Project Title	**Drugs, Side Effects and Medical Condition** **arrow_drop_up**
Tools	Python, ML, SQL, Excel
Domain	Data Analyst & Data scientist
Project Difficulties level	intermediate

Dataset : Dataset is available in the given link. You can download it at your convenience.

Click here to download data set

About Dataset

Data contains details of various drugs (used for conditions like Acne, Cancer, Heart Disease, etc.) and their side effects

Drugs detail URLs were collected from following dataset

Major Column Descriptors:

generic_name:

The chemical name of the drug (not brand name)

drug_classes:

The drug belongs to which drug class, i.e a drug class is a set of medications

and other compounds that have a similar chemical structure, the same mechanism of action (i.e. binding to the same biological target), a related mode of action, and/or are used to treat the same disease.

brand_names:

brand names in which the drugs are being sold or available in the market.

activity:

Activity is based on recent site visitor activity relative to other medications in the list. Data was gathered from https://www.drugs.com

rx_otc:

Rx-to-OTC switch is the transfer of proven prescription drugs to nonprescription, where

OTC (Over-the-counter) = Medication that can be purchased without a medical prescription

Rx = Prescription Needed

Rx/OTC = Prescription or Over-the-counter.

pregnancy_category:

A = Adequate and well-controlled studies have failed to demonstrate a risk to the fetus in the first trimester of pregnancy (and there is no evidence of risk in later trimesters).

B = Animal reproduction studies have failed to demonstrate a risk to the fetus and there are no adequate and well-controlled studies in pregnant women.

C = Animal reproduction studies have shown an adverse effect on the fetus and there are no adequate and well-controlled studies in humans, but potential benefits may warrant use in pregnant women despite potential risks.

D = There is positive evidence of human fetal risk based on adverse reaction data from investigational or marketing experience or studies in humans, but potential benefits may warrant use in pregnant women despite potential risks.

X = Studies in animals or humans have demonstrated fetal abnormalities and/or there is positive evidence of human fetal risk based on adverse reaction data

from investigational or marketing experience, and the risks involved in use in pregnant women clearly outweigh potential benefits.
N = FDA has not classified the drug.

csa:

Controlled Substances Act (CSA) Schedule
M = The drug has multiple schedules. The schedule may depend on the exact dosage form or strength of the medication.
U = CSA Schedule is unknown.
N = Is not subject to the Controlled Substances Act.
1 = Has a high potential for abuse. Has no currently accepted medical use in treatment in the United States. There is a lack of accepted safety for use under medical supervision.
2 = Has a high potential for abuse. Has a currently accepted medical use in treatment in the United States or a currently accepted medical use with severe restrictions. Abuse may lead to severe psychological or physical dependence.
3 = Has a potential for abuse less than those in schedules 1 and 2. Has a currently accepted medical use in treatment in the United States. Abuse may lead to moderate or low physical dependence or high psychological dependence.
4 = Has a low potential for abuse relative to those in schedule 3. It has a currently accepted medical use in treatment in the United States. Abuse may lead to limited physical dependence or psychological dependence relative to those in schedule 3.
5 = Has a low potential for abuse relative to those in schedule 4. Has a currently accepted medical use in treatment in the United States. Abuse may lead to limited physical dependence or psychological dependence relative to those in schedule 4.

alcohol:

X = Interacts with Alcohol.

rating:

For ratings, users were asked how effective they found the medicine while considering positive/adverse effects and ease of use (1 = not effective, 10 = most effective).

All other columns are self-explanatory.

NOTE :

1. this project is only for your guidance, not exactly the same you have to create. Here I am trying to show the way or idea of what steps you can follow and how your projects look. Some projects are very advanced (because it will be made with the help of flask, nlp, advance ai, advance DL and some advanced things) which you can not understand .

2. You can make or analyze your project with yourself, with your idea, make it more creative from where we can get some information and understand about our business. make sure what overall things you have created all things you understand very well.

Example: You can get the basic idea how you can create a project from here

Here's a beginner-friendly guide to performing data analytics on a dataset involving Drugs, Side Effects, and Medical Conditions. The project will involve exploratory data analysis (EDA) using Python with the specified columns.

Project Title:

Exploratory Data Analysis on Drugs, Side Effects, and Medical Conditions

1. Objective

The goal is to analyze the relationships between drugs, their side effects, and the medical conditions they treat, as well as to explore the ratings and reviews associated with these drugs.

2. Dataset Overview

The dataset contains the following columns:

- `drug_name`: Name of the drug.
- `medical_condition`: The condition the drug is used to treat.
- `side_effects`: Common side effects of the drug.
- `generic_name`: The generic name of the drug.
- `drug_classes`: The class of the drug (e.g., antibiotic, antihistamine).
- `brand_names`: Brand names under which the drug is sold.
- `activity`: The activity of the drug (e.g., active, inactive).
- `rx_otc`: Indicates if the drug is prescription (Rx) or over-the-counter (OTC).
- `pregnancy_category`: The drug's pregnancy risk category.
- `csa`: Controlled Substances Act schedule, if applicable.
- `alcohol`: Interactions with alcohol.

- `related_drugs`: Other drugs related to the primary drug.
- `medical_condition_description`: A brief description of the medical condition.
- `rating`: Average user rating of the drug.
- `no_of_reviews`: Number of user reviews.
- `drug_link`: URL link to more information about the drug.
- `medical_condition_url`: URL link to more information about the medical condition.

3. Tools Required

- **Python**: The primary programming language for data analysis.
- **Pandas**: For data manipulation and analysis.
- **Matplotlib/Seaborn**: For data visualization.
- **Jupyter Notebook**: To write and run Python code.

4. Step-by-Step Guide

Step 1: Import Libraries

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

Step 2: Load the Dataset

```
# Load your dataset
df = pd.read_csv('path_to_your_dataset.csv')
```

```
# Display the first few rows of the dataset
df.head()
```

Step 3: Data Cleaning

- **Check for missing values:**

```
# Check for missing values
df.isnull().sum()
```

- **Handle missing values:**
  - Drop or fill missing values depending on the context.

```
# Example: Drop rows with missing values
df_cleaned = df.dropna()

# Or fill missing values with a placeholder
df_filled = df.fillna('Unknown')
```

Step 4: Basic Data Exploration

- **Summary statistics:**

```
# Summary statistics
```

```
df.describe()
```

- **Distribution of Ratings:**

```
# Distribution of drug ratings
plt.figure(figsize=(10, 6))
sns.histplot(df['rating'], bins=10, kde=True)
plt.title('Distribution of Drug Ratings')
plt.xlabel('Rating')
plt.ylabel('Frequency')
plt.show()
```

Step 5: Analyzing Relationships

- **Top Drugs by Condition:**

```
# Count the most common drugs for each medical condition
top_drugs =
df.groupby('medical_condition')['drug_name'].value_counts().nla
rgest(10)
print(top_drugs)
```

- **Side Effects Analysis:**

```
# Analyzing the most common side effects
side_effects = df['side_effects'].value_counts().head(10)
print(side_effects)
```

- **Drug Ratings by Class:**

```
# Boxplot of ratings by drug class
plt.figure(figsize=(12, 8))
sns.boxplot(x='drug_classes', y='rating', data=df)
plt.xticks(rotation=90)
plt.title('Drug Ratings by Class')
plt.show()
```

Step 6: Conclusion

- **Summarize findings**:
  - Identify any trends or patterns in the data.
  - Discuss how certain drug classes or conditions are associated with specific side effects or ratings.

5. Next Steps

- **Advanced Analysis**: Perform more sophisticated statistical tests or machine learning techniques.
- **Reporting**: Create a report or presentation to share the findings.

6. Example Output

- **Distribution of Drug Ratings:**
    - A histogram showing how drug ratings are distributed, with peaks at certain rating values.
- **Top Drugs for a Condition:**
    - A list or bar chart showing the most commonly prescribed drugs for a particular condition.
- **Side Effects Analysis:**
    - A list of the most common side effects reported in the dataset.

By following this guide, a beginner can start exploring and analyzing the dataset effectively. Let me know if you need further assistance!

Example: You can get the basic idea how you can create a project from here

Sample code with output

```
# Import dataset

import pandas as pd

import numpy as np



# Read the CSV file into a DataFrame

fpath =
'/kaggle/input/drugs-side-effects-and-medical-condition/drugs_s
ide_effects_drugs_com.csv'

data = pd.read_csv(fpath)



# Display the columns quantity and names

print('The dataset has {} rows and {}
columns'.format(data.shape[0], data.shape[1]))

print("column:")

print(data.columns)
```

```
The dataset has 2931 rows and 17 columns

column:

Index(['drug_name', 'medical_condition', 'side_effects',
'generic_name',

       'drug_classes', 'brand_names', 'activity', 'rx_otc',

       'pregnancy_category', 'csa', 'alcohol', 'related_drugs',

       'medical_condition_description', 'rating',
'no_of_reviews', 'drug_link',

       'medical_condition_url'],

      dtype='object')



In [2]:

# Show the main information about dataset

data.info()
```

```
<class 'pandas.core.frame.DataFrame'>

RangeIndex: 2931 entries, 0 to 2930

Data columns (total 17 columns):
```

```
 #   Column                          Non-Null Count  Dtype
---  ------                          --------------  -----
 0   drug_name                       2931 non-null   object
 1   medical_condition               2931 non-null   object
 2   side_effects                    2807 non-null   object
 3   generic_name                    2888 non-null   object
 4   drug_classes                    2849 non-null   object
 5   brand_names                     1718 non-null   object
 6   activity                        2931 non-null   object
 7   rx_otc                          2930 non-null   object
 8   pregnancy_category              2702 non-null   object
 9   csa                             2931 non-null   object
 10  alcohol                         1377 non-null   object
 11  related_drugs                   1462 non-null   object
 12  medical_condition_description   2931 non-null   object
 13  rating                          1586 non-null   float64
 14  no_of_reviews                   1586 non-null   float64
```

```
 15  drug_link                    2931 non-null   object

 16  medical_condition_url        2931 non-null   object

dtypes: float64(2), object(15)

memory usage: 389.4+ KB
```

In [3]:

```
data.head()
```

Out[3]:

	drug_name	medical_condition	side_effects	generic_name	drug_classes	brand_names	activity	rx_otc	pregnancy_category	csa	alcohol	related_drugs	medical_condition_description	rating	no_of_reviews	drug_link	medical_condition_url

0	doxycycline	Acne	(hives, difficult breathing, swelli	doxycycline	Miscellaneous antimalarials, Tetracyclines	Acticlate, Adoxa CK, Adoxa Pak, Adoxa	87%	Rx	D	N	X	amoxicillin: https://www.drugs.com/amoxicillin...	Acne Other names: Acne Vulgaris; Blackheads; B...	6.8	760.0	https://www.drugs.com/doxycycline.html	https://www.drugs.com/condition/acne.html

			ginyour...			TT, Alod...											
1	spironolactone	Acne	hivess; difficultybre	spironolactone	Aldosteronereceptorantago	Aldactone, Caro Spir	82%	Rx	C	N	X	amlodipine: https://www.drugs.com/amlodipine.h...	Acne Other names: Acne Vulgaris; Blackheads; B...	7.2	449.0	https://www.drugs.com/spironolactone.html	https://www.drugs.com/condition/acne.html

			athing; swelling of your...		ni sts, Potassium-sp...												
2	minocyclin	Acne	skin ra	minocyclin	Tetracyclines	Dynacin,	48%	Rx	D	N	NaN	amoxicillin: https://www.drugs.com/amo	Acne Other names: Acne Vulga	5.7	482.0	https://www.drugs.com/minocycline.html	https://www.drugs.com/condition/acne.html

	e		sh, fever, swollen glands, flu-like sy	e		Minocin, Minolira, Solodyn, Ximino, V...						xicillin...	ris; Blackheads; B...				

			m...														
3	Accutane	Acne	problem with your vision or	isotretinoin (oral)	Miscellaneous antineoplastics, Miscellane	NaN	41%	Rx	X	N	X	doxycycline: https://www.drugs.com/doxycycline...	Acne Other names: Acne Vulgaris; Blackheads; B...	7.9	623.0	https://www.drugs.com/accutane.html	https://www.drugs.com/condition/acne.html

			hearing; muscleo...		ouu...												
4	clindamycin	Acne	hives; diffic	clindamycin topic	Topical acne age	Cleocin T, Clind	39%	Rx	B	N	NaN	doxycycline: https://www.drugs.com/doxycycline...	Acne Other names: Acne Vulgaris; Blackheads; B...	74.4	146.0	https://www.drugs.com/mtm/clindamycin-topical....	https://www.drugs.com/condition/acne.html

			ultbreathing;swellingofyour...	al	nts, Vaginal anti-infectives	acinETZ, Clindaciin P, Clindag...											

In [4]:

```
# Dropping the 'brand_names' column and delete from dataset

data.drop(columns=['brand_names'], inplace=True)
```

In [5]:

```
# Find duplicate rows based on all columns

duplicate_rows= data[data.duplicated()]

#Count the duplicated rows

duplicate_count = duplicate_rows.shape[0]

# Print the count of duplicate rows

print("Count of Duplicate Rows:", duplicate_count)

print(duplicate_rows) # Print the duplicate rows
```

```
Count of Duplicate Rows: 0

Empty DataFrame

Columns: [drug_name, medical_condition, side_effects,

generic_name, drug_classes, activity, rx_otc,

pregnancy_category, csa, alcohol, related_drugs,

medical_condition_description, rating, no_of_reviews,
```

```
drug_link, medical_condition_url]

Index: []
```

In [6]:

```
# Convert 'rating' and 'no_of_reviews' attributes to numeric

data['rating'] = pd.to_numeric(data['rating'], errors='coerce')

# data['no_of_reviews'] = pd.to_numeric(data['no_of_reviews'],
errors='coerce')


print(data.dtypes.value_counts())
```

```
object     14

float64     2

Name: count, dtype: int64
```

In [7]:

```
# Convert 'activity' to string, remove whitespace and '%'
character, then convert to float and divide by 100
```

```
data['activity'] =
data['activity'].astype(str).str.replace(r'\s+', '',
regex=True).str.rstrip('%').astype('float')/100


# Display the updated 'activity' column
print(data['activity'].head())
```

```
0    0.87
1    0.82
2    0.48
3    0.41
4    0.39
Name: activity, dtype: float64
```

In [8]:

```
# Print the total number of missing values
print("There are {} missing values in this
dataset".format(data.isnull().sum().sum()))
```

```
print('Number of instances = %d' % (data.shape[0]))

print('Number of attributes = %d' % (data.shape[1]))

print('Number of missing values:')

for col in data.columns:

    print('\t%s: %d' % (col,data[col].isna().sum()))
```

```
There are 6192 missing values in this dataset

Number of instances = 2931

Number of attributes = 16

Number of missing values:

    drug_name: 0

    medical_condition: 0

    side_effects: 124

    generic_name: 43

    drug_classes: 82

    activity: 0

    rx_otc: 1
```

```
    pregnancy_category: 229

    csa: 0

    alcohol: 1554

    related_drugs: 1469

    medical_condition_description: 0

    rating: 1345

    no_of_reviews: 1345

    drug_link: 0

    medical_condition_url: 0
```

In [9]:

```
# In the alcohol column we have X and null(NaN) values, because
the drug can interact with alcohol or not.

# Therefore, let's replace the values of ak=lcohol column with
boolean values.

# Let X will be 1 of interaction, NaN will be 0.

data['alcohol']=data['alcohol'].replace(np.NaN,'0')

data['alcohol']=data['alcohol'].replace({'X': 1})
```

In [10]:

```
# To avoid missing values let's fill them with some information
# In our case we will replace all them
# Fill the null values in 'side_effects' and 'related_drugs'
with no
data["side_effects"] = data['side_effects'].fillna('Unknown')
data["related_drugs"] = data['related_drugs'].fillna('Unknown')
```

In [11]:

```
# Fill the null values with 0 as a base for 'rating' and
'no_of_reviews' columns
# It will show that there are no information about it
data["rating"] = data['rating'].fillna('0')
data["no_of_reviews"] = data['no_of_reviews'].fillna('0')
```

In [12]:

```
# Fill the null values with ?
```

```
data['generic_name']=data['generic_name'].replace(np.NaN,'Unkno
wn')


# Fill the null values with undefined for 'drug_classes'

data['drug_classes']=data['drug_classes'].replace(np.NaN,'Unkno
wn')
```

In [13]:

```
# For these two columns we already have some category values
from dataset's description

# So, let's check the categorical values


# For Rx_OTC

data["rx_otc"].unique()
```

Out[13]:

```
array(['Rx', 'Rx/OTC', 'OTC', nan], dtype=object)
```

In [14]:

```
# For pregnancy categories

data["pregnancy_category"].unique()
```

```
Out[14]:

array(['D', 'C', 'X', 'B', 'N', nan, 'A'], dtype=object)

In [15]:

# Fill the null value with Unknown as a basic value

data['rx_otc']=data['rx_otc'].replace(np.NaN, 'Unknown')


# Fill the null value with Unknown as a basic value

data['pregnancy_category']=data['pregnancy_category'].replace(n
p.NaN, 'Unknown')


data['no_of_reviews'] = pd.to_numeric(data['no_of_reviews'],
errors='coerce')


print(data.head())
```

```
dfs=data.copy()
```

```
       drug_name medical_condition  \
0     doxycycline              Acne
1  spironolactone              Acne
2     minocycline              Acne
3        Accutane              Acne
4     clindamycin              Acne

                                          side_effects
generic_name  \
0  (hives, difficult breathing, swelling in your ...
doxycycline
1  hives ; difficulty breathing; swelling of your...
spironolactone
2  skin rash, fever, swollen glands, flu-like sym...
minocycline
3  problems with your vision or hearing; muscle o...
```

```
isotretinoin (oral)

4  hives ; difficult breathing; swelling of your ...
clindamycin topical



                                          drug_classes  activity
rx_otc  \
0         Miscellaneous antimalarials, Tetracyclines      0.87
Rx
1  Aldosterone receptor antagonists, Potassium-sp...      0.82
Rx
2                                     Tetracyclines      0.48
Rx
3  Miscellaneous antineoplastics, Miscellaneous u...      0.41
Rx
4       Topical acne agents, Vaginal anti-infectives      0.39
Rx



  pregnancy_category csa alcohol  \
0                  D   N       1
1                  C   N       1
```

```
2                  D   N       0

3                  X   N       1

4                  B   N       0


                                        related_drugs  \

0  amoxicillin: https://www.drugs.com/amoxicillin...

1  amlodipine: https://www.drugs.com/amlodipine.h...

2  amoxicillin: https://www.drugs.com/amoxicillin...

3  doxycycline: https://www.drugs.com/doxycycline...

4  doxycycline: https://www.drugs.com/doxycycline...


                      medical_condition_description rating
no_of_reviews  \

0  Acne Other names: Acne Vulgaris; Blackheads; B...    6.8
760.0

1  Acne Other names: Acne Vulgaris; Blackheads; B...    7.2
449.0

2  Acne Other names: Acne Vulgaris; Blackheads; B...    5.7
482.0
```

```
3  Acne Other names: Acne Vulgaris; Blackheads; B...    7.9
623.0

4  Acne Other names: Acne Vulgaris; Blackheads; B...    7.4
146.0



                                              drug_link  \

0             https://www.drugs.com/doxycycline.html

1          https://www.drugs.com/spironolactone.html

2             https://www.drugs.com/minocycline.html

3                https://www.drugs.com/accutane.html

4  https://www.drugs.com/mtm/clindamycin-topical....



                      medical_condition_url

0  https://www.drugs.com/condition/acne.html

1  https://www.drugs.com/condition/acne.html

2  https://www.drugs.com/condition/acne.html

3  https://www.drugs.com/condition/acne.html

4  https://www.drugs.com/condition/acne.html
```

In [16]:

```
# Let's check is there any missing values left

print("There are {} missing values in this
dataset".format(data.isnull().sum().sum()))

print('Number of instances = %d' % (data.shape[0]))

print('Number of attributes = %d' % (data.shape[1]))

print('Number of missing values:')

for col in data.columns:

    print('\t%s: %d' % (col,data[col].isna().sum()))
```

```
There are 0 missing values in this dataset

Number of instances = 2931

Number of attributes = 16

Number of missing values:

    drug_name: 0

    medical_condition: 0
```

```
    side_effects: 0

    generic_name: 0

    drug_classes: 0

    activity: 0

    rx_otc: 0

    pregnancy_category: 0

    csa: 0

    alcohol: 0

    related_drugs: 0

    medical_condition_description: 0

    rating: 0

    no_of_reviews: 0

    drug_link: 0

    medical_condition_url: 0
```

In [17]:

```
data_version2=data.copy()
```

```
print(data_version2.head())

# Print head of dataset to our check
```

```
       drug_name medical_condition  \
0     doxycycline             Acne
1  spironolactone             Acne
2     minocycline             Acne
3        Accutane             Acne
4     clindamycin             Acne

                                        side_effects
generic_name  \
0  (hives, difficult breathing, swelling in your ...
doxycycline
1  hives ; difficulty breathing; swelling of your...
spironolactone
2  skin rash, fever, swollen glands, flu-like sym...
minocycline
3  problems with your vision or hearing; muscle o...
```

```
isotretinoin (oral)

4  hives ; difficult breathing; swelling of your ...
clindamycin topical



                                          drug_classes  activity
rx_otc  \
0         Miscellaneous antimalarials, Tetracyclines      0.87
Rx
1  Aldosterone receptor antagonists, Potassium-sp...      0.82
Rx
2                                     Tetracyclines      0.48
Rx
3  Miscellaneous antineoplastics, Miscellaneous u...      0.41
Rx
4       Topical acne agents, Vaginal anti-infectives      0.39
Rx



  pregnancy_category csa alcohol  \
0                  D   N       1
1                  C   N       1
```

```
2                  D   N       0

3                  X   N       1

4                  B   N       0


                                        related_drugs  \

0  amoxicillin: https://www.drugs.com/amoxicillin...

1  amlodipine: https://www.drugs.com/amlodipine.h...

2  amoxicillin: https://www.drugs.com/amoxicillin...

3  doxycycline: https://www.drugs.com/doxycycline...

4  doxycycline: https://www.drugs.com/doxycycline...


                      medical_condition_description rating
no_of_reviews  \

0  Acne Other names: Acne Vulgaris; Blackheads; B...    6.8
760.0

1  Acne Other names: Acne Vulgaris; Blackheads; B...    7.2
449.0

2  Acne Other names: Acne Vulgaris; Blackheads; B...    5.7
482.0
```

```
3  Acne Other names: Acne Vulgaris; Blackheads; B...    7.9
623.0

4  Acne Other names: Acne Vulgaris; Blackheads; B...    7.4
146.0



                                              drug_link  \

0             https://www.drugs.com/doxycycline.html

1          https://www.drugs.com/spironolactone.html

2             https://www.drugs.com/minocycline.html

3                https://www.drugs.com/accutane.html

4  https://www.drugs.com/mtm/clindamycin-topical....



                      medical_condition_url

0  https://www.drugs.com/condition/acne.html

1  https://www.drugs.com/condition/acne.html

2  https://www.drugs.com/condition/acne.html

3  https://www.drugs.com/condition/acne.html

4  https://www.drugs.com/condition/acne.html
```

In [18]:

```
# Save the data

data_version2.to_csv('drugs_side_effects_drugs_com_version2.csv', index=False)
```

In [19]:

```
# Read the new version dataset

data_ver3=pd.read_csv('drugs_side_effects_drugs_com_version2.csv')
```

```
data_ver3["pregnancy_category"].unique()
```

Out[19]:

```
array(['D', 'C', 'X', 'B', 'N', 'Unknown', 'A'], dtype=object)
```

In [20]:

```
data_ver3["csa"].unique()
```

Out[20]:

```
array(['N', '2', '4', 'U', 'M', '5', '3'], dtype=object)
```

In [21]:

```
data_ver3["rx_otc"].unique()
```

Out[21]:

```
array(['Rx', 'Rx/OTC', 'OTC', 'Unknown'], dtype=object)
```

In [22]:

```
data_ver3["generic_name"].unique()
```

Out[22]:

```
array(['doxycycline', 'spironolactone', 'minocycline', ...,
       'fenfluramine', 'phendimetrazine tartrate',
'setmelanotide'],
      dtype=object)
```

In [23]:

```
data_ver3["medical_condition"].unique()
```

Out[23]:

```
array(['Acne', 'ADHD', 'AIDS/HIV', 'Allergies', "Alzheimer's",
'Angina',
       'Anxiety', 'Asthma', 'Bipolar Disorder', 'Bronchitis',
'Cancer',
       'Cholesterol', 'Colds & Flu', 'Constipation', 'COPD',
'Covid 19',
       'Depression', 'Diabetes (Type 1)', 'Diabetes (Type 2)',
'Diarrhea',
       'Eczema', 'Erectile Dysfunction', 'Gastrointestinal',
       'GERD (Heartburn)', 'Gout', 'Hair Loss', 'Hayfever',
'Herpes',
       'Hypertension', 'Hypothyroidism', 'IBD (Bowel)',
'Incontinence',
       'Insomnia', 'Menopause', 'Migraine', 'Osteoarthritis',
       'Osteoporosis', 'Pain', 'Pneumonia', 'Psoriasis',
       'Rheumatoid Arthritis', 'Schizophrenia', 'Seizures',
'Stroke',
```

```
       'Swine Flu', 'UTI', 'Weight Loss'], dtype=object)
```

In [24]:

```
from sklearn.preprocessing import LabelEncoder

label_encoder = LabelEncoder()

data_ver3["csa"]=label_encoder.fit_transform(data_ver3["csa"])

data_ver3["rx_otc"]=label_encoder.fit_transform(data_ver3["rx_otc"])

data_ver3["generic_name"] =
label_encoder.fit_transform(data_ver3["generic_name"])

data_ver3["medical_condition"] =
label_encoder.fit_transform(data_ver3["medical_condition"])

data_ver3["pregnancy_category"] =
label_encoder.fit_transform(data_ver3["pregnancy_category"])

data_ver3["side_effects"] =
label_encoder.fit_transform(data_ver3["side_effects"])
```

In [25]:

```
data_ver3["generic_name"].unique()
```

Out[25]:

```
array([ 642, 1270, 1034, ...,  729, 1157, 1259])
```

In [26]:

```
data_ver3["rx_otc"].unique()
```

Out[26]:

```
array([1, 2, 0, 3])
```

In [27]:

```
data_ver3["csa"].unique()
```

Out[27]:

```
array([5, 0, 2, 6, 4, 3, 1])
```

In [28]:

```
data_ver3["side_effects"].unique()
```

Out[28]:

```
array([  15, 1972, 2697, ..., 1647,  416, 1706])
```

In [29]:

```
data_ver3["medical_condition"].unique()
```

Out[29]:

```
array([ 2,  0,  1,  3,  4,  5,  6,  7,  8,  9, 11, 12, 13, 14,
10, 15, 16,
       17, 18, 19, 20, 21, 23, 22, 24, 25, 26, 27, 28, 29, 30,
31, 32, 33,
       34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46])
```

In [30]:

```
data_ver3["pregnancy_category"].unique()
```

Out[30]:

```
array([3, 2, 6, 1, 4, 5, 0])
```

In [31]:

```
df=pd.DataFrame(data_ver3,columns=('generic_name',
'medical_condition', 'no_of_reviews', 'side_effects', 'rating',
'csa', 'pregnancy_category', 'rx_otc', 'alcohol'))
```

```
df.head(10)
```

Out[31]:

	generic_name	medical_condition	no_of_reviews	side_effects	rating	csa	pregnancy_category	rx_otc	alcohol
0	642	2	760.0	15	6.8	5	3	1	1
1	1270	2	449.0	1972	7.2	5	2	1	1
2	1034	2	482.0	2697	5.7	5	3	1	0
3	903	2	623.0	2570	7.9	5	6	1	1
4	505	2	146.0	1260	7.4	5	1	1	0
5	1270	2	8.0	1971	7.6	5	2	1	1

6	1335	2	439.0	1895	7.7	5	2	1	0
7	903	2	999.0	2577	8.0	5	6	1	1
8	1276	2	96.0	2702	8.5	5	3	1	1
9	162	2	86.0	2405	7.9	5	2	1	0

In [32]:

```
from sklearn.preprocessing import StandardScaler

scaler=StandardScaler()

scaler.fit(df)

scaled_data=scaler.transform(df)

print(scaled_data)
```

```
[[-0.11111578 -1.43400434  5.10119829 ...  0.28892455
-0.17025661

   1.06232778]
```

```
 [ 1.50040103 -1.43400434  2.89586941 ... -0.43301735
-0.17025661

   1.06232778]

 [ 0.89479917 -1.43400434  3.12987537 ...  0.28892455
-0.17025661

  -0.94132905]

 ...

 [ 1.21043065  1.82918864 -0.28802985 ... -0.43301735
-0.17025661

   1.06232778]

 [ 1.47217383  1.82918864 -0.28802985 ...  1.73280834
-0.17025661

  -0.94132905]

 [ 1.47217383  1.82918864 -0.28802985 ...  1.73280834
-0.17025661

  -0.94132905]]
```

In [33]:

```
df_std = pd.DataFrame(scaler.fit_transform(df),
```

```
columns=df.columns)

print(df_std)
```

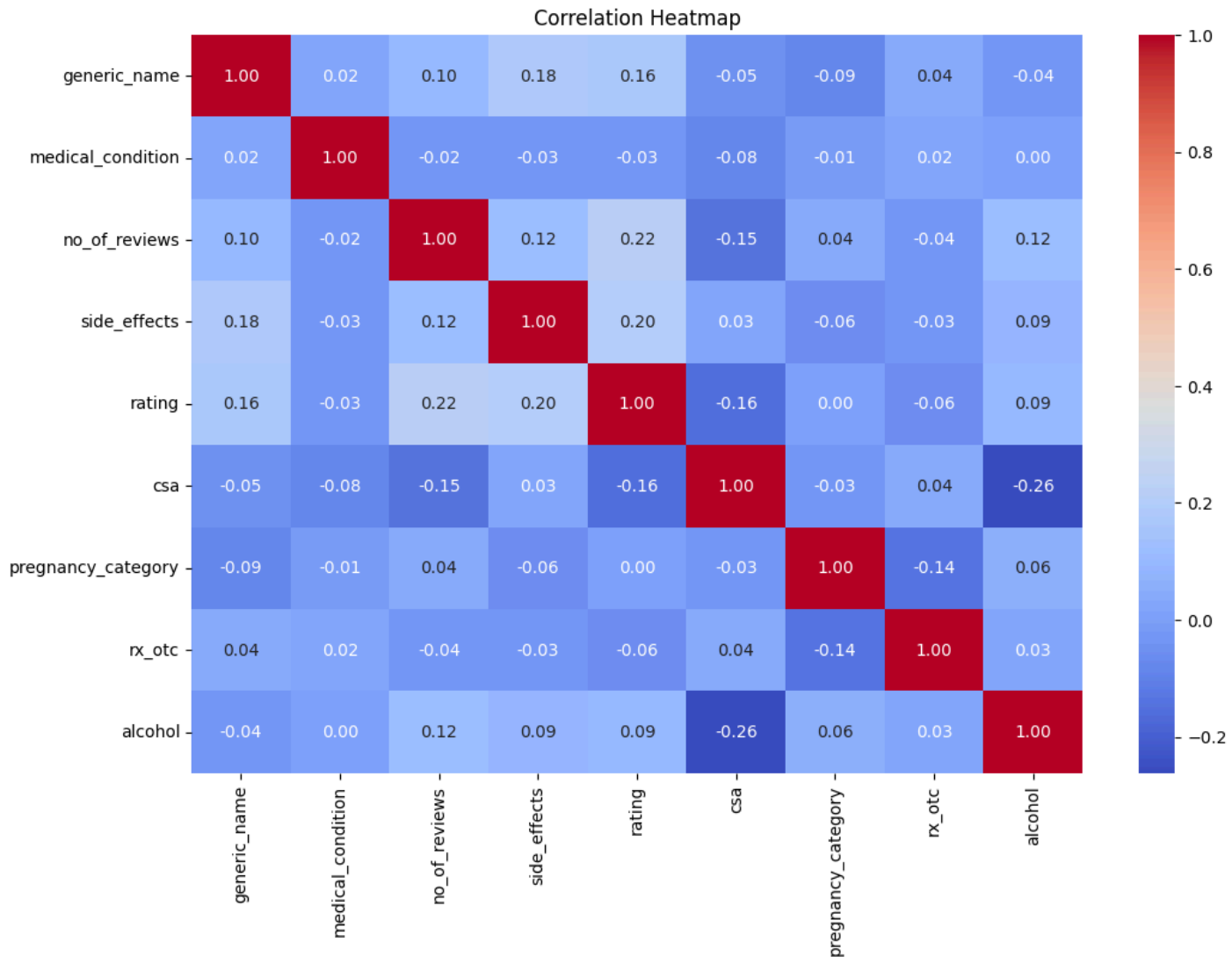
```
     generic_name  medical_condition  no_of_reviews
side_effects    rating  \

0        -0.111116          -1.434004       5.101198
-1.678954  0.819930

1         1.500401          -1.434004       2.895869
0.778579  0.925271

2         0.894799          -1.434004       3.129875
1.689009  0.530244

3         0.558639          -1.434004       4.129719
1.529527  1.109617

4        -0.462673          -1.434004       0.747269
-0.115526  0.977941

...             ...                ...            ...
...       ...

2926     -0.832193           1.829189      -0.167481
0.757231  1.004277

2927      0.112136           1.829189      -0.288030
```

```
0.370455 -0.970861

2928      1.210431            1.829189      -0.288030
-1.029724 -0.970861

2929      1.472174            1.829189      -0.288030
-1.175392 -0.970861

2930      1.472174            1.829189      -0.288030
0.444545 -0.970861



           csa  pregnancy_category    rx_otc   alcohol

0     0.274178            0.288925 -0.170257  1.062328

1     0.274178           -0.433017 -0.170257  1.062328

2     0.274178            0.288925 -0.170257 -0.941329

3     0.274178            2.454750 -0.170257  1.062328

4     0.274178           -1.154959 -0.170257 -0.941329

...        ...                 ...       ...       ...

2926 -3.424857            2.454750 -0.170257  1.062328

2927 -2.500098           -0.433017 -0.170257  1.062328

2928 -3.424857           -0.433017 -0.170257  1.062328
```

```
2929  0.274178            1.732808 -0.170257 -0.941329

2930  0.274178            1.732808 -0.170257 -0.941329


[2931 rows x 9 columns]
```

In [34]:

```
import seaborn as sns

import matplotlib.pyplot as plt


plt.figure(figsize=(12, 8))

sns.heatmap(df.corr(), annot=True, cmap='coolwarm', fmt=".2f")

plt.title('Correlation Heatmap')

plt.show()
```



In [35]:

```
# Read the new version dataset

data_ver4 =
pd.read_csv('drugs_side_effects_drugs_com_version2.csv')



# Importing necessary libraries

from mlxtend.frequent_patterns import apriori,
```

```
association_rules

import matplotlib.pyplot as plt

import pandas as pd



# Check for occurrence and frequency of medical conditions,
sorted from highest to lowest

medical_condition_counts =
data_ver4['medical_condition'].value_counts().sort_values(ascen
ding=False)

print("\nMedical condition occurrence and frequency (sorted
from highest to lowest):")

print(medical_condition_counts)
```

```
Medical condition occurrence and frequency (sorted from highest
to lowest):

medical_condition

Pain                    264

Colds & Flu             245

Acne                    238
```

Hypertension	177
Osteoarthritis	129
Hayfever	124
Eczema	122
AIDS/HIV	109
Diabetes (Type 2)	104
Psoriasis	93
GERD (Heartburn)	77
Pneumonia	72
Angina	71
Bronchitis	71
Migraine	61
Insomnia	60
Constipation	60
Diabetes (Type 1)	57
Osteoporosis	56
ADHD	55

Depression	51
Seizures	50
Bipolar Disorder	47
UTI	46
Asthma	45
Anxiety	45
Cholesterol	45
Diarrhea	38
Covid 19	34
Rheumatoid Arthritis	33
Alzheimer's	27
Weight Loss	23
COPD	23
IBD (Bowel)	22
Schizophrenia	20
Cancer	20
Incontinence	19

```
Hypothyroidism           17
Allergies                14
Erectile Dysfunction     13
Hair Loss                11
Herpes                   10
Gout                      9
Menopause                 7
Gastrointestinal          7
Stroke                    5
Swine Flu                 5
Name: count, dtype: int64
```

In [36]:

```
# Save the results to CSV files if needed
medical_condition_counts.to_csv('medical_condition_counts.csv')
```

In [37]:

```
# Importing necessary libraries for processing text
from collections import Counter
import re


# Function to extract side effects from text, split by
semicolons
def extract_side_effects(text):
    # Split the text on semicolons then strip whitespace
    return [effect.strip() for effect in re.split(r'[;]',
text)]


# Extract and count occurrences of side effects
side_effects =
data_ver4['side_effects'].dropna().apply(extract_side_effects).
explode()
side_effect_counts =
side_effects.value_counts().sort_values(ascending=False)


print("\nSide effects occurrence and frequency (sorted from
```

```
highest to lowest):")

print(side_effect_counts)
```

```
Side effects occurrence and frequency (sorted from highest to
lowest):

side_effects

hives
1788

difficult breathing
1130

difficulty breathing
450

itching
275

a light-headed feeling, like you might pass out
272


...

swelling of your face, lips, tongue, or throat. Rizatriptan may
cause serious side effects. Stop using rizatriptan and call
```

your doctor at once if you have: sudden and severe stomach pain and bloody diarrhea
1

swelling of your face, lips, tongue, or throat. Report any new or worsening symptoms to your doctor, such as: mood or behavior changes, anxiety , panic attacks , trouble sleeping, or if you feel impulsive, irritable, agitated, hostile, aggressive, restless, hyperactive (mentally or physically), depressed, or have thoughts about suicide or hurting yourself. Zarontin may cause serious side effects. Call your doctor at once if you have: fever, chills, flu symptoms, sore throat , feeling very weak
1

or signs of a stroke--sudden numbness or weakness (especially on one side of the body), sudden severe headache, slurred speech, problems with vision or balance. Common side effects of rizatriptan may include: dizziness , drowsiness, feeling tired
1

Suddenly stopping or reducing the dose of Diastat AcuDial very quickly may precipitate acute withdrawal reactions, which can be life-threatening. In some cases, patients have developed withdrawal symptoms lasting weeks to more than 12 months, including but not limited to: anxiety difficulty thinking mental changes depression insomnia abnormal skin sensations

```
muscle weakness tremors twitching ringing in your ears burning
or prickling feeling in your hands, arms, or feet The most
frequent side effect reported for Diastat AcuDial in clinical
studies was somnolence (sleepiness or drowsiness). Other side
effects included dizziness, headache, pain, abdominal pain,
nervousness, vasodilation (increase in diameter of blood
vessel), diarrhea, ataxia/incoordination (lack of
coordination), euphoria (feeling of great happiness or
well-being), asthma, rhinitis (irritation of the nose similar
to an allergy or a cold), and rash. You are encouraged to
report negative side effects of prescription drugs to the FDA.
Visit www.fda.gov/medwatch, or call 1-800-FDA-1088. You may
also contact Bausch Health Customer Service at 1-800-321-4576.
Diastat AcuDial side effects       1

or nausea , vomiting , diarrhea , or stomach pain.
1

Name: count, Length: 8438, dtype: int64



In [38]:

# Save the side effect counts to a CSV file

side_effect_counts.to_csv('side_effect_counts.csv')
```

In [39]:

```
# Function to extract drug classes from text, split by commas
def extract_drug_classes(text):
    # Split the text on commas then strip whitespace
    return [effect.strip() for effect in re.split(r'[,]', text)]


# Extract and count occurrences of drug classes
drug_classes = data_ver4['drug_classes'].dropna().apply(extract_drug_classes).explode()
drug_classes_counts = drug_classes.value_counts().sort_values(ascending=False)


print("\nDrug Classes occurrence and frequency (sorted from highest to lowest):")
print(drug_classes_counts)
```

```
Drug Classes occurrence and frequency (sorted from highest to
```

```
lowest):

drug_classes

Upper respiratory combinations           245

Topical acne agents                      125

Topical steroids                          94

Antihistamines                            82

Unknown                                   82

                                         ...

Immune globulins                           1

Smoking cessation agents                   1

Mouth and throat products                  1

Skeletal muscle relaxant combinations      1

Anthelmintics                              1

Name: count, Length: 244, dtype: int64
```

In [40]:

```
# Save the drug classes counts to a CSV file
```

```
drug_classes_counts.to_csv('drug_classes_counts.csv')
```

In [41]:

```
# Define functions to check for specific side effects and create
new boolean columns

def has_hives(text):

    return 'hives' in text.lower()

data_ver4['Hives'] = data_ver4['side_effects'].apply(has_hives)



def has_difficult_breathing(text):

    return 'difficult breathing' in text.lower() or 'difficulty
breathing' in text.lower()

data_ver4['Difficult Breathing'] =
data_ver4['side_effects'].apply(has_difficult_breathing)



def has_itching(text):

    return 'itching' in text.lower()

data_ver4['Itching'] =
```

```
data_ver4['side_effects'].apply(has_itching)
```

In [42]:

```
# Define functions to check for specific drug classes and create
new boolean columns

def is_usc(text):

    return 'Upper respiratory combinations' in text

data_ver4['Upper respiratory combinations'] =
data_ver4['drug_classes'].apply(is_usc)



def is_steriods(text):

    return 'Topical steroids' in text

data_ver4['Topical steroids'] =
data_ver4['drug_classes'].apply(is_steriods)



def is_acne(text):

    return 'Topical acne agents' in text

data_ver4['Topical acne agents'] =
data_ver4['drug_classes'].apply(is_acne)
```

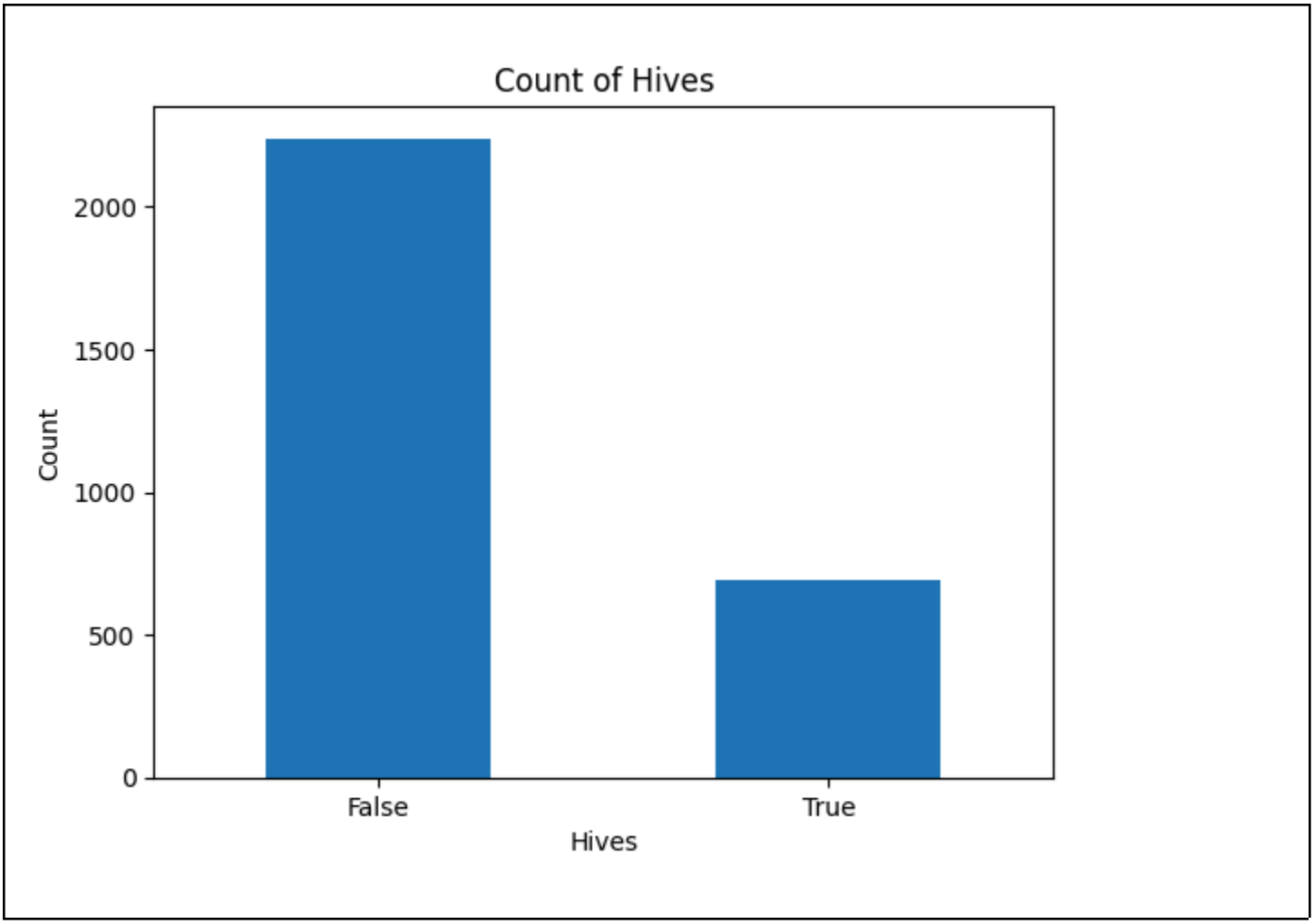
In [43]:

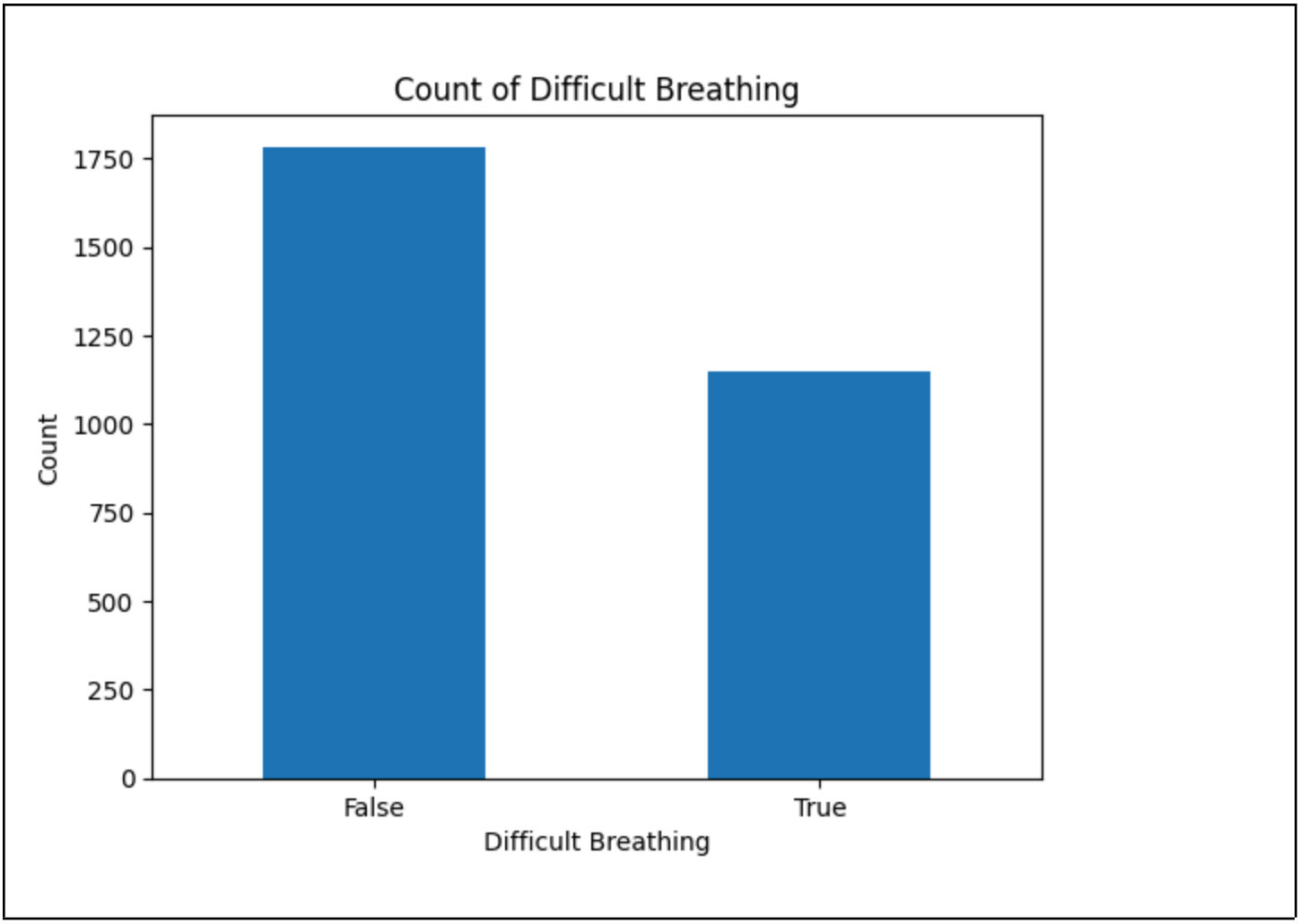
```
# Define functions to check for specific medical conditions and
create new boolean columns

def has_pain(text):

    return 'Pain' in text

data_ver4['Pain'] =
data_ver4['medical_condition'].apply(has_pain)



def has_colds_and_flu(text):

    return 'Colds & Flu' in text

data_ver4['Colds & Flu'] =
data_ver4['medical_condition'].apply(has_colds_and_flu)



def has_acne(text):

    return 'Acne' in text

data_ver4['Acne'] =
data_ver4['medical_condition'].apply(has_acne)
```

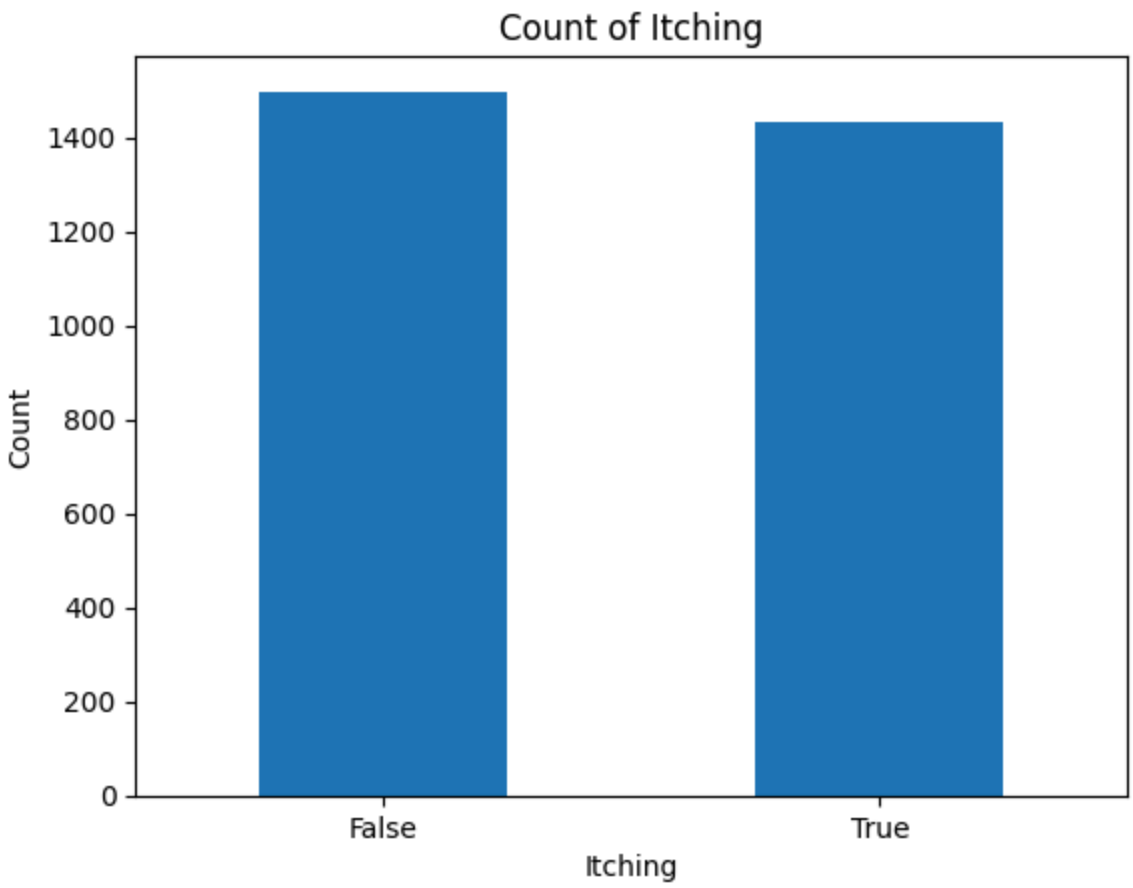
In [44]:

```
# Plot the count of occurrences for each side effect

import seaborn as sns



# Plot count of Hives

data_ver4['Hives'].value_counts().plot(kind='bar')

plt.title('Count of Hives')

plt.xlabel('Hives')

plt.ylabel('Count')

plt.xticks([0, 1], ['False', 'True'], rotation=0)

plt.show()



# Plot count of Difficult Breathing

data_ver4['Difficult
Breathing'].value_counts().plot(kind='bar')

plt.title('Count of Difficult Breathing')

plt.xlabel('Difficult Breathing')
```

```
plt.ylabel('Count')

plt.xticks([0, 1], ['False', 'True'], rotation=0)

plt.show()



# Plot count of Itching

data_ver4['Itching'].value_counts().plot(kind='bar')

plt.title('Count of Itching')

plt.xlabel('Itching')

plt.ylabel('Count')

plt.xticks([0, 1], ['False', 'True'], rotation=0)

plt.show()
```


Count of Hives
2000
1500
1000
500
0
Count
False
True
Hives


Count of Difficult Breathing
Count
1750
1500
1250
1000
750
500
250
0
False
True
Difficult Breathing



In [45]:

```
# Plot the count of occurrences for each drug class



# Plot count of Upper respiratory combinations

data_ver4['Upper respiratory
combinations'].value_counts().plot(kind='bar')

plt.title('Count of Upper respiratory combinations')

plt.xlabel('Upper respiratory combinations')
```

```
plt.ylabel('Count')

plt.xticks([0, 1], ['False', 'True'], rotation=0)

plt.show()



# Plot count of Topical steroids

data_ver4['Topical steroids'].value_counts().plot(kind='bar')

plt.title('Count of Topical steroids')

plt.xlabel('Topical steroids')

plt.ylabel('Count')

plt.xticks([0, 1], ['False', 'True'], rotation=0)

plt.show()
```

Reference link