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Project Title	**Drugs, Side Effects and Medical Condition arrow_drop_up**
Tools	Python, ML, SQL, Excel
Technologies	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

what steps you should have to follow

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().nlargest(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!

Sample code

```
# 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_side_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	doxycycli	Acn	(hives	doxycycli	Miscellan	Acticlate	87	R	D	N	X	amoxicillin: https://www.drugs.com/	Acne Other names:	6.	76	https://www.drugs.com/dox	https://www.drugs.com/condition/acne.h

	ne	e	, difficult breathing, swelling in your ...	ne	eous antimalarials, Tetracyclines	, Adoxa CK, Adoxa Pak, Adoxa TT, Alod...	%	x				amoxicillin...	Acne Vulgaris; Blackheads; B...	8	0.0	ycycline.html	ml
1	spironolactone	Acne	hives; difficulty breathing; swelling of your ...	spironolactone	Aldosterone receptor antagonists, Potassium-sp...	Aldactone, CaroSpir	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
2	minocycline	Acne	skin rash, fever, s	minocycline	Tetracyclines	Dynacin, Minocin, Mi	48%	Rx	D	N	NaN	amoxicillin: https://www.drugs.com/amoxicillin...	Acne Other names: Acne Vulgaris; Blackheads; B...	5.7	482.0	https://www.drugs.com/minocycline.html	https://www.drugs.com/condition/acne.html

			wollen glands, flu-like sym...			nolira, Solodyn, Ximino, V...											
3	Accutane	Acne	problems with your vision or hearing; muscle o...	isotretinoin (oral)	Miscellaneous antineoplastics, Miscellaneous u...	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
4	clindamycin	Acne	hives; difficult breat	clindamycin topical	Topical acne agents, Vagin	Cleocin T, Clindacin ET	39%	Rx	B	N	NaN	doxycycline: https://www.drugs.com/doxycycline...	Acne Other names: Acne Vulgaris; Blackheads; B...	7.4	146.0	https://www.drugs.com/mtm/clindamycin-topical....	https://www.drugs.com/condition/acne.html

			hing; swelling of your ...		al anti-infectives	Z, Clindacin 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
```

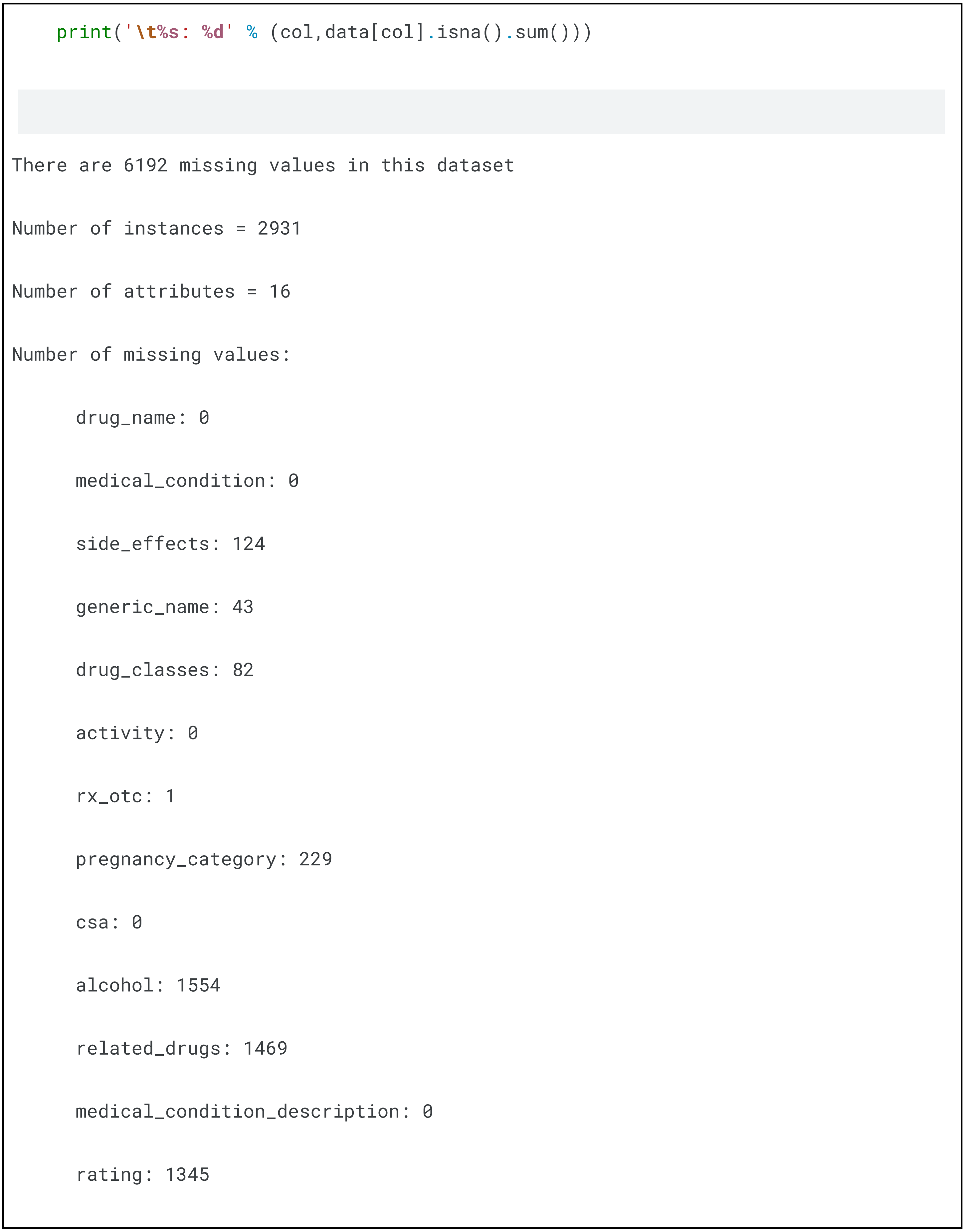
In [7]:

```
# 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,'Unknown')



# Fill the null values with undefined for 'drug_classes'

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

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]:

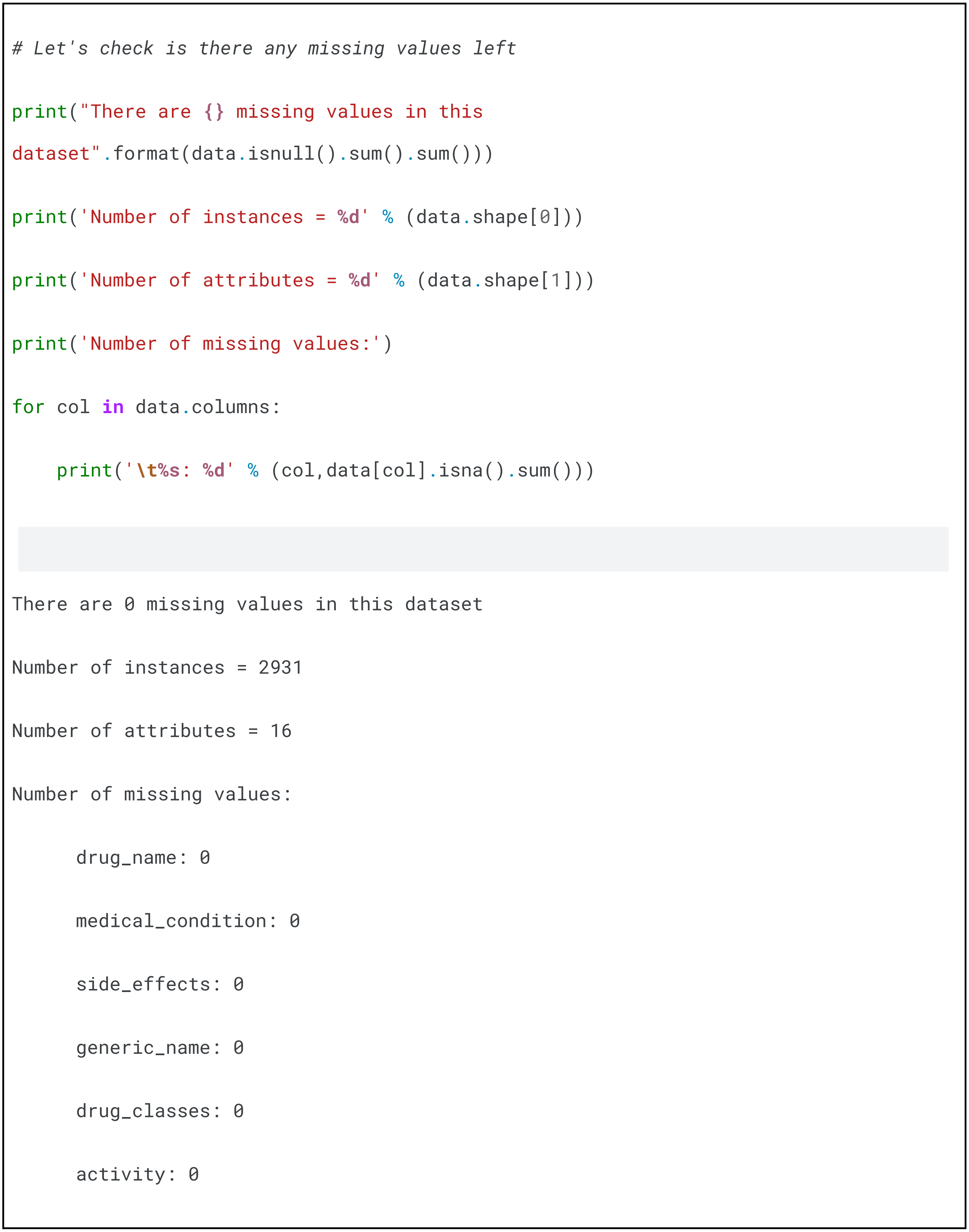
```
# Fill the null value with Unknown as a basic value

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(np.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]:

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

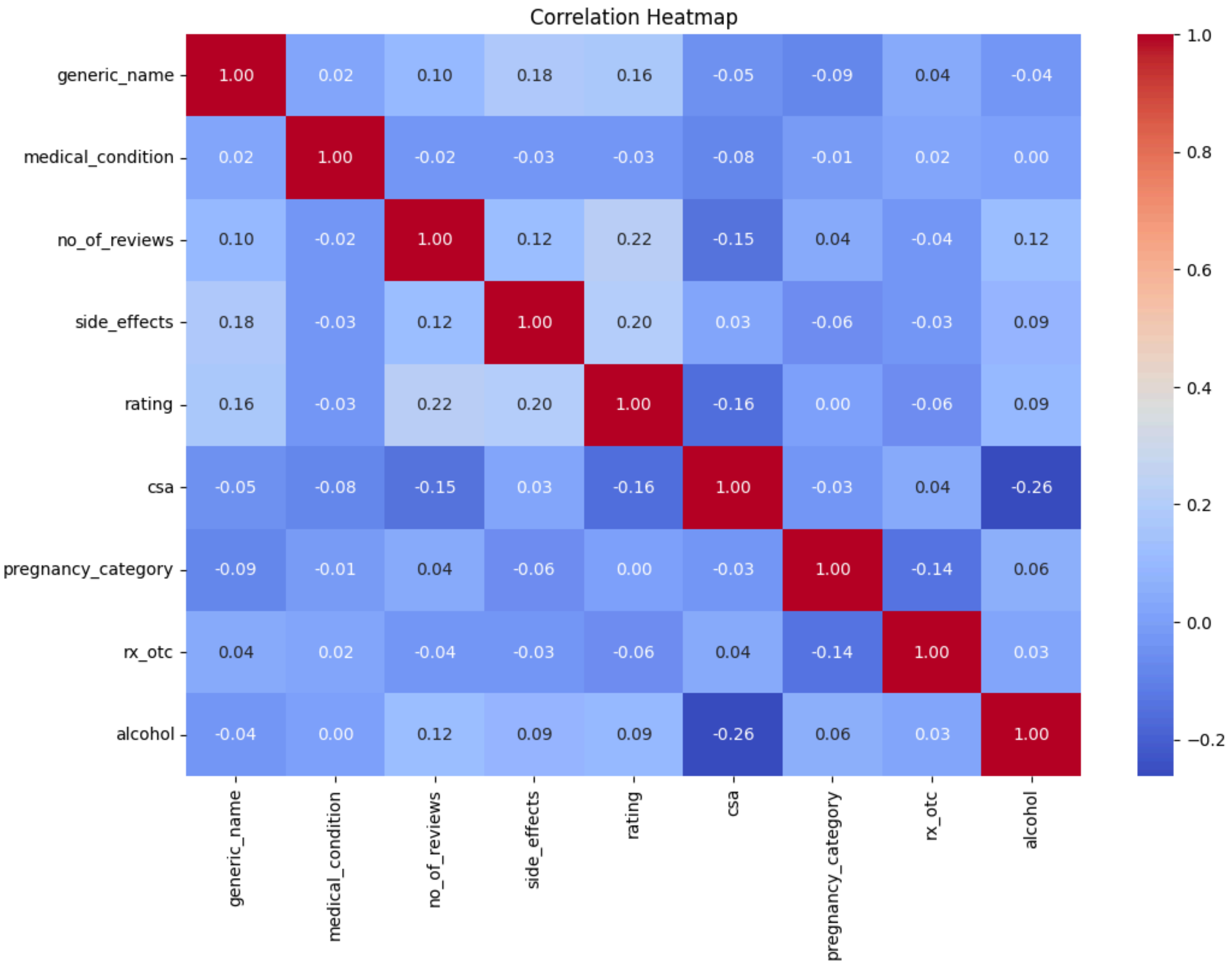
```
     generic_name  medical_condition  no_of_reviews  side_effects    rating  \
0       -0.111116          -1.434004       5.101198     -1.678954  0.819930
```

```
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]:

```python
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()
```



	generic_name	medical_condition	no_of_reviews	side_effects	rating	csa	pregnancy_category	rx_otc	alcohol
generic_name	1.00	0.02	0.10	0.18	0.16	-0.05	-0.09	0.04	-0.04
medical_condition	0.02	1.00	-0.02	-0.03	-0.03	-0.08	-0.01	0.02	0.00
no_of_reviews	0.10	-0.02	1.00	0.12	0.22	-0.15	0.04	-0.04	0.12
side_effects	0.18	-0.03	0.12	1.00	0.20	0.03	-0.06	-0.03	0.09
rating	0.16	-0.03	0.22	0.20	1.00	-0.16	0.00	-0.06	0.09
csa	-0.05	-0.08	-0.15	0.03	-0.16	1.00	-0.03	0.04	-0.26
pregnancy_category	-0.09	-0.01	0.04	-0.06	0.00	-0.03	1.00	-0.14	0.06
rx_otc	0.04	0.02	-0.04	-0.03	-0.06	0.04	-0.14	1.00	0.03
alcohol	-0.04	0.00	0.12	0.09	0.09	-0.26	0.06	0.03	1.00

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
```

```python
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(ascending=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]:

```python
# Save the side effect counts to a CSV file

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

In [39]:

```python
# 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)
```

```python
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)
```

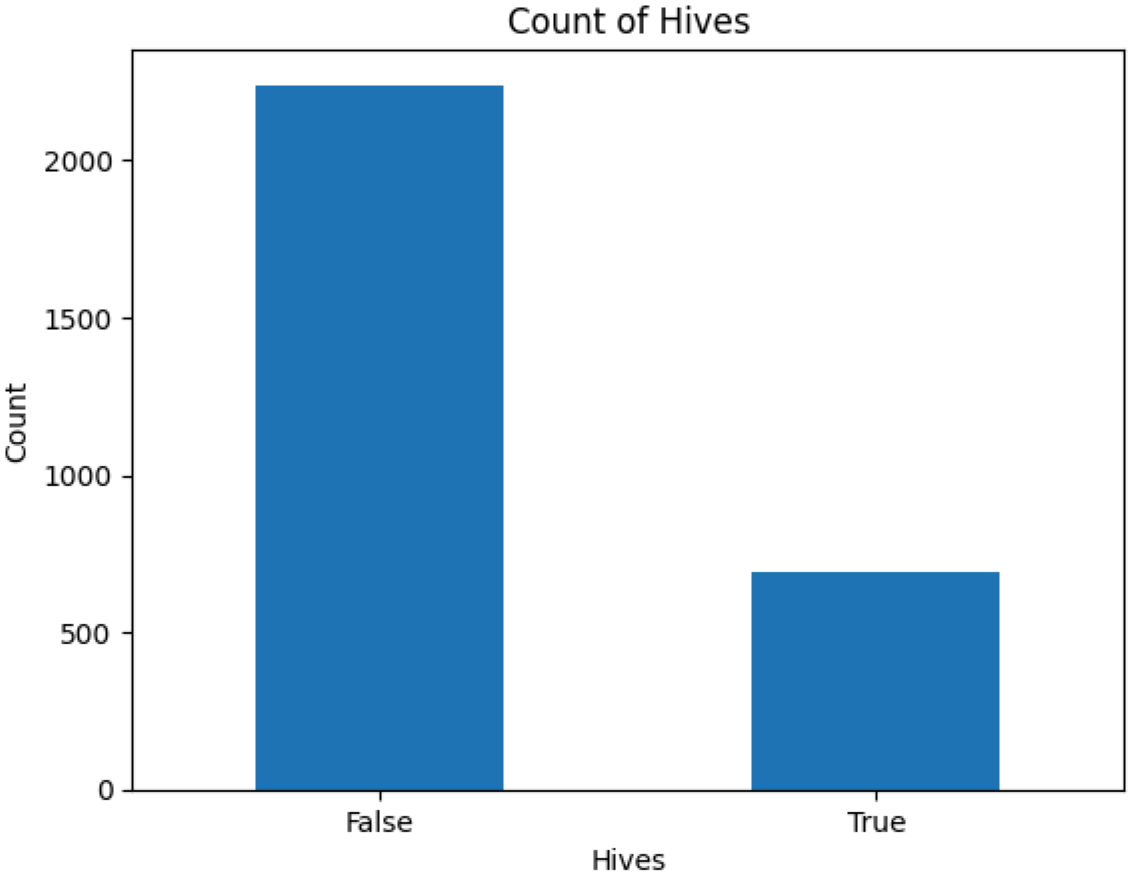
In [43]:

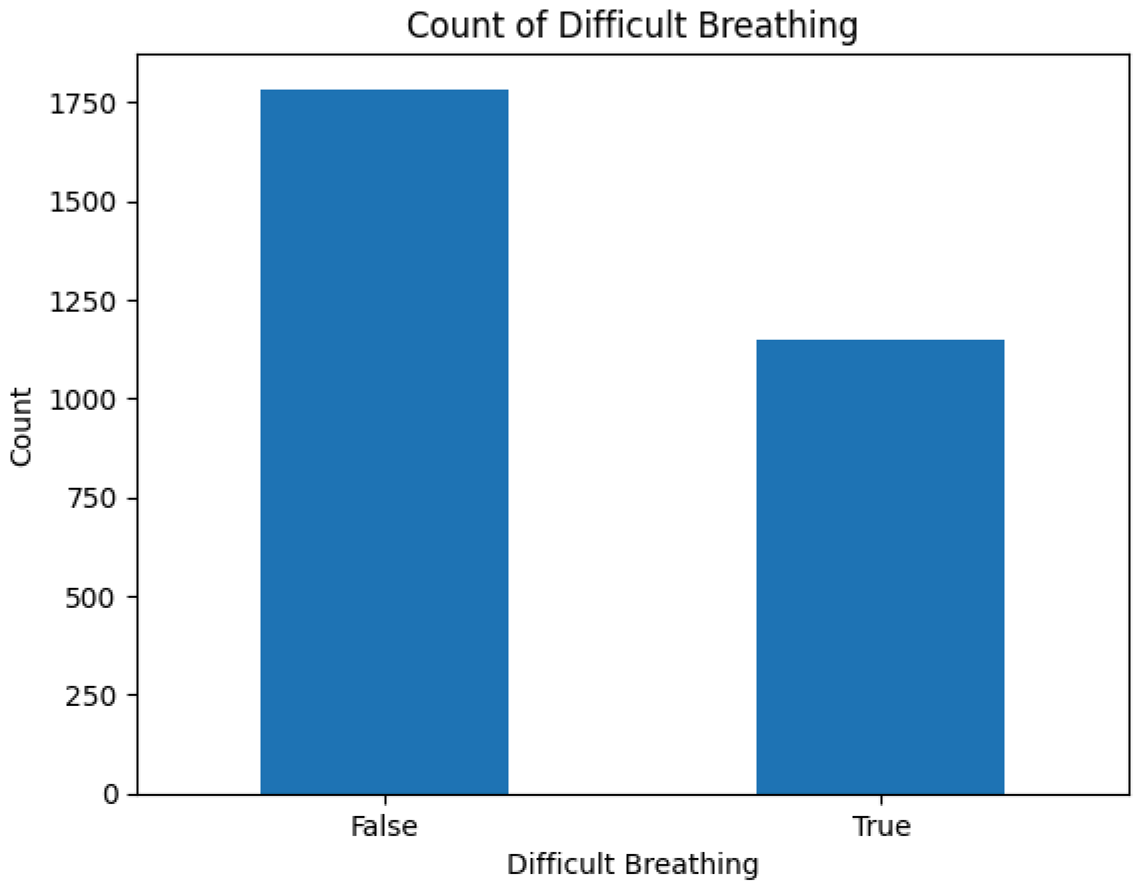
```
# Define functions to check for specific medical conditions and create new boolean
columns

def has_pain(text):

    return 'Pain' in text

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

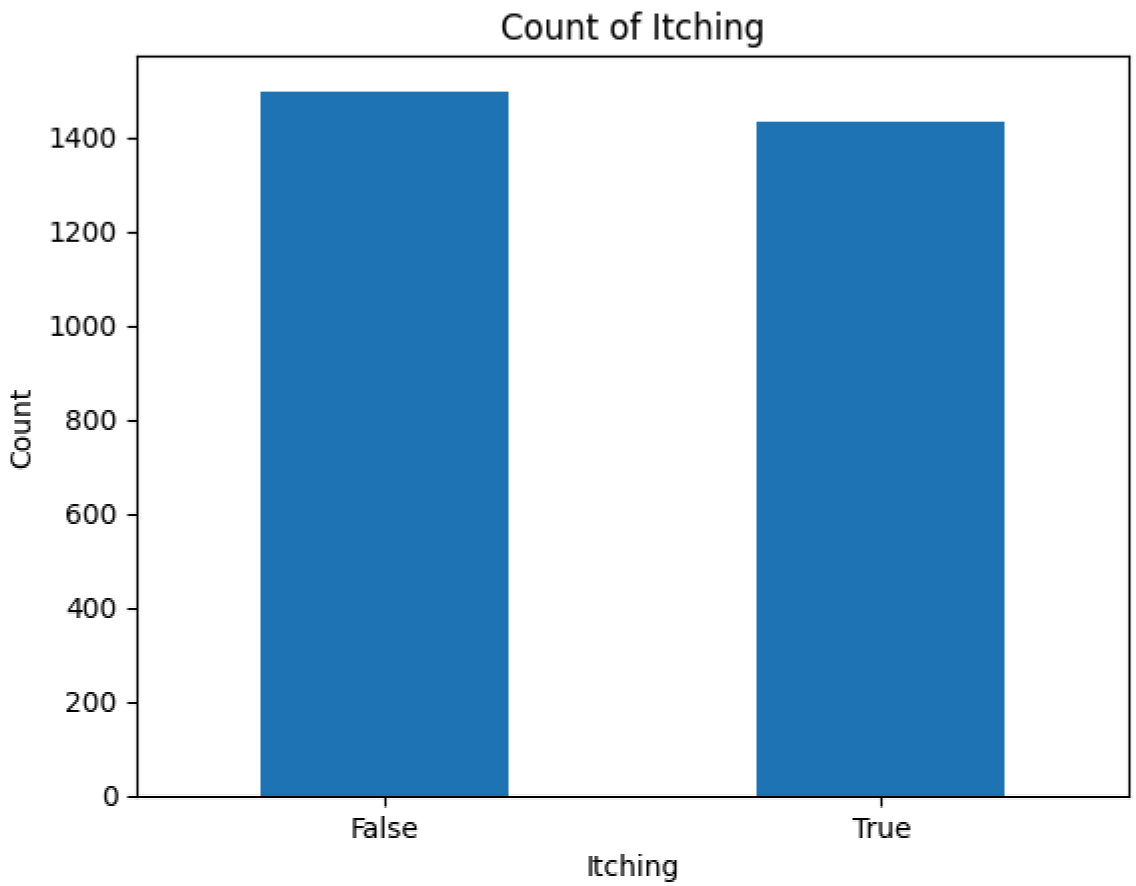
```
def has_colds_and_flu(text):
    return 'Colds & Flu' in text
data_ver4['Colds & Flu'] = data_ver4['medical_condition'].apply(has_colds_and_flu)

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
Count
2000
1500
1000
500
0
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()
```

1 Reference link
2 Reference link for ML project