HEALTH INFO STANDARDS AND TERMINOLOGIES

Project sprint 2

Team Name- The Avengers

Lavanya Ranganatham | Prathik Reddy Kotha | Rupasri Pamulapati | Teja Pavani Jyesta | Ushaswini Sunkara

INTRODUCTION

UNIFIED MODELING LANGUAGE (UML):

Unified Modeling Language (UML) is essential in healthcare, offering a standardized framework for modeling systems and processes. Its versatility spans various domains, facilitating efficient design. UML diagrams like use case, activity, and sequence diagrams visualize interactions in healthcare system modeling. For instance, use case diagrams delineate actors like patients, doctors, and administrators. UML aids in EHR design and clinical pathway modeling, crucial in medical device design, and supports healthcare information exchange initiatives, promoting interoperability (Aggarwal, 2002).

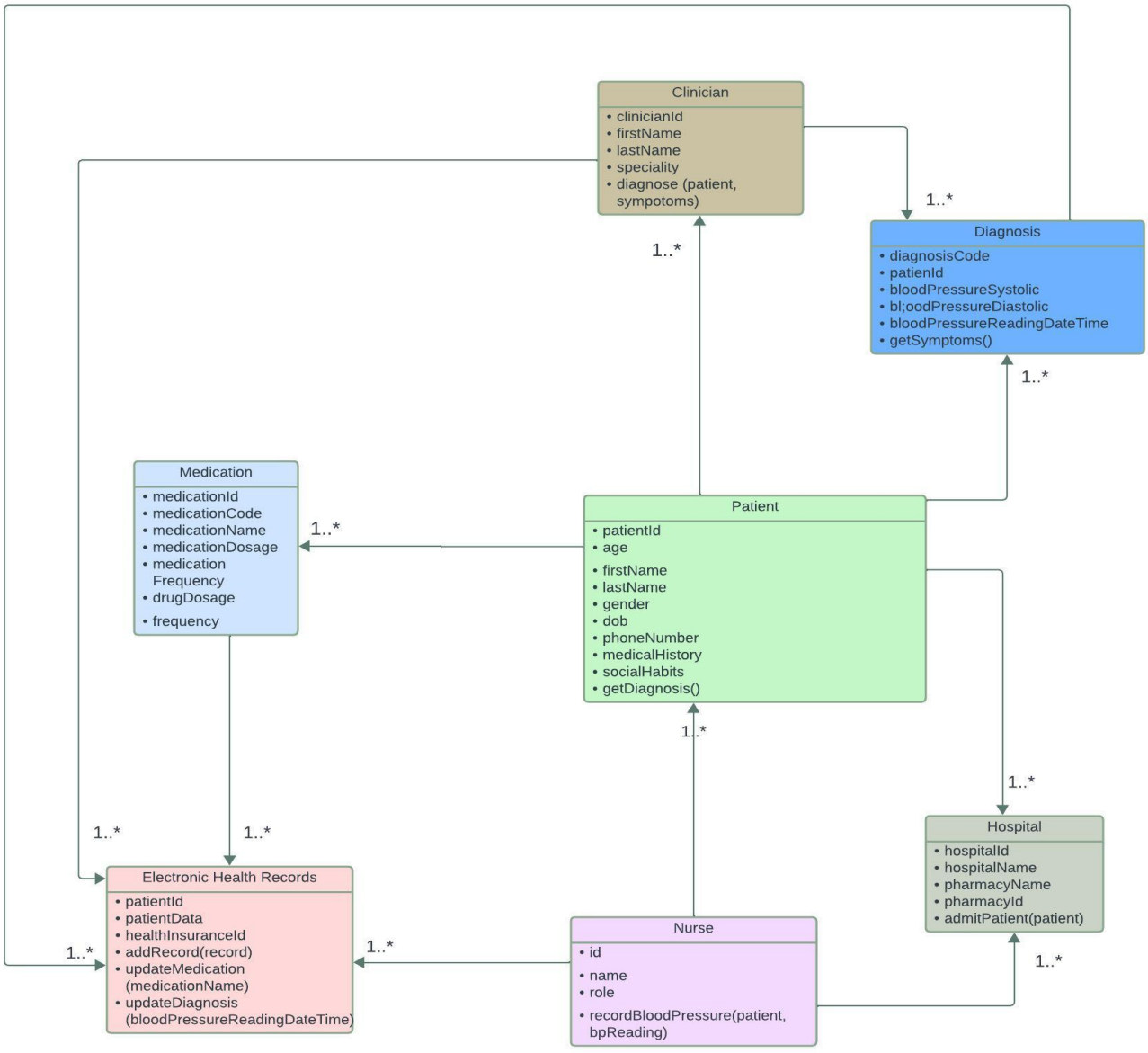
BUSINESS PROCESS MODELING NOTATION (BPMN):

BPMN is essential for optimizing processes and improving efficiency in healthcare by providing a standardized framework for depicting business processes, facilitating comprehension, analysis, and optimization (Wright, 2022).

In healthcare, BPMN models various processes, such as clinical workflows and administrative procedures, aiding in the identification of inefficiencies and enhancement of patient care delivery. Moreover, BPMN supports quality management initiatives, enabling organizations to document and analyze improvement processes (Kassim et al., 2022).

It also plays a crucial role in healthcare IT projects, ensuring seamless data exchange and integration, thereby enhancing operational efficiency and patient outcomes. Additionally, BPMN assists in healthcare compliance by standardizing processes related to privacy, security, and data governance, thus mitigating risks associated with non-compliance (Wright, 2022).

Patient Centered UML Class Diagram:



DESCRIPTION:

The UML diagram illustrates 7 classes: Patient, Hospital, Medication, Clinician, Electronic Health Records (EHR), Nurse, and Diagnosis. Each class contains specific elements representing attributes and methods. Relationships between classes, such as associations and dependencies, are depicted to show how they interact within the system. This comprehensive model facilitates understanding of the system's structure and behavior, aiding in the development and management of healthcare systems.

FOOTNOTES:

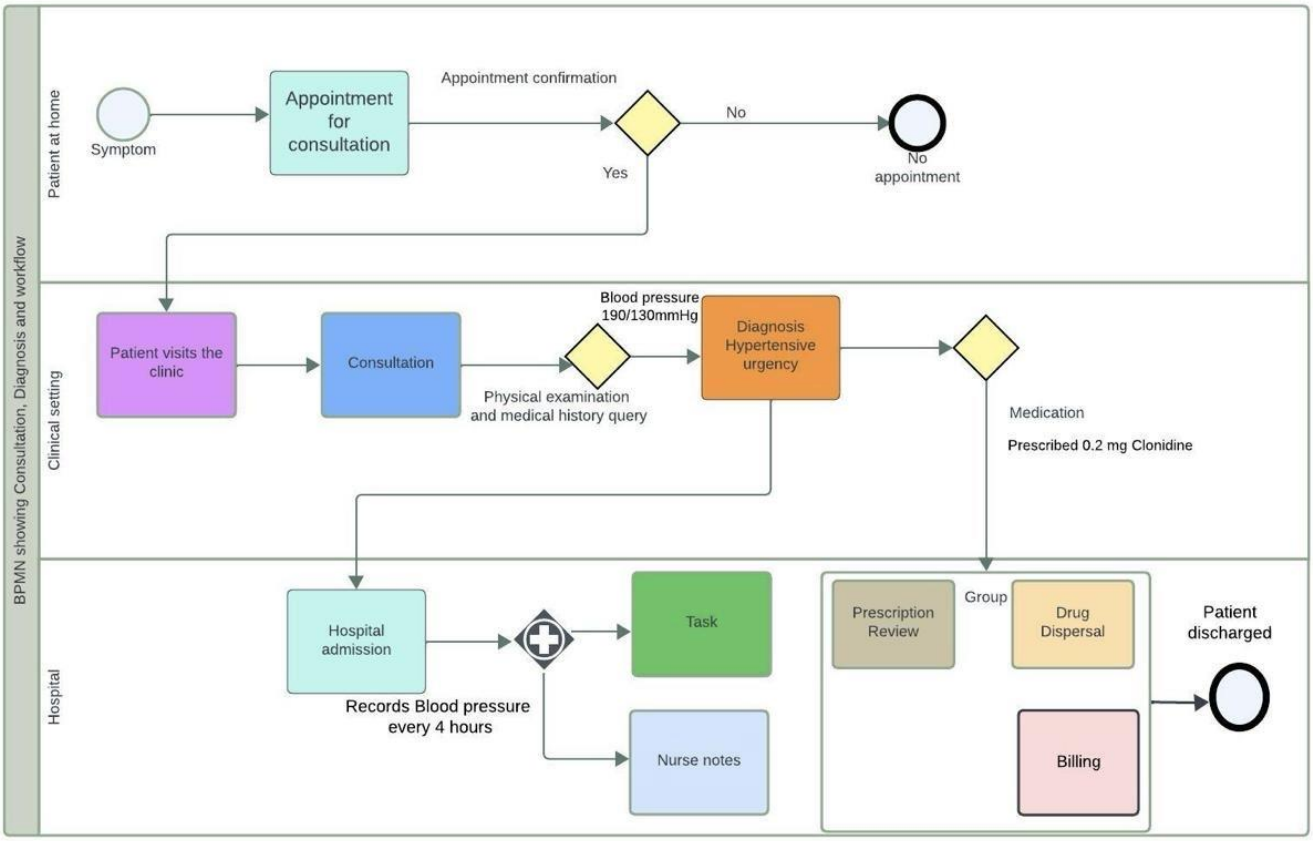
In our UML Class diagram, the patient is the central entity, connected to various classes where a patient can visit multiple clinicians and multiple hospitals, receive diagnoses for various conditions, and be prescribed multiple medications based on the conditions (1..*). Nurses update the Electronic Health Record (EHR) with various details they measure and on provided tasks, and the EHR is also updated with details regarding medication and diagnosis. Moreover, clinicians can make multiple diagnoses based on symptoms. These relationships facilitate the effective management and coordination of patient care across different healthcare entities and professionals.

INTEROPERABILITY:

Semantic interoperability ensures that exchanged information's meaning remains consistent across systems. In our scenario, it ensures precise alignment between diagnosis data in Electronic Health Records (EHR) and the diagnosis class, guaranteeing accurate representation of diagnoses and clinical notes. Similarly, semantic interoperability aligns clinicians' diagnoses with the final diagnosis and treatment plan stored in the diagnosis class.

Process interoperability enables efficient interaction between workflows. Nurse observations seamlessly integrate into EHR, enhancing patient data. This is depicted by information flow from the Nurse class to EHR, enriching the patient's record. Furthermore, process interoperability ensures accurate recording and storage of blood pressure measurements in EHR, accessible for diagnosis and treatment planning. Visual alignment between attributes of both classes illustrates clear mapping, aiding integration, and consistency.

BPMN Diagram:



DESCRIPTION:

This diagram outlines the steps involved in managing a patient experiencing hypertensive urgency. The patient confirms an appointment, undergoes consultation at the clinic including symptom reporting and examination. Hospital admission is decided based on severity; hospitalized patients undergo further evaluation and treatment. The pharmacy processes and dispenses medication. Hospitalized patients may be discharged once stabilized. Billing occurs for services and medication.

FOOTNOTES:

The diamond shapes in diagram represent situations in which the medical professional must make decisions based on an assessment of the patient's symptoms and diagnostic findings. The patient's treatment plan subsequently proceeds according to these decisions. For instance, the largest diamond depicts the physician evaluating the patient and determining whether to admit them to the hospital. This decision is based on their evaluation of the degree of high blood pressure and the existence of organ damage. Circles stand for things that cause actions to happen. The circles represent events that trigger mechanisms for controlling the patient's hypertensive urgency. The succeeding steps in the therapy route shown in the diagram are initiated by these

triggering events. For instance, the first consultation and assessment are sparked by the patient scheduling an appointment. A parallel gateway is added between hospital admission and nurse care and Ehr updating. The nurse continuously monitors the patient by recording blood pressure every 4hours and administration of 0.2 mg clonidine and updates Ehr and follows clinician notes. The pharmacy's preparation and delivery of medication is initiated upon receipt of the prescription.

Five Important Phases represented in BPMN are:

- The patient schedules a clinic appointment after experiencing symptoms.
- The doctor conducts a physical examination and obtains the medical history and social habits of the patient.
- The doctor uses evaluation to identify hypertensive urgency and decide whether to admit the patient to the hospital.
- After admitting patient in hospital nurse monitors patient's blood pressure for every 4 hours and administrates 0.2mg clonidine. Ehr updating takes place and nurse follows clinician notes for the care of patient.
- The pharmacy orders and fills prescriptions as directed.

INTEROPERABILITY:

This diagram illustrates the management steps for hypertensive urgency, showing syntactic interoperability. Each stage, from clinic visit to medication order fulfillment, is structured consistently, aiding seamless communication and information exchange.

In our use case Organizational interoperability is evident as the clinic staff initiates patient consultation, potentially leading to hospital admission if required, while ensuring seamless coordination of vital patient information between the clinic and hospital. Additionally, the pharmacy receives medication orders and dispenses medication, enhancing collaboration among stakeholders.

Compatibility interoperability is facilitated through Electronic Health Record (EHR) systems enabling data exchange between the clinic and hospital, and Pharmacy Management Systems processing medication orders.

EXCLUDED DATA ELEMENTS AND SITUATIONS:

Missing data elements, such as unique patient identifiers, timestamps, clinician notes, and admission/discharge information, play critical roles in enhancing clarity and effectiveness within BPMN diagrams for healthcare processes. Unique patient identifiers ensure accurate patient identification, while timestamps track process flow, aiding in bottleneck identification. Clinician notes capture vital patient information, enriching documentation. Incorporating admission/discharge details provides insights into the patient's journey, fostering informed decision-making. Symptoms such as headache, adverse reactions, and concurrent medical conditions could also impact patient care but are not fully represented in the provided models.

These elements are essential for optimizing workflow, promoting patient safety, and enabling comprehensive depiction of care processes. Their inclusion in BPMN diagrams is indispensable for facilitating efficient healthcare operations and ensuring high-quality patient care.

CONCLUSION:

The essential components and connections involved in managing hypertensive urgency patients in various healthcare settings are shown in the UML class diagram being presented. It offers a crucial framework for comprehending how patients interact with doctors, electronic health data, diagnoses, and treatment regimens. The BPMN diagram, on the other hand, shows the complete workflow starting with the first symptoms and continuing through diagnosis, hospital admission, treatment, and filling prescription orders from pharmacies. Collaboratively, these models facilitate the standardization of the examination, creation, and incorporation of the distinct systems and transitions necessary for the secure and efficient management of medical care.

REFERENCES

Aggarwal, V. (2002). The application of the unified modeling language in object-oriented analysis of healthcare information systems. *Journal of Medical Systems*, 26, 383–397. https://doi.org/10.1023/a:1016449031753.

Kassim, S. A., Gartner, J.-B., Labbé, L., Landa, P., Paquet, C., Bergeron, F., Lemaire, C., & Côté, A. (2022). Benefits and limitations of business process model notation in modelling patient healthcare trajectory: a scoping review protocol. *BMJ Open*, 12(5). https://doi.org/10.1136/bmjopen-2021-060357

Wright, G. (2022, April). What is Business Process Modeling Notation (BPMN)? TechTarget.com. Retrieved from What Is Business Process Modeling Notation (BPMN)? | Definition from TechTarget on 27 February 2024.