NIH Collaboratory Rethinking Clinical Trials®

Health Care Systems Research Collaboratory

Using the RxNorm System

Table of Contents

Introduction

RxNorm is a national initiative created by the National Library of Medicine (NLM). Its purpose is to provide a single system for unambiguously identifying brand-name and generic drugs. RxNorm emerged as a response to the proliferation of drug identification and classification systems among hospitals, clinics, pharmacies, health systems, manufacturers, and payers—all of which might use an array of different names for the same drug, making it difficult to extract meaningful information and communicate across different systems and databases.

RxNorm, which is free and fully open to public access, provides a "normalized" name for each brand-name or generic drug, plus a unique identifier that makes it possible to clearly identify a given drug. RxNorm contains information for drugs only; it does not include dietary supplements, medical devices, radioactive agents, or food items. RxNorm is part of the National Library of Medicine's Unified Medical Language System (UMLS).

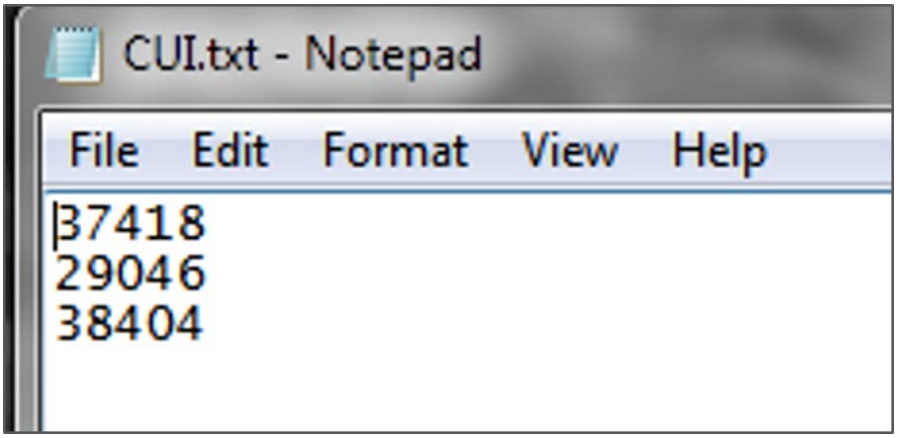
RxNorm is particularly important because it allows information about medications to be exchanged across electronic health records (EHRs). In fact, the Office of the National Coordinator designated use of RxNorm as a criterion for EHR certification of interoperability and Stage 2 Meaningful Use.

RxNav Browser

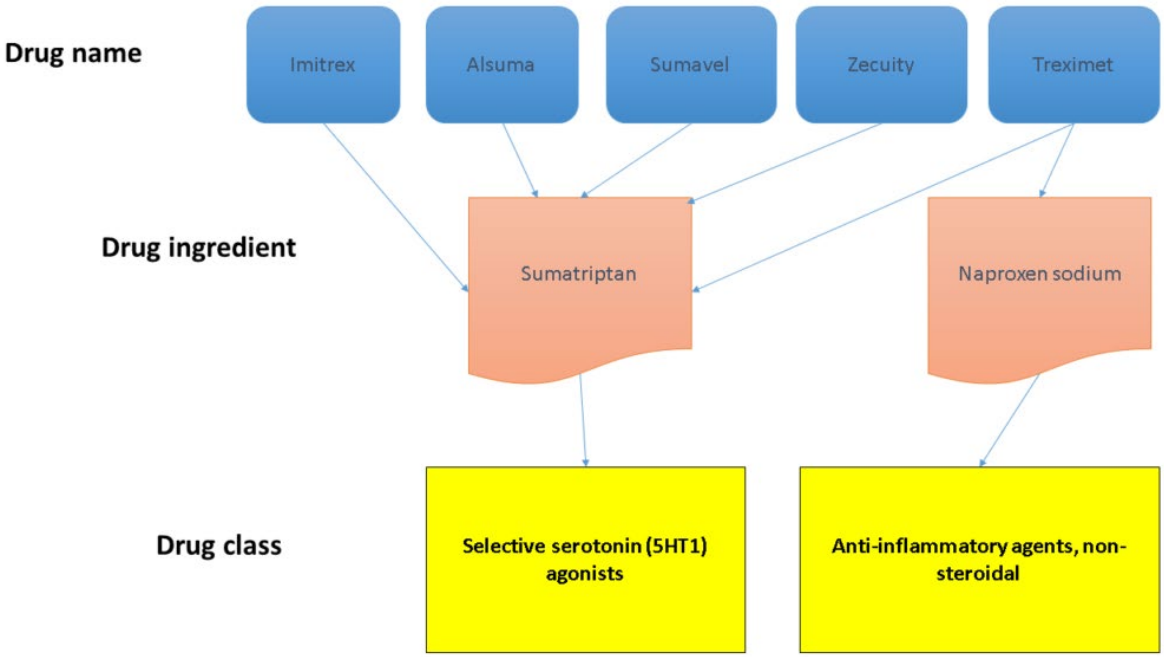
One method of interacting with the content within RxNorm is the RxNav browser, which can be used to search for different drug attributes across multiple classification systems.

Concept Unique Identifier (RxCUI)

A key component of RxNorm is the Concept Unique Identifier (RxCUI). The RxCUI is a unique, unambiguous identifier that is assigned to an individual drug entity in RxNorm and used to relate to all things associated with that drug. The following figure shows an example of a simple .txt file containing a list of RxCUIs for upload.



The RxCUI is used to link one entity in RxNorm to every other entity it is related to, such as name to ingredient to class. The following diagram depicts the relationships between some fundamental RxNorm concepts: drug name, drug ingredient, and drug class. Drug names are linked to the drug ingredients they contain, and it is these drug ingredients that are grouped into drug classes.



RxNorm Users

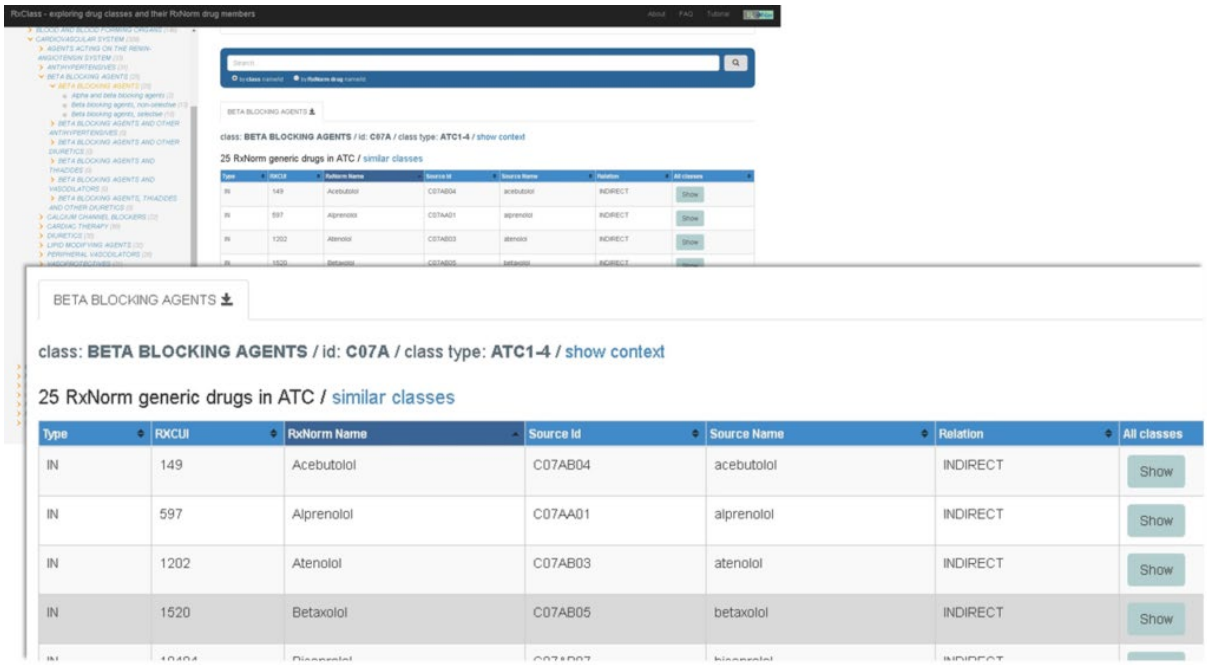
RxNorm is designed to be used by investigators, statisticians, data managers, and other clinical trial personnel.

RxClass

RxClass is a web application that allows users to explore and navigate drug class hierarchies in order to find RxNorm drugs associated with each class. RxClass links drug classes as described by a number of different sources (including ATC, MeSH, NDF-RT, and FDA/SPL) to their RxNorm drug elements, including ingredients, precise ingredients, and multiple ingredients.

The tool also allows users to search by class name or identifier to find the relevant RxNorm drug members or to search by RxNorm drug name or identifier to find the classes that the RxNorm drug belongs to.

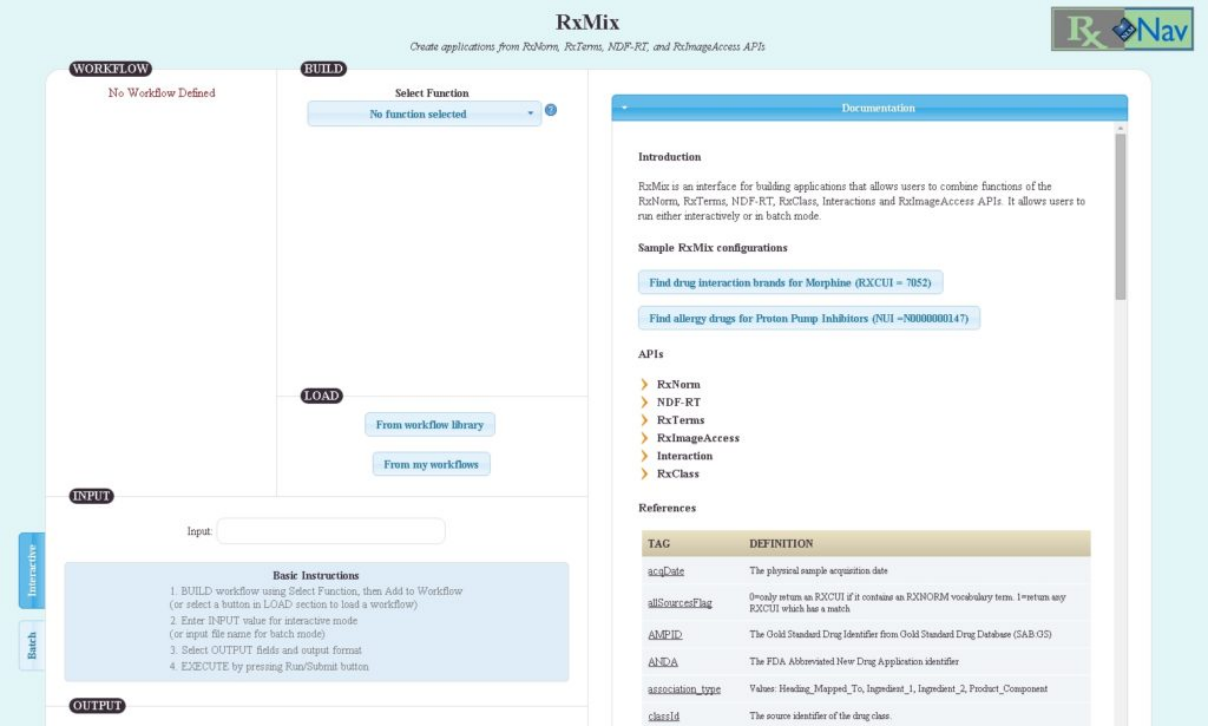
The following screen capture shows an example of the RxClass tool displaying results for "beta blocking agents."



RxMix

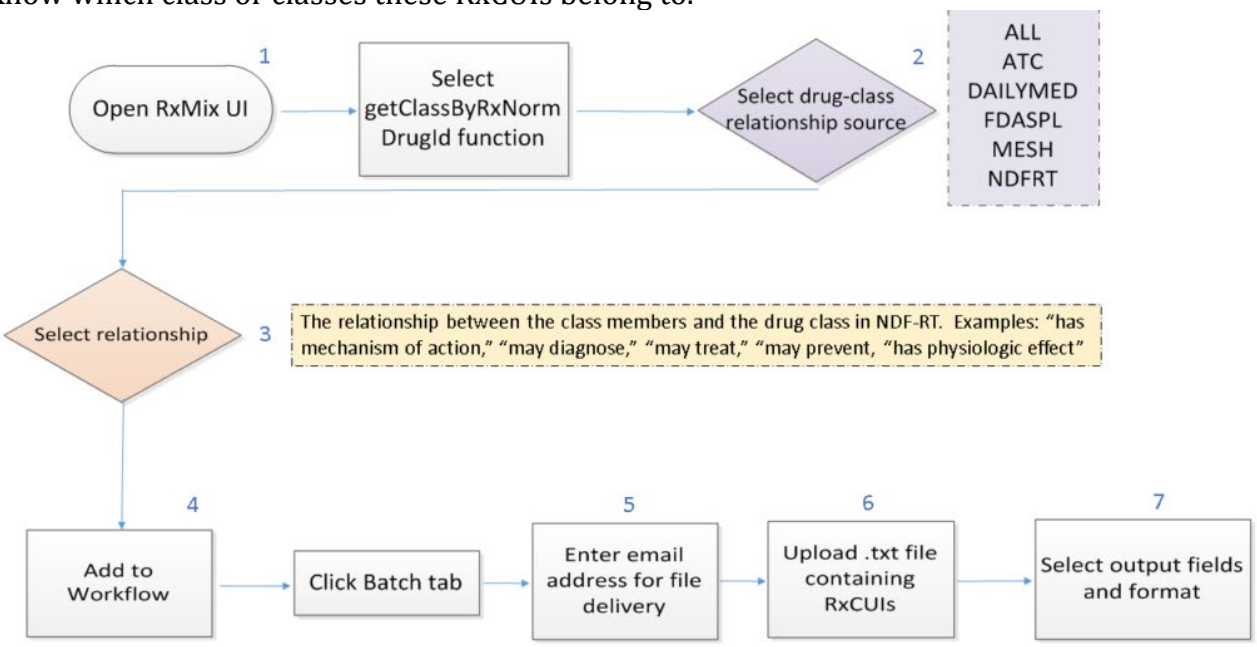
RxMix is a web application that allows users to construct programs for exploring RxNorm functions available via the RxNorm application programming interface (API), using a graphical user interface (GUI) tool that eliminates the need to write computer programming code. RxMix offers users the ability to test and run programs instantaneously or in batch mode, with resulting files automatically emailed to the user.

The following figure is an example of the RxMix user interface, available at https://mor.nlm.nih.gov/RxMix/.



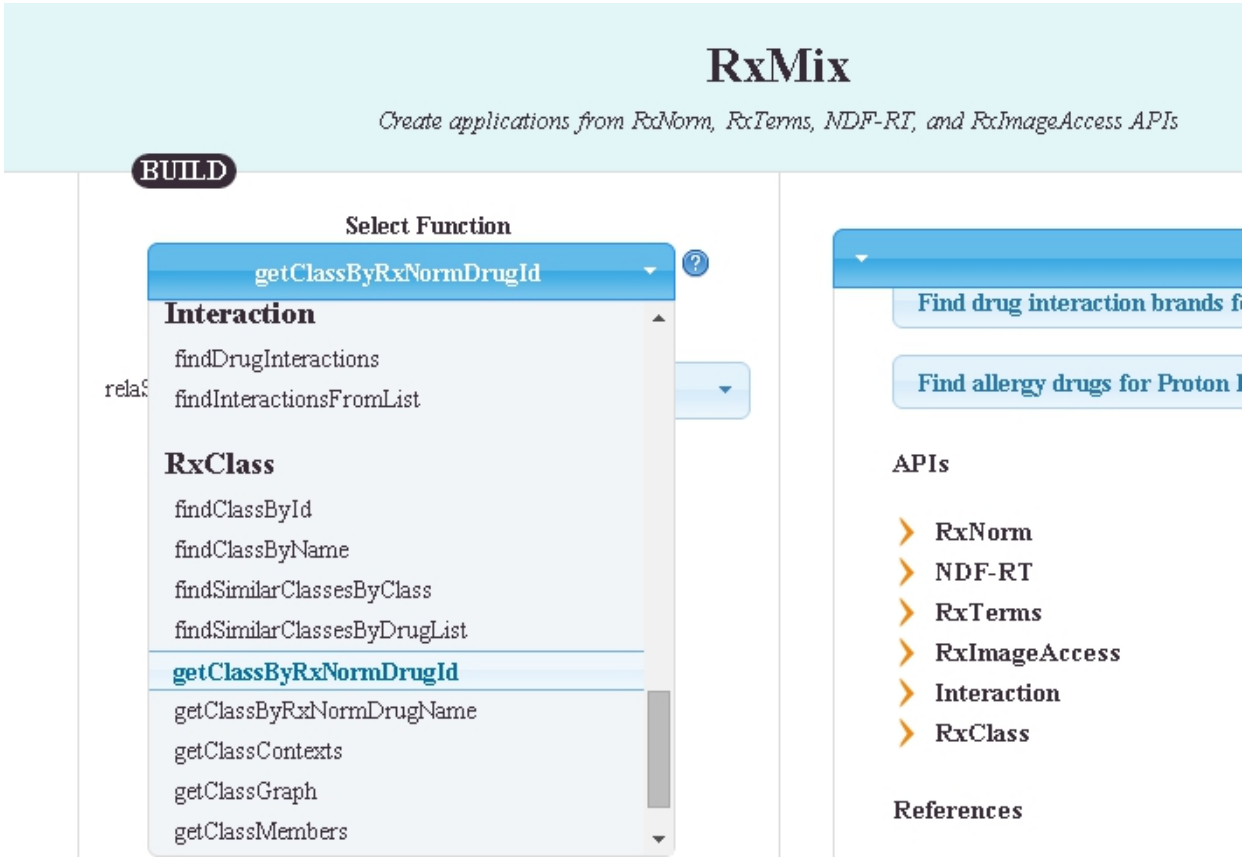
RxMix: Example Query

The following schematic shows an example data manager query of the sort that a user might run using the RxMix tool. In this situation, the user has a list of RxCUIs and wants to know which class or classes these RxCUIs belong to.



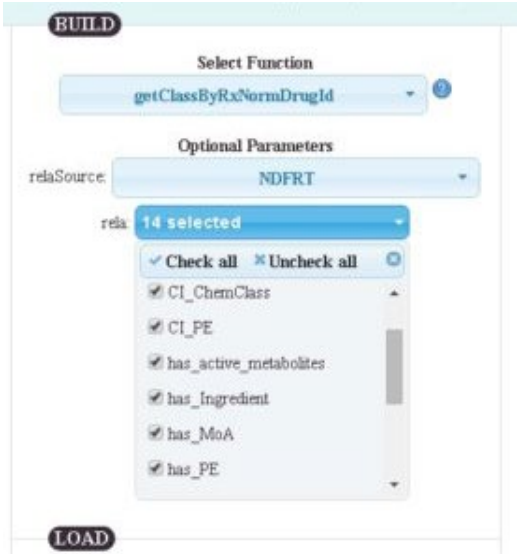
Step 1

In Step 1, the user opens RxMix and selects the function “getClassByRxNormDrugID” from the menu available under “Build.”



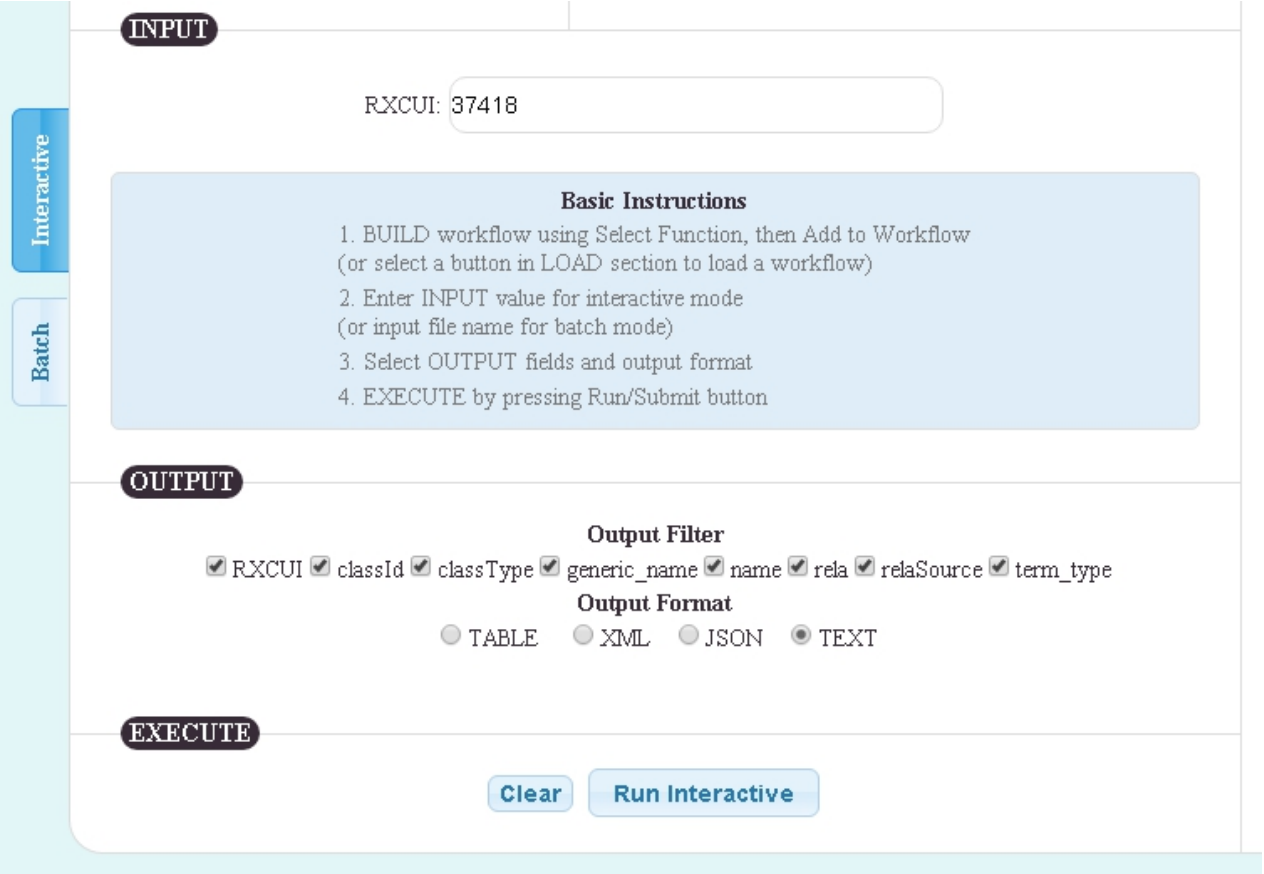
Steps 2-3

In Step 2, the user selects the source of drug-class relationships to use. Depending on the drug-class source selected, the user may then need to choose the TYPE of drug-class relationship for which to query (Step 3). The source NDFRT (shown below) offers several relationship types including: “has mechanism of action,” “may diagnose,” “may treat,” “may prevent,” and “has physiologic effect.”



Steps 4-7

The user then adds the selected parameters to the workflow and selects batch mode (Step 4); enters email address for file delivery (Step 5); enters or uploads the RxCUIs (Step 6); and selects the desired fields to include in output file and the desired file format (table, xml, json, text) (Step 7).



The resulting query output is then shown, as in the following example (table output).

relaSource	term_type	drugName	RXCUI	rela	classId	name	classType
NDFRT	IN	Sumatriptan	37418	CI_with	N0000000406	Angina Pectoris	DISEASE
NDFRT	IN	Sumatriptan	37418	CI_with	N0000000407	Angina Pectoris, Variant	DISEASE
NDFRT	IN	Sumatriptan	37418	CI_with	N0000000724	Ischemic Attack, Transient	DISEASE
NDFRT	IN	Sumatriptan	37418	CI_with	N0000000999	Drug Hypersensitivity	DISEASE
NDFRT	IN	Sumatriptan	37418	CI_with	N0000001616	Hypertension	DISEASE
NDFRT	IN	Sumatriptan	37418	CI_with	N0000002085	Myocardial Infarction	DISEASE
NDFRT	IN	Sumatriptan	37418	CI_with	N0000003550	Myocardial Ischemia	DISEASE
NDFRT	IN	Sumatriptan	37418	CI_with	N0000004160	Stroke	DISEASE
NDFRT	IN	Sumatriptan	37418	may_treat	N0000000798	Cluster Headache	DISEASE
NDFRT	IN	Sumatriptan	37418	has_Ingredient	N0000007273	Sumatriptan	CHEM
NDFRT	IN	Sumatriptan	37418	CI_MoA	N0000000184	Monoamine Oxidase Inhibitors	MOA
NDFRT	IN	Sumatriptan	37418	has_MoA	N0000000256	Serotonin Agonists	MOA
NDFRT	IN	Sumatriptan	37418	has_PE	N0000008351	Cerebral Arterial Vasoconstriction	PE
NDFRT	IN	Sumatriptan	37418	has_PE	N0000009198	Increased Central Nervous System Serotonin Activity	PE

Additional Information

Additional guidance on using RxNav, including video tutorials for RxMix, are available on the RxNav website. This content was originally developed as part of a special topic assessment for the National Patient-Centered Clinical Research Network (PCORnet), and presented during the PCORnet Common Data Model (CDM) v3.0 Stakeholder meetings April 28-29, 2015.