PS5: Project Terminologies Presentation (Project Sprint 5)

A case study of an 18-year-old female patient who complaints of generalized weakness and other signs and symptoms: Terminology considerations

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Introduction

- Health care standards and terminologies refers to a group of terms used in patient assessment, patient management, and treatment[2].
- Different standardized coding systems employ different codes to represent terms used in healthcare[2].
- The SNOMED-CT, ICD-10, CPT, and LOINC coding systems are only a few of the many available.
- Any medical information must be reported in a systematic manner using standard language for public health and research to be properly conducted[2].

Summary of the Use Case

- Use Case - Use case B was selected and utilized in this project. In this use case, a female patient, age 18, visits the physician with complaints of generalized weakness and reports she has been unable to carry out basic duties for a few months. The patient exhibits various symptoms such as shortness, palpitations, lightheadedness, cramps in her legs, and a need to crunch on something. Upon inspection, the patient discovers she has been having excessive monthly bleeding for the past six months. She was only eating once a day, and her appetite had decreased. Upon examination, her doctors discovered that she had tachycardia, a swollen tongue, and pale gums and nail beds. Based on the patient's medical history and the findings of her physical examination, the doctor suspected that the patient was anemic and so he asked for a blood sample to be examined. The lab technician received orders from clinician and performed the test. The lab orders from EHR should be generated and added to the lab information systems worklist item. The test results should be updated in the EHR after the lab technician has completed the procedure[1].

Use Case

- For this research, a case study that was carefully examined to find all the signs, symptoms, lab tests, and diagnoses was chosen. We used the four widely used terminologies ICD-10-CM, CPT, LOINC, and SNOMED CT to relate and compare each of them. These terms enable us to create systems that ensure patient safety and support advancements in the healthcare industry.

- Also In this project, we have created model diagrams for use case "B." The case study's model diagrams were created in UML and BPMN. UML is used to represent the architecture of classes, interpretations, and their relationships. A software program called BPMN makes it possible to visually analyze complex interactions in a simple manner.

Terminologies/Ontologies

- Ontology describes the concepts of medical terminologies and the relation between them, which enables sharing of medical knowledge[2].
- Terminology is a set of concepts and relationships which provide a common reference point for comparison and aggregation of data about the terms related to healthcare which is defined and coded by specific codes by different standards[2].
- Medical information can be more effectively used in public health and research, by using standard terminology and structured reporting[2].
- Medical standards and terminologies are used to improve healthcare by reducing the rate of occurrence of adverse events and misdiagnosis[2].

Terminologies and Ontologies in the Use case

1. Lethargy
2. Generalized Weakness
3. Inability to do routine work
4. Excessive bleeding during menstruation
5. Breathlessness
6. Palpitations
7. Light-Headedness
8. Cramping in legs
9. Desire to crunch on ice
10. No history of fear

1. No history of abdominal pain
2. No history of drug intake
3. Decreased appetite
4. Taking meals once a day
5. Had Tachycardia
6. Pale gums
7. Nail beds
8. Swollen tongue
9. Anemic
10. Blood sample ordered

Terminologies/Ontologies chosen

- For this project, the selected use case study has been thoroughly analyzed to determine the different signs, symptoms, lab tests, and diagnosis
- To associate and compare each of these we have made use of four terminologies that are in accordance with the standards namely ICD 10-CM, CPT, LOINC and SNOMED CT.
- The International Classification of Diseases, Tenth Revision, Clinical Modification (ICD10-CM) is a standardized coding system that allows the clinicians to code the diagnosis codes for various signs and symptoms of diseases and related health problems[4].
- SNOMED-CT is the most extensive, multidisciplinary medical healthcare terminology standard that is utilized in the healthcare settings[3].

Terminologies/Ontologies chosen

- The Current Procedural Terminology (CPT) codes offer doctors and health care professionals a uniform language for coding medical services and procedures to streamline reporting, increase accuracy and efficiency.
- There are different clinical elements used in this case study. We have noted down multiple clinical elements for which different standards have been noted.
- These clinical elements consist of signs, symptoms, diagnosis, and laboratory tests mentioned in the use case study.
- Some of the clinical elements are Lethargy, Generalized weakness, Excessive bleeding during menstruation, Breathlessness, Palpitations, Light-headedness etc.

Examples of Signs/Symptoms

1. **Lethargy:**

- **ICD-10-CM: The ICD10-CM code is R53.83 and it is being used since October 1, 2021. This sign is most commonly applicable to tiredness, lack of energy, fatigue. It also means lack of energy and sluggishness to do basic activities.**
- **SNOMED-CT: The SNOMED-CT code for Lethargy is 2142264003.**
- **LOINC: The LOINC code 45495-9 is applicable to periods of lethargy.**

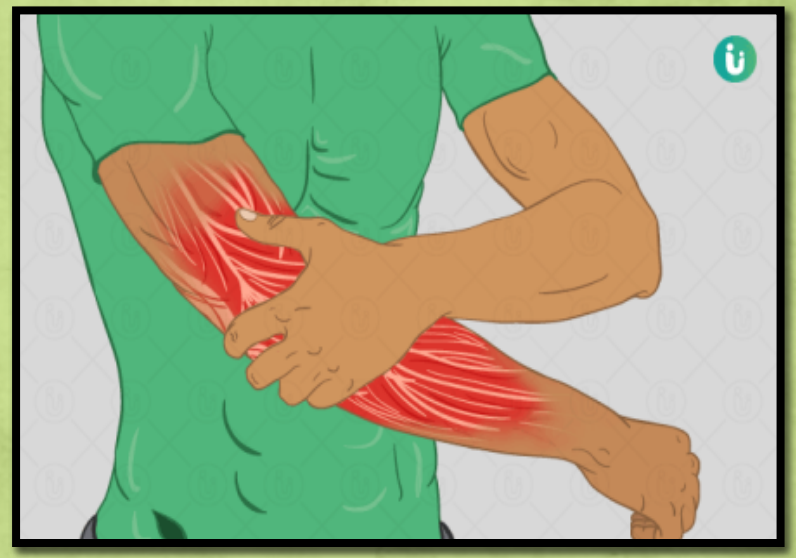
(Lethargy Businessman Stock Illustration. Illustration of Guts - 53098133, n.d.)

Image source: *Lethargy businessman stock illustration. Illustration of guts - 53098133*. (n.d.). Www.dreamstime.com. Retrieved December 14, 2022, from https://www.dreamstime.com/stock-illustration-lethargy-businessman-to-sit-down-lethargic-image53098133

Examples of Signs/Symptoms

2. Generalized weakness:

- **ICD-10-CM: The ICD10-CM suggests the code M62.81 for generalized weakness in a patient. The code covers symptoms like muscle weakness in general and trunk muscle weakness.**
- **SNOMED-CT: The SNOMED-CT code for generalized weakness is 260407003.**
- **LOINC: The LOINC code 66669-3 refers to weakness and muscle weakness. This sign shows a lack of energy in the body that causes weakness.**



(Dr. Nadheer K M (AIIMS, 2018)

Image source: Dr. Nadheer K M (AIIMS. (2018, December 23). *Muscle Weakness*. MyUpchar; myUpchar. https://www.myupchar.com/en/disease/muscle-weakness

Examples of Signs/Symptoms

3. Palpitations:

- **ICD-10-CM: The ICD10-CM code for palpitations is R00.2 and it is a billable code. It explains the clinical situation when an unpleasant sensation and irregular heartbeats are experienced by a person.**
- **SNOMED-CT: The SNOMED-CT code for palpitations is 80313002.**
- **LOINC: Palpitation's LOINC code is 76281-5. Most palpitations are caused by stress, depression, or strenuous exercise**

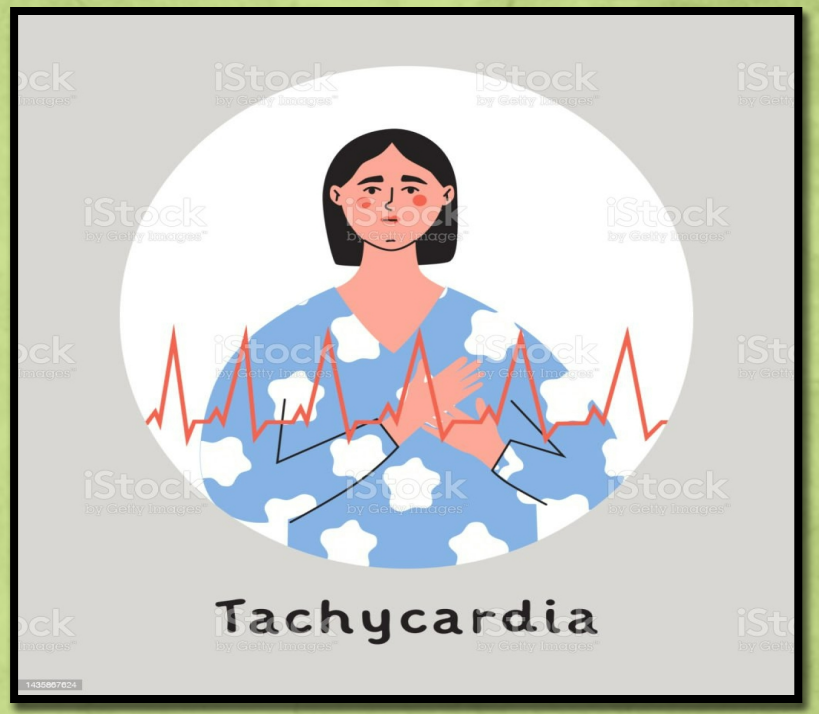
(*Female Suffering from Palpitations, Cold Sweat Symptoms*, n.d.)

Image source: *Female suffering from palpitations, cold sweat symptoms*. (n.d.). IStock. Retrieved December 14, 2022, from https://www.istockphoto.com/vector/female-suffering-from-palpitations-cold-sweat-symptoms-gm1357465981-431354514

Examples of Signs/Symptoms

4. Had tachycardia:

- **ICD-10-CM: ICD10-CM gives R00.0 as the code for Tachycardia. This covers inappropriate heart rate, sinus tachycardia, and rapid heartbeat.**
- **SNOMEDCT: The SNOMED-CT code for this is 3424008. Tachycardia is a condition where heart rate is increased rapidly.**
- **LOINC: Rhythmic or arrhythmic heart rate in LOINC is represented by 88104-5 code.**



(Hotaman, 2022)

Image source: Hotaman, A. (2022, October 23). *Tachycardia, Heart arrhytmia. Woman press her chest with hand. Flat. . .* iStock. https://www.istockphoto.com/vector/tachycardia-heart-arrhytmia-woman-press-her-chest-with-hand-flat-vector-isolated-gm1435867624-477064133?irgwc=1

Lessons Learned

- One of the most important things that we learnt through this project was that using terminologies helps to maintain semantic interoperability.
- Semantic Interoperability refers to the sharing of information across various systems.
- Using terminologies helps in patient safety and reduced medical errors.
- With the use of standards and terminologies, it becomes easier for the medical staff to communicate with each other and understand the patient's needs.
- Standardization of terminologies provides consistent quality and greater flexibility.

Lessons Learned

- **Additionally, another lesson we learnt was clinical terminology. This consisted of coding and classification that can be useful in the categorization of concepts. This is closely associated with semantic interoperability.**

- **Most importantly we were introduced to the different coding and classification schemes such as ICD, SNOMED, LOINC that can be used for different purposes in the field of medical terminologies.**

- **We also studied about precision medicine that discussed about the unique facts that can be used to optimize patient care.**

- **The concept of phenotypes and genotypes were introduced which helped to gain knowledge about the other linked standards.**

Semantic gaps while coding terms

- One major challenge that we encountered was the difference between the meaning of terms in different terminologies.
- SNOMED gives more generalized coding whereas ICD-10 is often limited and specific to a disease.
- At times, there is only partial meaning match between the terms in different coding systems and this makes it difficult to map them[6].
- Often the specifications for a disease are different in different coding systems which make it difficult for doing the ontological mapping[7].

Potential drawbacks to the terminologies themselves

- The amount of time it takes certain doctors to search through a list of standardized terminologies in search of the correct diagnosis is an obstacle they mention when using medical terminologies because it limits their face time with patients. The complexity and constant change of the medical industry is the fundamental obstacle to standardization. A universally accepted list of terminology that meets everyone's demands is all but impossible to develop. Additionally, mapping poses a significant barrier to interoperability because different EHRs use different vocabularies, which is another problem[8].

- The difficulty in describing a disease that can be found in a list of coded diagnoses and assessments is one of the many factors that frustrates people. Many healthcare professionals see this as a common complaint since they believe that standardization misses the genuine nature of a patient, or the care given. These healthcare professionals still use narratives and dictation to record their conclusions and diagnoses as unstructured data in the healthcare systems. This makes mapping or extracting data for research or billing reasons quite challenging[8].

Potential drawbacks to the terminologies themselves

Special terminology and notions that may not have an exact translation in other languages can be found in many medical publications. Depending on the language of origin, terms, acronyms, and abbreviations may seem differently, which could be confusing. The most prevalent concepts are poor comprehension, poor medical literacy, and difficult medical terminology[9].

Another potential drawback is that there may be terminology code available for a term in ICD-10 however it may not be directly available in SNOMED-CT. This creates a barrier while coding in medical language[9].

What changes can be made in terminology choices that were made

- Changing the terminology may be one strategy to reduce patient preferences for health management responses to low-risk conditions[5].

- Based on the use case selected for the project, we could have modelled the patient's past laboratory reports.

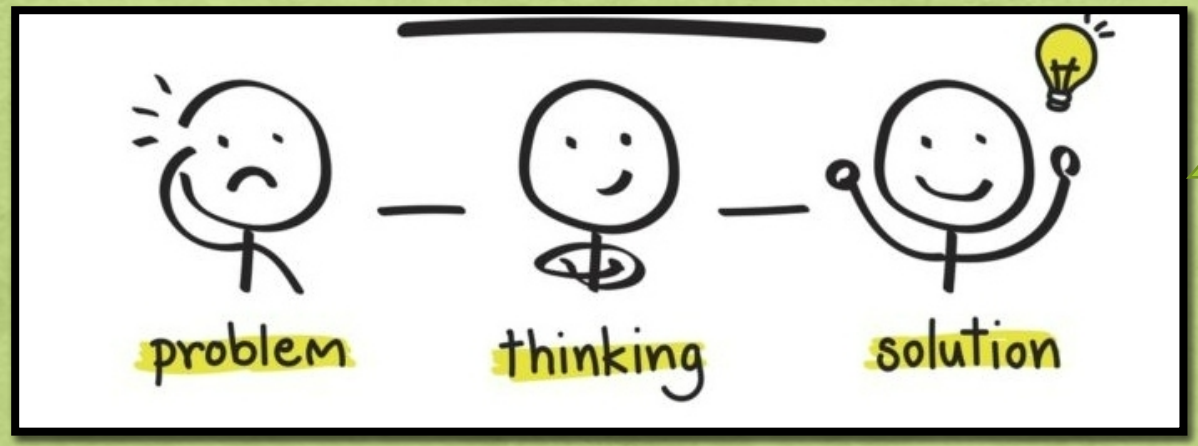
- Her past reports would have given a clearer picture of her blood sugar levels and other necessary components in her body. These reports might help the physician to understand her disease better and will eventually help in designing a more accurate treatment plan for her.

Fun Group Learnings..!!

Critical Thinking

Brainstorming

Rationalization



New Learnings

Interoperability

- Interoperability refers to the exchange of information between two or more systems in a way that can be interpreted by both[5].
- Syntactically interoperable messages are encrypted using XML attributes and elements in our project[5].

Standards and terminology

- Interoperability is improved using standard terminology[5].
- Health IT should be able to use standard terminology effortlessly and logically[5].

New Learnings

- As a part of the project modules, we were introduced to the concept of cardinality.
- Modeling is used to understand a complex system's performance in a simpler way. A clear, well-organized graphic aids in understanding the concept.
- Various XML elements and attributes are used in our project to encrypt syntactically interoperable messages assisting in semantic interoperability.

Summarization of work

- Appropriate knowledge and use of standardized terminologies such as ICD, SNOMED, CPT and LOINC.
- Identification of the problem mentioned in the used case.
- BMPN diagrammatic representation is a standardized flowchart used for displaying workflow in a standardized setup.
- Use of Unified Modeling Language (UML) relationships between the actors to represent their role in in actions and to elaborate the artifacts.
- Use of data elements such as demographics of the patient, diagnosis, or medical history. This is essential for identification of the patients and to reduce the medical errors caused due to wrong identification of the patient.
- We created 3 Clinical Document Architecture(CDA) files that were used to model the different use case scenarios. This helped us to define the structure of certain medical records as a way to better exchange information between providers and patients.

Findings

- Utilization of current procedural terminology (CPT) was not useful in this case, as it is used for billing purposes. Using case-based classification.
- Using semantic interoperability and choosing SNOMED over SNOP.
- Using coded data as most of the elements had coded information already available.
- Using single BPMN diagram to analyze the workflow in the model of the used case.
- CDA models were used to demonstrate the different procedures that were a part of the use case study.
- Additionally, rationales were described for every signs and symptoms that were selected for this project.

Conclusion

- This sprint project was a learning ground for understanding the importance and implications of standards and terminology and their role in maintaining interoperability in the health care system.
- Learning markup languages such as XML have helped to understand the syntactic and semantic interoperable systems. After analysis and critical thinking, decision making regarding the used case was easier to understand. In conclusion, this was a prototype project that could be implemented in real life for patients to maintain the realness of data.

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