

## VCLIC Value Set Full-Stack Programming Exercise

### Background

Vanderbilt uses an electronic health record system which contains a range of data, including diagnoses, medications, allergies, lab test results and procedures. Data in the system is usually coded, meaning that we use standard identifiers to refer to important concepts in a patient's medical history. For example, we might use the ICD-10 code "E11.3" to indicate that a patient has "Type 2 diabetes mellitus with ophthalmic complications."

There are thousands of codes available, and we often need to use sets of them to identify a concept. For example, we might want to find all patients who have a history of having a myocardial infarction (heart attack), and there are dozens of diagnosis codes that all mean heart attack, such as I21.0, which means "Acute transmural myocardial infarction of anterior wall" and I21.1 which means "Acute transmural myocardial infarction of inferior wall." If we want to accurately find all patients who had a heart attack, we would need to assemble a complete list of relevant codes. We call these lists of codes "value sets". In addition to value sets of diagnoses, we also frequently create value sets of medications, such as a list of all drugs that are "beta blockers. Creating, finding and maintaining value sets can be difficult, so we're working on developing tools that help people do this more effectively.

If you're interested, you can read this paper we wrote to learn a bit more about this problem:

[Wright A, Wright AP, Aaron S, Sittig DF. Smashing the strict hierarchy: three cases of clinical decision support malfunctions involving carvedilol. Journal of the American Medical Informatics Association. 2018 Nov;25\(11\):1552-5.](#)

### The Data

We queried our data warehouse and have provided two simple data files:

[beta\\_blocker\\_value\\_sets.csv](#)

Contains information on value sets in our system that appear to represent beta blockers.

Field name	Example value	Description
value_set_id	100165	The ID number for the value set
value_set_name	ERX GENERAL BETA BLOCKERS PQRS MEASURE 7,8	The name of the value set
medications	716 717 718 1037 1048 1916 1917 1918 4565 4566 5007 5008 5009...	The ID numbers of the medications contained in the value set, separated by a pipe character (see medications.csv for more about each medication -- e.g. 716 represents

		atenolol 100mg tablets)
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#### medications.csv

The file medications.csv contains information on all the medications referenced in the beta\_blocker\_value\_sets.csv. The field medication\_id is the primary key of the medications.csv file and appears as a foreign key in beta\_blocker\_value\_sets.csv.

Field name	Example value	Description
medication_id	716	The ID number for the medication (primary key)
medname	ATENOLOL 100 MG TABLET	The name of the medication
simple_generic_name	atenolol	The name of the generic ingredient in the medication
route	oral	The route of administration for the medication
outpatients	2983	The number of outpatients who have been prescribed the drug
inpatients	101	The number of inpatients who have been prescribed the drug
patients	2997	The total number of patients who have been prescribed the drug (some patients may have received it as inpatients and outpatients)

### **The Task**

Create a simple app that would help users find, view, compare and select the best value set for their purpose. Two possible use cases are:

- Aaron wants to find a value set of beta blockers that he can use when writing a SQL query that computes the percentage of patients taking a beta blocker.
- Becky wants to build an alert in the EHR that suggests appropriate monitoring for patients taking a beta blocker.

Your tool should help users see the similarities and differences in existing value sets and select one for their use.

The application can be written in any programming language, but it should have a user-friendly front-end (possibly web-based). Imagine that the tool would be used primarily as a prototype in usability studies, so performance isn't very important as long as the overall architecture is reasonable. Feel free to use any libraries, frameworks, packages, tool, etc. that would help you do the task more efficiently.

### **The Writeup**

Please send us your code, some screenshots (or a video) of the tool working and answer the following questions: (Note, these aren't trick questions and there is no right or wrong answer, but please answer honestly so that we can understand how you work.)

- What architectural and design decisions did you make as you developed your tool? How did you make them?
- What are some extensions you could add in the future that might make the tool more useful and usable?
- How long did it take you to complete the task?
- Did you use any AI tools like Copilot or ChatGPT to help with this task?