PS1 Use Case A: Clinician to Pharmacy

The Semantics Squad (Group 7)

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INFO B581: Health Information Standards & Terminologies

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February 6, 2024

PS1 Use Case A: Clinician to Pharmacy

This team project goal is to improve data exchange efficiency and accuracy through interoperability. Specifically, our focus is on effectively communicating electronic health record information through XML messaging based on an assigned use case. In the first sprint, we will analyze terminologies and ontologies to develop an ontological framework to standardize terms and codes across various domains.

The primary aims are to:

1) identify and describe clinical elements in the assigned use case,
2) investigate multiple terminologies, ontologies, and associated codes (*2024 ICD-10-CM Codes*, 2024; AAPC, n.d.; Food and Drug Administration, 2024; InnoviHealth®□, n.d.; National Drug Codes Information, 2024; Regenstrief Institute, n.d.) for best fit-for-purpose, and
3) determine the best terminology or ontology and one associated code for each clinical element in the assigned use case (see Table 1)

Use Case A: Clinician to Pharmacy

The assigned use case follows:

A male patient aged 65 years consulted a clinician with the chief complaints of headache and has been diagnosed with hypertension. He had no past medical or medication history. He is a chronic smoker for 10 years and non-alcoholic. Also, had a family history of diabetes mellitus and hypertension. Physical examination was found to be normal. The patient has been prescribed

Atenolol 50mg, Telmisartan 40mg. All information was updated in the electronic health records. Surescripts should be generated from EHR and sent to pharmacy network for dispensing.

Ontologies/Terminologies

The clinical ontologies and terminologies considered for electronically communication in the assigned use case include International Classification of Diseases, Tenth revision, Clinical Modification (ICD-10-CM) (Centers for Medicare and Medicaid Services & National Center for Health Statistics, 2021), Systematized Nomenclature of Medicine Clinical Terms (SNOMED-CT) (National Library of Medicine, 2016), Logical Observation Identifier Names and Codes (LOINC®) , RxNorm (Unified Medical Language System®□ (UMLS®□), 2022), National Drug Code (Food and Drug Administration, 2024), and Current Procedural Terminology-4.

ICD-10-CM

ICD-10-CM is a mandated disease classification system used in the United States (U.S.) for coding diagnoses and health-related conditions in clinical settings since it was adopted in 2015 (Centers for Medicare and Medicaid Services & National Center for Health Statistics, 2021; National Center for Health Statistics, 2023). It is essential for U.S. medical billing and enables consistent global tracking of morbidity (Hirsch et al., 2016).

SNOMED-CT US Edition

SNOMED-CT is a clinical terminology used in electronic health records, covering clinical assessment, treatment, research, and population monitoring (National Library of Medicine, 2023; SNOMED International, 2023). SNOMED-CT US Edition is often used in parallel with ICD because ICD provides only disease information, while SNOMED also provides classification for information storage and retrieval (Chavis, 2013). The U.S. designates SNOMED-CT US Edition

as an interoperability standard for exchanging electronic health information (National Library of Medicine, 2016).

LOINC

LOINC serves as a global terminology system for naming and communicating laboratory and clinical values, facilitating electronic communication of health information between systems. LOINC has expanded to include universal codes for digital imaging, radiology, and clinical data used in pharmaceutical messaging (McDonald et al., 2003).

RxNorm

RxNorm is a drug terminology providing names, attributes, and relationships for clinical drugs (Unified Medical Language System®□ (UMLS®□), 2022). The RxNorm code matches exactly the display of the medicine (drug ingredient, strength and dosage form). (Halamka, 2011). RxNorm compiles drug information from other terminologies (Unified Medical Language System®□ (UMLS®□), 2022). It was chosen over the National Drug Code (NDC) (Food and Drug Administration, 2024) for this ontological framework due to its representation of drug ingredients across manufactures and streamlining data transmission to pharmacies. An NDC identifier is specific to a particular manufacturers/labeler and product while a RxNorm for a drug ingredient has one RxNorm code to represent all manufactures (Halamka, 2011). RxNorm includes the NDC codes in the data about a drug that is transmitted to a pharmacy. Therefore, using RxNorm will also include NDC (Unified Medical Language System®□ (UMLS®□), 2023).

CPT-4

Current Procedural Terminology, Fourth Edition (CPT-4) is a mandated U.S. terminology created by the American Medical Association for coding of medical procedures in clinical settings.

It is primarily used for documentation and reimbursement for billing of claims (American Medical Association, n.d.).

Clinical Concepts

Concept: Headache

Terminology: ICD-10-CM

Term: Headache, Unspecified

Code: R51.9

Other terminologies:

SNOMED-CT: Generalized Headache 162299003

Description: The patient reports experiencing a headache without a specific cause. The ICD-10-CM designated code for this type of headache is unspecified. The U.S billing standard mandates ICD-10-CM codes for reimbursement. This code will be included with the CPT-4 E/M codes in claims submitted to payers for billing purposes.

Concept: Hypertension

Terminology: ICD-10-CM

Term: Essential (Primary) Hypertension

Code: I10

Other terminologies:

SNOMED-CT: Essential Hypertension 59621000

Description: The clinician diagnosed the patient with hypertension and did not attribute it to any other medical conditions such as kidney or heart disease. Therefore, the code for primary hypertension was chosen. The U.S billing standard mandates ICD-10-CM codes for reimbursement. This code will be included with the CPT-4 E/M codes in claims submitted to payers for billing purposes.

Concept: No Past Medical History

Terminology: SNOMED-CT

Term: No Medical history

Code: 160243008

Description: The patient lacks a specific documented medical history, therefore the SNOMED code for no medical history was selected.

Concept: No Past Medication History

Terminology: SNOMED-CT

Term: Medication History Section

Code: 1003606003

Other terminologies:

LOINC: Does the patient take any medications 67791-4

Description: The clinician documents that the patient has no past medication history, therefore the SNOMED code for medication history section was selected where the narrative of "no past medication history" can be entered.

Concept: Chronic Smoker

Terminology: ICD-10-CM

Term: Cigarettes, with unspecified nicotine-induced disorder

Code: F17.219

Description: The use case states that the patient is a smoker of 10 years. There was not enough information to determine the type of smoking (cigarette, vaping). Therefore, the team assumed that since the clinician did not specifically denote vaping, the likely code was for traditional cigarettes. ICD-10 was chosen over SNOMED for billing purposes.

Other terminologies:

ICD-10-CM: Vaping-related disorder U07.0

SNOMED-CT: Smoker 77176002

Concept: Non-alcoholic

Terminology: SNOMED-CT

Term: Number of Alcohol Units Consumed on Typical Drinking Day

Code: 443315005

Other terminologies:

LOINC: History of Alcohol Use 11331-6

Description: The clinician documented that the patient was non-alcoholic. The SNOMED-CT code allows for the documentation of any alcoholic beverages, if any. This code will provide a more specific detail of the data than the term “non-alcoholic.” Considering that SNOMED has

been chosen for other concepts and is designated as the standard for health information exchange for interoperability, the SNOMED code is chosen for this concept.

Concept: Family History of Diabetes Mellitus

Terminology: ICD-10-CM

Term: Family history of diabetes mellitus

Code: Z83. 3

Other terminologies:

SNOMED-CT: Family history of diabetes mellitus 160303001

Description: Reviewing family history provides the clinician indicators of possible risk for disease in the patient. Noting this in the EHR also justifies screening exams and laboratory tests that may be performed. ICD-10-CM was chosen instead of SNOMED in case future tests need billed in the future.

Concept: Family History of Hypertension

Terminology: ICD-10-CM

Code: Z82.49

Other terminologies:

SNOMED-CT: Family history of hypertension

Description: Reviewing family history provides the clinician indicators of possible risk for disease in the patient. This patient also has an ICD-10-CM code for hypertension; therefore, the ICD-10 code was also chosen for the family history.

Concept: Physical Examination

Terminology: CPT-4

Term: Evaluation and Management (E/M)

Code: 99243

Other terminologies:

SNOMED-CT: Clinical history/examination observable 363788007

LOINC: Pharmacology Evaluation and management of hypertension 85156-8

ICD-10-CM: Encounter for examination of blood pressure Z01.3

Description: "The provider sees a patient for an office or other outpatient consultation involving evaluation and management (E/M). The E/M involves a low level of medical decision making or the provider spends at least 30 minutes of total time on the encounter on a single date" (AAPC, n.d.). Although SNOMED, LOINC and ICD-10-CM all offer codes for a physical examination, U.S billing standards mandate CPT-4 codes for reimbursement. This code will be included with the ICD-10-CM diagnosis codes in claims submitted to payers for billing purposes.

Concept: Atenolol

Terminology: RxNorm

Code: 19738

Other terminologies:

NDC: 64980-437-01, 64980-437-10, 64980-438-01, 64980-438-10

LOINC: 4132-7

SNOMED-CT: 387506000

Description: RxNorm compiles the drug information from other terminologies and manufactures for Atenolol oral tablet while other terminologies are not comprehensive.

Concept: Telmisartan

Terminology: RxNorm

Code: 205304

Other terminologies

SNOMED-CT: 318986004

NDC: 67877-482-05, 67877-482-30, 67877-482-84, 67877-482-90

Description: RxNorm compiles drug information from other terminologies and manufactures Telmisartan oral tablets while other terminologies are not comprehensive.

Table 1

Final Terminologies & Codes for Identified Concepts

Clinical Concepts	Best Terminology	Code
Headache	ICD-10-CM	R51.9
Hypertension	ICD-10-CM	I10
No Past Medical History	SNOMED-CT	160243008
No Past Medication History	SNOMED-CT	1003606003
Chronic Smoker	ICD-10-CM	F17.219
Non-Alcoholic	SNOMED-CT	443315005
Family History Diabetes Mellitus	ICD-10-CM	Z83.3
Family History Hypertension	ICD-10-CM	Z82.49
Physical Examination (Normal)	CPT-4	99242
Atenolol	RxNorm	19738
Telmisartan	RxNorm	205304

Conclusion

Our team project aims to enhance the efficiency and accuracy of data exchange between clinician and pharmacy through improved interoperability. In the first sprint, we focused on developing a terminology/ontology framework for the clinician-to-pharmacy use case. We

analyzed various terminologies and ontologies, such as ICD-10-CM, SNOMED-CT, LOINC, RxNorm, NDC, and CPT-4 to standardize clinical concepts and code them.

For each clinical element in the use case, we carefully selected the most suitable terminology and associated code. Our choices were based on factors like specificity, coverage, and relevance to the clinical information. For instance, we chose SNOMED-CT for representing past medical history, ICD-10-CM for diagnosing essential hypertension, CPT-4 for physical/clinical examination, and RxNorm for prescribing and dispensing medications like Atenolol and Telmisartan. The final list of terminologies and codes provides a standardized and efficient way to communicate crucial clinical data from electronic health records to pharmacy networks.

This standardized approach promotes interoperability and enhances the overall quality of healthcare information exchange. In the process, we considered the strengths and purposes of each terminology, keeping in mind the unique requirements of the clinician-to-pharmacy use case. Our decision-making process aimed to maintain a balance between specificity and broad applicability to ensure accurate representation of clinical concepts.

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