Medications

This document was developed by the Data Standardization Work Group (DSWG) of the Council of State and Territorial Epidemiologists (CSTE) Surveillance Practice and Implementation Subcommittee (SPIS) as a part of a larger data harmonization effort. It will be published and maintained in a repository on the CSTE website.

More information about the DSWG and data harmonization can be found here: [link to DSWG Core Surveillance Project Brief (pending)].

Background

The collection of medication data for public health surveillance can provide insight into medication usage patterns, trends in medication effectiveness, and adverse drug reactions. However, medication information is not relevant to all conditions under public health surveillance. For the conditions where medication information is applicable, public health typically obtains this information from case interviews, provider reports, or review of EHRs. Electronic Case Reporting (eCR) is an emerging source of this data but these reports still require manual abstraction of the data in most cases.

Several data elements have been incorporated into message mapping guides (MMGs) to define how medication information should be transmitted to CDC as part of case notification messages. The most common approach uses a repeating group structure that contains the name of the medication administered in addition to some combination of the start date, stop date, or duration of treatment. Some MMGs capture additional information regarding medication dose, route, frequency, and prescription date. A few MMGs include a summative indicator that captures whether or not the person received any medication at all as treatment for the condition.

Currently, multiple data elements are used to transmit similar information across MMGs. For example, Table 1 shows three different data element identifiers used to transmit information on the name of the medication or treatment administered for various conditions. In the case of the last element in the table, although the same identifier is used, the concept is implemented for different conditions with slight variations in the data element name and description.

Table 1. Variations in Current Data Elements: Medication Administered

Data Element Identifier	Data Element Name	Description	MMGs
29303-5	Medication Administered	What antibiotic did the patient receive?	Pertussis Varicella RIBD Lyme/TBRD
52418-1	Medication	Medication	STD
55753-8	Treatment Information	Listing of treatment the subject received for this illness	Malaria
	Treatment Drug(s)	Treatment drug(s) used for babesiosis	Babesiosis

	Treatment Type	Listing of treatment or medical intervention the subject received for this illness	COVID19

Similar variations can be noted with the medication start date, which is also represented by three different data element identifiers across various MMGs, and the medication duration and medication dose, each of which are represented by two data element identifiers across MMGs. Standardization of these and other medication related data elements using consistent data element identifiers (i.e., standard codes), names, and descriptions would make data transmission to CDC much more efficient and MMG onboarding less time consuming for jurisdictions.

Current MMGs have program specific value sets for medication names. This requires many jurisdictions to maintain separate tables for different value sets, including making changes to each as updates are made. RxNorm is a standardized coding and terminology system developed and maintained by the National Library of Medicine (NLM) that contains all generic and brand name drugs available on the US market. The use of a single system for identifying drugs allows entities such hospitals, pharmacies, payers, and public health to communicate and exchange medication data at multiple levels of specificity, even if different systems are used within those entities. RxNorm is one of the required terminologies referenced in the MMGs for transmitting medication information; several of the medications in associated value sets for the data elements listed above must be sent using an RxNorm code. Therefore, public health systems must be equipped to either access this terminology or map medication information from other coding systems to RxNorm.

Core Surveillance Medications Data Elements for Routine Case Notifications

The DSWG did not come to consensus that medication information be considered core surveillance data elements for case notification to CDC; therefore, no medication data elements will be outlined in depth here as has been done in other DSWG recommendations documents.

Despite not recommending the inclusion of medications data as core surveillance, there was general support for standardizing medication data transmission in the form of a universal medication repeating group. Such a data group could be included in pertinent condition-specific guides with additional medication related questions added as needed. The group discussed the utility and feasibility of the data elements in Table 2 in the context of such a repeating group. Two data elements had strong support for inclusion: Medication Name (100% support) and Date Medication Started (85%). The remaining four data elements had weaker support: Date Medication Ended (74%), Date Medication Prescribed (70%), Medication Status (67%), and Medication Prescribed Duration (63%).

Table 2. Proposed Data Elements for Medications

Data Element	Definition	Value Set
Medication Name	Name of medication received for this condition	RxNorm
Medication Status	Status of Medication	Prescribed Administered/Taken Unknown
Date Medication Prescribed	Date medication prescribed	N/A (Date)
Medication Prescribed Duration	Prescribed duration (in days) of medication	N/A (Numeric)
Date Medication Started	Date the medication was started	N/A (Date)
Date Medication Ended	Date the medication was ended	N/A (Date)

Discussion of a standardized medications repeating group centered primarily around two themes: 1) data element and value set utility and 2) reliability of information in these fields if requested

The idea of a universal value set for Medication Name was welcome as it would ease the burden on jurisdictions to keep multiple lists updated for different conditions. There was some concern, however, that the size of the RxNorm value set would be difficult to manage for systems requiring a background table for front end surveillance system data entry. Front end data entry was noted to be very common as the use of electronic case reporting is still in its most rudimentary form at most jurisdictions. It was also suggested that a specific version of RxNorm be specified in any guides to eliminate ambiguity in the specification.

The Medication Status value set was deemed too high level for it to be useful across conditions. Group members noted that this data was used in different ways across conditions and that more granular values might be required depending on what a program area is trying to assess with the data. This thought, paired with the weak support for inclusion in a standardized medication repeating group, suggests a need for this data element to maintain more flexibility if it is to be retained as a meaningful data element.

Little was said regarding the Date Medication Prescribed data element. Medication Prescribed Duration and Dates Medication Started/Ended were more thoroughly discussed. Medication Duration was noted to be the most reliable data found in chart reviews but the Date Medication Started was seen as the more important, if also more difficult, data element to obtain. Date Medication Ended is a data element which was noted to be ideal but often too difficult to obtain, especially for conditions which have little to no follow-up by provider or case interviewer.

Because they will not be recommended as core surveillance data elements, the data elements above will not be annotated as fully as if they had been recommended. Appendix A outlines suggested data sources for these data elements for potential future use.

Appendix A. Input Data Sources for Medication and Treatment Data

Electronic Case Reporting (eCR)

More recently, eCR has become an increasingly useful source of medication information, as medication information is readily available in the EHR. Such information that would be of interest to public health includes:

- The medications that were administered (using RxNorm codes)
- The start and end time of administration
- The amount of medication per dose
- The dose quantity per unit of time (the rate)
- The route and method of administration
- The body site to which the medication was administered
- The reason for administration

The CDA implementation guide for eCR defines several components of an eICR that communicates medication-related data:

- Medications Section (entries required) – Contains the patient's current medications and pertinent medication history. An entry of the Medication Activity template is required in this section, either to summarize the person's medications or to indicate that the person is not known to be on any medications.
- Medication Activity – Describes medication administrations that have occurred or are intended to occur. At a minimum, this template includes the following elements:
    - effectiveTime - Some indication of the time during which the medication is administered (e.g., start and stop dates, timestamp for a single administration)
    - The actual consumable (i.e., drug) that was administered using the Medication Information template
    - doseQuantity – Representation of how many consumables are being administered
- Medication Information – Contains the name of the specific drug that was or will be administered. A medication should be recorded as a pre-coordinated ingredient + strength + dose form (e.g., "metoprolol 25mg tablet", "amoxicillin 400mg/5mL suspension") where possible.
    - The drug is named in the manufacturedMaterial field, which is associated with a value set containing RxNorm codes of all prescribable medication formulations represented using either a "generic" or "brand-specific" concept.

The US Public Health MedicationAdministration profile in the eCR FHIR specification largely aligns with the Medications Section of the CDA implementation guide in terms of how the data elements are defined. The MedicationAdministration resource covers both inpatient and outpatient settings and is intended to track the administration of non-vaccine medications. It includes the following fields:

- status – The current status of the medication administration, being one of: In Progress, Not Done, On Hold, Completed, Entered in Error, Stopped, Unknown
- medication[x] – A coded concept (using RxNorm) indicating the name of the medication that was administered
- effective[x] – A timestamp (effectiveDateTime) or time period (effectivePeriod) representing the start and end time of administration

- dosage – Details of how the medication was taken
    - dosage.route – A coded concept (using SNOMED CT) describing the route or physiological path of administration of a therapeutic agent into or onto the body of a subject
    - dosage.dose – Amount of medication per dose

Electronic Laboratory Reporting (ELR)

ELR does not contain defined data elements related to medications and treatment.

USCDI and USCDI+

USCDI has contained a Medications data class since version 1, at which time contained a single data element, Medications, defined as "Pharmacologic agent used in the diagnosis, cure, mitigation, treatment, or prevention of disease." The required vocabulary standard for medication data is RxNorm, while National Drug Code is optional.

As of version 5, several additional elements have been added to the data class (see Table 3).

Table 3. Data Elements in the Medications Data Class of USCDI

Data Element	Definition	USCDI Status	USCDI+ Status*
Medications	Pharmacologic agent used in the diagnosis, cure, mitigation, treatment, or prevention of disease.	Included starting in V1	Not included
Dose	Amount of a medication for each administration.	Included starting in V3	Included as "Medication Administration Dose"
Dose Unit of Measure	Units of measure of a medication. Examples include but are not limited to: milligram (mg) and milliliter (mL).	Included starting in V3	Included as "Medication Administration Dose Units"
Route of Administration	Physiological administration path of a therapeutic agent into or onto a patient Examples include but are not limited to: oral, topical, and intravenous.	Included starting in V5	Not included
Indication	Sign, symptom, or medical condition that is the reason for giving or taking a medication.	Included starting in V3	Not included
Fill Status	State of a medication with regards to dispensing or other activity. Examples include but are not limited to: dispensed, partially dispensed, and not dispensed.	Included starting in V3	Not included
Medication Instructions	Directions for administering or taking a medication. Usage note: May include route, quantity, timing/frequency, and special instructions (PRN, sliding scale, taper). Examples include but are not limited to: prescription directions for taking a medication, and package instructions for over-the-counter medications.	Included starting in V4	Not included

Medication Adherence	Statement of whether a medication has been consumed according to instructions. Examples include but are not limited to: taking as directed, taking less than directed, and not taking.	Included starting in V4	Not included

* Refers to the status of data elements in the Case Reporting use case of the Public Health domain of USCDI+.

Although the Public Health Case Reporting use case in USCDI+ has not adopted the majority of the medications-related data elements in USCDI, several elements that remain in Level 0 of USCDI have been included in USCDI+, as shown in Table 4. A USCDI status of Level 0 indicates that these elements are in the most rudimentary stages of standardization and are not used in most clinical settings.

Table 4. Elements in the Medications Data Class of USCDI+ Case Reporting Use Case

Data Element	Definition	USCDI Status
Date Medication Administered	A specific date/time or interval of time during which the administration took place (or did not take place, when the 'notGiven' attribute is true).	Level 0
Date Medication Prescribed	The date when the prescription was initially written or authored.	Level 0
Discharge Medications	Indication that a medication should be taken by or given to the patient after being discharged from an encounter.	Level 0
Medication Administered Code	A code (or set of codes) that specify the medication that was administered.	Level 0
Medication Administered Performer	Indicates who or what performed the medication administration and how they were involved.	Level 0
Medication Administered Reason Reference	Reference to a condition that is the reason for the medication administration.	Level 0
Medication Administration Dose	The amount of the medication given at one administration event.	Included as "Dose"
Medication Administration Dose Units	The units of measure associated with the amount of medication given at one administration event.	Included as "Dose Unit of Measure"
Medication Prescribed Code	A code (or set of codes) that specify this medication, or a textual description if no code is available.	Level 0
Medication Prescribed Dose	Indicates the amount of medication per dose that is to be used by the patient.	Level 0
Medication Prescribed Dose Units	The units of measure associated with the amount of medication prescribed. (e.g., milligrams, milliliters).	Not included
Medications Dispensed	Description/ list of medications supplied to a patient with the intention that it is subsequently consumed by the patient.	Not included
Therapeutic Medication Response	Represents a therapeutic response (as opposed to an undesired reaction) to the administration of a medication.	Level 0