

## RxNav: Browser and Application Programming Interfaces for Drug Information Sources

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### The RxNav browser

Developed at the National Library of Medicine, *RxNav* was originally designed for displaying graphically and navigating the relations among various kinds of drug entities (ingredient, brand name, clinical drug, branded drug, etc.) in *RxNorm*. The entry module supports autocompletion and spelling correction. In addition to drug names, *RxNav* provides access to the National Drug Codes (NDC codes) for clinical and branded drugs, as well as external links to resources, such as *DailyMed*.

*RxNav* was recently extended to provide access to additional drug information sources, including *RxTerms* (an interface terminology derived from *RxNorm*) and the Veterans Health Administration (VHA) National Drug File-Reference Terminology (*NDF-RT*). The three datasets are updated monthly (with additional weekly additions to *RxNorm*). *RxNav* always displays the most recent releases of the datasets (from our servers) and does not require users to maintain local copies of the datasets. *RxNav* is a standalone Java Web Start application and requires an Internet connection. *RxNav* can be used behind a proxy server and is available at: <http://rxnav.nlm.nih.gov/>.

### Application Programming Interfaces (APIs)

Underlying *RxNav* are three APIs providing programmatic access to *RxNorm*, *RxTerms* and *NDF-RT*. These web services APIs come in two flavors, SOAP-based and RESTful. They are publicly available (see *RxNav*).

**RxNorm.** The RxNorm API enables users to integrate *RxNorm* data into their applications. For example, the API can be used for resolving “Zyrtec” into an *RxNorm* identifier (58930) and for finding which ingredients are associated with the branded drug “Bactrim 400 MG / 80 MG Oral Tablet” (Sulfamethoxazole + Trimethoprim). The API also helps map codes (e.g., NDCs) to *RxNorm* concepts and map obsolete identifiers to current ones.

**RxTerms.** The RxTerms API provides access to the display names created in *RxTerms* for clinical and branded drugs from *RxNorm*, and to information such as the strength of these drug entities.

**NDF-RT.** The major functions of the *NDF-RT* API enable users to find an *NDF-RT* entity by name or by identifier and to traverse the rich network of relations in *NDF-RT*. Clinically-oriented functions associate drugs with their pharmacologic classes and can list all interacting drug for a given drug or test interaction for a given pair of drugs.

### Usage and uses

Usage has increased steadily over time, reaching about 10M queries in 2010 (browser and APIs) and 5000 monthly browsing sessions. The API is used in applications including *MyMedicationList* and *MyRxPad* (e-prescribing). Based on feedback from users, *RxNav* and the APIs have been used in academic environments, by health insurance companies, EHR vendors, and drug information providers. Mapping names and NDC codes to *RxNorm* concepts is one of the main uses of the API, which has been employed to process large amounts of queries.

### Recent and future developments

Since 2010, we have established a redundant system for continuity of service, anticipating integration of our services in production applications. In addition to the *RxTerms* and *NDF-RT* APIs, and the corresponding tabs in *RxNav*, we recently developed an approximate matching algorithm for clinical drugs, soon to be available as a service. We are also working on a local implementation of the APIs to help users increase performance without having to redevelop the services locally. Finally, we are planning to release two new applications: *RxMap*, for mapping batches of names and codes to *RxNorm* identifiers and *RxCrossMap*, for navigation across the source vocabularies in *RxNorm*.