- Analysis and Recommendation

# Medical Appointment No-Shows

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# Business Case

**Objective:** Build a predictive model to identify patients who are more likely to miss their medical appointments, using factors like age, gender, health conditions, SMS reminders, and scheduling details.

The healthcare industry suffers from a common issue of patients failing to attend scheduled appointments, known as "no-shows." This problem significantly affects healthcare providers and facilities by causing inefficiencies, resource wastage, and loss of revenue.

Missed appointments lead to unutilized time for medical staff while also preventing other patients from receiving timely care.

Additionally, healthcare organizations are financially impacted by the reduction in patient turnover, which lowers the overall revenue stream.

**Dataset:**
https://www.kaggle.com/datasets/joniarroba/noshowappointments

# Data Exploration

**Rows:** 110,527 (represents medical appointments)

**Columns:** 14 (associated variables)

**Target Variable:** 'No-show'

Yes = did not show up

No = showed up

# Data Dictionary

| Coloumn | Description |
| --- | --- |
| PatientId | Unique identifier for each patient. |
| AppointmentID | Unique identifier for each appointment. |
| Gender | The gender of the patient (F for female, M for male). |
| ScheduledDay | The date and time the appointment was scheduled. |
| AppointmentDay | The date of the actual appointment. |
| Age | The age of the patient. |
| Neighbourhood | The location of the hospital. |
| Scholarship | Indicates whether the patient is enrolled in the welfare program (0 = No, 1 = Yes). |
| Hipertension | Indicates if the patient has hypertension (0 = No, 1 = Yes). |
| Diabetes | Indicates if the patient has diabetes (0 = No, 1 = Yes). |
| Alcoholism | Indicates if the patient is an alcoholic (0 = No, 1 = Yes). |
| Handcap | Indicates if the patient has a handicap (0 = No, 1 = Yes; note that this column may need clarification on values). |
| SMS_received | Indicates if the patient received an SMS reminder (0 = No, 1 = Yes). |
| No-show | The target variable, indicating whether the patient showed up for their appointment (No = showed up, Yes = did not show up). |

# Model Approaches

| Model | Precision | Recall | F1-score | Accuracy | AUC |
|---|---|---|---|---|---|
| Logistic Regression | 0.71 | 0.80 | 0.72 | 0.79 | 0.66 |
| Decision Tree | 0.74 | 0.74 | 0.74 | 0.74 | 0.59 |
| Random Forest | 0.76 | 0.80 | 0.75 | **0.80** | **0.74** |

# Model Comparison

- Best Model Based on Accuracy: **Random Forest**
- Best Model Based on AUC: **Random Forest**

| Model | Accuracy | AUC |
|---|---|---|
| Logistic Regression | 0.79 | 0.66 |
| Decision Tree | 0.74 | 0.59 |
| Random Forest | **0.80** | **0.74** |

# Data Visualization and Insights
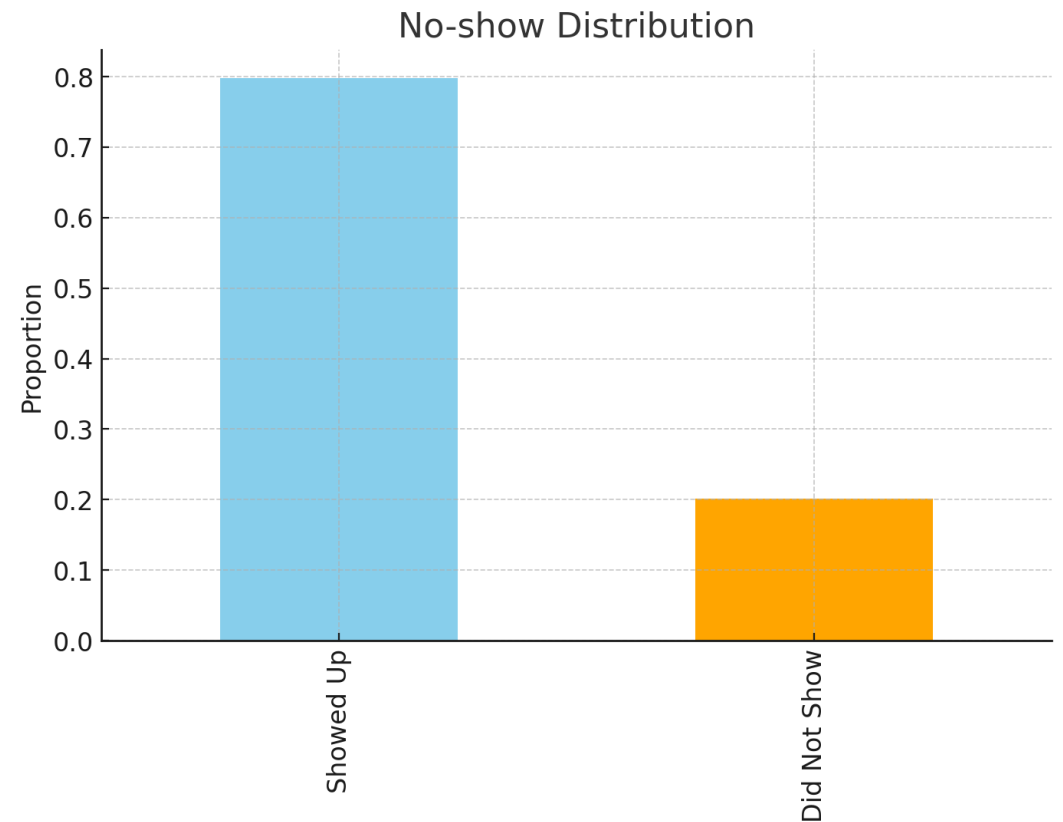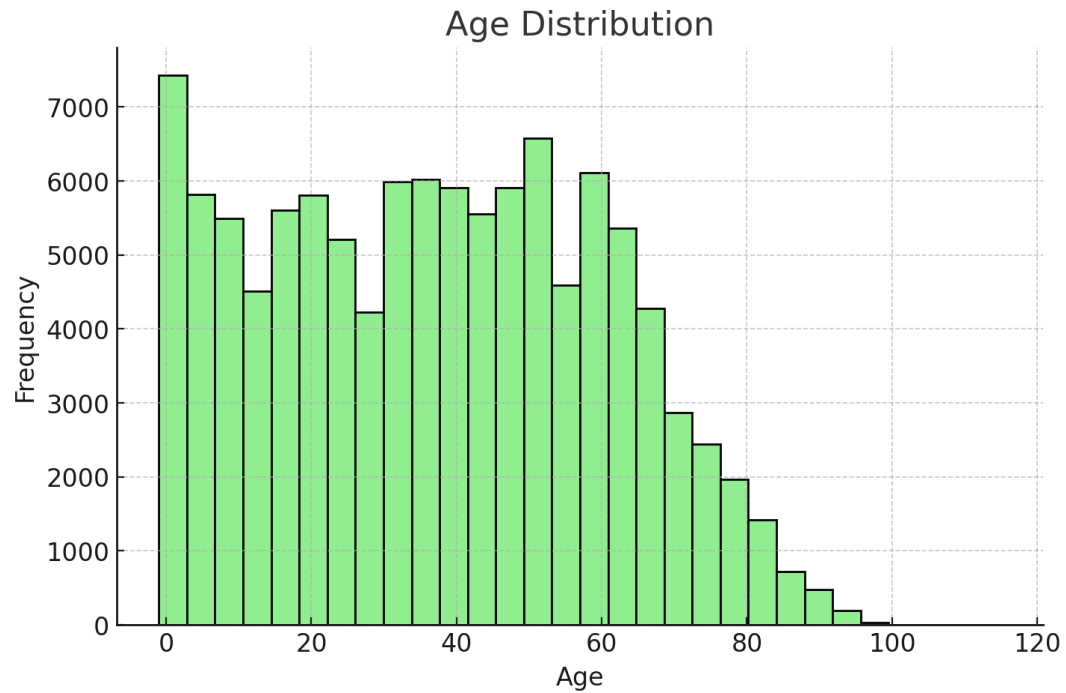
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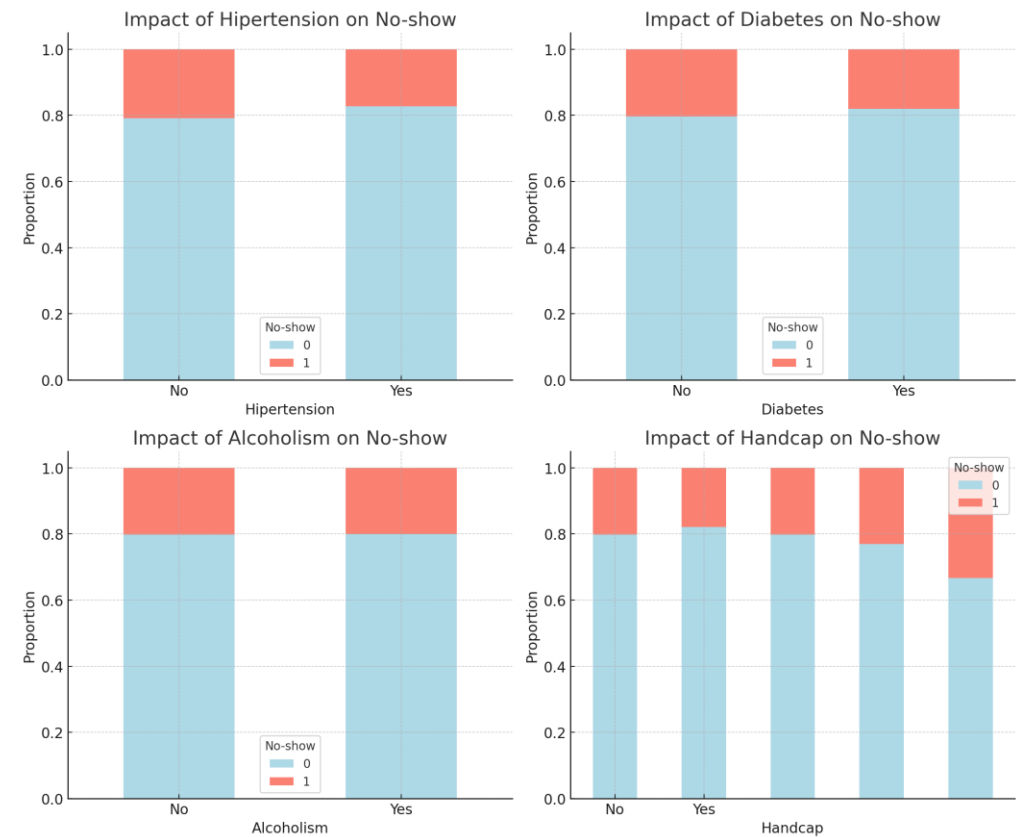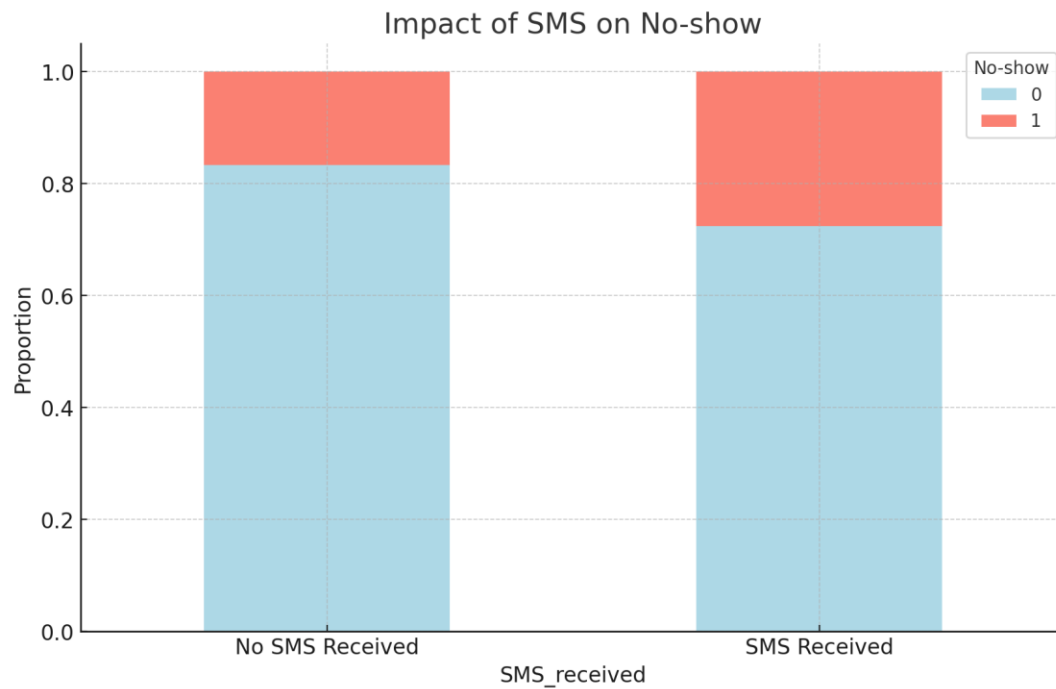
# Next Steps and Recommendations

- **Targeted Interventions:** Focus on high-risk groups, such as patients with severe handicaps or chronic illnesses (e.g., diabetes), for proactive follow-up (e.g., additional reminders or calls).

- **Enhanced Communication:** Increase the use of SMS reminders and possibly experiment with more frequent reminders, especially for patients who have a history of missing appointments or belong to high-risk groups.

- **Flexible Scheduling for Vulnerable Patients:** Offer more flexible or convenient appointment times for patients with higher levels of handicap to reduce barriers to attending appointments.

# Future Exploration and Conclusion



**Future Exploration:** Investigate the impact of external factors (e.g., weather, distance to the clinic) by incorporating additional data sources that might affect a patient's likelihood of attending appointments.

**Conclusion:** Predictive modelling can significantly improve healthcare efficiency by identifying patients likely to miss appointments. By focusing on key risk factors such as handicap status and using reminders effectively, clinics can reduce no-show rates and enhance overall patient care.