

HEALTH INFORMATICS STANDARDS AND TERMINOLOGIES

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PS1: Use case selection and details (Project Sprint 1)
USE CASE E: CLINICIAN TO NURSES AND BACK

Final Project-5
GROUP NAME- HEALTH INFO HUNTERS

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INTRODUCTION:

Accurate and standardized clinical terminology is essential for high-quality health information exchange between providers and systems (World Health Organization, 2022). This case involves a 65-year-old male patient diagnosed and treated for hypertensive urgency, with documentation spanning chief complaints, medical history, vital signs, diagnosis, medication, and nursing orders. We selected this case because its breadth of clinical details requires thoughtful terminology mapping to enable interoperable data usage and analytics (Richesson et al., 2008).

Based on our research, we chose four key standards - SNOMED CT, LOINC, RxNorm, and ICD-10 to cover the terminology needs.

SNOMED CT is widely considered the most comprehensive clinical terminology system currently available. Originally created in 2007 by combining two older systems - the Clinical Terms Version 3 (CTV3) developed in the UK and the Systematized Nomenclature of Medicine - Clinical Terms (SNOMED CT) from the College of American Pathologists (SNOMED CT, 2019) - SNOMED CT now contains more than 311,000 unique clinical concepts with descriptions and codes. These concepts cover diseases, findings, procedures and more across a vast range of clinical specialties.

A key benefit of SNOMED CT is it provides a standardized way for clinicians to capture, store and retrieve clinical data across care settings. This supports clear communication and data analysis. For example, one clinician can enter "viral pharyngitis" and another can retrieve this by searching upper respiratory tract infections (SNOMED CT, 2019). As of 2022, SNOMED CT had been adopted for use in over 60 countries globally. However, challenges still remain in ensuring consistent use of terminology across clinicians. Significant training and governance is required.

The Logical Observation Identifiers Names and Codes (LOINC) system also focuses on standardizing clinical terminology, but is more narrowly focused on laboratory tests and clinical measurements from medical devices. It was developed specifically to aid exchange and aggregation of clinical research outcomes (McDonald et al., 2003). For example, using universal LOINC codes makes it easier compile and analyze blood pressure readings across many studies in meta-analyses. First launched in 1994, LOINC codes now exist for over 90,000 clinical terms, paired with extensive metadata to support their use (McDonald et al., 2003). Adoption is widespread, from large research studies to individual health facilities integrating data across clinical systems.

In contrast, RxNorm focuses specifically on normalised naming of prescription medications. Created by the United States' National Library of Medicine and first released in 2004, RxNorm integrates over 200 different drug dictionaries (Nelson et al., 2011). It assigns "concept identifiers" enabling computer systems to recognize different brand/generic names and dose forms for the same medication. This prevents medication errors and enables the aggregation of data about specific drugs across systems. RxNorm forms a key part of clinical decision support systems and is integrated into all major electronic medical record systems in the USA (Nelson et al., 2011).

WHO's International Classification of Diseases system (ICD) pre-dates these other terminology systems, with the first edition published in 1893 (World Health Organization, 2022). Updated periodically, the current tenth revision (ICD-10) contains around 55,000 diagnosis codes in a hierarchy that aims to classify all diseases and related health problems (World Health Organization, 2022). Underpinning population health statistics and administrative systems globally, ICD provides an overarching map of morbidity and mortality. The upcoming shift to ICD-11 will incorporate modern insights from clinical medicine and parallel terminologies such as SNOMED CT (World Health Organization, 2022).

IDENTIFICATION AND DESCRIPTION OF CLINICAL CONCEPTS:

Symptom

Anxiety in the head or face is referred to as a headache. The location, severity, and frequency of a headache's discomfort might vary substantially (Headache, n.d.).

Diagnosis

Hypertension refers to abnormally high blood pressure resulting from the force exerted on artery walls as blood is pumped by heart contractions. The flexibility and diameter of blood vessels impact blood pressure. With each heartbeat, arteries undergo cycles of constriction and relaxation. Extremely high blood pressure without acute end-organ damage is termed hypertensive urgency. This is distinguished from hypertensive emergency which involves sudden onset of target organ dysfunction such as renal failure, pulmonary edema, cardiac ischemia or neurological deficits. Careful monitoring and controlled blood pressure lowering is the treatment goal in hypertensive urgency to prevent progression to emergency scenarios involving life-threatening damage to vital organs (High Blood Pressure/Hypertension, 2020; Alley & Copelin II, 2020).

FamilyHistory

Diabetes Mellitus: Diabetes mellitus (DM) is a condition in which blood glucose levels are not adequately controlled. There are numerous subcategories of it, such as type 1, type 2, steroid-induced diabetes, newborn diabetes and gestational diabetes, (Sapra & Bhandari, 2023).

Hypertension: A person is more likely to acquire hypertension if there is a family history of high blood pressure in close relatives, highlighting the role that both environmental and **genetic factors** play in the development of hypertension. In order to use preventative healthcare and treatment strategies, it is imperative to comprehend this family pattern (High Blood Pressure/Hypertension, 2020).

Vital Sign

Blood pressure refers to the force exerted by blood flow against arterial walls. It comprises two measurements - systolic pressure corresponding to the contraction phase of the heartbeat, and diastolic pressure measured between heartbeats when the heart relaxes. Under normal conditions, diastolic pressure exceeds systolic pressure in the arteries. A standard blood pressure reading for a healthy adult is 120 millimeters of mercury (mmHg) for systolic pressure and 80 mmHg for diastolic pressure (Cleveland Clinic, 2022).

Prescription

Clonidine is an antihypertensive drug that works by relaxing blood vessels and increasing the flow of blood to the heart. It is used to treat hypertension, or high blood pressure, in both adults and children. It can also be prescribed to treat other conditions like managing tics that are frequently associated with Tourette syndrome, as an adjunct therapy for severe pain related to cancer, and as a newborn opioid withdrawal syndrome treatment (Rama Yasaei & Abdolreza Saadabadi, 2019).

Treatment

Blood Pressure Monitoring: In the case we've chosen, E Based on the blood pressure recordings that the nurse placed into the EHR, this is a recommended monitoring parameter to keep an eye on the patient's blood pressure and make any necessary treatment adjustments.

Demographics

In this case, demographics include age and gender, which are crucial patient identifiers for tailored care and data-driven health assessments.

	Clinical Concept	SNOMED	RXNORM	ICD10	LOINC
Headache	Symptom	25064002	896890 Link	R51 Link	82231-2 hyperlink
Hypertension	Diagnosis	38341003	Not Available	I97.3 Link	45643-4 hyperlink
Hypertensive urgency	Diagnosis	443482000	Not Available	I16.0 Link	Not Available
Diabetes mellitus	Family History	160303001	Not Available	Z83.3 Link	45636-8 hyperlink
Hypertension	Family History	160357008	Not Available	Z82.49 Link	Not Available
Blood Pressure	Vital Sign	392570002	Not Available	Not Available	55284-4 hyperlink
Clonidine 0.2 mg	Prescription	778813009	2599 Link	Not Available	LG37550-7 hyperlink
Blood Pressure Monitoring every 4 hours	Treatment	46973005	Not Available	Z01.30 Link	Not Available
Name	Demographics	371484003	Not Available	Not Available	Not Available
Age	Demographics	Not Available	Not Available	Not Available	30525-0 hyperlink
Gender	Demographics	365873007		F64.9 Link	
Smoking since 10 years	Personal History	1221000119103	Not Available	Z53.01 Link	72166-2 hyperlink
Admission status		308540004	Not Available	Not Available	52536-0 hyperlink

JUSTIFICATION:

SNOMED CT was selected given its comprehensive clinical content and status as the recommended standard terminology for clinical findings and observations (HIMSS, 2017). SNOMED CT has broad coverage of over 311,000 concepts spanning symptoms, diagnoses, procedures, and more (SNOMED CT, 2019). SNOMED CT can represent the chief complaints, histories, physical exam findings, and nursing orders in this case.

LOINC was chosen to encode the vital sign measurements as it is the emerging standard terminology for clinical observations in healthcare (McDonald et al., 2003). LOINC contains over 30,000 terms for clinical measurements like blood pressure, labs, and other quantified observations and recent studies explain that LOINC codes are becoming ubiquitous in medical reporting and exchange of laboratory results (McDonald et al., 2003).

RxNorm was selected as the standard terminology for medications in this case. RxNorm provides normalized names for clinical drugs by integrating various drug vocabularies and is widely used in electronic health records and e-prescribing systems (Nelson et al., 2011). It contains information on branded and generic drugs, ingredients, and dosage forms.

ICD-10 was chosen as the diagnosis terminology because it is the global standard disease classification endorsed by the World Health Organization (World Health Organization, 2022). ICD-10 enables consistent capture of health statistics, trends, and billing across countries. It contains more than 50,000 diagnosis codes that allow granular and precise classification of diseases, disorders, injuries and causes of death (HIMSS, 2017).

Overall, Thoughtful mapping of the detailed clinical concepts extracted from the patient scenario to precise codes from these terminologies is essential to high-quality, interoperable data exchange between providers and applications. The four terminologies selected allow structured representation of the key elements in this case - chief complaints, histories, exam findings, vital signs, diagnoses, medications, and nursing orders.

CONCLUSION:

Improving the efficiency, effectiveness, and delivery of healthcare all start with accurate and interoperable clinical data. Sophisticated terminology must be used to express specific clinical details in an organized fashion. Healthcare environments and clinicians of different backgrounds can easily communicate health information by mapping symptoms, diagnoses, drugs, treatments, and more to recognized coding systems. The broad implementation of terminology standards yields many advantages, including population health analytics and clinical decision assistance, while also preventing fragmentation and medical errors.

SNOMED CT enables thorough clinical results to be recorded in a coded format. For consistency, RxNorm standardizes drug names. For test findings and clinical observations, LOINC acts as a common standard. For clinical documentation and billing purposes, ICD-10 provides uniform

disease classification. These vocabulary standards provide structured data representation that supports evidence-based medicine guidelines, big data analytics, public health surveillance, and computer-assisted treatment. We can realize the full potential of health IT by working together to accelerate the adoption of SNOMED CT, LOINC, RxNorm, ICD-10, and other necessary standards. Overall, the advancement of data-driven healthcare and the provision of integrated, excellent, and cost-effective care for all depend heavily on the use of interoperable clinical terminologies.

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