```
%autosave 60
```

```
Autosaving every 60 seconds
```

```
from google.colab import files
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
```

```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

```
# Load patients data
#d1 = files.upload()
#patients = pd.read_csv('PATIENTS.csv')
patients = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/AIH/MIMICIIITables/PATIENTS.csv')
```

```
# Load admissions data
#d2 = files.upload()
#admissions = pd.read_csv('ADMISSIONS.csv')
admissions = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/AIH/MIMICIIITables/ADMISSIONS.csv')
```

```
# Load diagnoses_icd data
#d3 = files.upload()
#diagnoses = pd.read_csv('DIAGNOSES_ICD.csv')
diagnoses = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/AIH/MIMICIIITables/DIAGNOSES_ICD.csv')
```

```
# Load D_ICD_DIAGNOSES data
#d4 = files.upload()
#diagnoses_labels = pd.read_csv('D_ICD_DIAGNOSES.csv')
diagnoses_labels = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/AIH/MIMICIIITables/D_ICD_DIAGNOSES.csv')
```

```
# Load ICUSTAYS data
#d5 = files.upload()
#icustays = pd.read_csv('ICUSTAYS.csv')
icustays = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/AIH/MIMICIIITables/ICUSTAYS.csv')
#icustays.head(2)
```

```
# Load PRESCRIPTIONS data
#d6 = files.upload()
#prescriptions = pd.read_csv('PRESCRIPTIONS.csv')
prescriptions = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/AIH/MIMICIIITables/PRESCRIPTIONS.csv')
```

```
# Load PRESCRIPTIONS data
#d7 = files.upload()
#procedures = pd.read_csv('PROCEDUREEVENTS_MV.csv')
procedures = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/AIH/MIMICIIITables/PROCEDUREEVENTS_MV.csv')
```

```
# Load D_ITEMS data
#d8 = files.upload()
#d_items = pd.read_csv('D_ITEMS.csv')
d_items = pd.read_csv('/content/drive/MyDrive/Colab Notebooks/AIH/MIMICIIITables/D_ITEMS.csv')
```

```
from datetime import datetime

df = patients
# Calculate age function
def calculate_age(dob, dod):
    dob_date = datetime.strptime(dob, "%Y-%m-%d %H:%M:%S")
    dod_date = datetime.strptime(dod, "%Y-%m-%d %H:%M:%S")
    age = (dod_date - dob_date).days // 365
    return age

# Apply calculate_age function to create "age" column
df["age"] = df.apply(lambda row: calculate_age(row["dob"], row["dod"]), axis=1)
```

```
# Filter out rows with age greater than or equal to 120
filtered_df = df[df["age"] < 120]

# Display the updated DataFrame
print(filtered_df.head(1))
```

```
   row_id  subject_id gender                 dob                 dod  \
0    9467       10006      F  2094-03-05 00:00:00  2165-08-12 00:00:00

             dod_hosp             dod_ssn  expire_flag  age
0  2165-08-12 00:00:00  2165-08-12 00:00:00            1   71
```

```
# Merge admissions and patients data on subject_id
merged_data = pd.merge(filtered_df, admissions, on='subject_id')
merged_data.head(1)
```

	row_id_x	subject_id	gender	dob	dod	dod_hosp	dod_ssn	expire_flag	age	row_id_y	...	insurance	language	religion	ma
0	9467	10006	F	2094-03-05 00:00:00	2165-08-12 00:00:00	2165-08-12 00:00:00	2165-08-12 00:00:00	1	71	12258	...	Medicare	NaN	CATHOLIC	

1 rows × 27 columns

```
# Merge diagnosis_icd with admissions on subject_id
merged_data_diagnosis = pd.merge(merged_data, diagnoses, on='subject_id', how='inner')
merged_data_diagnosis.head(1)
```

	row_id_x	subject_id	gender	dob	dod	dod_hosp	dod_ssn	expire_flag	age	row_id_y	...	ethnicity	edregtime	edoutti
0	9467	10006	F	2094-03-05 00:00:00	2165-08-12 00:00:00	2165-08-12 00:00:00	2165-08-12 00:00:00	1	71	12258	...	BLACK/AFRICAN AMERICAN	2164-10-23 16:43:00	2164- 23:00

1 rows × 31 columns

```
# Convert the DataFrame to a dictionary to link icd9 codes to respective labels
icd9_dict = diagnoses_labels.set_index('icd9_code')['short_title'].to_dict()

# Print the dictionary
#print(icd9_dict)
```

```
merged_data_diagnosis['icd9_code'].value_counts().head(5) #Top 5 diagnosed icd code
```

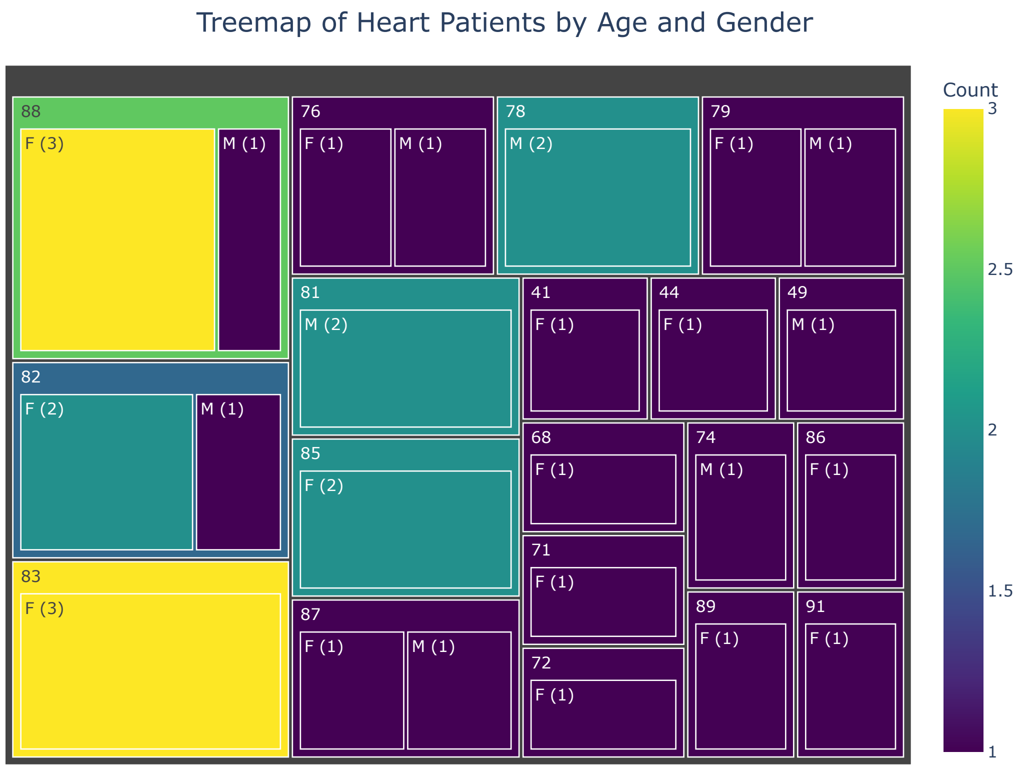
icd9_code	count
4019	250
42731	221
2449	202
5849	191
3572	181

dtype: int64

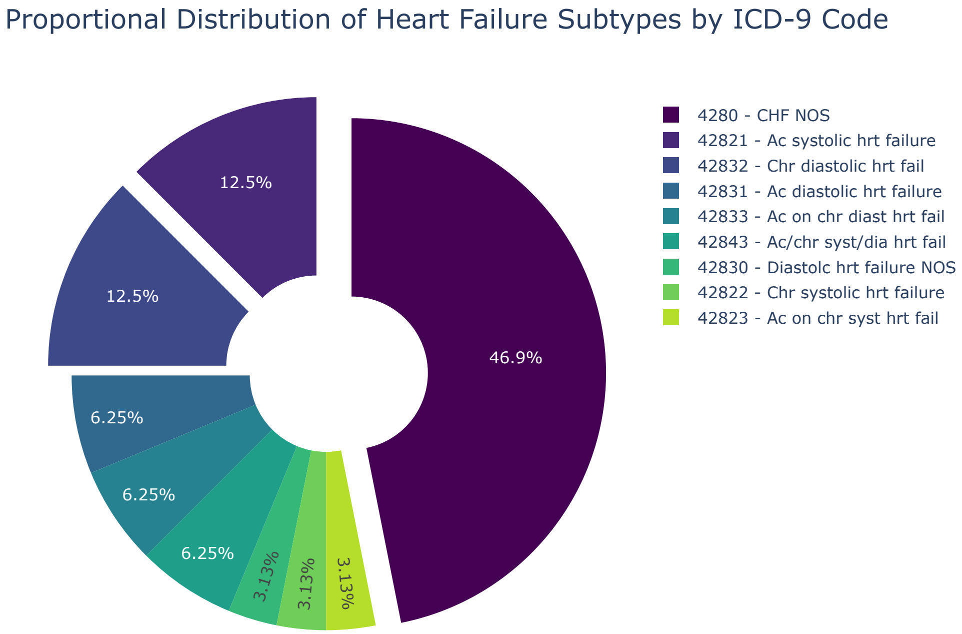
Plot-1 : Analysis of heart patients based on gender, age, and ICD-9 subtypes.

```
import plotly.express as px
import pandas as pd

# Filter for patients based on ICD-9 codes (428.x series)
diabetes_patients = merged_data_diagnosis[merged_data_diagnosis['icd9_code'].str.startswith('428')]

# Drop duplicate subject IDs to avoid double-counting patients
unique_patients = diabetes_patients.drop_duplicates(subset='subject_id')
```

```
# Create Treemap chart
treemap_data = (
    unique_patients
    .groupby(['age', 'gender'])
    .size()
    .reset_index(name='count')
)

# Add counts to the gender labels
treemap_data['gender'] = treemap_data.apply(lambda row: f"{row['gender']} ({row['count']})", axis=1)

# Create a Treemap visualization
fig1 = px.treemap(
    treemap_data,
    path=['age', 'gender'],
    values='count',
    color='count',
    color_continuous_scale='Viridis',
    hover_data={'age': True, 'gender': False, 'count': True}
)

fig1.update_layout(
    height=600, width=800,
    title='Treemap of Heart Patients by Age and Gender',
    title_font_size=20,
    title_x=0.5,
    margin=dict(t=50, l=25, r=25, b=25),
    coloraxis_colorbar=dict(
        title="Count"
    )
)
fig1.show()

# Prepare icd code - short description labels
icd9_counts = unique_patients['icd9_code'].value_counts()
icd9_labels = [f"{code} - {desc}" for code, desc in zip(icd9_counts.index, icd9_counts.index.map(icd9_dict))]
icd9_data = pd.DataFrame({'ICD-9 Code': icd9_counts.index, 'Description': icd9_labels, 'Count': icd9_counts.values})

# Set pull value for slice effect
pull_values = [0.1 if i < 3 else 0 for i in range(len(icd9_data))]

# Create Pie chart using Plotly Express
fig2 = px.pie(icd9_data, names='Description', values='Count',
             title='Proportional Distribution of Heart Failure Subtypes by ICD-9 Code',
             color='Description',
             color_discrete_sequence=px.colors.sequential.Viridis)

# Adding the slice effect
fig2.update_traces(hole=0.3, pull=pull_values)
fig2.update_layout(title_x=0.5, title_font_size=20, height=600, width=800)

fig2.show()
```



Treemap of Heart Patients by Age and Gender

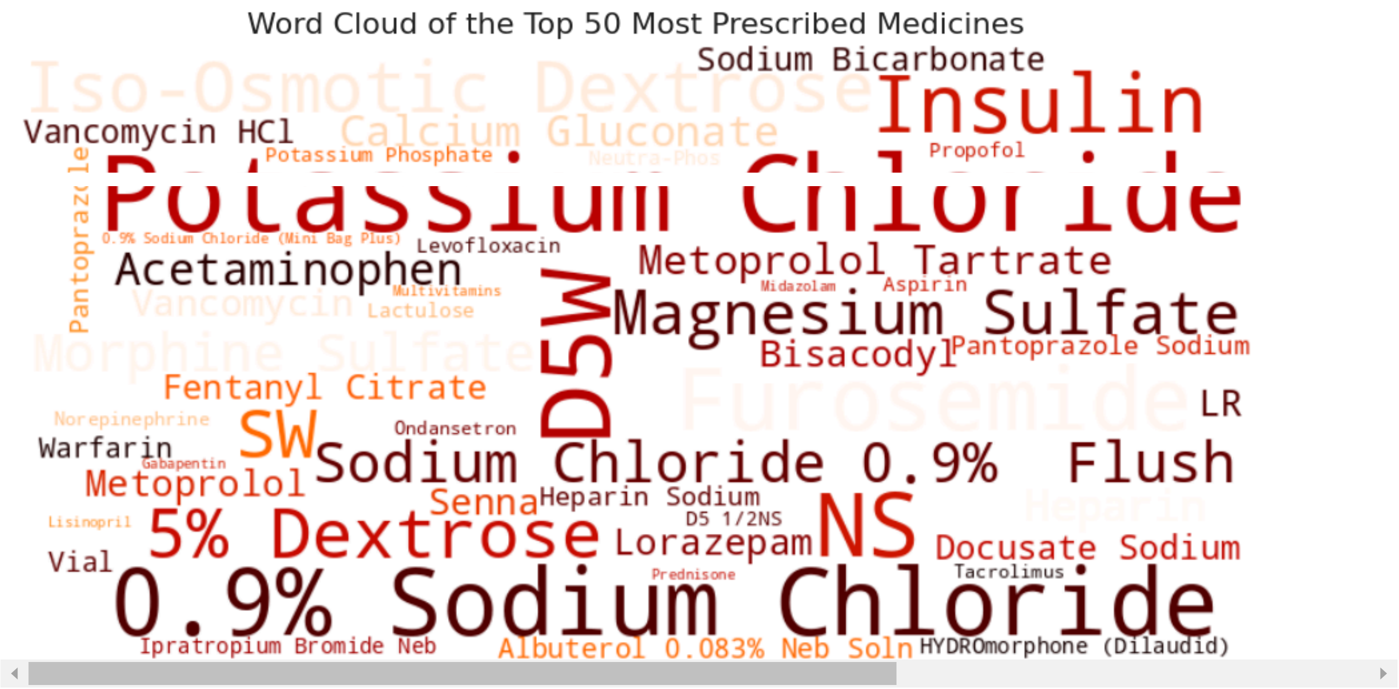


Proportional Distribution of Heart Failure Subtypes by ICD-9 Code

Plot-2 : Word Cloud of the Top 50 Most Prescribed Medicines

```
from wordcloud import WordCloud

# Extract the top 50 medication names and counts
medication_counts = prescriptions['drug'].value_counts(ascending=False)
top_prescribed_meds = medication_counts.head(50)
#print(medication_counts.head(5))
```

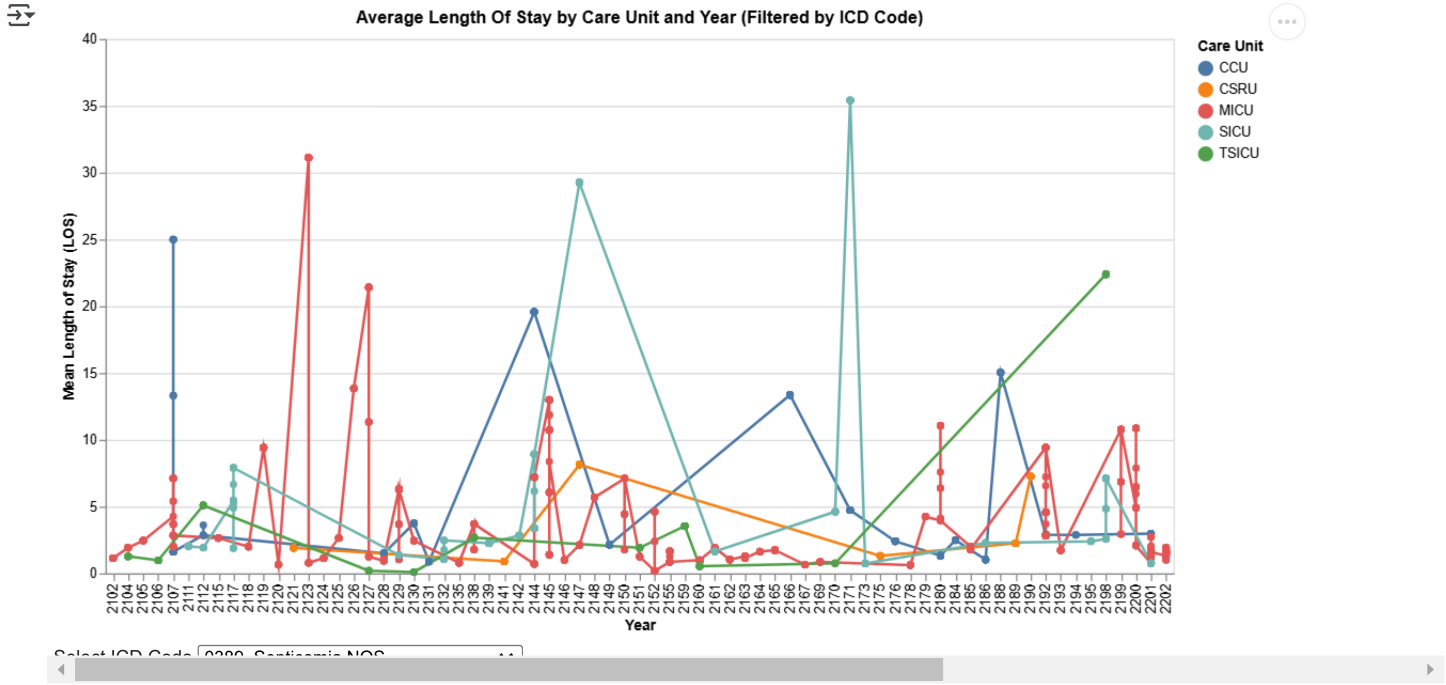
```
# Generate the word cloud using the top prescribed medications directly
wordcloud = WordCloud(width=800, height=400, background_color="white", colormap = 'gist_heat').generate_from_frequencies(top_prescribed_meds

# Plot the word cloud
plt.figure(figsize=(12, 6))
plt.imshow(wordcloud, interpolation='bilinear')
plt.axis('off')
plt.title('Word Cloud of the Top 50 Most Prescribed Medicines', fontsize=16)
plt.show()
```



```
#merged_data_diagnosis.head(2)
```

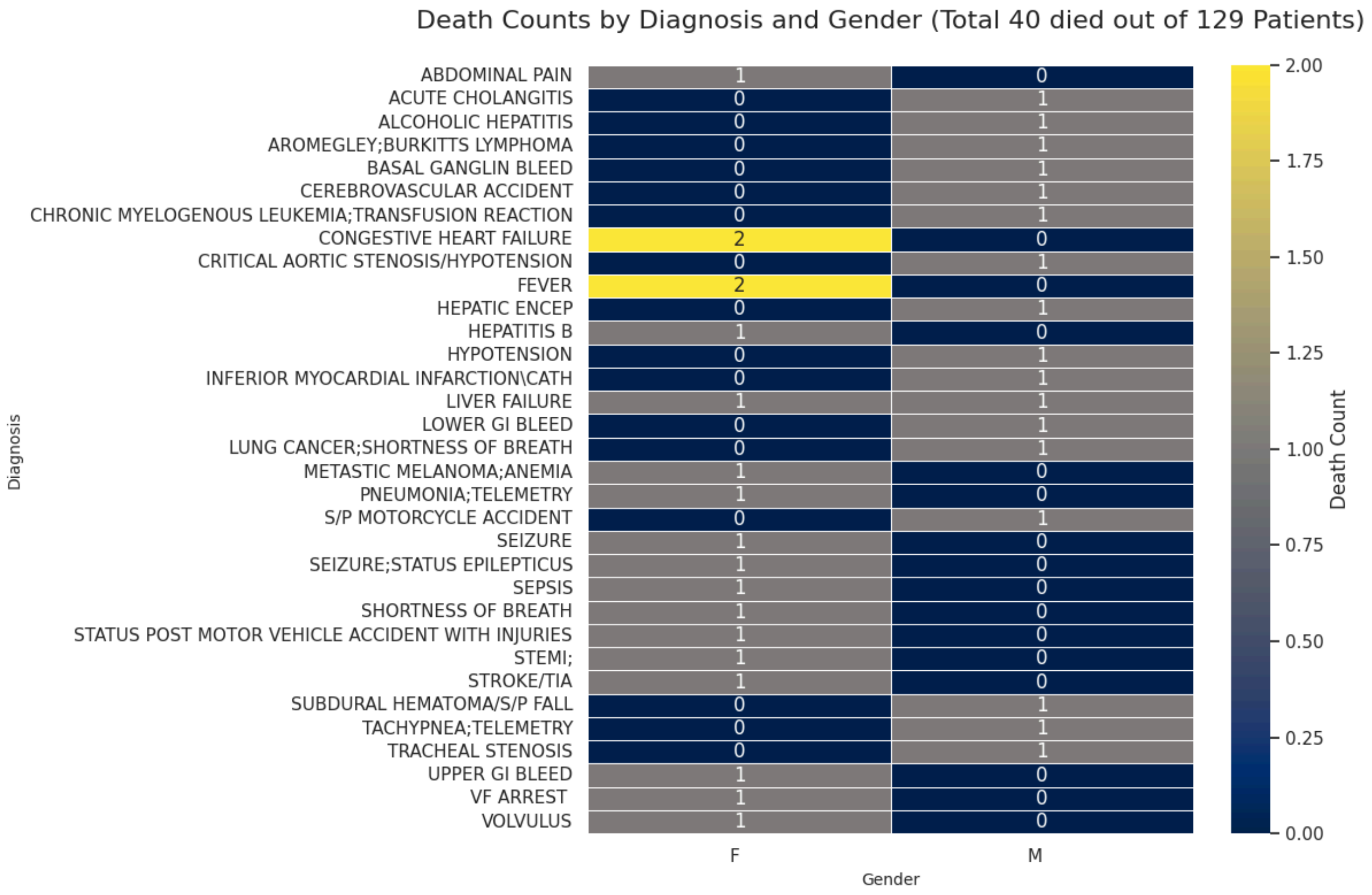
Plot-3 : Average Length Of Stay by Care Unit and Year (Filtered by ICD Code)

```
import altair as alt

# Average Length of Stay by Care Unit and Year (Can be Filtered by ICD Code)

# Convert 'intime' and 'outtime' to datetime
icustays['intime'] = pd.to_datetime(icustays['intime'])
icustays['outtime'] = pd.to_datetime(icustays['outtime'])

# Extract the year from 'intime'
icustays['intime_year'] = icustays['intime'].dt.year

# Merge icustays with ICD-9 diagnosis codes
icustays_with_icd = icustays.merge(diagnoses, on='hadm_id', how='left')

# Calculate the mean LOS for each care unit and year
los_stats = icustays_with_icd.groupby(['first_careunit', 'intime_year', 'icd9_code'])['los'].mean().reset_index()

# Create a list of 'ICD9 code - short description' for each unique ICD9 code
icd_label_options = [(code, f" {icd9_dict.get(code, 'Unknown description')}") for code in los_stats['icd9_code'].unique()]

# Create a selection widget for ICD-9 codes
icd_selection = alt.selection_point(
    fields=['icd9_code'],
    bind=alt.binding_select(options=icd_label_options, name="Select ICD Code ")
)

# Create the Altair chart
chart = alt.Chart(los_stats).mark_line(point=True).encode(
    x=alt.X('intime_year:O', title='Year'),
    y=alt.Y('los:Q', title='Mean Length of Stay (LOS)'),
    color=alt.Color('first_careunit:N', title='Care Unit'),
    tooltip=['first_careunit', 'intime_year', 'los', 'icd9_code']  # Add tooltips for interactivity
).add_params(
    icd_selection
).transform_filter(
    icd_selection
).properties(
    title='Average Length Of Stay by Care Unit and Year (Filtered by ICD Code)',
    width=800,
    height=400
)

# Display the chart
chart
```



Plot-4 : Analysis of Death Counts by Diagnosis and Gender

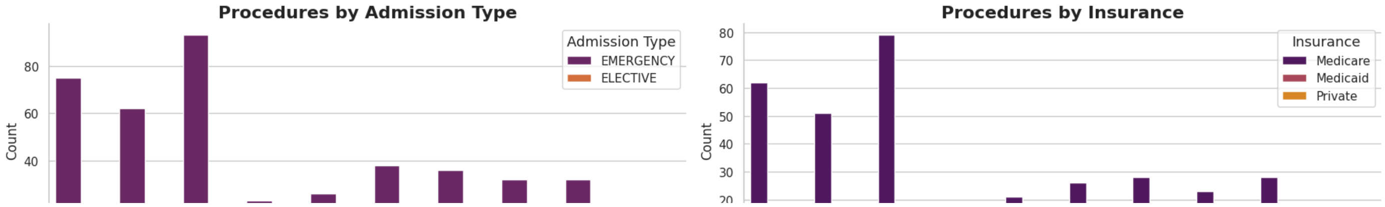
```
# Import necessary libraries
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt

# Filter data for deceased patients
deceased = merged_data[merged_data['discharge_location'] == 'DEAD/EXPIRED']

# Calculate total patients and deceased patients
total_patients = len(admissions)
total_deceased = len(admissions[admissions['discharge_location'] == 'DEAD/EXPIRED'])

# Group deceased data by diagnosis and gender
deaths_by_diagnosis = deceased.groupby(['diagnosis', 'gender']).size().reset_index(name='death_count')
deaths_by_diagnosis = deaths_by_diagnosis.sort_values(by='death_count', ascending=False)

# Prepare heatmap data
heatmap_data = deaths_by_diagnosis.pivot_table(
    index='diagnosis',
    columns='gender',
    values='death_count',
    aggfunc='sum',
    fill_value=0
)

# Plot the heatmap
plt.figure(figsize=(12, 8))
sns.heatmap(heatmap_data, annot=True, cmap="cividis", cbar_kws={'label': 'Death Count'}, linewidths=0.5)

# Add title and labels
plt.title(f'Death Counts by Diagnosis and Gender (Total {total_deceased} died out of {total_patients} Patients)\n', fontsize=16)
plt.xlabel('Gender', fontsize=10)
plt.ylabel('Diagnosis', fontsize=10)
plt.xticks(rotation=0, ha='right')
plt.tight_layout()
plt.show()
```



Plot-5 : Analysis of Most Performed Procedure

```
import seaborn as sns

# Merge procedures with merged data and procedure labels, directly sort by 'hadm_id'
procedures_merged = (
    pd.merge(procedures, merged_data, on='hadm_id', how='inner')
    .merge(d_items[['itemid', 'label']], on='itemid', how='left')
    .sort_values(by='hadm_id')
)

# Get the top 10 most performed procedures and merge directly with labels
top_procedures_with_labels = (
    procedures_merged['itemid']
    .value_counts()
    .head(10)
    .reset_index(name='count')
    .rename(columns={'index': 'itemid'})
    .merge(d_items[['itemid', 'label']], on='itemid', how='left')
)

# Filter procedures data to include only the top 10 procedures
top_procedures_data = procedures_merged[procedures_merged['itemid'].isin(top_procedures_with_labels['itemid'])]

sns.set(style="whitegrid")
```

```
# Set up the figure for multiple subplots
plt.figure(figsize=(18, 10))

# Analysis 1: Count plot of Procedures by Admission Type
plt.subplot(2, 2, 1)
sns.countplot(data=top_procedures_data, x='label', hue='admission_type', palette='inferno')
plt.title("Procedures by Admission Type", fontsize=16, fontweight='bold')
plt.xlabel("Procedure", fontsize=12)
plt.ylabel("Count", fontsize=12)
plt.legend(title="Admission Type", title_fontsize='13', loc='upper right')
plt.xticks(rotation=45, ha='right')

# Analysis 2: Count plot of Procedures by Insurance
plt.subplot(2, 2, 2)
sns.countplot(data=top_procedures_data, x='label', hue='insurance', palette='inferno')
plt.title("Procedures by Insurance", fontsize=16, fontweight='bold')
plt.xlabel("Procedure", fontsize=12)
plt.ylabel("Count", fontsize=12)
plt.legend(title="Insurance", title_fontsize='13', loc='upper right')
plt.xticks(rotation=45, ha='right')

# Analysis 3: Count plot of Procedures by Gender
plt.subplot(2, 2, 3)
sns.countplot(data=top_procedures_data, x='label', hue='gender', palette='inferno')
plt.title("Procedures by Gender", fontsize=16, fontweight='bold')
plt.xlabel("Procedure", fontsize=12)
plt.ylabel("Count", fontsize=12)
plt.legend(title="Gender", title_fontsize='13', loc='upper right')
plt.xticks(rotation=45, ha='right')

# Analysis 4: Count plot of Procedures by Discharge Location
plt.subplot(2, 2, 4)
sns.countplot(data=top_procedures_data, x='label', hue='discharge_location', palette='inferno')
plt.title("Procedures by Discharge Location", fontsize=16, fontweight='bold')
plt.xlabel("Procedure", fontsize=12)
plt.ylabel("Count", fontsize=12)
plt.legend(title="Discharge Location", title_fontsize='13', loc='upper right')
plt.xticks(rotation=45, ha='right')

# Remove spines for a cleaner look
sns.despine()

# Adjust layout to prevent overlap
plt.tight_layout()

# Show the plot
plt.show()
```


Procedures by Admission Type
Count
80
60
40
Admission Type
EMERGENCY
ELECTIVE
Procedures by Insurance
Count
80
70
60
50
40
30
20
Insurance
Medicare
Medicaid
Private