

Patient Health Data Analysis

This data provides an analysis of **hospital visit records** for a dataset of 51,000 patients, highlighting demographic trends, health conditions, medications, and other healthcare utilization patterns. It offers insights into patient distributions across genders, age groups, and medical conditions, while also examining prescription trends and the balance between chronic disease management and routine healthcare needs.

Dataset Overview

Patient_ID: Unique identifier for each patient.

Age: Age of the patient in years (18-89).

Gender: The gender of the patient (Male, Female, Other).

Blood_Pressure_Systolic/Diastolic: Blood pressure measurements in mmHg.

Heart_Rate: Heart rate in beats per minute (BPM).

Cholesterol_Level: Cholesterol levels in mg/dL.

Medical_Conditions: Common medical conditions such as Diabetes, Hypertension, Asthma, or None.

Medications: Types of medication, including Metformin, Lisinopril, Statins, or None.

Visit_Date: Date of the most recent medical visit within the current year.

Diagnosis: Type of medical diagnosis (Routine Check, Infection, Emergency, Follow-up).

Hospital_Visits_Past_Year: The number of hospital visits in the past year (0-9).

BMI: Body Mass Index (18.5 to 35).

Smoker_Status: Whether the patient is a smoker (Yes/No).

Physical_Activity_Level: The patient's physical activity level (Sedentary, Moderate, Active).

Tools and Technologies

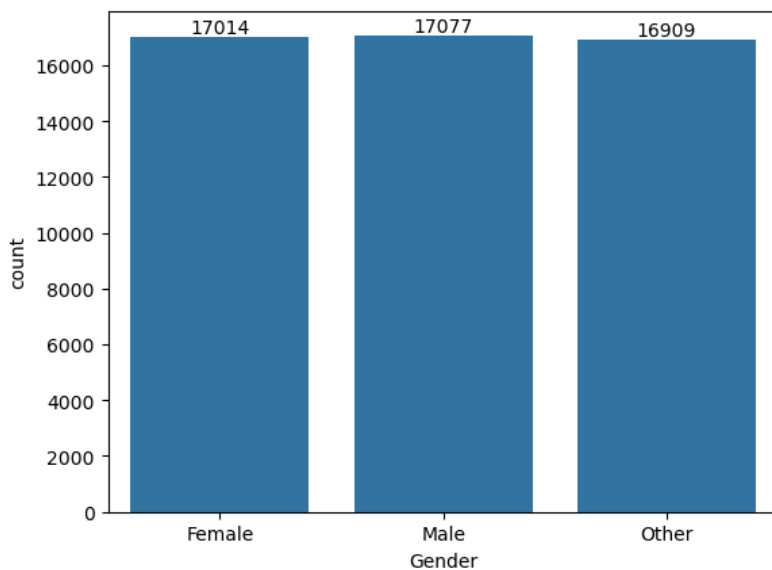
Data Collection and Cleaning :

Python (Pandas, NumPy).

Visualization:

Matplotlib and Seaborn for visuals.

Insights And Findings



Hospital visit records of 51,000 patients reveals that patient counts are distributed relatively equally across genders. Among the total patients, 17,017 were female, 17,077 were male, and 16,909 identified as other.

Gender Parity in Health Challenges:

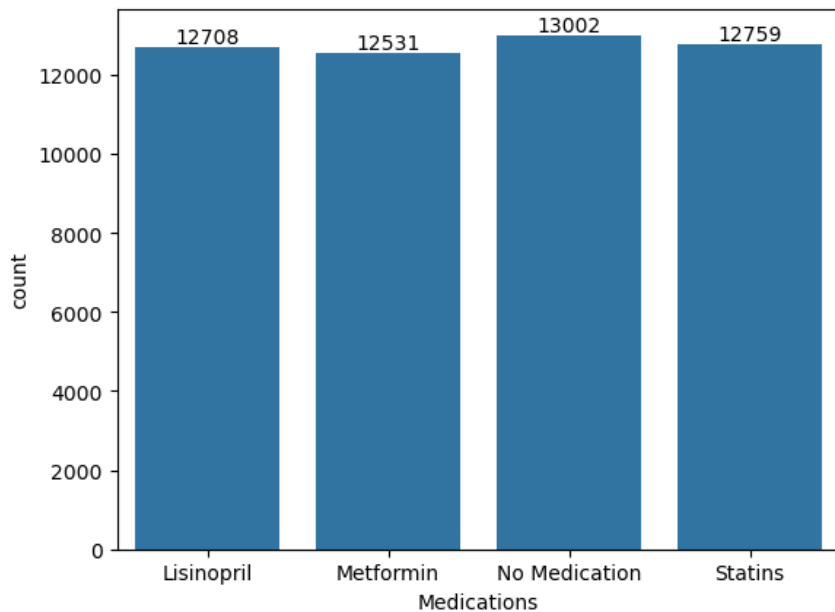
The near-equal distribution of hospital visits across genders suggests that health concerns are not disproportionately affecting any specific genders

Inclusivity in Data:

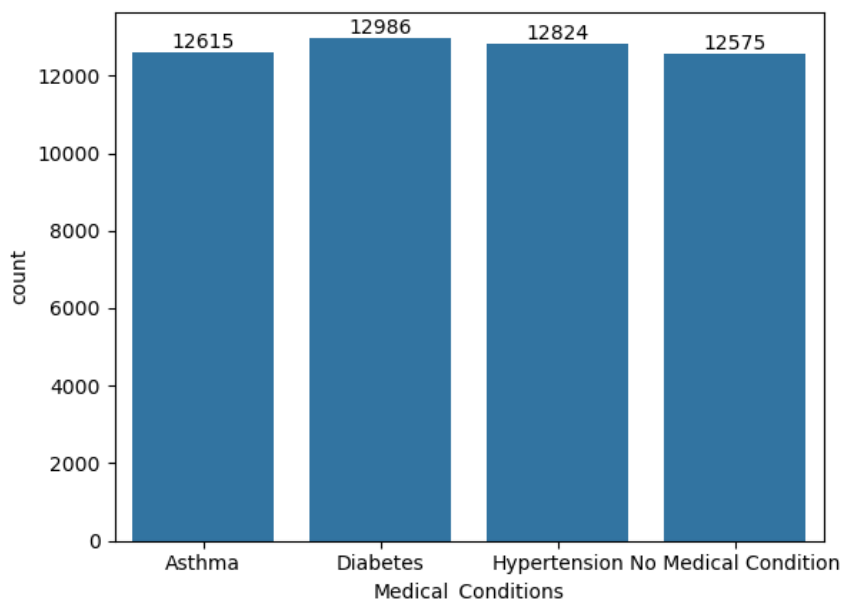
A significant number of patients (16,909) identified as other than male or female, indicating inclusivity in healthcare services and the need to understand health trends for all genders.

Healthcare Utilization:

Equal visitation rates imply that healthcare facilities are being utilized similarly by all genders, reflecting balanced accessibility or awareness across gender demographics.



The dataset includes three main types of medications prescribed: **Statins (12,759 patients)**, **Metformin (12,531 patients)**, and **Lisinopril (12,708 patients)**. Additionally, there is a significant group classified as receiving **no medication**, comprising patients who might have been visiting for routine check-ups, emergencies, or cases where medication was unnecessary.



Three primary medical conditions include: Asthma (12,615 patients), Hypertension (12,824 patients), and Diabetes (12,986 patients). Additionally, there are 12,575 patients classified under "no medical condition," which likely includes individuals visiting for routine check-ups, minor concerns, or situations where a specific medical condition was not diagnosed at the time of the visit. Some in this group may also have received prescriptions even without a formally diagnosed condition.

Asthma (12,615 patients):

While asthma patients represent a smaller portion compared to Hypertension and Diabetes, it still indicates a notable presence of individuals managing a chronic respiratory condition.

Hypertension (12,824 patients):

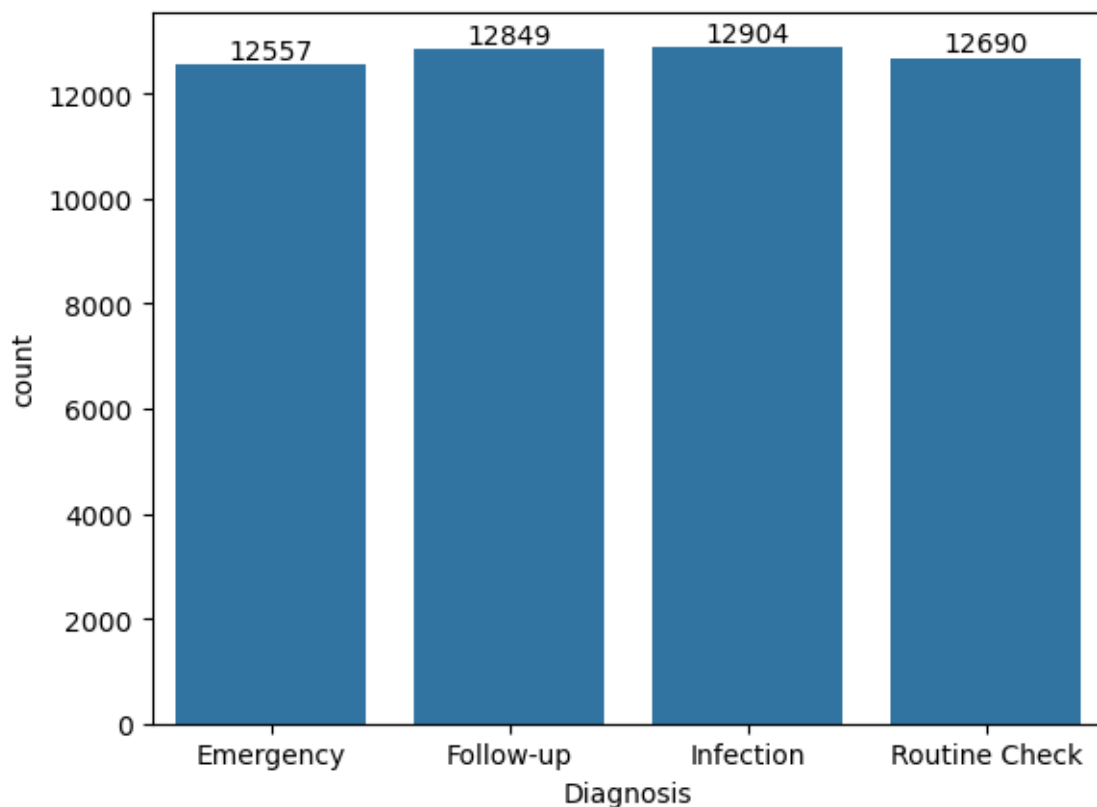
Hypertension is highly prevalent, affecting a large number of patients. This suggests the importance of regular monitoring and treatment to reduce cardiovascular risks.

Diabetes (12,986 patients):

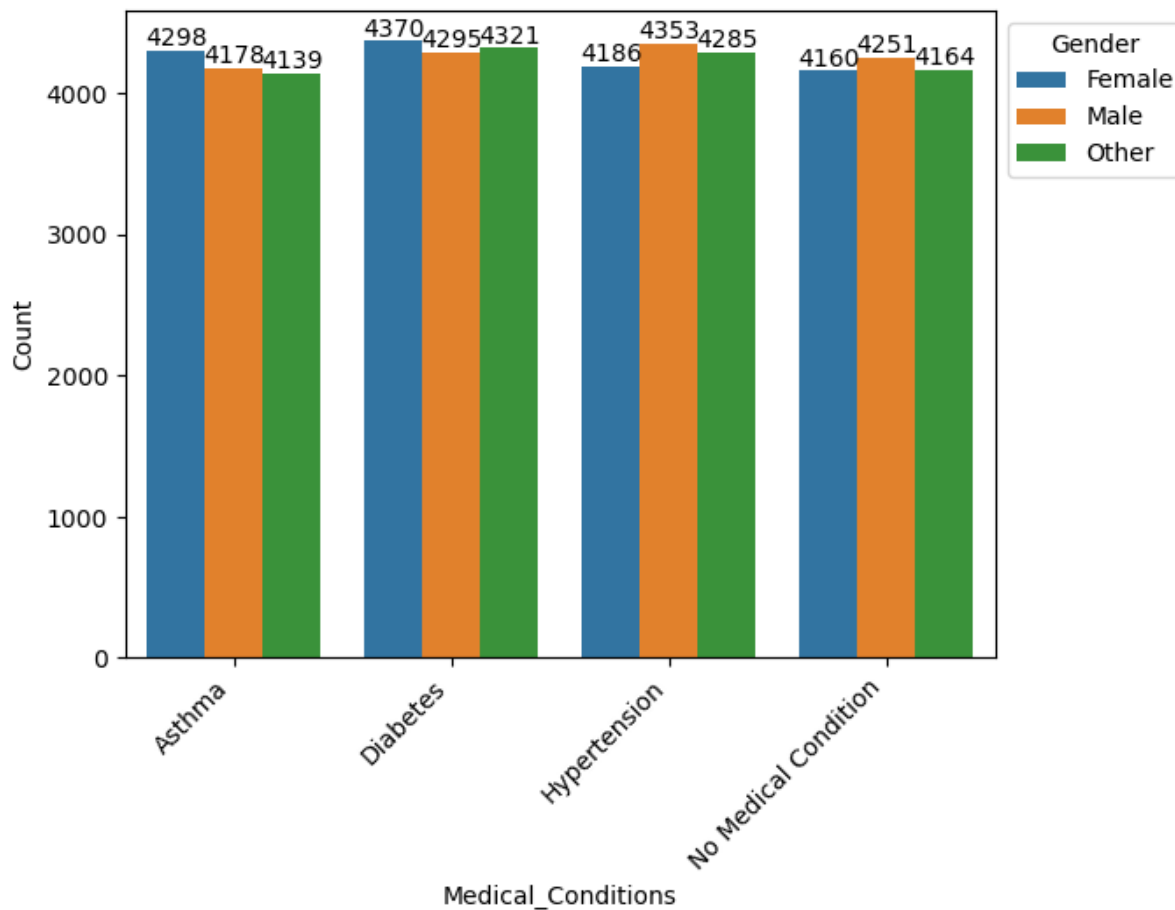
Diabetes is also highly prevalent, emphasizing the need for effective management of blood sugar levels, regular screenings, and lifestyle interventions to prevent complications.

No Medical Condition (12,575 patients):

This category reflects patients who may not have a specific condition diagnosed at the time of the visit but still require healthcare services. These individuals could be receiving routine check-ups, wellness visits, or preventive care. Some might have been prescribed medication for non-specific symptoms or to prevent future health issues.

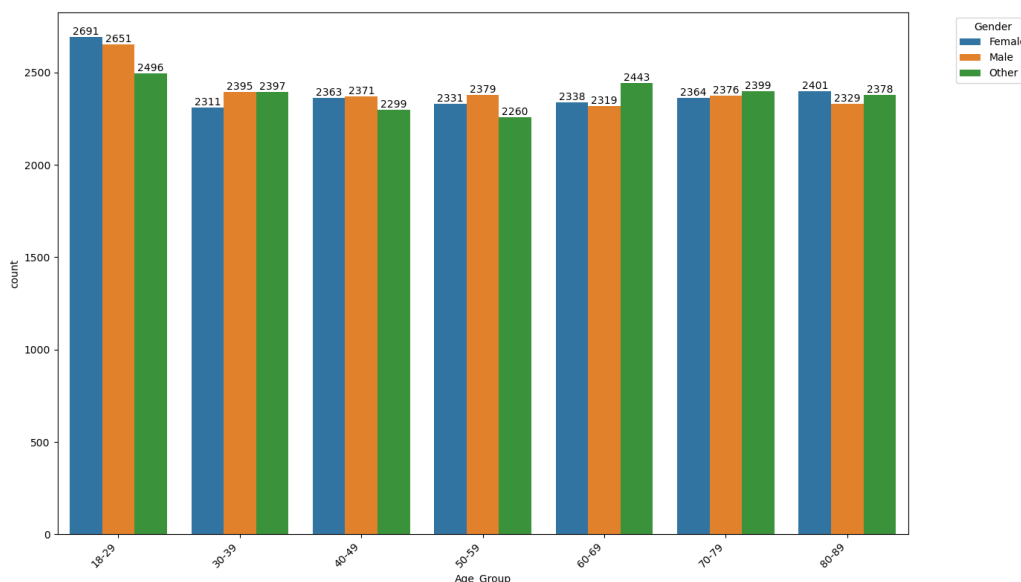


Similar number of visits across different categories: **Infection** (12,904 patients), **Follow-up** (12,849 patients), **Routine check-ups** (12,690 patients), **Emergency** (12,557 patients), and **Diagnosis** (12,000 patients)., indicates a well-rounded need for urgent care, chronic condition monitoring, and preventive healthcare. The data highlights the importance of comprehensive healthcare services to address these diverse patient needs.

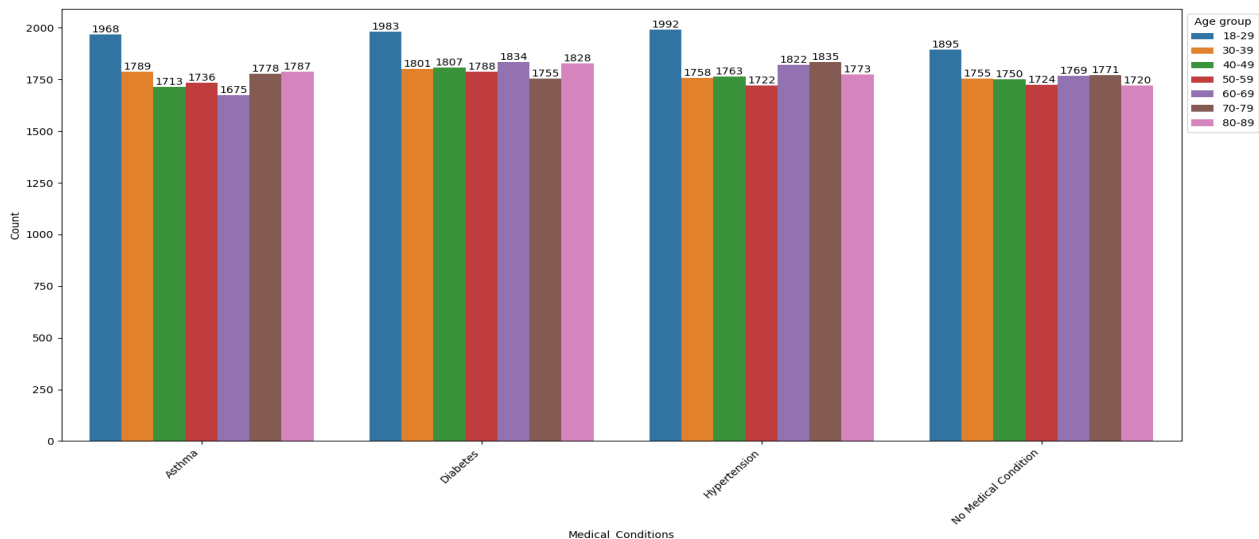


Females consistently represent a slightly higher number of patients in asthma and hypertension compared to males and others. **Males** have the highest count in diabetes, slightly surpassing females and others.

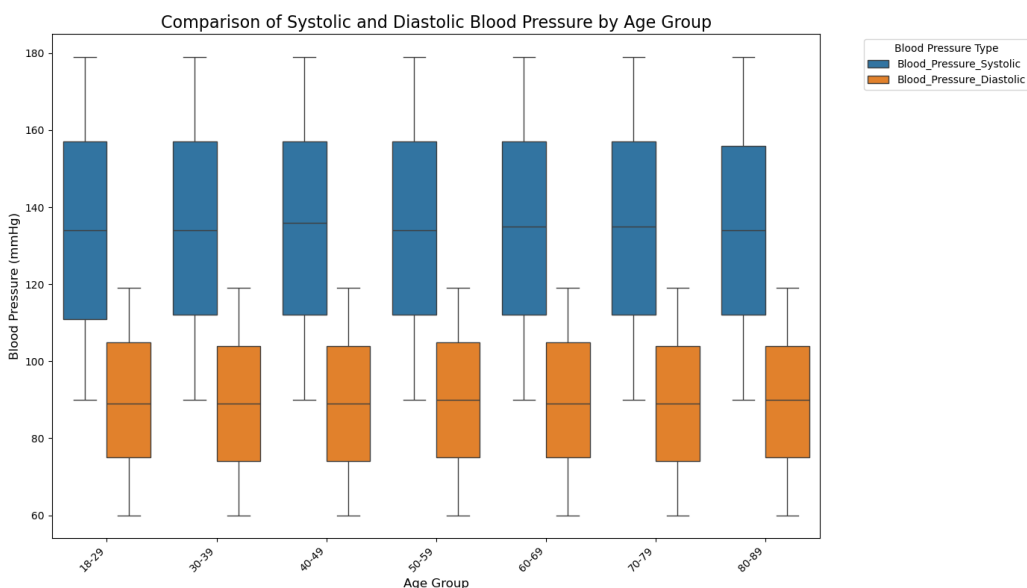
Chronic conditions such as **Asthma**, **Diabetes**, and **Hypertension** are evenly distributed across **females**, **males**, and **other genders**, with slight variations in prevalence. **Diabetes** stands out as the most common condition, particularly among males. The **No Medical Condition** group, though smaller, underscores the importance of routine and preventive healthcare across all genders. This balanced distribution emphasizes the need for comprehensive and inclusive healthcare strategies to effectively manage and support diverse patient populations.



- The 30-39 age group has the highest patients across all genders.
- Females show higher patients in older age groups (50-59, 60-69, 70-79), indicating more chronic conditions in older age.
- Males patients are more in younger age groups (18-29, 30-39).
- Patients are balanced across genders, with a slight tilt towards females in older age groups.
- Patients peak in middle age and slightly decrease with age, likely due to long-term management of conditions.

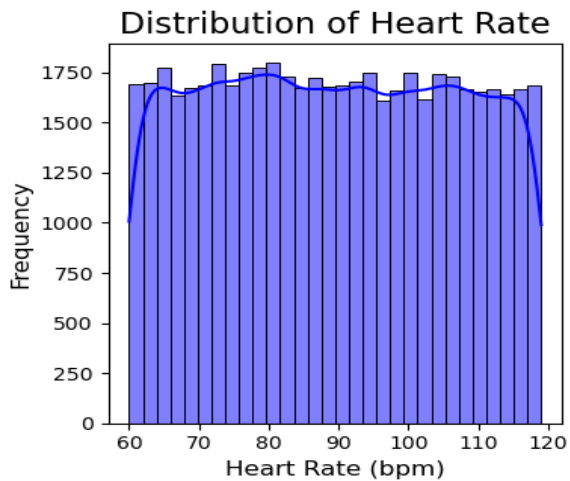


The hospital visit data shows that the highest number of patients occurs in the 18-29 and 30-39 age groups, primarily for asthma, diabetes, and hypertension. Patients decline gradually in the 40-49 and 50-59 age groups, suggesting ongoing management of chronic conditions. The 60-69 and 70-79 groups show fewer patients, likely due to better long-term management. The 80-89 age group has the lowest number of patients, reflecting a focus on routine care and existing condition management. Overall, patient visits are most frequent in younger adults, with a decrease as age increases.



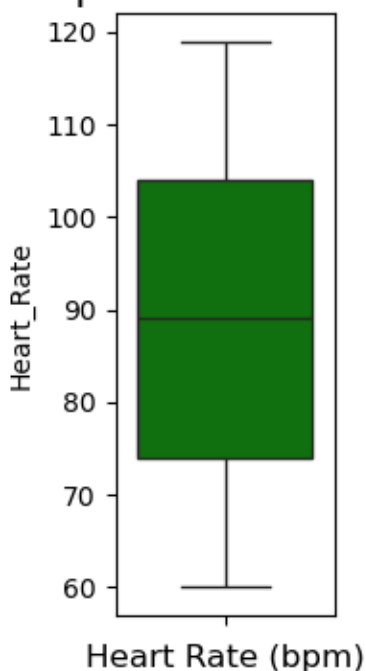
- Systolic blood pressure (blue box plots) tends to increase with age, particularly after 50 years.

- Diastolic blood pressure (orange box plots) shows less variation across age groups but has a slight decreasing trend with age. The interquartile range (IQR) for systolic pressure.



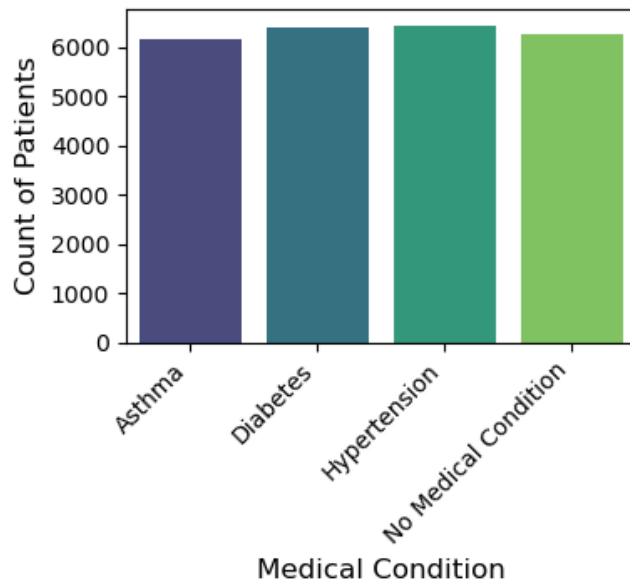
- Heart rates are distributed fairly uniformly between 60 and 120 bpm, with slight peaks at certain intervals. The data is spread out without big spikes, showing that most heart rates fall within this range.

Boxplot of Heart Rate



- The **median** suggests that most individuals have a resting or slightly elevated heart rate. This value is within the normal range for adults (60-100 bpm), which may indicate a general population sample rather than individuals with severe abnormalities.
- The relatively high median, close to 90 bpm, could reflect slight stress, physical activity, or a significant number of individuals with medical conditions like hypertension or diabetes.

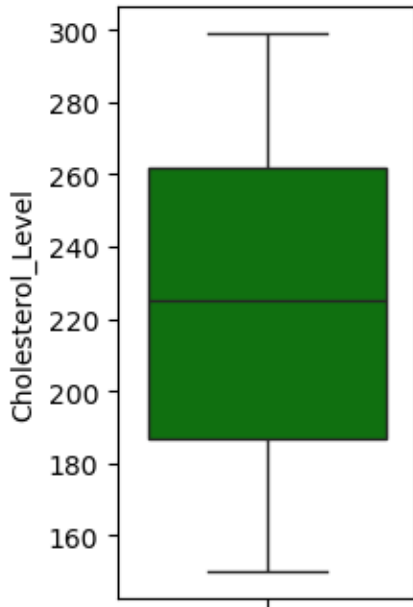
Medical Conditions for Patients with Heart Rate Above Average



Hypertension and **diabetes** are the conditions most strongly associated with **above-average heart rates**.

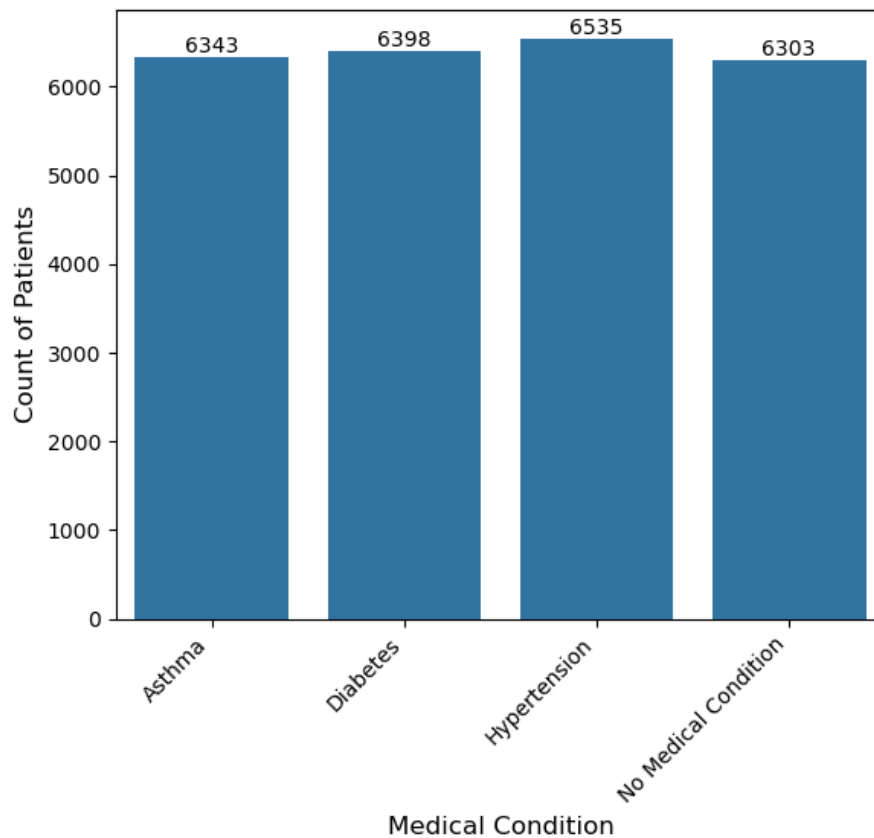
Asthma shows a **slightly lower than average heart rate** in comparison.

Patients with **no medical condition** typically have a **normal or mildly elevated heart rate**, likely requiring just a routine check-up.

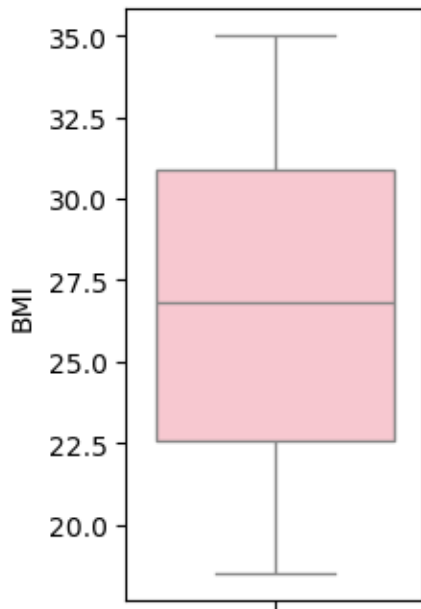


- The **median cholesterol level is above the desirable level (<200 mg/dL)**, indicating a significant portion of the population is at higher risk for cardiovascular issues.
- A median in the borderline-high category suggests that preventive healthcare measures might be necessary for this population.
- **Lower end (150 mg/dL):** These individuals may have optimal cholesterol levels or underlying conditions like malnutrition or hyperthyroidism.
- **Upper end (300 mg/dL):** These values fall in the high-risk category for hypercholesterolemia, necessitating immediate medical intervention to manage cardiovascular risks.

Medical Conditions for Patients with Cholesterol Level above average

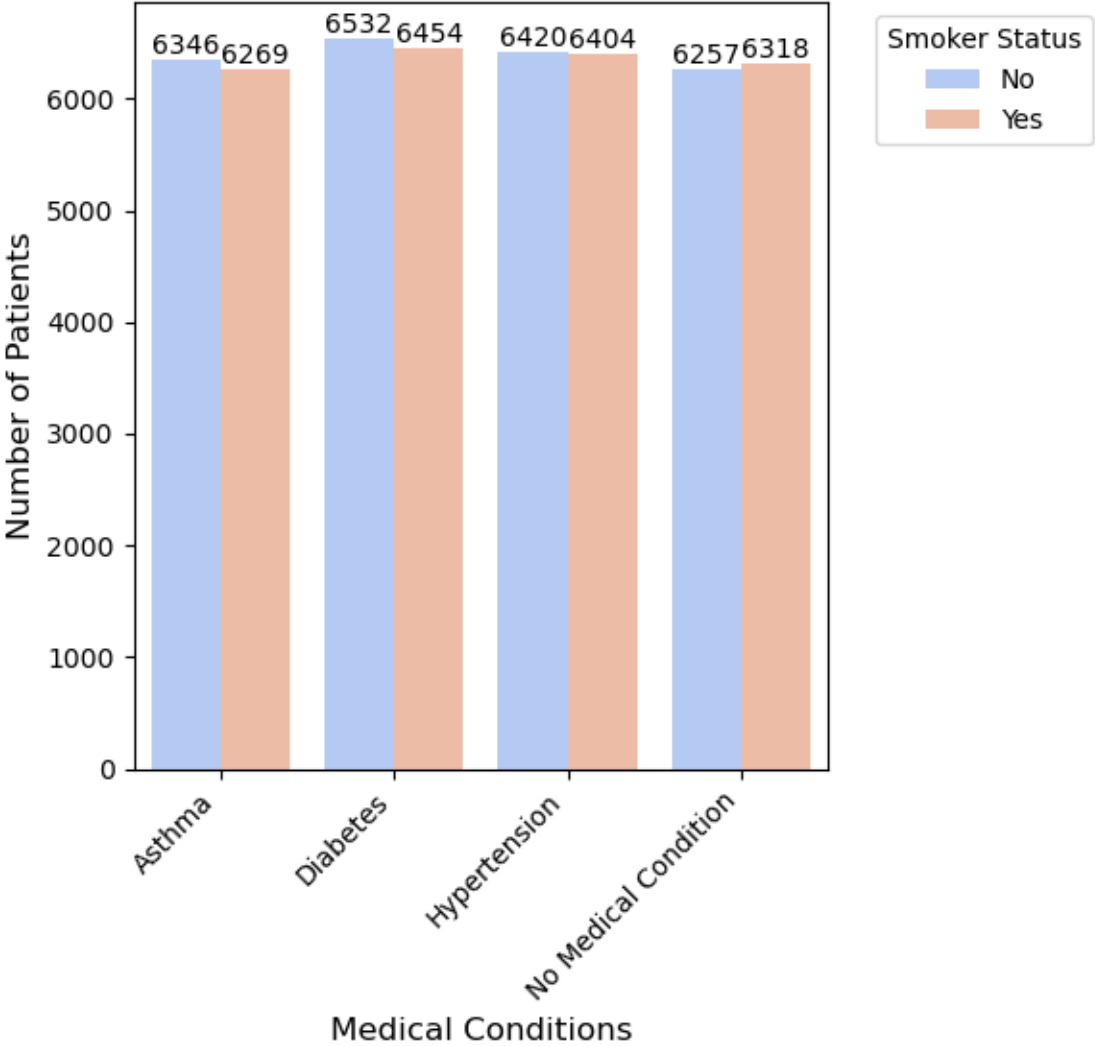


Patients with **hypertension** and **diabetes** show the highest number of cases with above-average cholesterol levels, indicating a strong link between these conditions and higher cholesterol, which increases the risk of cardiovascular diseases. It's crucial to monitor and manage cholesterol in these groups to prevent heart disease. **Asthma** patients, although slightly fewer, also have elevated cholesterol, possibly due to long-term steroid use affecting lipid metabolism. These patients should have their cholesterol monitored regularly. For those with **no medical condition** but high cholesterol, lifestyle changes like improved diet and exercise are recommended to reduce future cardiovascular risks.

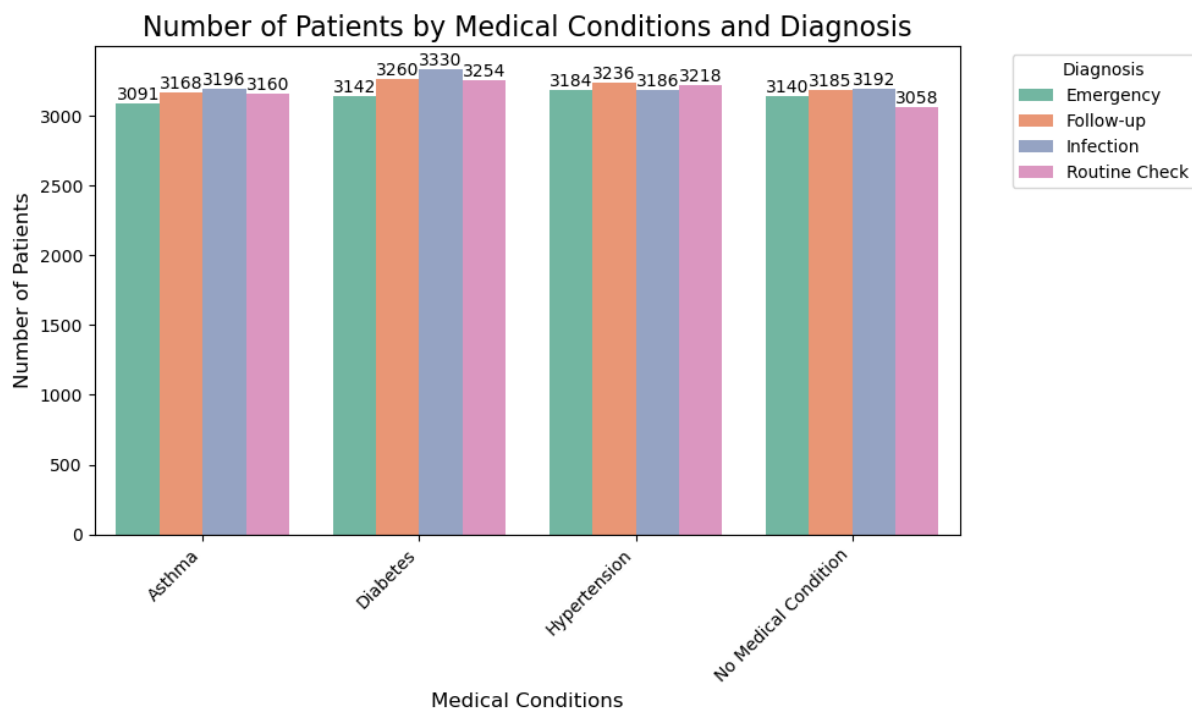


- The **median BMI** falls within the "**overweight**" category (**25–29.9**) according to WHO BMI classification.
- This suggests that a significant portion of the population is at risk of obesity-related health issues like diabetes, cardiovascular diseases, and joint problems.
- **Lower Range (18-22.5):** Represents individuals with normal or underweight BMI, possibly younger populations or those with higher metabolic rates.
- **Upper Range (31-35):** Indicates individuals in the obese category, requiring interventions for weight management to prevent health risks.
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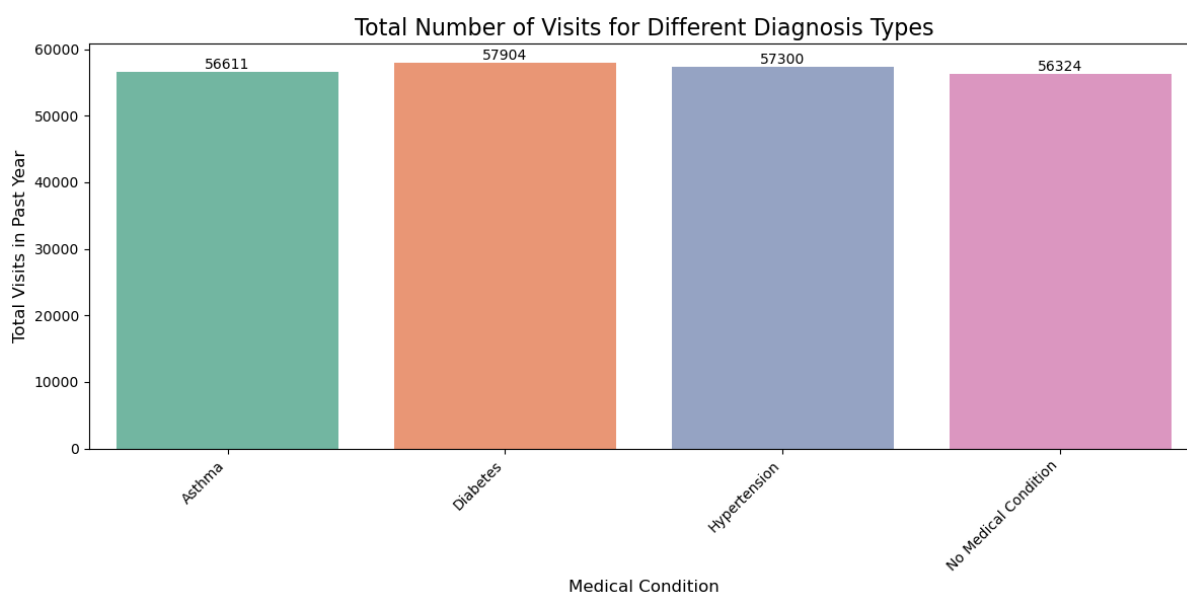
Patients by Medical Conditions and Smoker Status



Smoking is common in patients with **diabetes**, **hypertension**, and **asthma**, with the number of smokers often equal to or higher than non-smokers. This increases the risk of complications like heart disease and worsened lung function. Even among those with **no medical condition**, smoking remains a concern for future health risks. Smoking cessation is essential for all groups to reduce these risks and improve health outcomes.

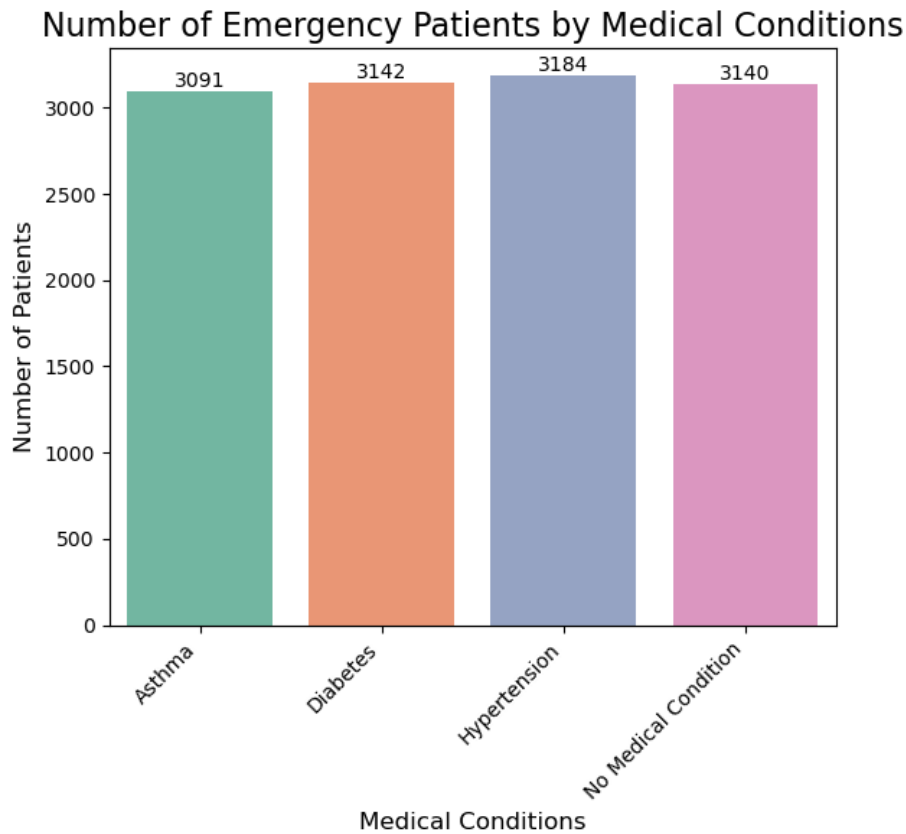


Hypertension leads all medical conditions in patient volume across diagnosis categories, with "Infection" cases peaking at 3330 patients. In contrast, Asthma reports the lowest total, particularly under "Emergency" diagnoses, with 3091 patients. The distribution of patient counts across diagnoses remains strikingly uniform, suggesting a balanced allocation of healthcare resources. Notably, the substantial patient count under "No Medical Condition" highlights the prevalence of routine visits or non-disease-specific consultations, underscoring the role of preventive and general healthcare in overall patient management.

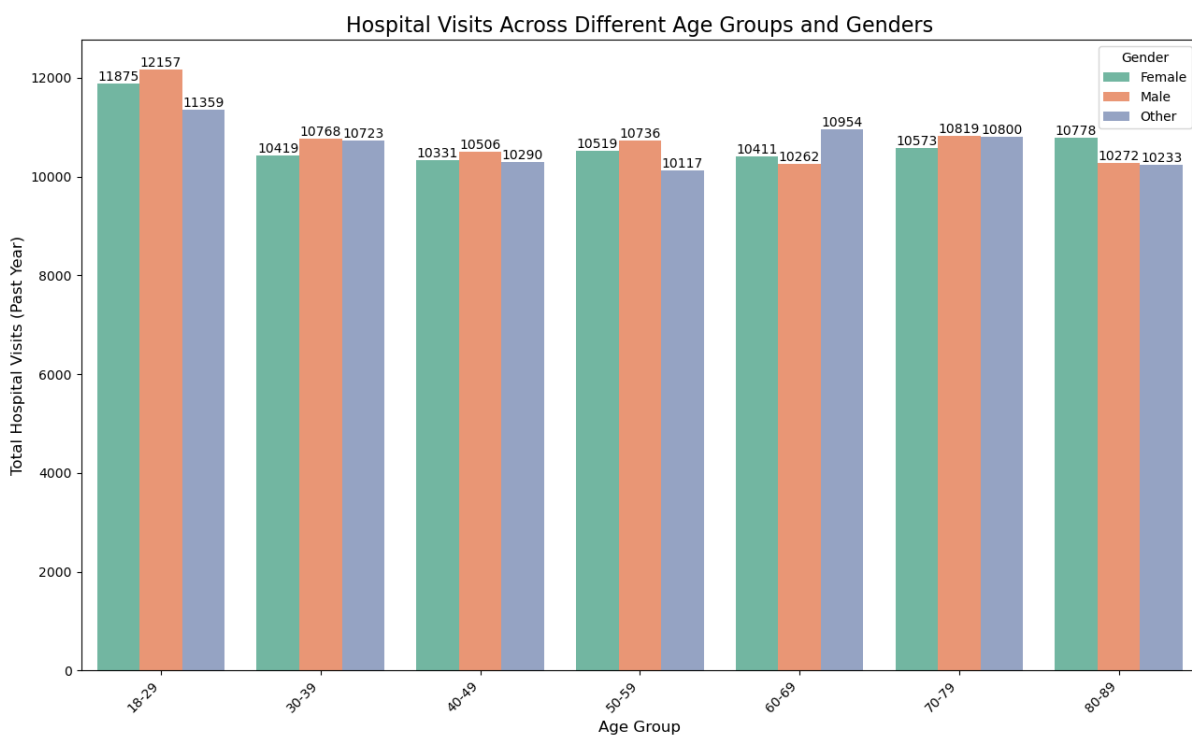


Healthcare visits are highest for diabetes (57,904) and hypertension (57,300), marginally surpassing asthma (56,611) and those with no medical conditions (56,324).

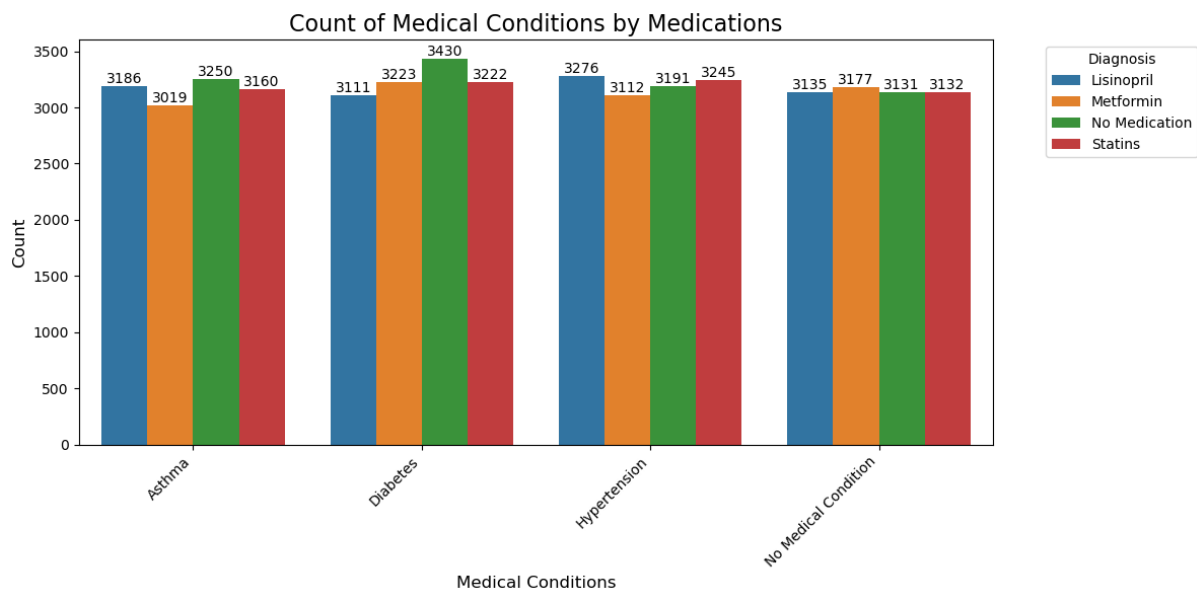
The differences in visit counts across all categories are minimal, indicating a consistent demand for healthcare services across these conditions. The data reflects a balanced utilization of healthcare resources between chronic diseases and routine or unrelated visits.



The 18-29 age group records the highest hospital visits across all genders, with males leading at 12,157 visits, followed by females at 11,875. From ages 30-89, hospital visits gradually decline up to the 40-49 group before stabilizing across older age ranges. Gender patterns reveal that males consistently have more visits compared to females, while the "Other" category maintains steady but lower representation across all age groups.



The bar chart shows that the **18-29 age group** has the highest hospital visits across all genders, with males recording 12,157 visits and females close behind at 11,875. Hospital visits decrease gradually with age until the **40-49 group** and then stabilize for older age groups (50-89). Across all age ranges, **males consistently lead in hospital visits**, followed by females, while the "Other" gender category shows fewer visits but steady representation. This suggests young adults, particularly males, may require targeted healthcare interventions, while older age groups likely reflect ongoing management of chronic conditions.



Hypertension has the highest Lisinopril prescriptions (3,276), reflecting its widespread use for blood pressure management, while the significant "No Medication" count (3,245) suggests reliance on lifestyle interventions. For diabetes, Metformin leads prescriptions at 3,223, though the "No Medication" group is even higher (3,430), indicating well-managed or early-stage cases. In asthma, "No Medication" dominates (3,160), highlighting its controlled or episodic nature. Patients without medical conditions exhibit an even distribution across medication groups, suggesting potential use for preventive or general health purposes.

Recommendations

Patients Across Ages and Genders

Young Adults (18–29 years)

- Medical Conditions: Address early signs of diabetes and hypertension with regular screenings and preventive measures.
- Heart Rate: Maintain a resting heart rate between 60-100 bpm with stress management techniques like yoga or meditation.
- BMI: Aim for a healthy BMI (18.5–24.9) through balanced nutrition and regular exercise (30 minutes/day).
- Cholesterol: Focus on heart-healthy diets rich in fruits, vegetables, whole grains, and lean proteins to keep cholesterol below 200 mg/dL.

Physical Activity: Engage in aerobic exercises (running, cycling) and strength training to build long-term health habits.

Middle-Aged Adults (30–49 years)

Medical Conditions: Manage increasing risks of diabetes, hypertension, and cholesterol with regular check-ups and lifestyle modifications.

Heart Rate: Monitor heart rate during physical activity and aim to stay within 70-85% of your maximum heart rate.

BMI: Prevent weight gain through portion control and high-protein, low-sugar diets. Target a BMI below 25.

Cholesterol: Limit saturated fats to prevent cardiovascular diseases.

Physical Activity: Balance cardio and resistance training with flexibility exercises to support joint health.

Older Adults (50+ years)

Medical Conditions: Prioritize managing chronic conditions (hypertension, diabetes, cholesterol). Schedule frequent check-ups.

Heart Rate: Track resting heart rate and address abnormal spikes, particularly during activities, to detect underlying issues.

BMI: Avoid obesity-related risks by maintaining a BMI under 30. Consider low-impact activities for weight management.

Cholesterol: Continue cholesterol-lowering diets and consider medication if levels exceed 240 mg/dL.

Physical Activity: Focus on low-impact exercises (walking, swimming, tai chi) to maintain mobility and cardiovascular health.

Gender-Specific Suggestions

Females:

Address higher prevalence of chronic conditions in older age with hormone health monitoring.

Incorporate calcium and vitamin D.

Males:

Monitor heart health closely, especially with higher cholesterol and diabetes risks in younger ages.

Reduce smoking rates to lower long-term cardiovascular risks.

Other :

Ensure inclusive healthcare support and personalized care plans for unique health needs.

Advocate for routine screenings and mental health support.

Health care Providers

Targeted Healthcare Interventions:

Focus on **hypertension** and **diabetes management** given their high prevalence, with an emphasis on lifestyle changes, regular monitoring, and medication adherence.

For **asthma** patients, ensure adequate management through appropriate medication, especially among younger patients.

Preventive Healthcare and Routine Check-ups:

Continue promoting **routine health check-ups** for the "No Medical Condition" group, ensuring early detection and preventive care to minimize future health risks.

Focus on **preventive screenings** for cholesterol, blood pressure, and BMI to prevent the onset of chronic conditions in younger adults.

Smoking Cessation Programs:

Implement smoking cessation initiatives targeting smokers with chronic conditions like **diabetes**, **hypertension**, and **asthma** to reduce the compounded risks and improve health outcomes.

Chronic Condition Management:

Enhance **care for older adults** (50-89 years) who may require ongoing management of chronic conditions such as diabetes and hypertension.

Ensure that **healthcare resources** are available for comprehensive chronic disease management and prevention.

Hospital Facility

Hypertension management: Offer lifestyle programs (diet, exercise, stress reduction) and 24/7 monitoring and follow-up services.

Diabetes care: Provide specialized endocrinology services, weight loss programs, dietitian support, and physical therapy for effective management.

Asthma management: Establish pulmonary departments or asthma clinics with respiratory therapists, allergy specialists, and patient education on inhaler use and triggers.

Preventive care: Focus on routine check-ups, screenings (cancer, cholesterol, blood pressure), and general health assessments.

Lifestyle management: Offer stress management workshops, fitness programs, and nutrition counselling for overall health improvement.