# Introduction

## Comprehensive analysis of hospital patient details using the following datasets

## The goal of this analysis is to gain insights into patient demographics, drug prescriptions, diagnoses, and mortality rates.

```
### Importing the required libraries

import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
import warnings
warnings.filterwarnings("ignore")

### Importing the dataset using pandas lib

drugs_df = pd.read_csv("drug_code.csv")
diagnostic_df = pd.read_csv("diagnostic_code.csv")
patinent_df = pd.read_csv("patient_data.csv")
```

Checking all the uploaded dataset

```
drugs_df.head()
```

```
   row_id  subject_id  hadm_id drg_type  drg_code description
drg_severity  \
0       1          97     1669   Type A       101      Drug 1
High
1       2          36     1632   Type B       134      Drug 2
Medium
2       3           3     1054   Type A       181      Drug 3
Medium
3       4          73     1911   Type A       177      Drug 4
High
4       5           8     1011   Type A       119      Drug 5
High

  drg_mortality
0           Low
1           Low
```

```
2        Medium
3           Low
4        Medium
```

```
diagnostic_df.head()
```

```
   row_id  subject_id  hadm_id  seq_num icd9_code
0       1          13     1521        3       D66
1       2          64     1782        1       D80
2       3          17     1272        3       D81
3       4           9     1935        2       D48
4       5          41     1401        2       D48
```

```
patinent_df.head()
```

```
   row_id  subject_id gender  expire_flag
0       1          70      M            0
1       2          83      M            0
2       3          30      F            0
3       4          71      M            0
4       5          74      F            0
```

```
### Checking the shape of every dataset

print("Drugs dataset shape:", drugs_df.shape)
print("Diagnostic dataset shape:", diagnostic_df.shape)
print("Patient dataset shape:", patinent_df.shape)
```

```
Drugs dataset shape: (50, 8)
Diagnostic dataset shape: (100, 5)
Patient dataset shape: (200, 4)
```

Based on the following dataset analysing the following details :--

1. High-Risk Patients Details.

2. Identifying all the patients who were prescribed drugs with a high severity level and had a high mortality rate.

3. Gender Distribution among Expired Patients

4. Percentage of male and female patients among the expired cases.

5. Common Diagnoses for High-Risk Patients

6. Mortality Rate by Diagnosis Type

7. Age of Patients with Common Diagnoses

8. Drug Prescription Trends

9. Gender Disparity in Critical Diagnoses

```
### Checking the null values in every dataset

print("Drugs dataset null values:", drugs_df.isnull().sum())
print("Diagnostic dataset null values:", diagnostic_df.isnull().sum())
print("Patient dataset null values:", patinent_df.isnull().sum())
```

```
Drugs dataset null values: row_id           0
subject_id       0
hadm_id          0
drg_type         0
drg_code         0
description      0
drg_severity     0
drg_mortality    0
dtype: int64
Diagnostic dataset null values: row_id         0
subject_id    0
hadm_id       0
seq_num       0
icd9_code     0
dtype: int64
Patient dataset null values: row_id          0
subject_id     0
gender         0
expire_flag    0
dtype: int64
```

There is no null values in the dataste

## Analysing the Drugs dataset

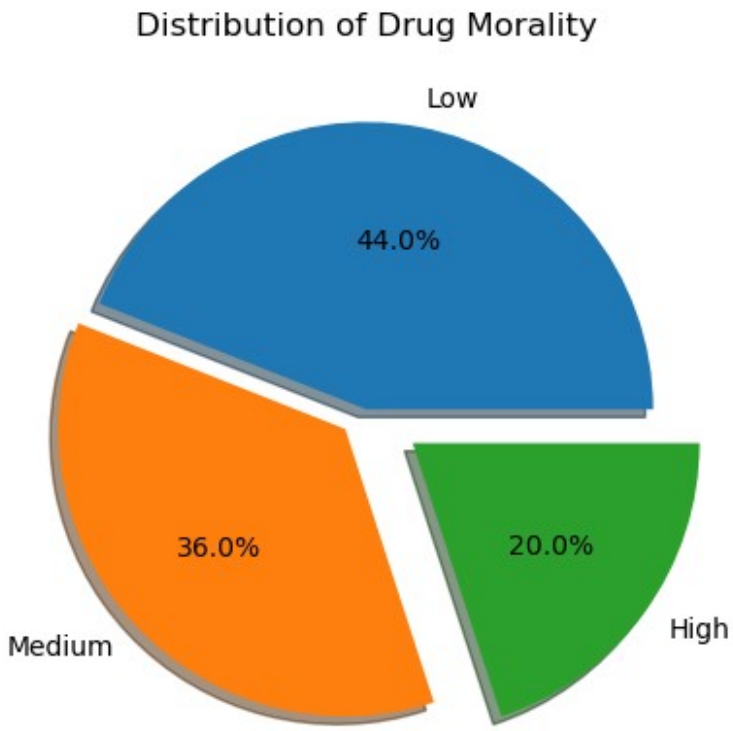
```
#### Checking the description

drugs_df.describe()
```

```
         row_id  subject_id      hadm_id    drg_code
count  50.00000   50.000000    50.000000   50.000000
mean   25.50000   48.240000  1533.440000  147.080000
std    14.57738   29.426879   266.805758   31.472593
min     1.00000    2.000000  1011.000000  101.000000
25%    13.25000   27.750000  1350.250000  119.250000
50%    25.50000   48.000000  1545.000000  142.000000
75%    37.75000   70.000000  1720.000000  177.000000
max    50.00000   98.000000  1979.000000  198.000000
```

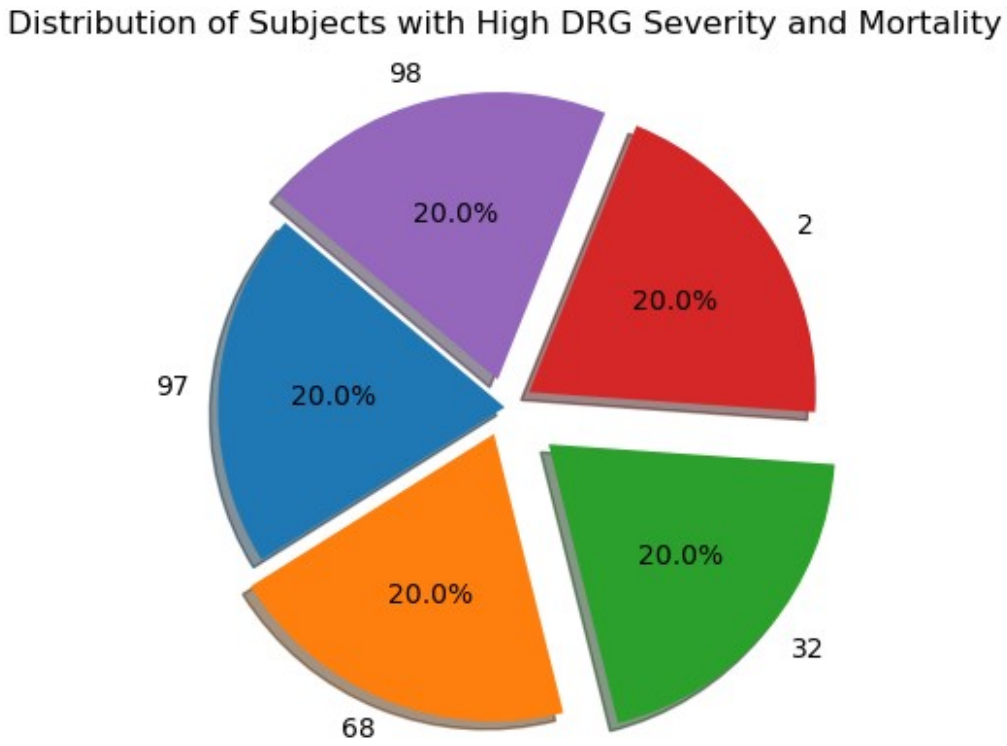
```
drugs_df.head(3)
```

```
   row_id  subject_id  hadm_id drg_type  drg_code description
drg_severity  \
0       1          97     1669   Type A       101      Drug 1
High
1       2          36     1632   Type B       134      Drug 2
Medium
2       3           3     1054   Type A       181      Drug 3
Medium

  drg_mortality
0           Low
1           Low
2        Medium
```

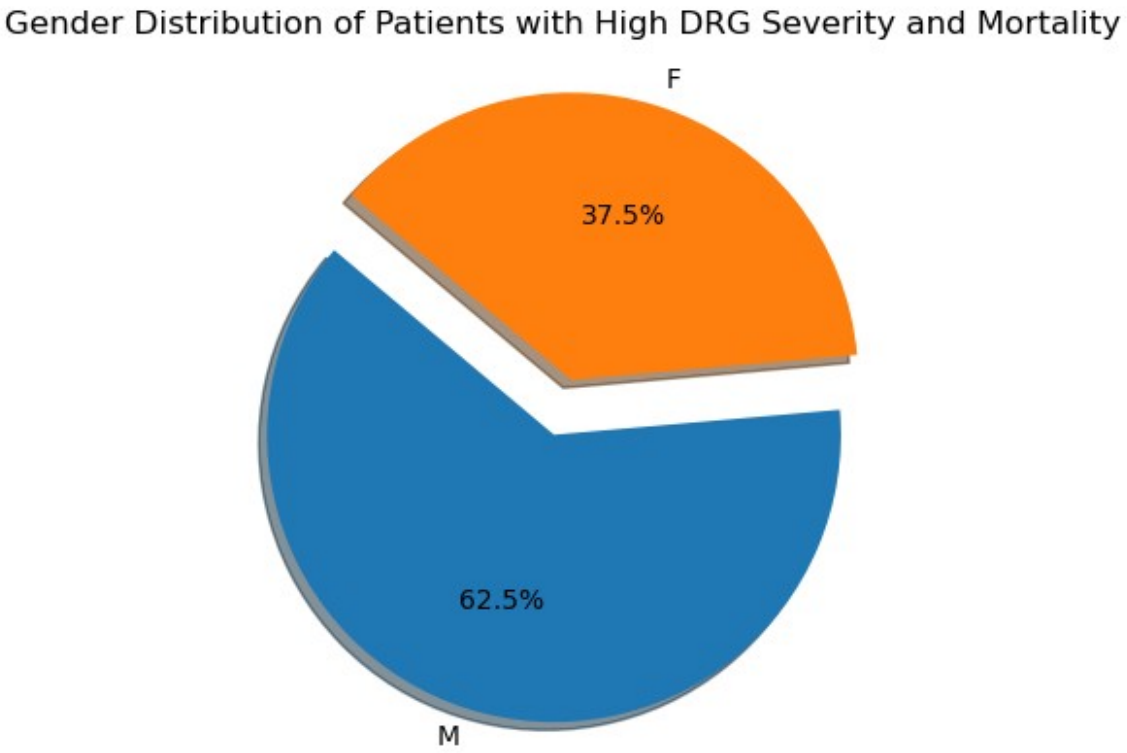
```
### Checking the drugs mortality

morality_counts = drugs_df['drg_mortality'].value_counts()
explode = (0, 0.1, 0.2)
labels = morality_counts.index
plt.pie(morality_counts, autopct='%1.1f%%',labels=labels, shadow=True,
explode=explode)
plt.title('Distribution of Drug Morality')
plt.show()
```




```
### Checking drugs severity in patient

high_severity_mortality = drugs_df[(drugs_df['drg_severity'] ==
'High') & (drugs_df['drg_mortality'] == 'High')]
subject_counts = high_severity_mortality['subject_id'].value_counts()
plt.pie(subject_counts, labels=subject_counts.index, autopct='%1.1f%
%', startangle=140, explode = (0, 0.1, 0.2, 0.1, 0.1), shadow = True )
plt.title('Distribution of Subjects with High DRG Severity and
Mortality')
plt.show()
```




```
### Checking the Severity & Mortality onthe basis of gender

high_severity_mortality = drugs_df[(drugs_df['drg_severity'] ==
'High') & (drugs_df['drg_mortality'] == 'High')]
merged_drugs_patient = pd.merge(high_severity_mortality, patinent_df,
on='subject_id')
gender_counts = merged_drugs_patient['gender'].value_counts()

plt.pie(gender_counts, labels=gender_counts.index, autopct='%1.1f%%',
startangle=140, shadow=True, explode=(0.1, 0.1))
plt.title('Gender Distribution of Patients with High DRG Severity and
Mortality')
plt.show()
```




```
### Checking the data distribution for the patient who were prescribed
higg severity and high mortality prescription


high_risk_patients = drugs_df[(drugs_df['drg_severity'] == 'High') &
(drugs_df['drg_mortality'] == 'High')]
high_risk_patients = pd.merge(high_risk_patients, patinent_df,
on='subject_id')
print("High-Risk Patients:")
high_risk_patients
```

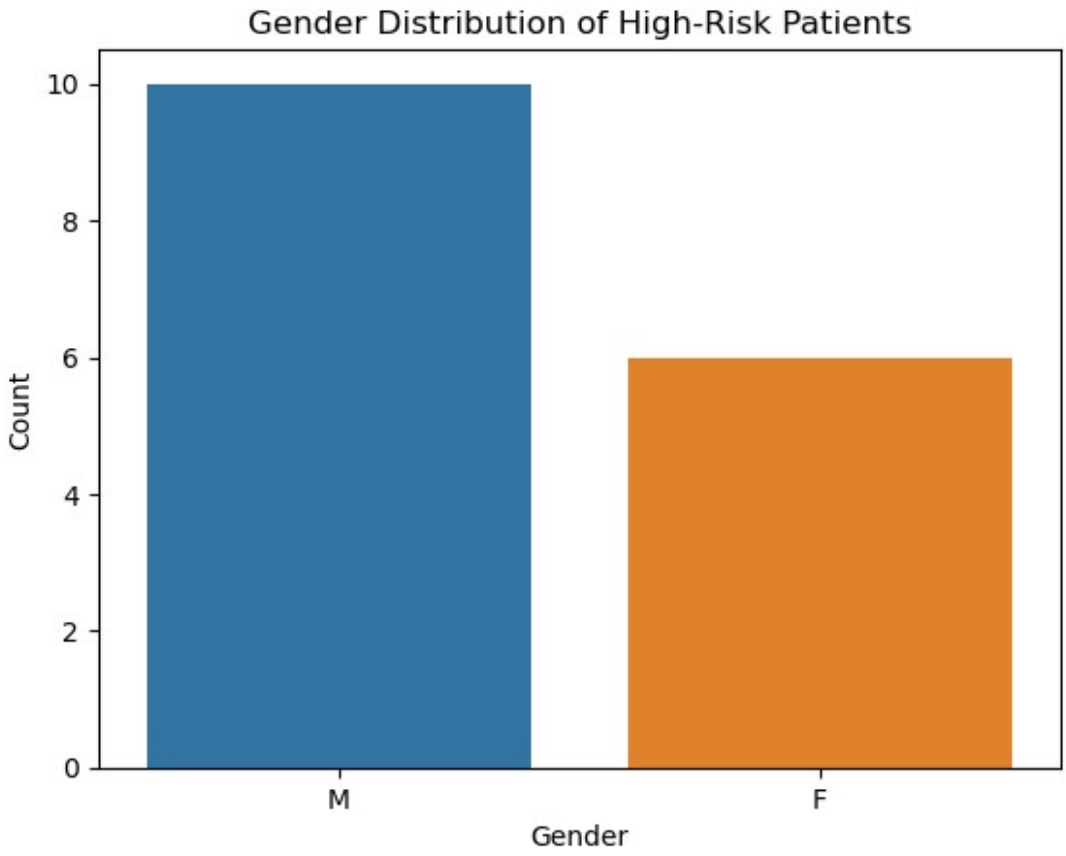
```
High-Risk Patients:
```

| | row_id_x | subject_id | hadm_id | drg_type | drg_code | description | drg_severity | \ |
|---|---|---|---|---|---|---|---|---|
| 0 | 6 | 97 | 1656 | Type A | 181 | Drug 6 | High | |
| 1 | 6 | 97 | 1656 | Type A | 181 | Drug 6 | High | |
| 2 | 9 | 68 | 1647 | Type B | 165 | Drug 9 | High | |
| 3 | 9 | 68 | 1647 | Type B | 165 | Drug 9 | High | |
| 4 | 18 | 32 | 1103 | Type B | 153 | Drug 18 | High | |
| 5 | 18 | 32 | 1103 | Type B | 153 | Drug 18 | | |

```
High
6          18           32     1103   Type B       153     Drug 18
High
7          18           32     1103   Type B       153     Drug 18
High
8          18           32     1103   Type B       153     Drug 18
High
9          32            2     1977   Type A       178     Drug 32
High
10         32            2     1977   Type A       178     Drug 32
High
11         32            2     1977   Type A       178     Drug 32
High
12         35           98     1799   Type B       159     Drug 35
High
13         35           98     1799   Type B       159     Drug 35
High
14         35           98     1799   Type B       159     Drug 35
High
15         35           98     1799   Type B       159     Drug 35
High
```

| | drg_mortality | row_id_y | gender | expire_flag |
|---|---|---|---|---|
| 0 | High | 181 | M | 0 |
| 1 | High | 183 | M | 0 |
| 2 | High | 16 | F | 0 |
| 3 | High | 19 | F | 0 |
| 4 | High | 47 | M | 0 |
| 5 | High | 66 | M | 1 |
| 6 | High | 155 | M | 0 |
| 7 | High | 170 | M | 0 |
| 8 | High | 180 | M | 0 |
| 9 | High | 67 | F | 0 |
| 10 | High | 140 | F | 0 |
| 11 | High | 182 | M | 0 |
| 12 | High | 7 | M | 0 |
| 13 | High | 53 | F | 0 |
| 14 | High | 55 | F | 0 |
| 15 | High | 196 | M | 0 |

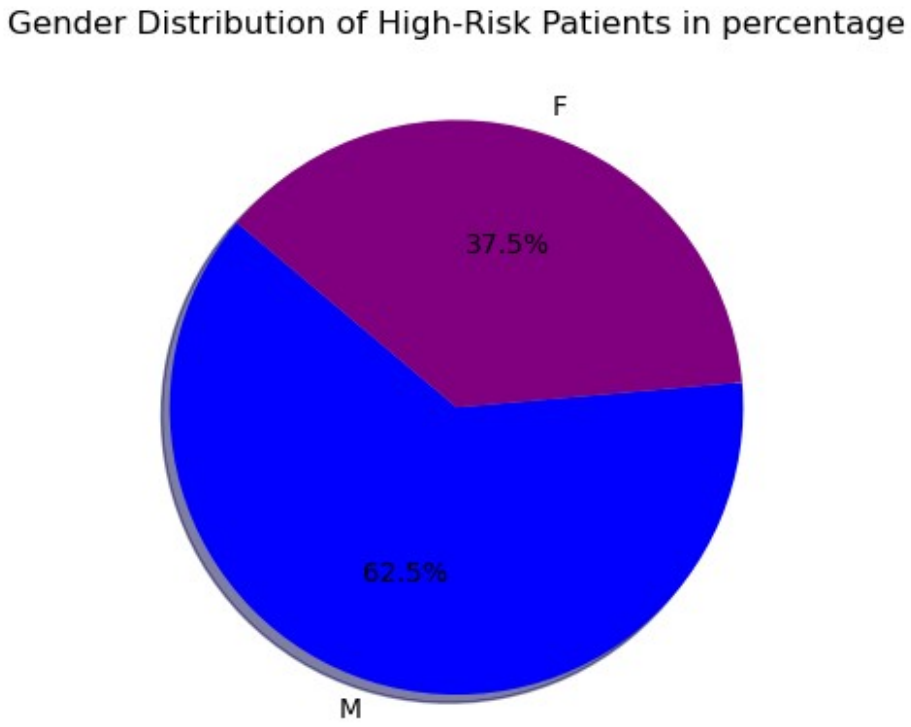
```
#### Checking the high risk gender distibution using graphical representation

sns.countplot(data=high_risk_patients, x='gender')
plt.title('Gender Distribution of High-Risk Patients')
plt.xlabel('Gender')
plt.ylabel('Count')
plt.show()
```



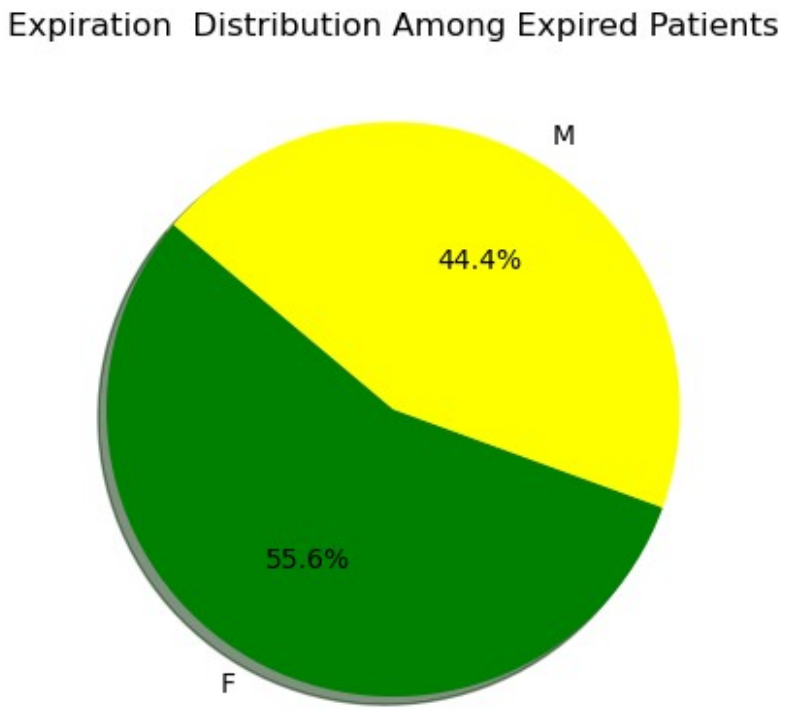

```
subject_ids_high_severity_mortality =
high_severity_mortality['subject_id'].tolist()
print("Subject IDs with High DRG Severity and Mortality:",
subject_ids_high_severity_mortality)
```

```
Subject IDs with High DRG Severity and Mortality: [97, 68, 32, 2, 98]
```

```
#### Checking the male and female percentae of high risk

gender_counts =
high_risk_patients['gender'].value_counts(normalize=True) * 100

plt.pie(gender_counts, labels=gender_counts.index, autopct='%1.1f%%',
startangle=140, colors=['blue', 'purple'], shadow=True)
plt.title('Gender Distribution of High-Risk Patients in percentage')
plt.show()
```




```
### Checking the data distribution of patient who have expired

expired_patients = patinent_df[patinent_df['expire_flag'] == 1]
gender_counts =
expired_patients['gender'].value_counts(normalize=True) * 100
plt.pie(gender_counts, labels=gender_counts.index, autopct='%1.1f%%',
startangle=140, colors=['Green', 'yellow'], shadow=True)
plt.title('Expiration  Distribution Among Expired Patients')
plt.show()
```




## Observations

Patient with ID's [ 97, 68, 32, 2, 98 ] have high morality & Severity patients

These are also high risk patients

As Compare to female, male patient are at high risk with the percentage rate of 62.5 % where as female patient at high rish with the percentage rate at 37.5 %

While Checking the expired patient details got that information that as compare to male female population is higher which means female population have high expiration rate which is 55.6% as compare to make expiration rate which is 44.4%

```
### Checking Diagonistic Dataset

diagnostic_df.head(3)
```

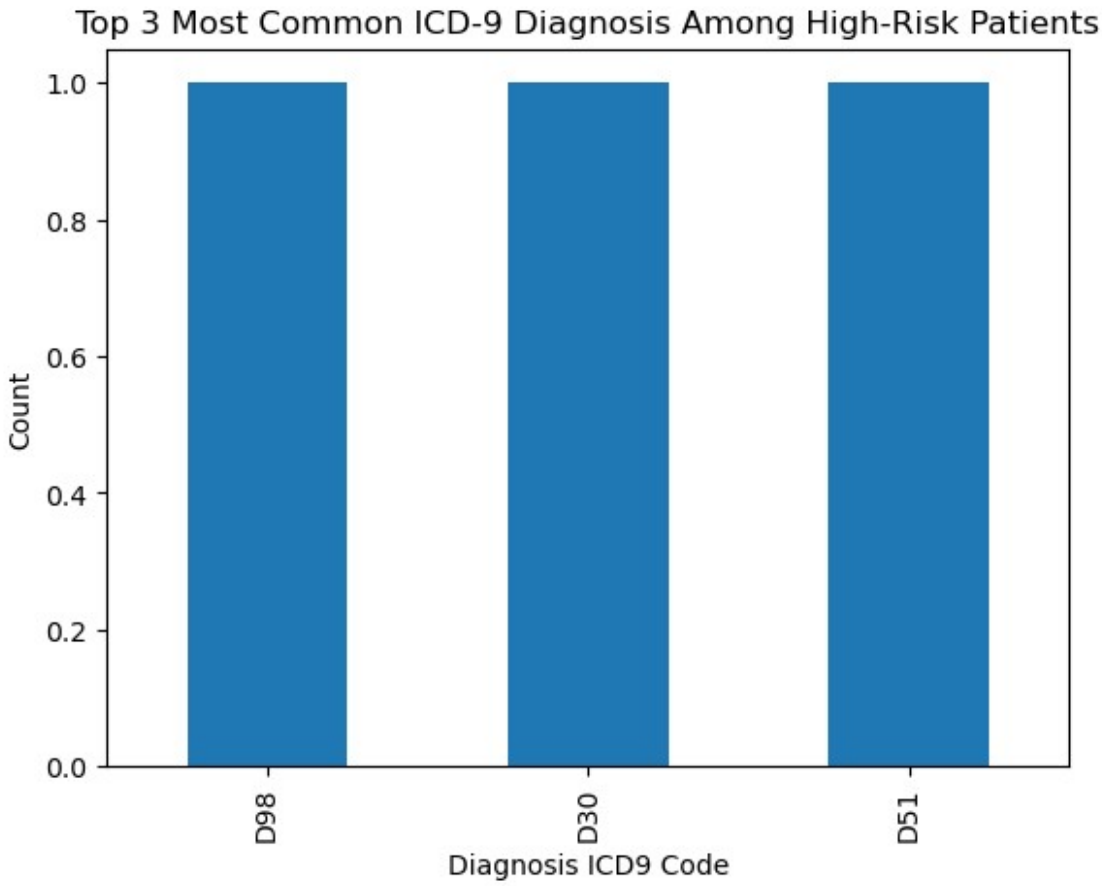
| | row_id | subject_id | hadm_id | seq_num | icd9_code |
|---|---|---|---|---|---|
| 0 | 1 | 13 | 1521 | 3 | D66 |
| 1 | 2 | 64 | 1782 | 1 | D80 |
| 2 | 3 | 17 | 1272 | 3 | D81 |

```
### Checking Common Diagonise for high risk patients


high_risk_subject_ids = high_risk_patients['subject_id'].unique()
```

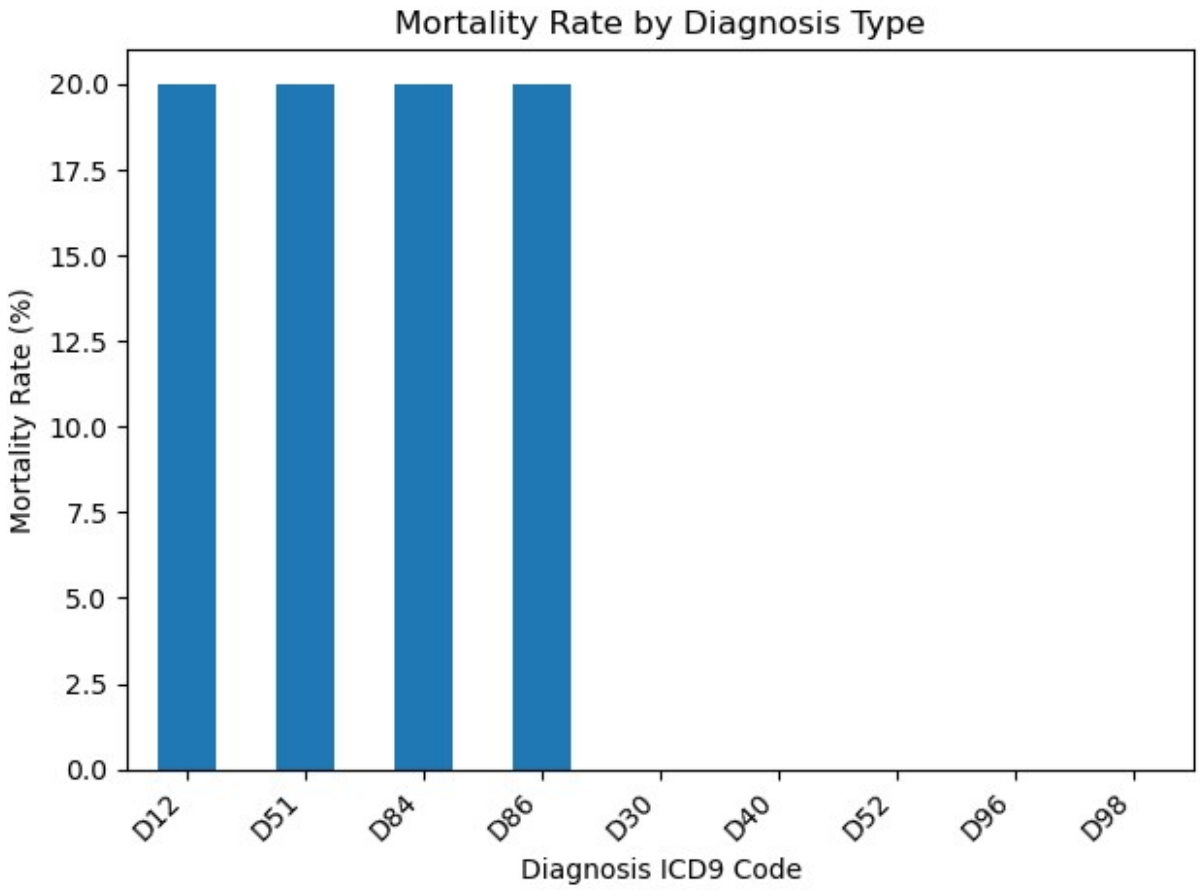
```
high_risk_diagnoses =
diagnostic_df[diagnostic_df['subject_id'].isin(high_risk_subject_ids)]

### Checking the Common Diagonise details

common_diagnoses = high_risk_diagnoses['icd9_code'].value_counts()

common_diagnoses
```

```
D98    1
D30    1
D51    1
D40    1
D96    1
D84    1
D12    1
D86    1
D52    1
Name: icd9_code, dtype: int64
```

```
### Checking the Top most most common diagnosis

top_3_diagnoses = common_diagnoses.head(3)
top_3_diagnoses.plot(kind='bar')
plt.title('Top 3 Most Common ICD-9 Diagnosis Among High-Risk
Patients')
plt.xlabel('Diagnosis ICD9 Code')
plt.ylabel('Count')
plt.show()
```




```
### Checking the morality rate Diagonise type

merged_diagnoses = pd.merge(high_risk_diagnoses, patinent_df,
on='subject_id')
diagnosis_counts = merged_diagnoses['icd9_code'].value_counts()
expired_counts = merged_diagnoses[merged_diagnoses['expire_flag'] ==
1]['icd9_code'].value_counts()
mortality_rate_by_diagnosis = (expired_counts / diagnosis_counts) *
100
sorted_mortality_rates =
mortality_rate_by_diagnosis.sort_values(ascending=False)

### Ploting Bar Chart for the same

sorted_mortality_rates.plot(kind='bar')
plt.title('Mortality Rate by Diagnosis Type')
plt.xlabel('Diagnosis ICD9 Code')
plt.ylabel('Mortality Rate (%)')
plt.xticks(rotation=45, ha='right')
plt.tight_layout()
plt.show()
```




```
diagnostic_df.head()
```

| | row_id | subject_id | hadm_id | seq_num | icd9_code |
|---|---|---|---|---|---|
| 0 | 1 | 13 | 1521 | 3 | D66 |
| 1 | 2 | 64 | 1782 | 1 | D80 |
| 2 | 3 | 17 | 1272 | 3 | D81 |
| 3 | 4 | 9 | 1935 | 2 | D48 |
| 4 | 5 | 41 | 1401 | 2 | D48 |

As dataset dont have any age columns in it so assuming "HADM_ID" as admission date of the patient and taking 2023 as the releasing date and calculating the details on the basis of that

```
high_risk_patients
```

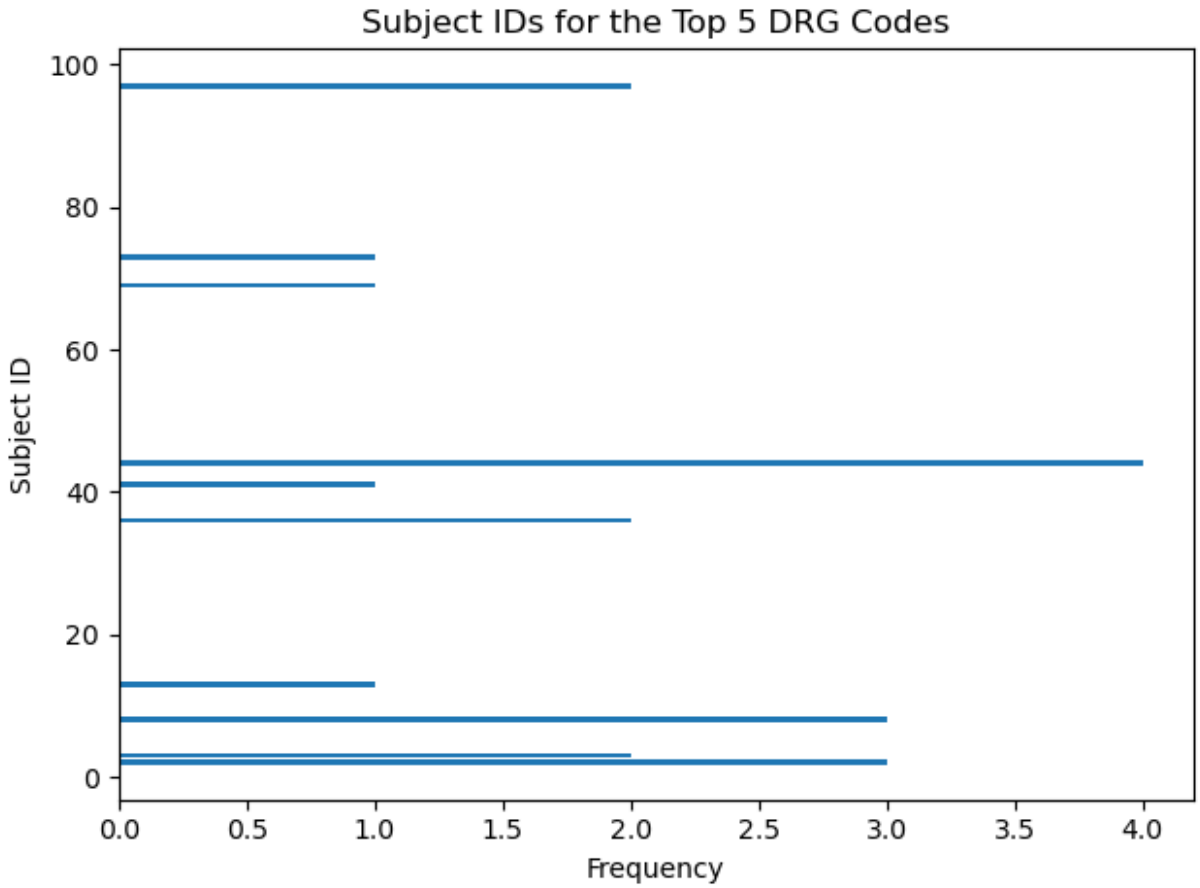
| | row_id_x | subject_id | hadm_id | drg_type | drg_code | description | drg_severity | \ |
|---|---|---|---|---|---|---|---|---|
| 0 | 6 | 97 | 1656 | Type A | 181 | Drug 6 | High | |

```
1           6           97     1656   Type A       181       Drug 6
High
2           9           68     1647   Type B       165       Drug 9
High
3           9           68     1647   Type B       165       Drug 9
High
4          18           32     1103   Type B       153      Drug 18
High
5          18           32     1103   Type B       153      Drug 18
High
6          18           32     1103   Type B       153      Drug 18
High
7          18           32     1103   Type B       153      Drug 18
High
8          18           32     1103   Type B       153      Drug 18
High
9          32            2     1977   Type A       178      Drug 32
High
10         32            2     1977   Type A       178      Drug 32
High
11         32            2     1977   Type A       178      Drug 32
High
12         35           98     1799   Type B       159      Drug 35
High
13         35           98     1799   Type B       159      Drug 35
High
14         35           98     1799   Type B       159      Drug 35
High
15         35           98     1799   Type B       159      Drug 35
High

   drg_mortality  row_id_y gender  expire_flag
0           High       181      M            0
1           High       183      M            0
2           High        16      F            0
3           High        19      F            0
4           High        47      M            0
5           High        66      M            1
6           High       155      M            0
7           High       170      M            0
8           High       180      M            0
9           High        67      F            0
10          High       140      F            0
11          High       182      M            0
12          High         7      M            0
13          High        53      F            0
14          High        55      F            0
15          High       196      M            0
```

Unable to get age as no age cols is in the dataset,, tried to create a dummy age but it didnt gave the proper result so unable to get the date details

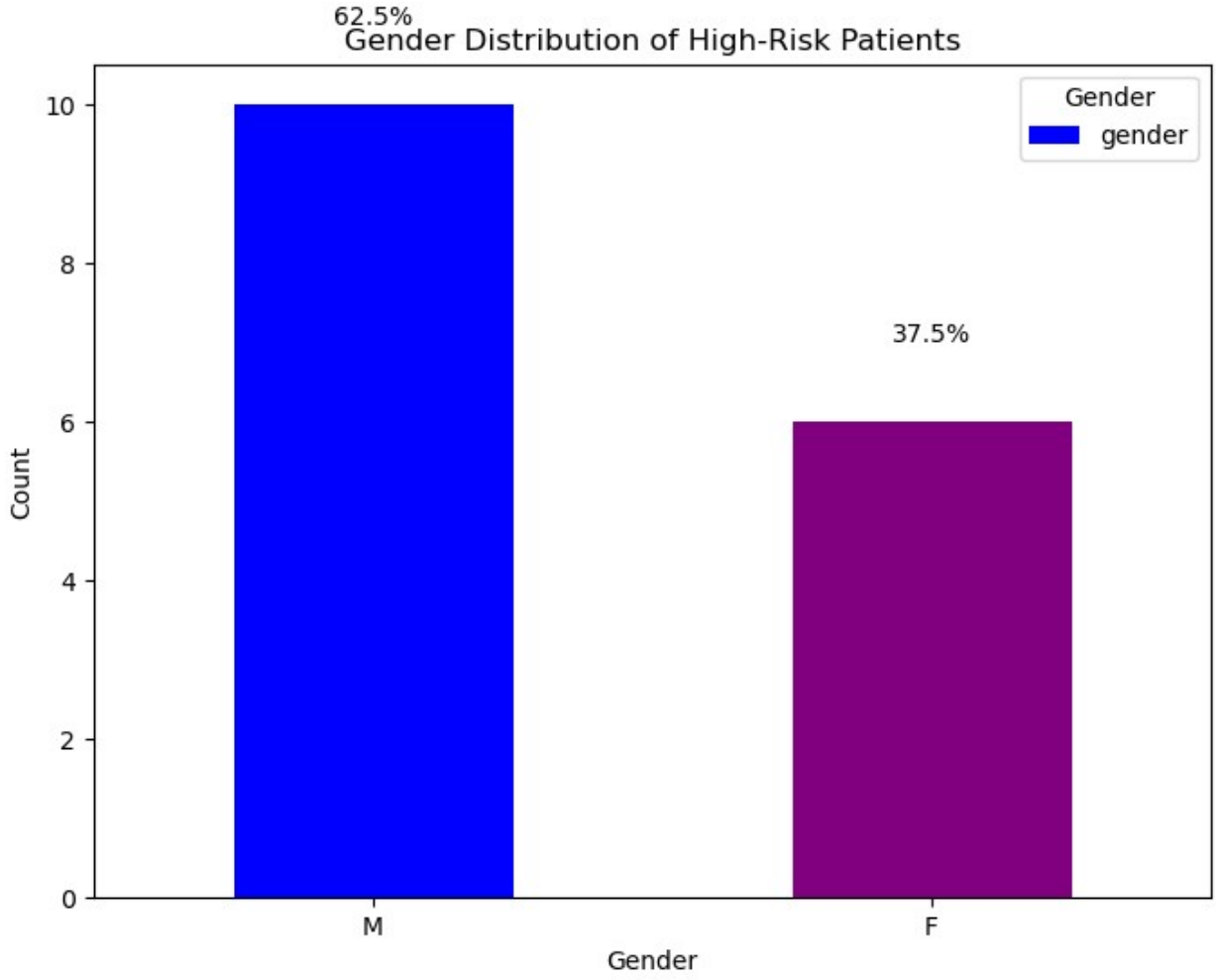
```
### Checking the prescription details

top_5_drug_codes = drugs_df['drg_code'].value_counts().head(5)

top_5_drug_codes

124    4
197    2
181    2
177    2
119    2
Name: drg_code, dtype: int64

drugs_df.head()

   row_id  subject_id  hadm_id drg_type  drg_code description
drg_severity  \
0       1          97     1669   Type A       101      Drug 1
High
1       2          36     1632   Type B       134      Drug 2
Medium
2       3           3     1054   Type A       181      Drug 3
Medium
3       4          73     1911   Type A       177      Drug 4
High
4       5           8     1011   Type A       119      Drug 5
High

  drg_mortality
0           Low
1           Low
2        Medium
3           Low
4        Medium

### Taking the subject _id's for the very same

top_subject_ids =
drugs_df[drugs_df['drg_code'].isin(top_5_drug_codes.index)]
['subject_id'].unique()

top_subject_ids

array([ 3, 73,  8, 97, 41, 13, 44,  2, 36, 69], dtype=int64)

### Using Graphical Representation for that
```

```
top_subject_ids_df =
drugs_df[drugs_df['subject_id'].isin(top_subject_ids)][['subject_id',
'drg_code']]
subject_id_counts = top_subject_ids_df['subject_id'].value_counts()
plt.barh(subject_id_counts.index, subject_id_counts.values)
plt.title('Subject IDs for the Top 5 DRG Codes')
plt.xlabel('Frequency')
plt.ylabel('Subject ID')
plt.tight_layout()
plt.show()
```




```
gender_distribution = high_risk_patients['gender'].value_counts()

total_count = gender_distribution.sum()
percentage_distribution = (gender_distribution / total_count) * 100

fig, ax = plt.subplots(figsize=(8, 6))
gender_distribution.plot(kind='bar', stacked=True, ax=ax,
color=['blue', 'purple'])
plt.title('Gender Distribution of High-Risk Patients')
plt.xlabel('Gender')
```

```
plt.ylabel('Count')
plt.xticks(rotation=0)
plt.legend(title='Gender')
for i, count in enumerate(gender_distribution):
    percentage = percentage_distribution[i]
    plt.text(i, count + 1, f'{percentage:.1f}%', ha='center',
color='black')

plt.show()
```



## Observations

Patient with ID's [ 97, 68, 32, 2, 98 ] have high morality & Severity patients are the high risk patient

As Compare to female, male patient are at high risk with the percentage rate of 62.5 % where as female patient at high rish with the percentage rate at 37.5 %

While Checking the expired patient details got that information that as compare to male female population is higher which means female population have high mortality rate which is 55.6% as compare to make expiration rate which is 44.4%

Drugs prescription trend is high with high risk patients

As compare to gender male population have critically diagonses while female population have high mortality rate