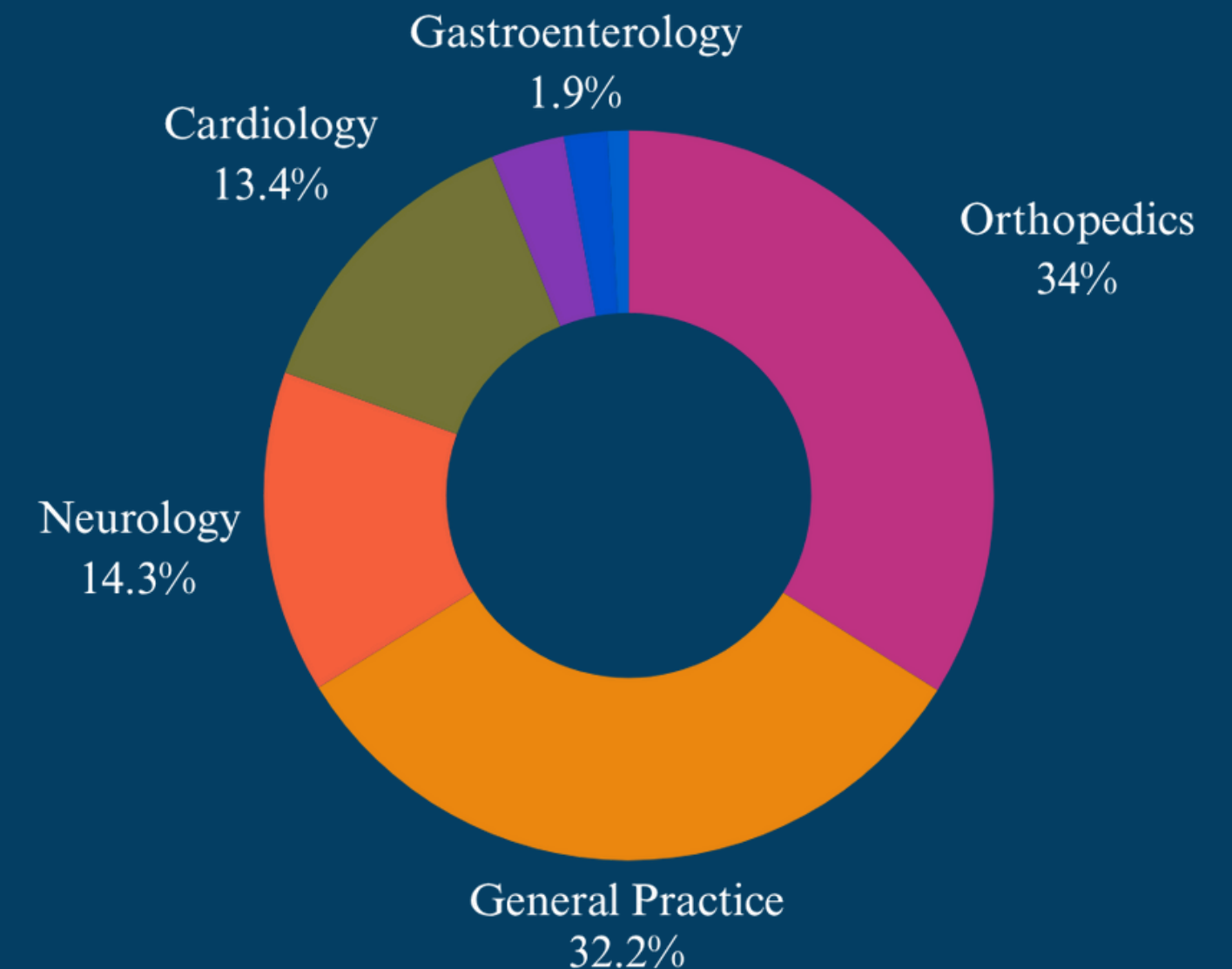-

Female
4487

Male
4705

PATIENTS BY DEPARTMENT

○ General Practice accounts for 78 percent of total patient visits (7,220), making it the primary point of care
○ Orthopedics is a distant second with 992 visits
○ Physiotherapy remains significantly underutilized with only 276 visits
○ Recommendations
○ Redirect appropriate Orthopedics overflow cases to Physiotherapy to improve capacity utilization
○ Promote Physiotherapy as a preventive and rehabilitative care option rather than a last-resort service
○

Orthopedics
10.8%

Cardiology
2.7%

Neurology
2.1%

General Practice
78.5%

REVENUE BY DEPARTMENT

- General Practice generates approximately ₹40.7 crore, contributing nearly 80 percent of total revenue from 7,220 visits
- Orthopedics contributes ₹5.5 crore from 992 visits, delivering a higher-than-average revenue per visit
- Neurology, despite lower patient volumes, records the highest revenue per visit, indicating strong pricing power
- Recommendations
- Further monetize General Practice through preventive care and subscription-based health packages
- Introduce premium pricing or differentiated service tiers for Neurology to maximize revenue per patient
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Gastroenterology 1.9%

Cardiology 13.4%

Orthopedics 34%
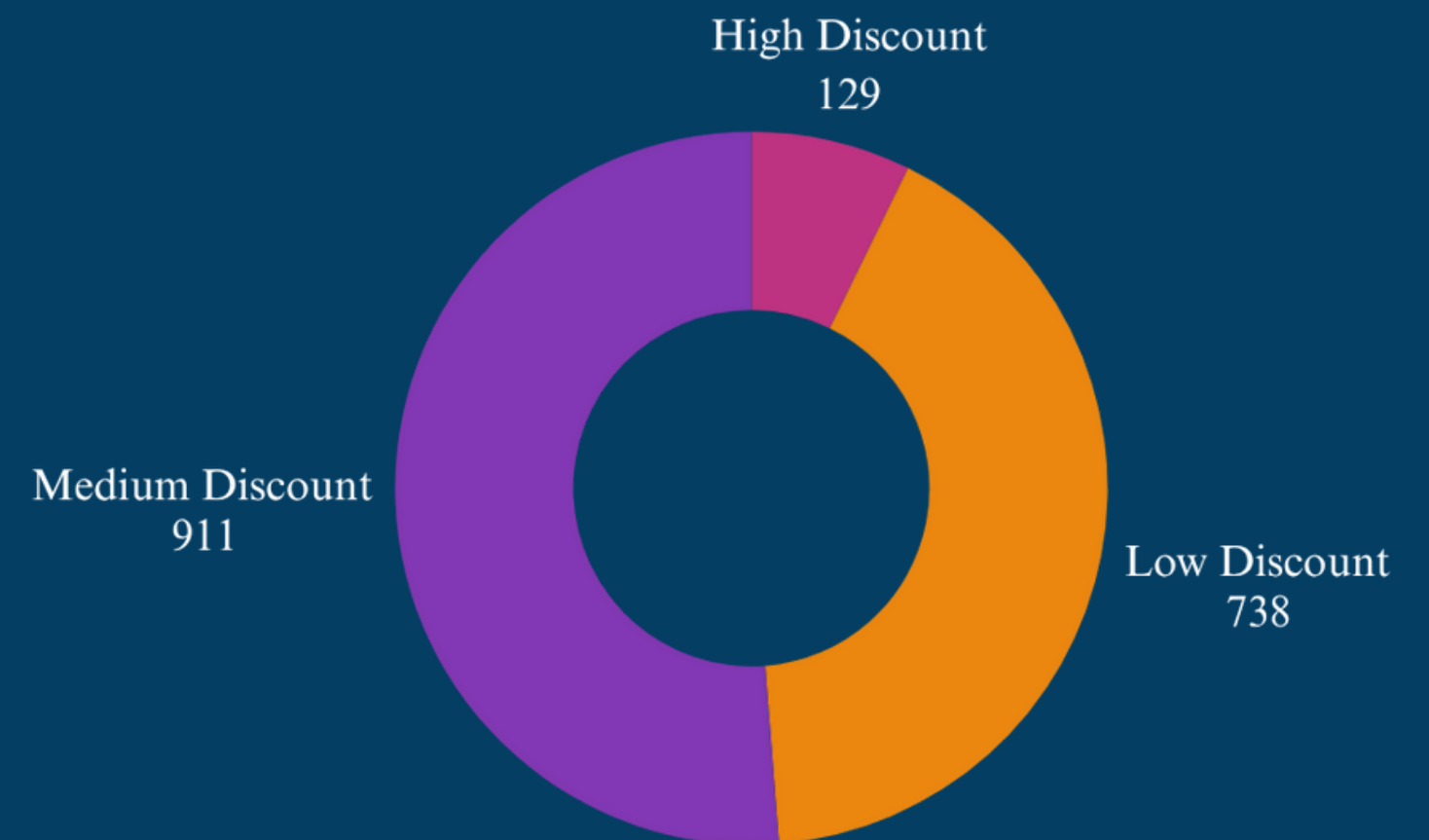
Neurology 14.3%

General Practice 32.2%

DISCOUNTS ANALYSIS

Insights

- Medium-value discounts are the most frequently applied, with 911 cases
- High-value discounts are used sparingly, recorded in only 129 cases
- A strong positive correlation exists between discount levels and improvements in patient satisfaction

Recommendations

- Expand medium discount programs to drive broader satisfaction gains
- Deploy high-value discounts selectively for at-risk or high-dissatisfaction patient groups
  - ○

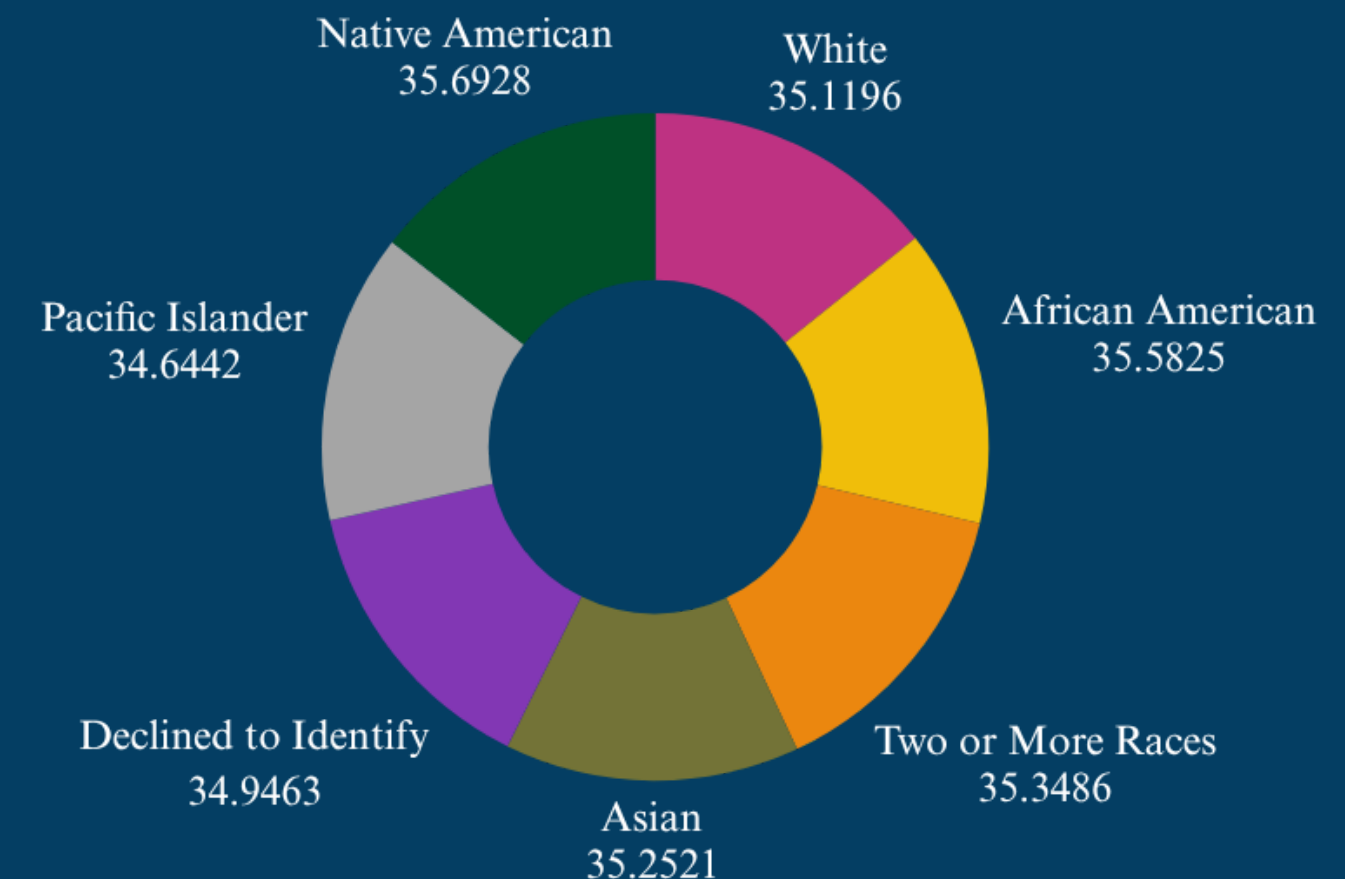High Discount
129

Medium Discount
911

Low Discount
738

PATIENT RACE VS AVG WAIT TIME

Insights
- Native American patients experience the longest average wait times at 35.69 minutes
- African American patients also face above-average delays at 35.58 minutes
- Pacific Islander patients have the shortest wait times at 34.64 minutes

Recommendations
- Prioritize operational improvements in departments where Native American and African American patients experience longer waits
- Introduce fast-track check-in or express consultation pathways for identified at-risk groups to reduce delays
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Native American 35.6928
White 35.1196
African American 35.5825
Two or More Races 35.3486
Asian 35.2521
Declined to Identify 34.9463
Pacific Islander 34.6442

Columbia Asia Hospital Analysis

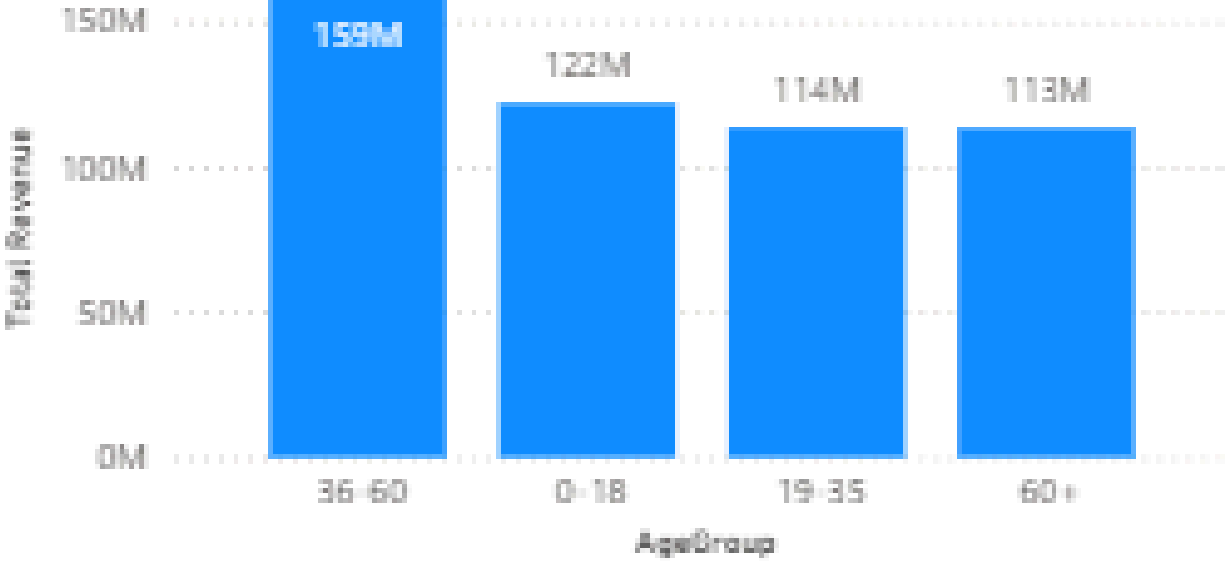| Total Patients	Avg Waiting Time	Avg Satisfaction Score	Total Revenue	Slicer month-year, depar... ⌄
9176	35.25	5.47	509M	All ⌄

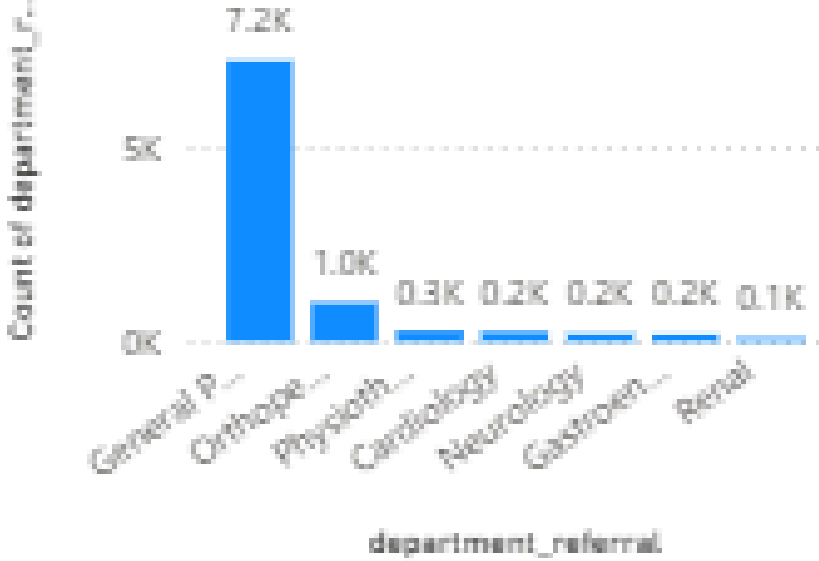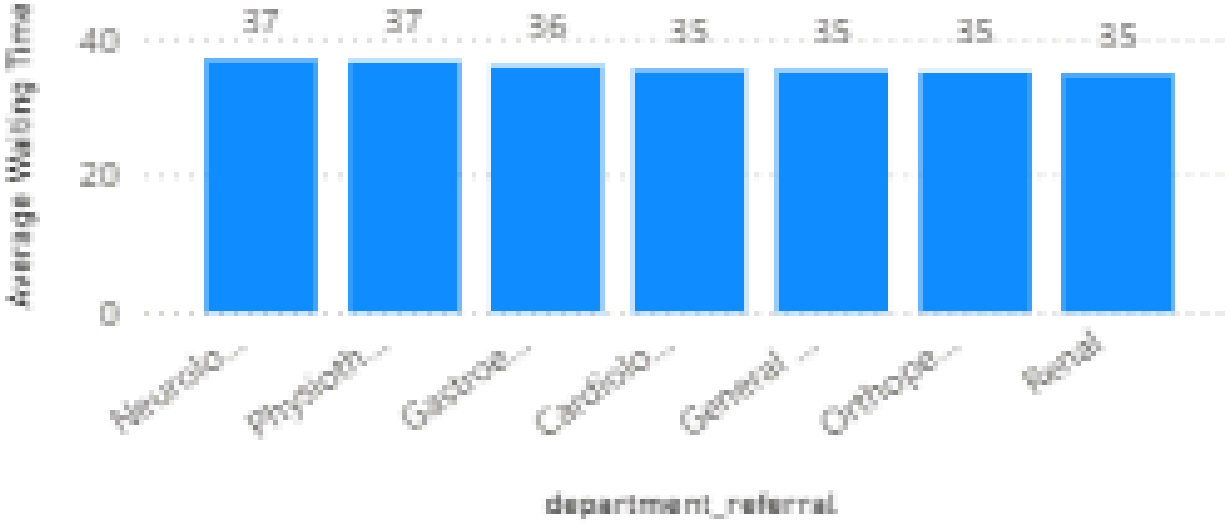## Revenue generated by Departments

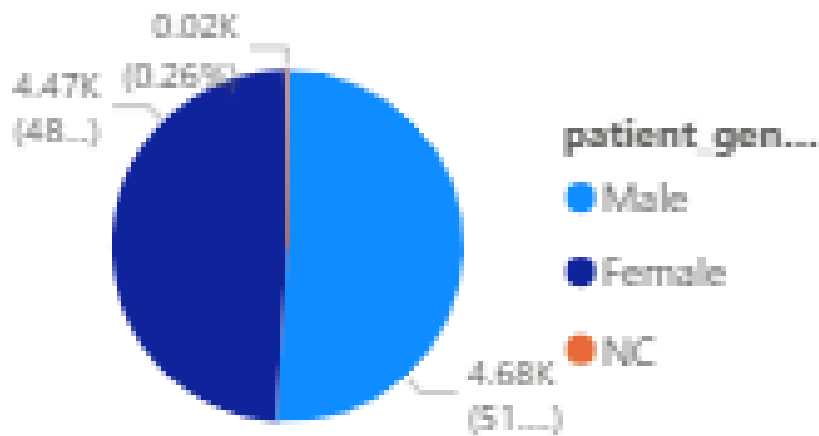Revenue generated by Departments

Revenue generated by Age-Group

Visit by department

Average Waiting Time by department
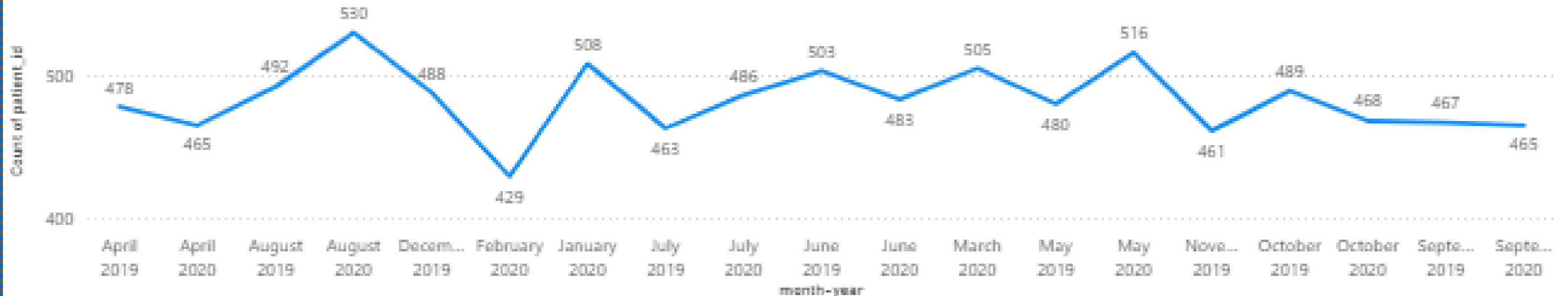

Count of patient_id by patient_gender

patient gen...
- Male
- Female
- NC

Columbia Asia Hospital Analysis

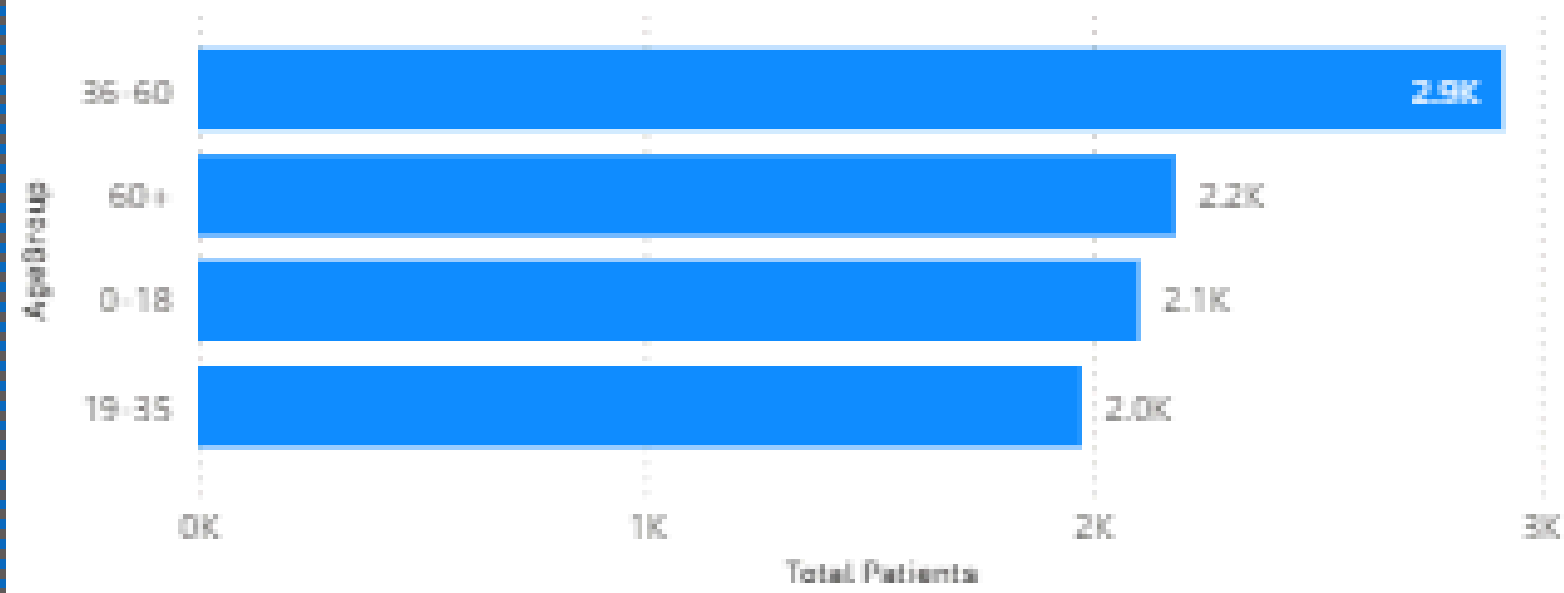| Doctor Name	Total Patients	Appointment Fee	Avg Satisfaction Score	Revenue	Department
Dr. Anderson	9176	5M	5.47	509M	Cardiology

Doctor Name
- ☐ Dr. Anderson
- ☐ Dr. Brown
- ☐ Dr. Clark
- ☐ Dr. Davis
- ☐ Dr. Garcia
- ☐ Dr. Harris
- ☐ Dr. Jackson
- ☐ Dr. Johnson
- ☐ Dr. Martin
- ☐ Dr. Martinez
- ☐ Dr. Miller
- ☐ Dr. Moore
- ☐ Dr. Robinson
- ☐ Dr. Rodriguez
- ☐ Dr. Smith
- ☐ Dr. Surya
- ☐ Dr. Taylor
- ☐ Dr. Thomas
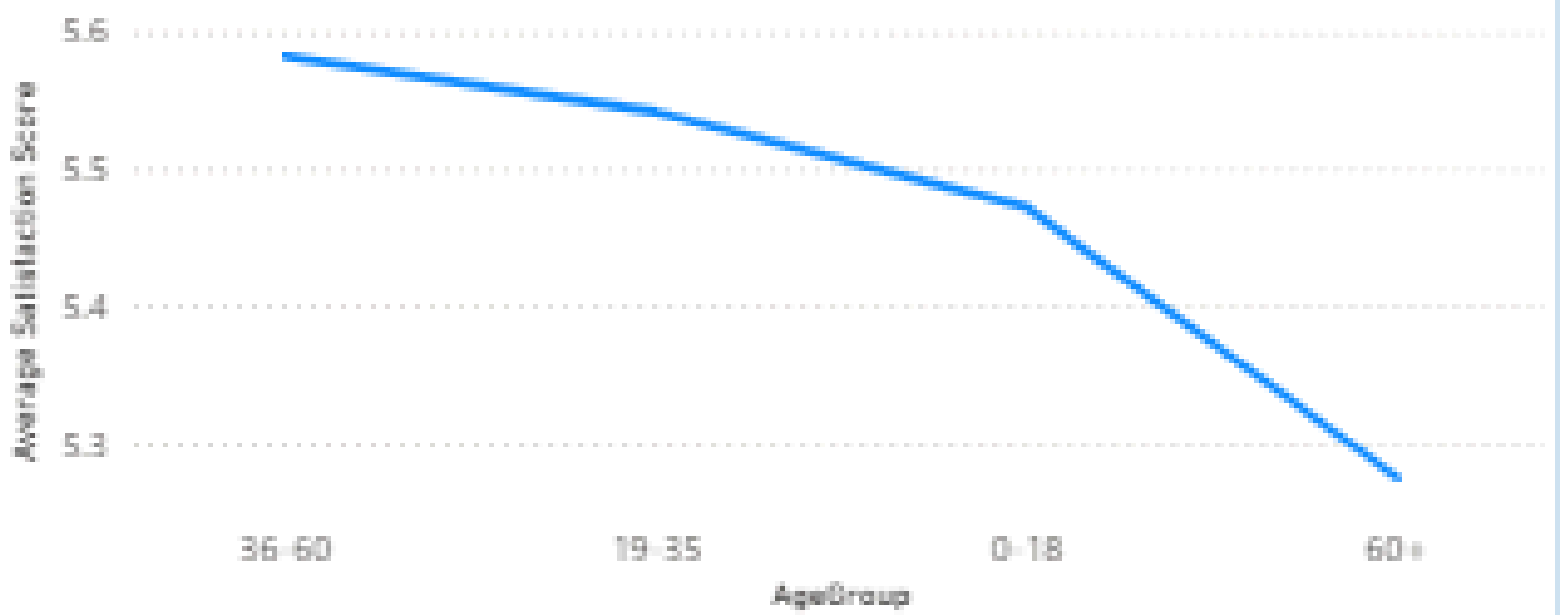- ☐ Dr. Thompson
- ☐ Dr. White

Visited patients throughout year

Total Patients by AgeGroup

Average Satisfaction Score by AgeGroup

Columbia Asia Hospital Analysis

Patients Name	Patient Gender	Patient Age	Avg Waiting time (in min)	Money Spent	Race
A Abarough	Female	39	35.25	509M	African American

Relationship between Satisfaction Score and patient waittime

Patients by departments

Average Waiting Time by patient_race
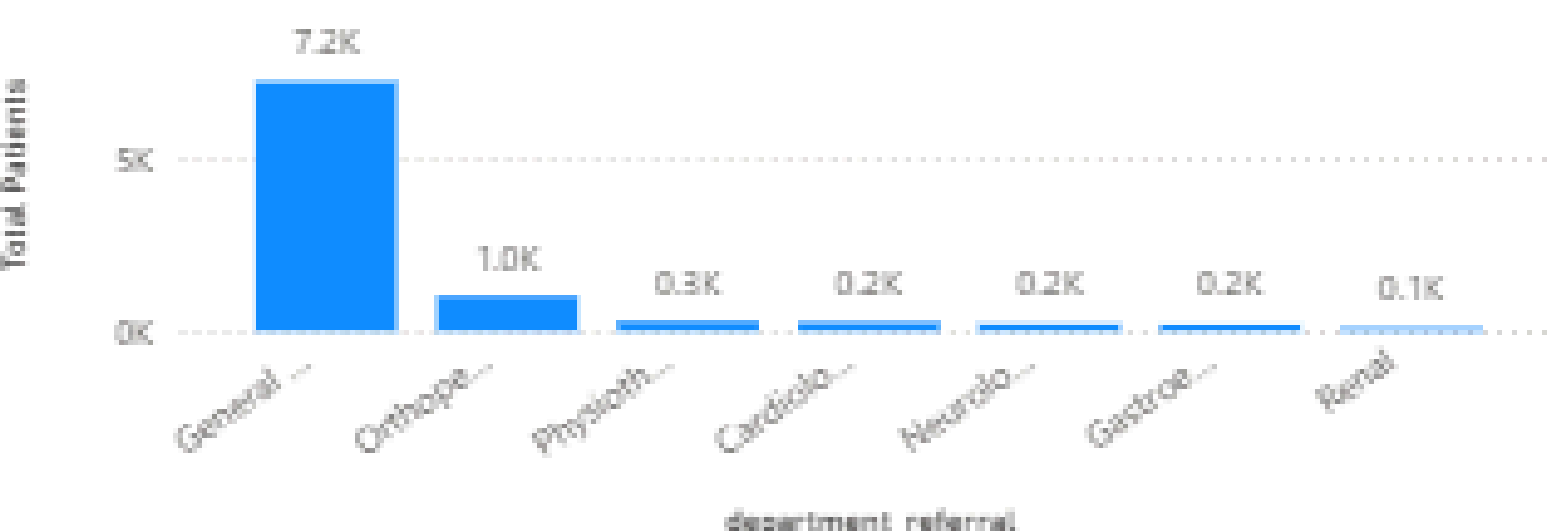
patients_name

- ☐ A Ambrogioni
- ☐ A Angell
- ☐ A Arden
- ☐ A Aspling
- ☐ A Assad
- ☐ A Attril
- ☐ A Backshaw
- ☐ A Bagnal
- ☐ A Barmadier
- ☐ A Basili
- ☐ A Batte
- ☐ A Baudichon
- ☐ A Beadnall
- ☐ A Beakes
- ☐ A Belt
- ☐ A Bevan
- ☐ A Bewlay
- ☐ A Biggadyke
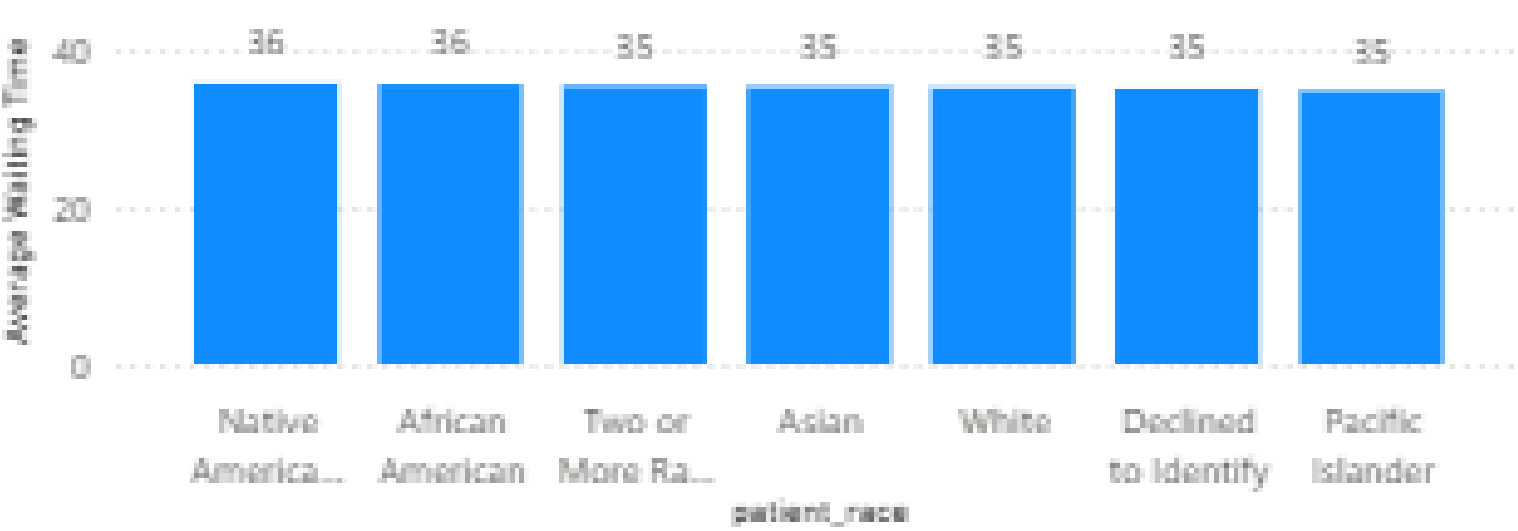- ☐ A Birbeck
- ☐ A Blowfelde

Recommendations

- Use a proper star schema to keep data structured and easy to understand
- Separate master data and transactional data to avoid repetition
- Create all KPIs using measures so values change correctly with slicers
- Maintain one common measures table to keep the report organized
- Ensure relationships are active and correctly mapped using IDs
- Reduce unnecessary columns to improve dashboard performance
- Apply consistent formatting for KPIs to improve readability
- Use slicers carefully to avoid confusing or misleading analysis
- Add trend analysis to understand monthly and yearly performance
- Monitor waiting time and satisfaction to improve hospital service quality
- Include doctor and department comparison to support better decisions
- Expand the model with patient demographics for deeper insights
- Use this dashboard as a base for future predictive analysis
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CONCLUSION

- General Practice is the primary volume driver, while Neurology contributes disproportionately to profitability
- Neurology and Physiotherapy require process redesign to improve throughput and utilization
- Targeted interventions are necessary to address service gaps among teenage patients and Asian male demographics
- Shift A is under-resourced and requires an estimated 20 percent increase in staffing or capacity
- Medium-value discounts deliver the strongest and most consistent impact on patient satisfaction
- Immediate, high-impact actions include launching dedicated teen clinics and hiring an additional neurologist
- Every one-minute reduction in wait time corresponds to an approximate 0.2-point increase in satisfaction score
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