Emergency Department Patient Management System

James Stevens

University of Maryland Global Campus

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Introduction

The Emergency Department (ED) faces mounting pressure as patient volumes increase and operational inefficiencies persist. Long wait times, inefficient specimen collection, and delays in diagnostics are common issues that disrupt patient care. Moreover, poor communication between departments such as radiology, laboratory, and nursing staff further exacerbates these problems, leading to delays in diagnosis and treatment, and sometimes even patient harm.

This project aims to design and implement a centralized Emergency Department Patient Management System (EDPMS) to address these challenges. The system will streamline processes by integrating all relevant departments, allowing for real-time tracking of patient status, specimen collection, and diagnostic orders. By providing seamless communication between healthcare providers, laboratory technicians, and radiologists, the EDPMS will minimize delays, improve coordination, and ensure timely care.

Beyond improving internal operations, the EDPMS aligns with broader trends in healthcare, such as digitization, interoperability, and compliance with privacy regulations like HIPAA. As hospitals increasingly adopt integrated solutions, the EDPMS will serve as a model for how emergency departments can improve operational efficiency, reduce wait times, and enhance patient outcomes using cutting-edge technology. Ultimately, this system will provide a more structured and responsive environment, reducing the stress on medical staff and improving the patient experience.

1. Phase 1: Requirement Analysis

1.1. Problem Definition

The Emergency Department (ED) faces several operational challenges that hinder patient care and increase stress for both medical staff and patients. These challenges include long wait times, incorrect or missed specimen collection, delayed diagnostics (such as x-rays, CT scans, MRI, ECG), and poor communication between departments. Inefficient tracking, lack of real-time visibility of patient status, and difficulty managing patient records contribute to further delays in care.

To address these issues, a centralized system is needed to streamline processes, integrate departments, and provide real-time visibility of patient information. This system will improve coordination across departments and ensure timely, accurate treatment for patients, ultimately enhancing the quality of care provided in the ED.

1.2. Issues

- **Increased Wait Times**
    - Patients frequently face extended delays in receiving treatment due to inefficient patient status tracking and inadequate care coordination.
- **Lack of Real-Time Visibility**
    - Departments frequently lack access to real-time updates on a patient's status, leading to delays in care and inefficient resource utilization.
- **Communication Gaps**
    - Poor communication between departments, such as the ED, radiology, and laboratory, leads to delays in diagnostics, treatment, and coordinated patient care.

- **Specimen Collection Problems**
    - Specimens that are not collected or collected incorrectly lead to repeated procedures, delaying diagnosis, treatment, and potentially causing harm to patients.
- **Delayed Diagnostics**
    - Delays in diagnostic procedures such as x-rays, CT scans, MRIs, and ECGs, often occur due to communication breakdowns and lack of prioritization, resulting in delayed treatment.
- **Difficulty in Managing Records**
    - The manual and disjointed management of patient records leads to delays and potential errors in treatment.
- **Limited System Integration**
    - The lack of integration between hospital information systems creates data silos, duplicate data entry, and communication breakdowns, further delaying patient care.

1.3. Objectives

- Develop a system that reduces patient wait times by improving care coordination and patient flow within the ED.
- Provide real-time visibility of patient status across departments, ensuring that all staff involved in care have up-to-date information.
- Improve communication between departments to ensure timely and accurate specimen collection, minimize diagnostic delays, and provide real-time updates on patient status, diagnostic orders, and specimen handling.
- Ensure seamless integration with existing hospital information systems to enable efficient data sharing and improve coordination and patient care.

1.4. Requirements

- The system must provide real-time updates on patient status across departments and integrate with existing hospital systems to ensure seamless access for all relevant personnel.
- A centralized communication system must be implemented to improve coordination and reduce delays in care, with real-time critical alerts notifying staff of critical lab values or radiological results (e.g., x-rays, CT, MRI), and alerts for overdue or incorrectly collected specimens to prevent diagnosis delays.
- The system must support timely and accurate specimen collection, track diagnostic orders (x-rays, CT, MRI, ECG), and provide reminders for overdue tasks to ensure timely completion. Critical alerts should be acknowledged by the receiving nurse or doctor to ensure accountability.
- The system must handle a large number of concurrent users while maintaining performance and compliance with healthcare standards, such as HIPAA.
- Integration with existing hospital information systems is essential to ensure consistent and accurate patient data across all departments, enabling efficient data sharing and coordination.
- The system should automatically prioritize urgent cases to ensure that critical patients receive prompt diagnostics and care, with escalation procedures in place if critical alerts are not acknowledged within a specified timeframe.

1.5. Constraints

- The system must comply with healthcare data privacy laws and regulations, such as HIPAA, and adhere to hospital IT infrastructure and security policies.

- Budget limitations may restrict the implementation of certain features, requiring prioritization of essential functionalities.
- The system must integrate with existing hospital information systems, such as Electronic Health Records (EHR), ensuring compatibility and seamless data exchange.
- The system should be scalable to handle varying patient volumes without compromising performance or security.
- User training and support must be provided to ensure smooth adoption and effective use of the system by medical staff and administrators.

1.6. Description of the Proposed System

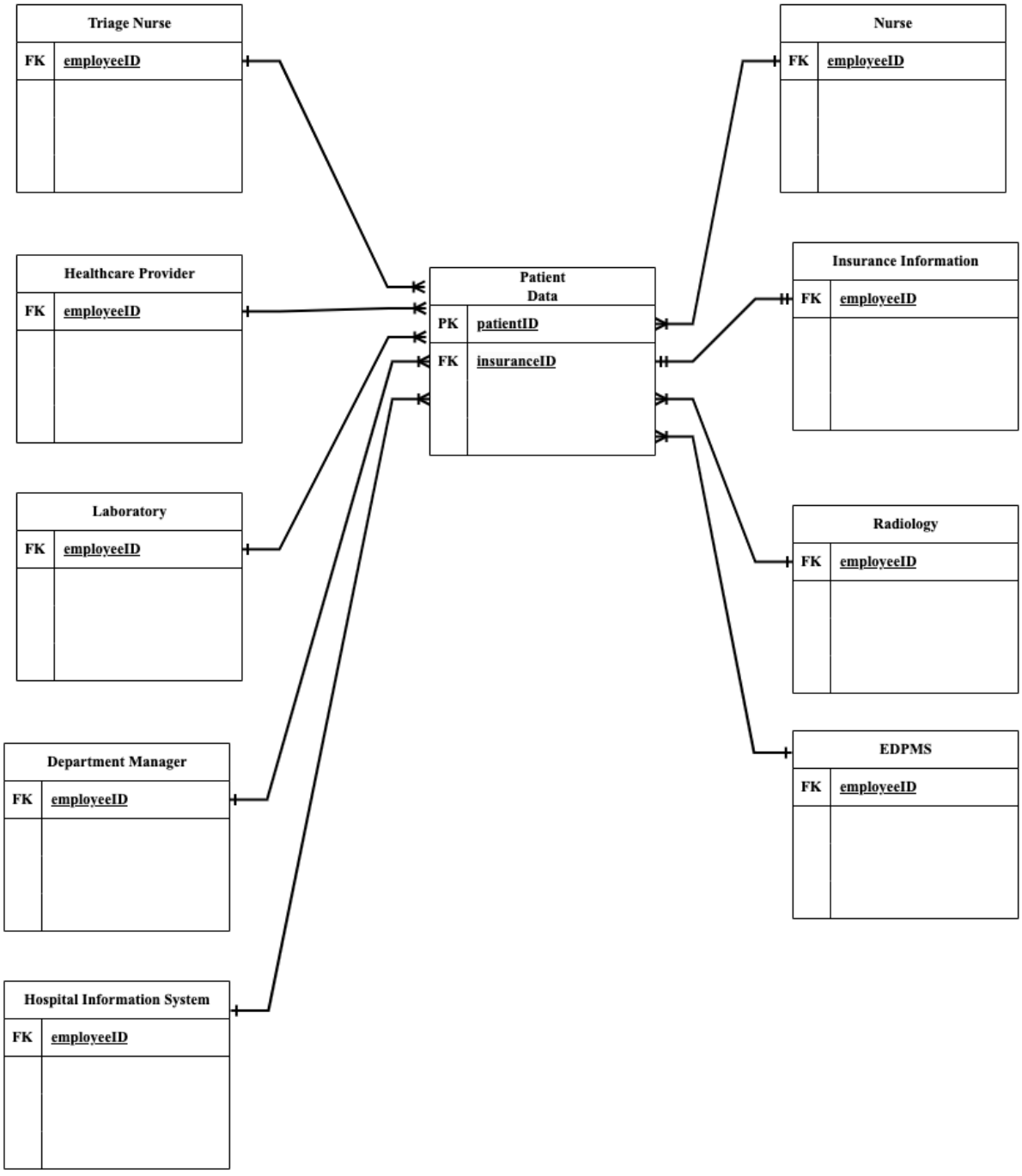
The Emergency Department Patient Management System (EDPMS) will provide a centralized platform for real-time patient tracking, specimen collection management, and diagnostics coordination. The system will integrate with existing hospital systems and feature role-based access to ensure privacy and security. It will prioritize urgent cases, manage diagnostic orders efficiently, and enhance communication between departments. Real-time critical alerts will notify staff, specifically nurses and doctors, when critical lab values or radiology results (e.g., x-rays, CT scans, MRI) are identified. Alerts will notify staff of overdue or missing specimens, and a dashboard will provide a comprehensive overview of patient status at various stages of care. An escalation system will be in place to ensure critical alerts are addressed within a defined timeframe. By improving coordination and reducing wait times, the system will enable faster and more accurate diagnosis and treatment.

1.7. Logical Model Design

1. Entities and Data Stores

- **Entities**
    - **Patient**: Contains patient demographic and insurance details.
    - **Nurse**: Manages patient assessments, lab results, and critical alerts.
    - **Triage Nurse**: Enters initial patient triage and status.
    - **Healthcare Provider (HCP)**: Issues lab orders, radiology orders, and manages critical alerts.
    - **Laboratory**: Records lab results, including critical results.
    - **Radiology**: Inputs radiology results.
    - **Department Manager**: Handles critical result escalation.
- **Data Store**
    - **Hospital Information System (HIS)**:
        - Acts as the primary data store, storing and managing patient records, demographic details, insurance information, lab results, radiology results, and staff data.
        - Integrates with the EDPMS for data verification and exchange between patient care processes and other departments.

- **Relationships**



Triage Nurse -> PatientData

- **Entities**: Triage Nurse, PatientData
- **Reading from left to right**: A Triage Nurse can triage many patients.
- **Reading from right to left**: A patient can be triaged by one Triage Nurse.
- **Cardinality**: One-to-many (1:N)

Nurse -> PatientData

- **Entities**: Nurse, PatientData
- **Reading from left to right**: A Nurse can manage the care of many patients.
- **Reading from right to left**: A patient can be managed by one Nurse at a time.
- **Cardinality**: One-to-many (1:N)

Healthcare Provider (HCP) -> PatientData

- **Entities**: Healthcare Provider (HCP), PatientData
- **Reading from left to right**: A Healthcare Provider can manage the diagnosis and treatment of many patients.
- **Reading from right to left**: A patient can be treated by one Healthcare Provider at a time.
- **Cardinality**: One-to-many (1:N)

PatientData -> InsuranceInfo

- **Entities**: PatientData, InsuranceInfo
- **Reading from left to right**: A patient can have one insurance record.
- **Reading from right to left**: An insurance record belongs to one patient.
- **Cardinality**: One-to-one (1:1)

Laboratory -> PatientData

- **Entities**: Laboratory, PatientData
- **Reading from left to right**: A Laboratory Technician can perform lab tests for many patients.
- **Reading from right to left**: A patient can have lab tests performed by one Laboratory Technician.
- **Cardinality**: One-to-many (1:N)

Radiology -> PatientData

- **Entities**: Radiology, PatientData
- **Reading from left to right**: A Radiologist can perform scans for many patients.
- **Reading from right to left**: A patient can have scans performed by one Radiologist.
- **Cardinality**: One-to-many (1:N)

Department Manager -> PatientData

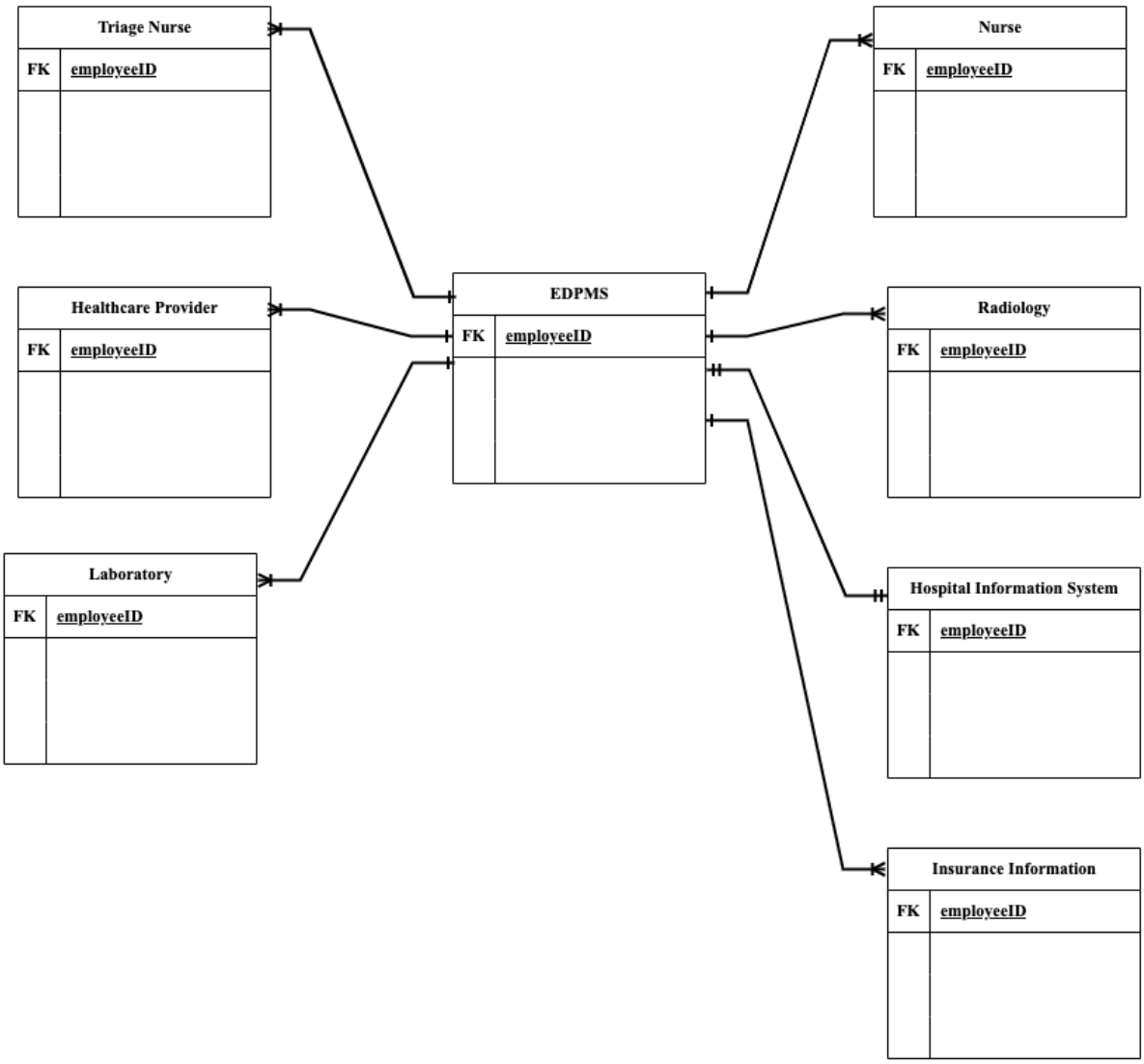
- **Entities**: Department Manager, PatientData
- **Reading from left to right**: A Department Manager can access and review data for many patients, usually in cases of escalation or reporting.
- **Reading from right to left**: A patient's data can be reviewed by one Department Manager in case of escalation or department-level management.
- **Cardinality**: One-to-many many (1:N)

EDPMS -> PatientData

- **Entities**: EDPMS, PatientData
- **Reading from left to right**: EDPMS can manage many patient records.
- **Reading from right to left**: A patient’s record is managed by one EDPMS.
- **Cardinality**: One-to-many (1:N)

HIS (Hospital Information System) -> PatientData

- **Entities**: HIS, PatientData
- **Reading from left to right**: HIS can verify and manage many patient records.
- **Reading from right to left**: A patient's record is managed and verified by one HIS.
- **Cardinality**: One-to-many (1:N)



EDPMS -> Healthcare Provider, Nurse, Triage Nurse, Laboratory, Radiology

- **Entities**: EDPMS, Healthcare Provider, Nurse, Triage Nurse, Laboratory, Radiology
- **Reading from left to right**: EDPMS can send alerts and manage records for many staff members (e.g., Healthcare Providers, Nurses, Laboratory Technicians, etc.).

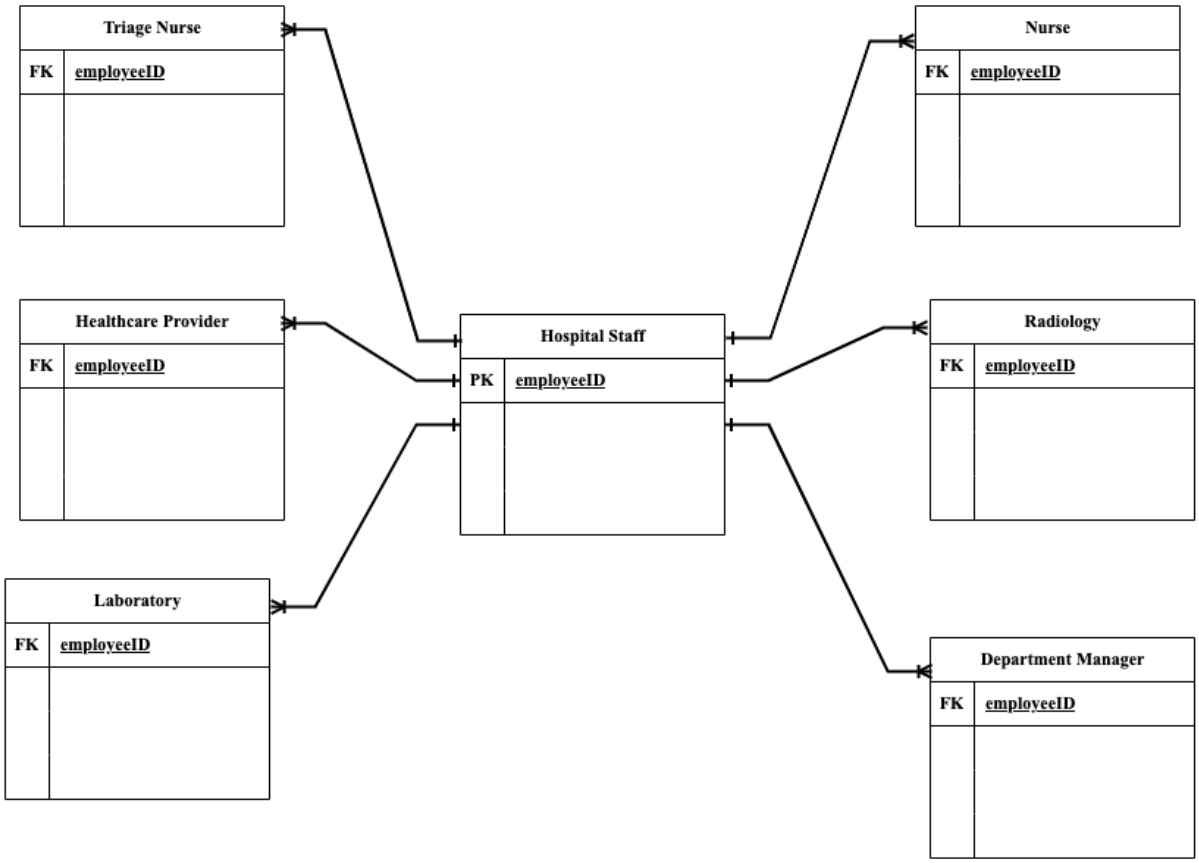
- **Reading from right to left**: Each staff member uses one EDPMS to access patient records and manage alerts.
- **Cardinality**: One-to-many (1:N)

EDPMS -> HIS (Hospital Information System)

- **Entities**: EDPMS, HIS
- **Reading from left to right**: EDPMS exchanges data with one HIS.
- **Reading from right to left**: HIS exchanges data with one EDPMS.
- **Cardinality**: One-to-one (1:1)

EDPMS -> InsuranceInfo

- **Entities**: EDPMS, InsuranceInfo
- **Reading from left to right**: EDPMS can manage and access many insurance records for different patients.
- **Reading from right to left**: An insurance record is managed by one EDPMS.
- **Cardinality**: One-to-many (1:N)



HospitalStaff -> Triage Nurse

- **Entities**: HospitalStaff, Triage Nurse
- **Reading from left to right**: HospitalStaff includes many Triage Nurses.
- **Reading from right to left**: A Triage Nurse is a specific type of HospitalStaff.
- **Cardinality**: One-to-many (1:N)

HospitalStaff -> Nurse

- **Entities**: HospitalStaff, Nurse
- **Reading from left to right**: HospitalStaff includes many Nurses.
- **Reading from right to left**: A Nurse is a specific type of HospitalStaff.
- **Cardinality**: One-to-many (1:N)

HospitalStaff -> Healthcare Provider (HCP)

- **Entities**: HospitalStaff, Healthcare Provider (HCP)
- **Reading from left to right**: HospitalStaff includes many Healthcare Providers.
- **Reading from right to left**: A Healthcare Provider is a specific type of HospitalStaff.
- **Cardinality**: One-to-many (1:N)

HospitalStaff -> Laboratory

- **Entities**: HospitalStaff, Laboratory
- **Reading from left to right**: HospitalStaff includes many Laboratory Technicians.
- **Reading from right to left**: A Laboratory Technician is a specific type of HospitalStaff.
- **Cardinality**: One-to-many (1:N)

HospitalStaff -> Radiology

- **Entities**: HospitalStaff, Radiology
- **Reading from left to right**: HospitalStaff includes many Radiologists.
- **Reading from right to left**: A Radiologist is a specific type of HospitalStaff.
- **Cardinality**: One-to-many (1:N)

HospitalStaff -> Department Manager

- **Entities**: HospitalStaff, Department Manager
- **Reading from left to right**: HospitalStaff includes many Department Managers.
- **Reading from right to left**: A Department Manager is a specific type of HospitalStaff.
- **Cardinality**: One-to-many (1:N)

2. Processes

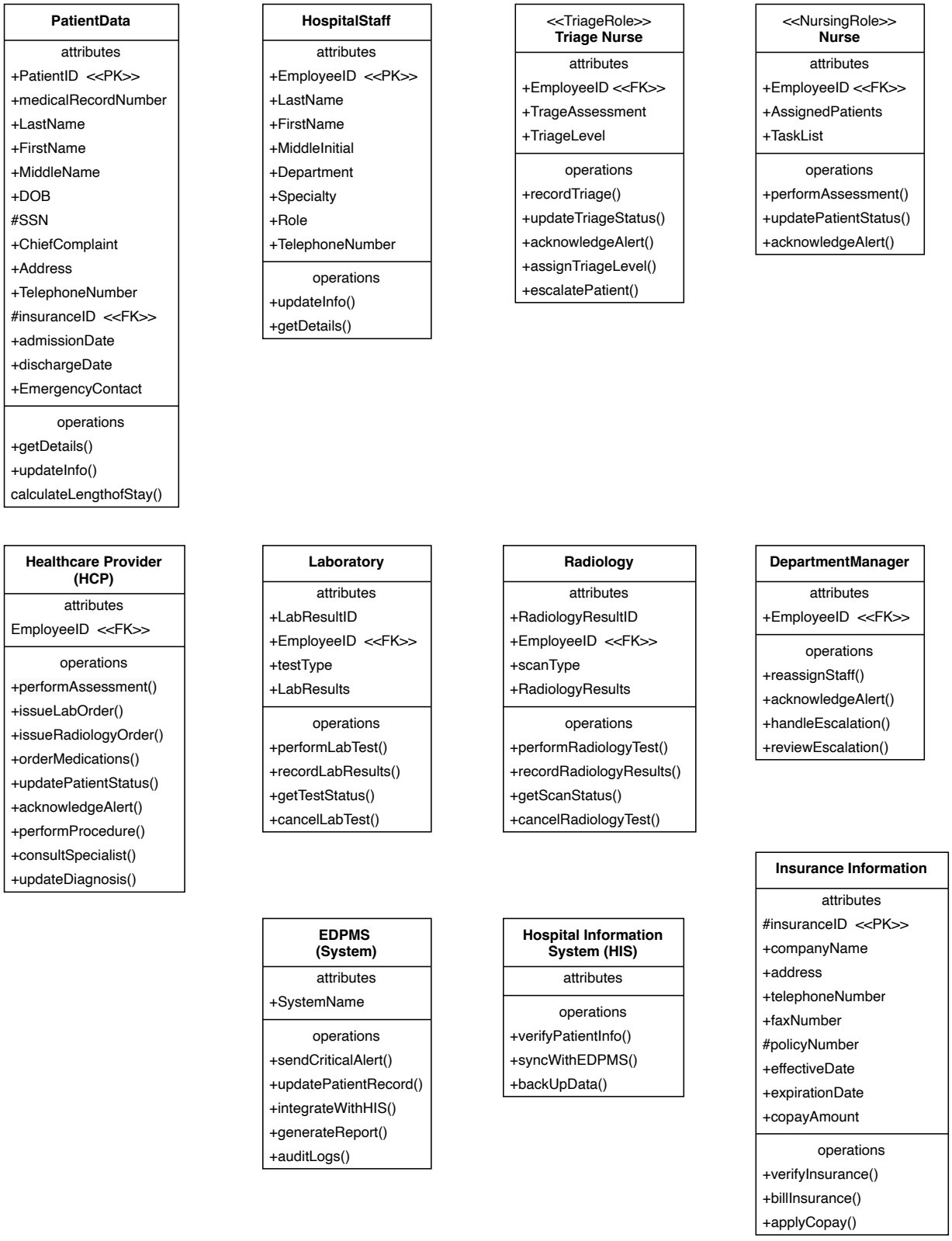
- **Patient Triage**: Triage nurse enters and updates patient assessment in the EDPMS, which updates the HIS.
- **Patient Registration**: Registration staff verifies patient data (e.g., demographics, insurance) in the HIS, and updates the EDPMS for patient care processes.
- **Lab and Radiology Orders**: Nurses and HCPs submit lab and radiology orders through the EDPMS, which pulls patient information from the HIS and updates results back to the HIS.
- **Lab and Radiology Results**: Results are input by lab technicians and radiologists into EDPMS, which pushes updates to the HIS for future use by other departments.
- **Critical Alerts**: EDPMS sends critical alerts for urgent lab or radiology results to relevant staff, updating the HIS when acknowledgments or escalations occur.
- **Patient Discharge**: Nurse and HCP enter discharge details into EDPMS, which updates the HIS with the final status.

3. Data Flow Diagram (High-Level)

- **Patient -> Triage Nurse**: Patient Info, Triage Assessment.
- **Patient -> Nurse**: Patient Info, Assessment.
- **Patient -> EDPMS**: Patient Demographics, Insurance Info
- **Triage Nurse <-> EDPMS**: Patient Details, Triage Assessment, Patient Status.
- **Registration <-> EDPMS**: Patient Demographics, Patient ID, Insurance Info

- **Nurse/HCP -> EDPMS**: Lab/Radiology/Medication/Procedure Orders, Treatment Notes.
- **Laboratory/Radiology <-> EDPMS**: Lab/Radiology Orders/Results.
- **Department Manager <-> EDPMS**: Critical Alerts.
- **EDPMS <-> HIS**: Patient Record Updates, Lab/Radiology Data, Critical Alerts, Discharge Info.

Unified Modeling Language (UML)



1.8. Data Flow Diagrams

Context Diagram

- The Context Diagram will show the high-level interaction between the Emergency Department Patient Management System (EDPMS) and its external entities, including Triage Nurse, Nurse, Healthcare Providers (HCPs) (physicians, nurse practitioners, physician assistants), Department Manager, Patients, Registration, Laboratory, Radiology, and the Hospital Information System (HIS). The system manages patient data, diagnostic results, lab orders, and critical result notifications, ensuring timely communication and escalation when necessary.

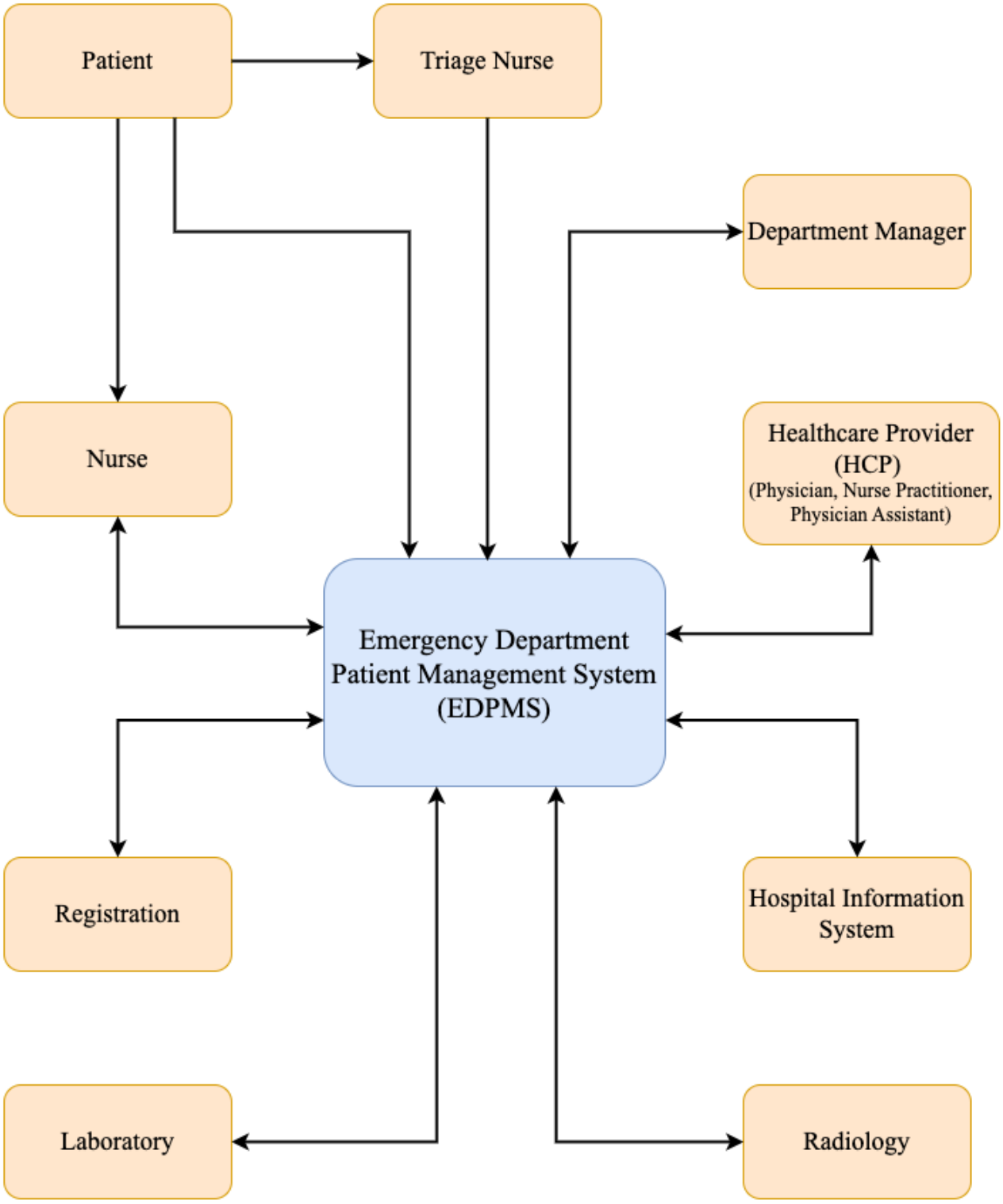
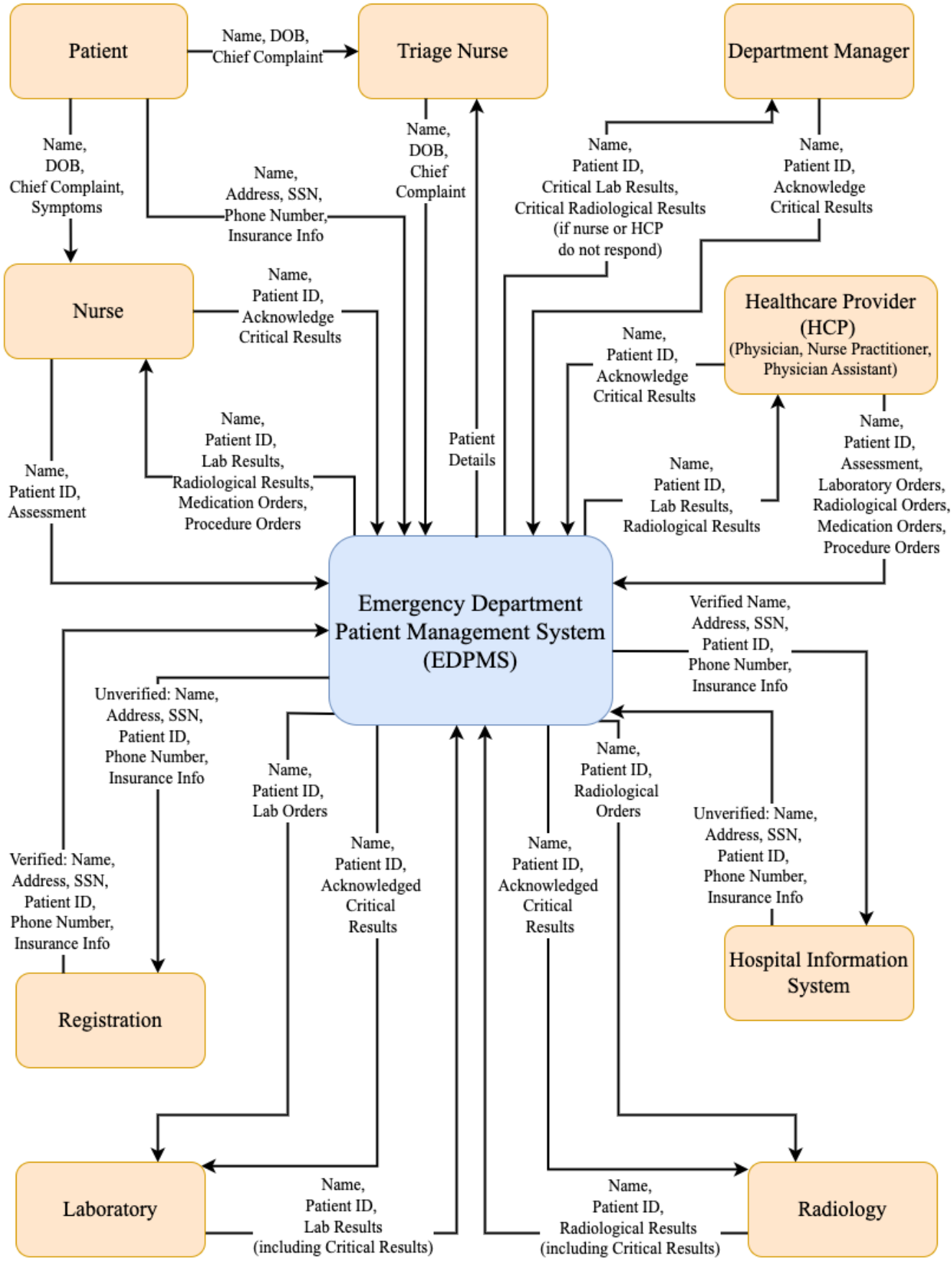

Patient
Triage Nurse
Department Manager
Nurse
Healthcare Provider (HCP)
(Physician, Nurse Practitioner, Physician Assistant)
Emergency Department Patient Management System (EDPMS)
Registration
Hospital Information System
Laboratory
Radiology

Diagram 0: Illustrates the main processes within the EDPMS, including patient triage, registration, lab orders, radiological orders, results management, critical result acknowledgment, and interdepartmental communication. It captures how data flows between the EDPMS and external entities such as nurses, HCPs, laboratory, radiology, and the hospital information system.


Patient
Name, DOB, Chief Complaint
Triage Nurse
Department Manager
Name, DOB, Chief Complaint, Symptoms
Name, Address, SSN, Phone Number, Insurance Info
Name, DOB, Chief Complaint
Name, Patient ID, Critical Lab Results, Critical Radiological Results (if nurse or HCP do not respond)
Name, Patient ID, Acknowledge Critical Results
Nurse
Name, Patient ID, Acknowledge Critical Results
Healthcare Provider (HCP) (Physician, Nurse Practitioner, Physician Assistant)
Name, Patient ID, Acknowledge Critical Results
Name, Patient ID, Assessment
Name, Patient ID, Lab Results, Radiological Results, Medication Orders, Procedure Orders
Patient Details
Name, Patient ID, Lab Results, Radiological Results
Name, Patient ID, Assessment, Laboratory Orders, Radiological Orders, Medication Orders, Procedure Orders
Emergency Department Patient Management System (EDPMS)
Verified Name, Address, SSN, Patient ID, Phone Number, Insurance Info
Unverified: Name, Address, SSN, Patient ID, Phone Number, Insurance Info
Name, Patient ID, Lab Orders
Name, Patient ID, Radiological Orders
Unverified: Name, Address, SSN, Patient ID, Phone Number, Insurance Info
Verified: Name, Address, SSN, Patient ID, Phone Number, Insurance Info
Name, Patient ID, Acknowledged Critical Results
Name, Patient ID, Acknowledged Critical Results
Hospital Information System
Registration
Laboratory
Name, Patient ID, Lab Results (including Critical Results)
Name, Patient ID, Radiological Results (including Critical Results)
Radiology

External Entities and Data Flows

1. Triage Nurse

- **Receives**: Name, Date of Birth (DOB), and Chief Complaint from the Patient
- **Sends**: Name, Date of Birth (DOB), and Chief Complaint to the EDPMS.
- **Receives**: Patient details after initial triage.

2. Patient

- **Sends**: Name, Date of Birth (DOB), and Chief Complaint to the Triage Nurse.
- **Sends**: Name, Address, SSN, Phone Number, and Insurance Info to the EDPMS.
- **Sends**: Name, Date of Birth (DOB), Chief Complaint, and Symptoms to the Nurse.
- The system processes the patient's demographic information for the hospital's records.

3. Nurse

- **Sends**: Name, Patient ID, and Assessment to the EDPMS.
- **Receives**: Patient ID, Lab Results, Radiological Results, Medication Orders and Procedure Orders.
- **Receives**: Name, Date of Birth (DOB), Chief Complaint, and Symptoms from the Patient.
- Also acknowledges critical results using the EDPMS, notifying that the critical information has been seen and acted upon.

4. Healthcare Provider (HCP) (Physician, Nurse Practitioner, Physician Assistant)

- **Sends**: Name, Patient ID, Assessment, Lab Orders, Radiological Orders and Medication Orders and Procedure Orders to the EDPMS.
- **Receives**: Lab Results, Radiological Results, and Critical Results.
- Acknowledges critical results as needed, and the system escalates if no acknowledgment is received.

5. Department Manager

- **Receives**: Critical Lab Results and Critical Radiological Results (if the Nurse or HCP do not respond in time).
- Acknowledges critical results as needed and responds accordingly.
- This ensures management is aware of critical situations and responds accordingly.

6. Registration

- **Receives**: Unverified Name, Address, SSN, Patient ID, Phone Number, and Insurance Info from the EDPMS.
- Verifies patient information and updates the hospital's database accordingly.
- **Sends**: Verified Name, Address, SSN, Patient ID, Phone Number, and Insurance Info to the EDPMS.

7. Laboratory

- **Receives**: Lab Orders and the patient's information required to process the lab request.
- **Sends**: Patient ID and Lab Results (including Critical Results) to the EDPMS.

8. Radiology

- **Receives**: Radiological Orders and necessary patient details for imaging.
- **Sends**: Patient ID and Radiological Results (including Critical Results) to the EDPMS.

9. Hospital Information System (HIS)

- **Sends**: Unverified Name, Address, SSN, Patient ID, Phone Number, and Insurance Info to the EDPMS.
- **Receives**: Verified Name, Address, SSN, Patient ID, Phone Number, and Insurance Info from the EDPMS after validation.

Data Flow Descriptions

- **Patient Data Flow**

  The patient's demographic and insurance information flows into the system through both Registration and HIS, ensuring the information is up-to-date and verified for billing and treatment purposes.

- **Medical and Diagnostic Data Flow**

  Both the Nurse and HCP send assessments, lab orders, and radiology orders to the EDPMS, and the Laboratory and Radiology departments provide test results back to the system. Nurses and healthcare providers receive these results in real-time.

- **Critical Result Management**

  If a critical result (from lab or radiology) is detected, the system notifies both the Nurse and HCP. If they do not acknowledge the result, it is escalated to the Department Manager.

1.9. Descriptions of Processes

- **Critical Alerts**
  - The system will automatically notify the assigned nurse and doctor in real-time when critical lab values or radiology results (e.g., x-rays, CT, MRI) are detected. These alerts will appear prominently on the system dashboard and will be sent via mobile or email notifications, ensuring immediate visibility. *Acknowledgment of the alert will be required by the receiving staff, and if not acknowledged within a specified timeframe, the alert will be escalated per the chain of command.*

- **Patient Triage**
    - The system will assign a priority level to each patient based on their condition.
- **Specimen Collection**
    - The system tracks the entire process from order to collection and alerts staff when specimens are not collected in a timely manner.
- **Diagnostic Orders**
    - The system tracks orders for diagnostic tests (x-rays, CT, MRI, ECG) and provides reminders when tasks are overdue.
- **Interdepartmental Communication**
    - Facilitates communication between ED, lab, and diagnostic staff for smooth coordination.

1.10. Descriptions of Outputs/Inputs/Performance/Security or Controls

- **Outputs**
    - Reports on patient status, specimen collection, and diagnostic orders.
- **Inputs**
    - Patient information, diagnostic orders, specimen requests, and communication logs.
- **Performance**
    - The system must handle 500 concurrent users and update patient status in real time.
- **Security/Controls**
    - Encryption, audit trails, and role-based access control to meet HIPAA compliance.

1.11. Specific Requirements

- **Interface**
    - The system will feature an intuitive, user-friendly interface for medical and administrative staff, allowing clinicians and lab technicians to easily track patient progress, specimen status, and diagnostic results, with prominent alerts for critical tasks. Critical alerts will be displayed prominently for urgent cases, and notifications will be sent directly to the responsible nurse and doctor for immediate attention.
- **Operational**
    - The system must support continuous 24/7 operation with minimal downtime and have backup systems and failover mechanisms in place to ensure reliability.
- **Resource**
    - The system requires integration with hospital databases and EHR systems to access patient records, diagnostic data, and specimen collection information.
- **Performance**
    - The system must provide real-time updates and be capable of handling at least 500 concurrent users with minimal response delays, ensuring timely updates on diagnostic orders, specimen collection, and critical lab or radiology results.

2. Phase 2: System and Database Design

2.1 User Interface

- **Data Input Method**
  - **Physical Layout**
    - The user interface will feature clear, organized input forms for capturing patient demographic details, with drop-down menus to simplify data entry and highlighted required fields. Tabs will be available for additional patient history.
  - **Input Design and Procedures**
    - The system will use drop-down menus for selecting common conditions and departments, with mandatory fields highlighted. It will validate inputs to prevent data entry errors and provide specific feedback for corrections to ensure data quality.
- **Data Output Method**
  - **Physical Layout**
    - Output screens will display patient status in tabular format, color-coded by urgency, with charts highlighting critical cases. Detailed reports will be available for printing or digital sharing, with options to drill down for more information.
  - **Output Design and Procedures**
    - Clinicians will be able to generate reports in PDF format for printing or electronic transmission, with the option to export data to other hospital systems. Notifications will be triggered based on specific criteria, such as critical test results.

2.2 Data Design

- **Database Design**
  - **Tables**
    - The system will include tables for Patients, Visits, Departments, LabResults, CarePlans, etc. Each table will include unique keys, foreign keys, and indices for fast lookups.
  - **Normalization**
    - The database will follow the three steps of normalization to ensure data integrity and reduce redundancy.
- **Entity-Relationship Diagrams**
  - The ER diagram will show relationships between entities such as patients, departments, and diagnostic tests.
- **Data File Storage and Access**
  - Patient records and diagnostic results will be securely stored in the cloud with role-based access. Backup and recovery systems will be in place to ensure data availability.

2.3 System Architecture

- **Architecture Type**

  The system will use a three-tier architecture, including:

  1. **Presentation Layer**
     - The user interface accessible via web browsers and mobile devices.
  2. **Application Layer**
     - Handles business logic, including patient management, interdepartmental communication, and care coordination.

3. **Data Layer**
    - Manages the relational database using SQL to store patient and hospital data.

3. Phase 3: Project Plan

3.1. Implementation Tasks / Activities

1. Design the user interface and gather feedback.
2. Develop data flow diagrams and ER diagrams.
3. Code the system modules, including patient tracking and diagnostics coordination.
4. Conduct testing with EHR and other hospital systems.

3.2. Estimated Completion Time

- The project is expected to take 9 months, with 3 months dedicated to testing and staff training.

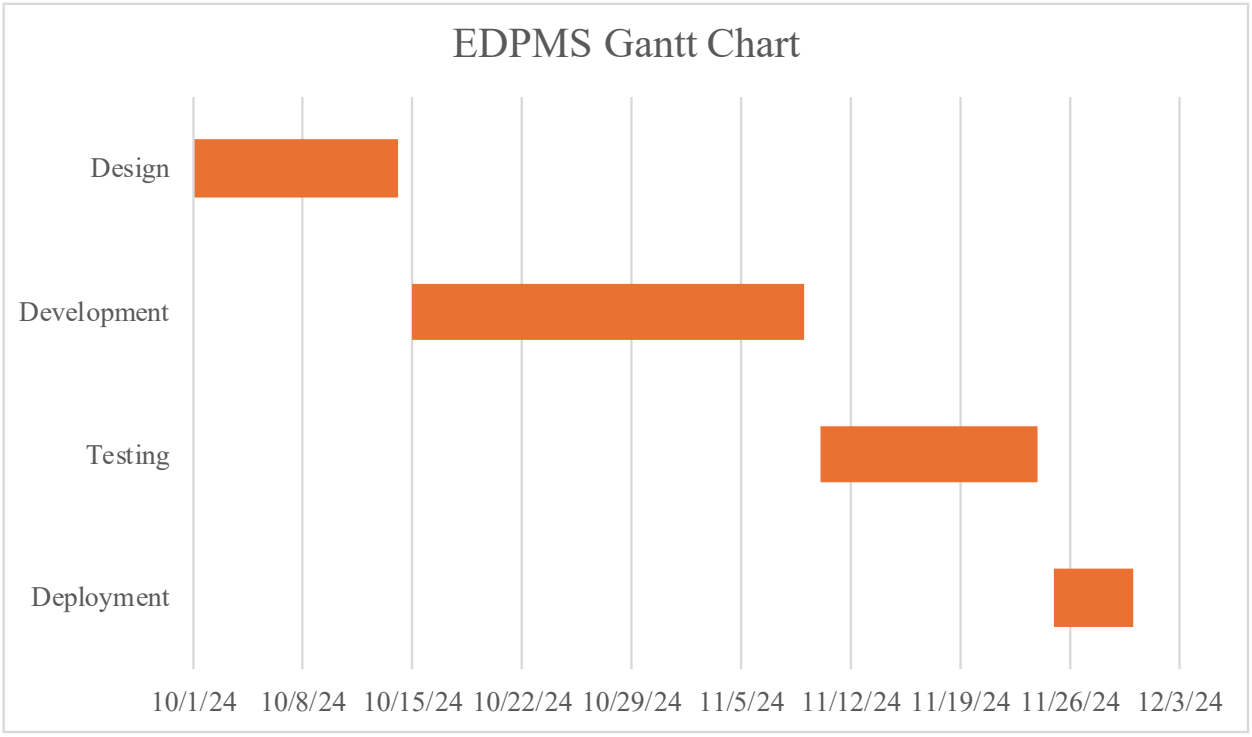
3.3. Estimated Costs

- **Development**: $500,000
- **Hardware/Infrastructure**: $100,000
- **Training/Support**: $50,000
- **Total**: $650,000

3.4. Project Schedule

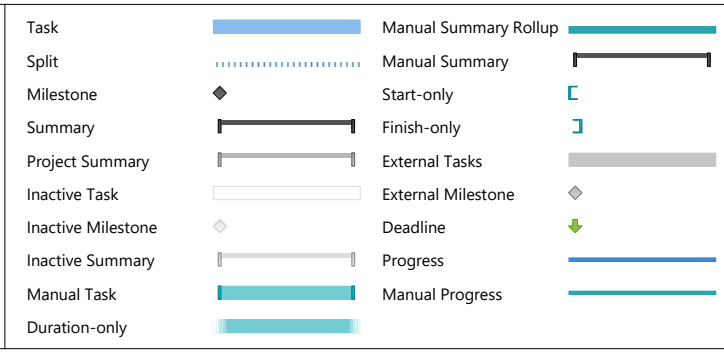
- **Gantt Chart**: A detailed timeline of tasks, from design to testing and deployment.
- **PERT Chart**: Will outline critical paths for each task to ensure timely project completion.

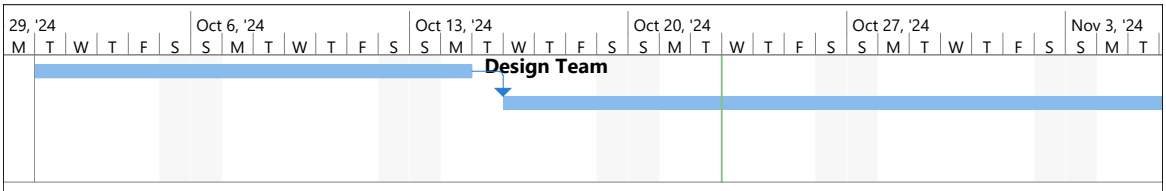
Gantt Charts



ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1		Design	10 days	Tue 10/1/24	Mon 10/14/24		Design Team
2		Development	18 days	Wed 10/16/24	Sat 11/9/24	1	Development Team
3		Testing	10 days	Mon 11/11/24	Sun 11/24/24	2	Testing Team
4		Deployment	4 days	Tue 11/26/24	Sat 11/30/24	3	Deployment Team

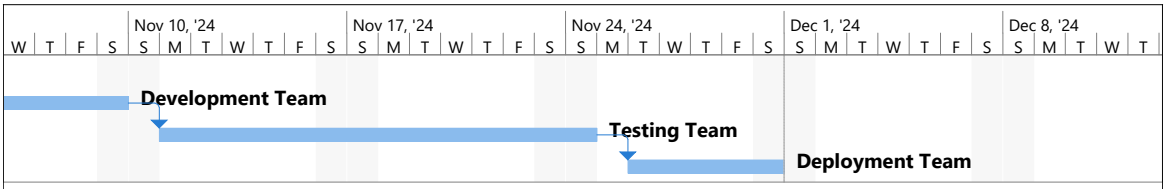
Project: EDPMS
Date: Wed 10/23/24





Project: EDPMS
Date: Wed 10/23/24

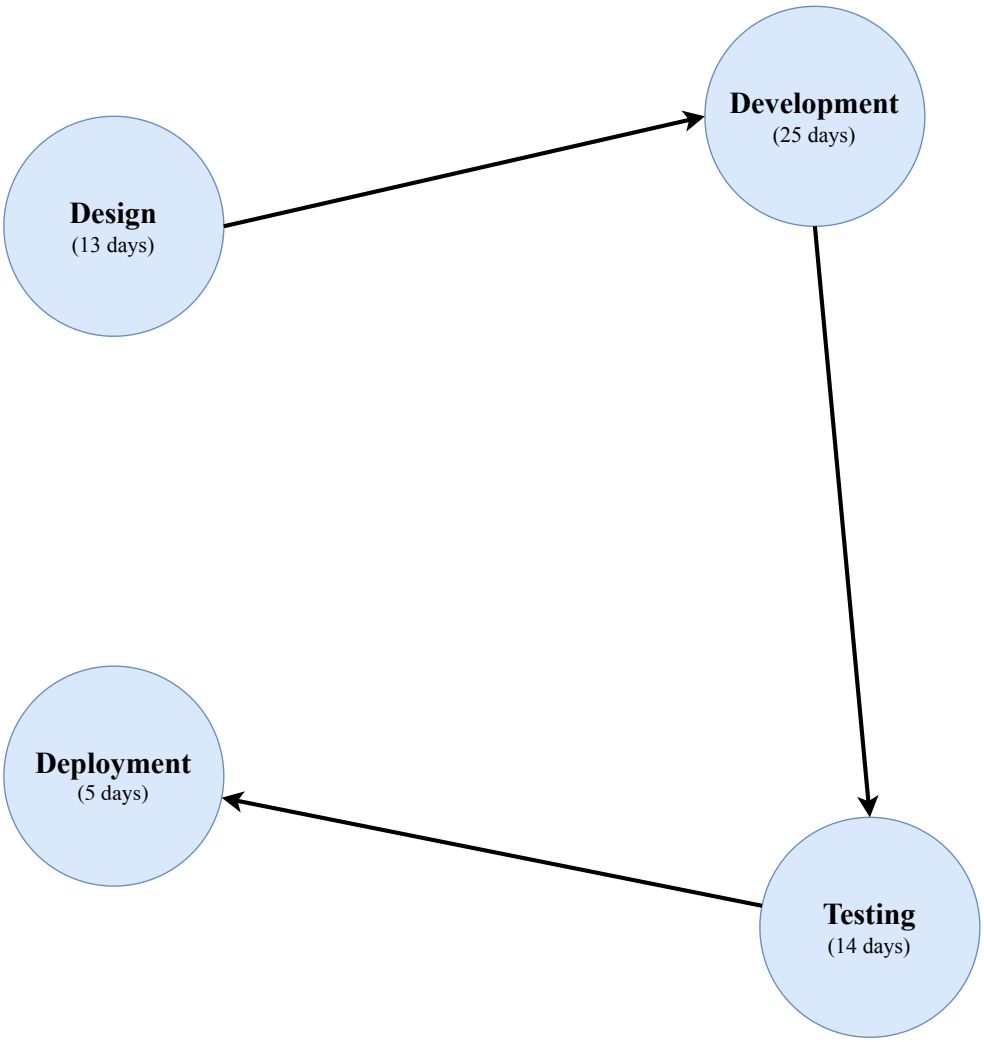
Task		Manual Summary Rollup	
Split		Manual Summary	
Milestone		Start-only	
Summary		Finish-only	
Project Summary		External Tasks	
Inactive Task		External Milestone	
Inactive Milestone		Deadline	
Inactive Summary		Progress	
Manual Task		Manual Progress	
Duration-only			



Project: EDPMS
Date: Wed 10/23/24

Task		Manual Summary Rollup	
Split		Manual Summary	
Milestone		Start-only	
Summary		Finish-only	
Project Summary		External Tasks	
Inactive Task		External Milestone	
Inactive Milestone		Deadline	
Inactive Summary		Progress	
Manual Task		Manual Progress	
Duration-only			

PERT Chart


Development
(25 days)
Design
(13 days)
Deployment
(5 days)
Testing
(14 days)

Summary

This project will design and implement a centralized Emergency Department Patient Management System (EDPMS)to address operational challenges in patient care, such as long wait times, inefficient specimen collection, and delayed diagnostics. The EDPMS will integrate real-time patient tracking, diagnostic order management, and communication between departments to streamline patient care in the emergency department.

The system will improve coordination by providing real-time visibility into patient status, enabling departments to act on critical lab and radiology results immediately, reducing delays in treatment. Integration with the existing Hospital Information System (HIS) ensures that data flows seamlessly across departments, providing healthcare providers with up-to-date patient information and facilitating smoother transitions in patient care.

Key phases of the project include:

- Phase 1: Requirement Analysis: Identifying the core problems such as communication gaps, increased wait times, and inefficient management of patient records, leading to the design of a system that offers real-time updates and critical alerts.
- Phase 2: System and Database Design: Creating a user-friendly interface and robust database architecture, ensuring the system supports seamless input, tracking, and retrieval of patient information. A three-tier architecture will be employed, with a strong focus on data integrity, security, and performance to comply with healthcare regulations like HIPAA.
- Phase 3: Project Plan: A detailed project implementation timeline using Gantt and PERT charts to ensure the project stays on track. The system will be designed, developed, tested, and deployed over nine months, with additional time allocated for staff training and system integration.

The system is projected to reduce wait times, enhance care coordination, and improve overall patient outcomes by minimizing diagnostic delays and enabling timely intervention through

critical alerts. With a total budget of $650,000, including hardware and infrastructure costs, the project will provide significant long-term benefits to the emergency department by improving efficiency and patient satisfaction.

References

Al-Ghabeesh, S. H., Thabet, A., Rayan, A., & Abu-Snieneh, H. M. (2023). Qualitative study of challenges facing emergency departments nurses in Jordan. *Heliyon*, e14141. https://doi.org/10.1016/j.heliyon.2023.e14141

Bharmal, A., & Khan, T. (2020). Tackling delays in patients requiring chest X-rays on the acute medical take. *Clinical Medicine*, *20*(Suppl 2), s74–s75. https://doi.org/10.7861/clinmed.20-2-s74

Dhanik, A., Stenson, B. A., Levenson, R. B., Antkowiak, P. S., Sanchez, L. D., & Chiu, D. T. (2024). Root Cause Analysis of Delayed Emergency Department Computed Tomography Scans. *PubMed*, *25*(2), 226–229. https://doi.org/10.5811/westjem.17831

Draw dependency graphs in draw.io. (2021). Drawio.com. https://www.drawio.com/blog/dependency-graphs

Fernandes, C. M. B., Walker, R., Pricern, A., Marsden, J., & Haley, L. (1997). Root cause analysis of laboratory delays to an emergency department. *The Journal of Emergency Medicine*, *15*(5), 735–739. https://doi.org/10.1016/s0736-4679(97)00158-3

Gross, T. K., Lane, N. E., Timm, N. L., Conners, G. P., Hoffmann, J., Hsu, B., Lee, L., Marin, J., Mazor, S., Paul, R., Saidinejad, M., Waseem, M., Cicero, M., Ishimine, P., Eisenberg, A., Fallat, M., Fanflik, P., Johnson, C. W., Kinsman, S., & Lightfoot, C. (2023). Crowding in the emergency department: Challenges and best practices for the care of children. *Pediatrics*, *151*(3). https://doi.org/10.1542/peds.2022-060972

Hwang, U., Baumlin, K., Berman, J., Chawla, N. K., Handel, D. A., Heard, K., Livote, E., Pines, J. M., Valley, M., & Yadav, K. (2010). Emergency Department Patient Volume and Troponin Laboratory Turnaround Time. *Academic Emergency Medicine*, *17*(5), 501–507. https://doi.org/10.1111/j.1553-2712.2010.00738.x

Jalili, M., Shalileh, K., Mojtahed, A., Mojtahed, M., & Moradi-Lakeh, M. (2012). Identifying causes of laboratory turnaround time delay in the emergency department. *Archives of Iranian Medicine*, *15*(12), 759–763.

Kaushik, N., Khangulov, V. S., O'Hara, M., & Arnaout, R. (2018). Reduction in laboratory turnaround time decreases emergency room length of stay. *Open Access Emergency Medicine*, *Volume 10*, 37–45. https://doi.org/10.2147/oaem.s155988

Petrino, R., Tuunainen, E., Bruzzone, G., & Garcia-Castrillo, L. (2023). Patient safety in emergency departments: a problem for health care systems? An international survey. *European Journal of Emergency Medicine*, *30*(4), 280–286. https://doi.org/10.1097/mej.0000000000001044

Present your data in a Gantt chart in Excel. (2023). Microsoft.com. https://support.microsoft.com/en-us/office/present-your-data-in-a-gantt-chart-in-excel-f8910ab4-ceda-4521-8207-f0fb34d9e2b6

Project Management Institute. (2021). *Guide to the Project Management Body of Knowledge* (7th ed.). Project Management Institute.

Shen, Y., & Lee, L. H. (2018). Improving the wait time to consultation at the emergency department. *BMJ Open Quality*, *7*(1), e000131. https://doi.org/10.1136/bmjoq-2017-000131

Sklar, D. P., & Crandall, C. (2010). What do we know about emergency department safety? *Psnet.ahrq.gov*. https://psnet.ahrq.gov/perspective/what-do-we-know-about-emergency-department-safety

Stone, H., & Baillie, S. (2019). Chest radiograph delays in the acute medical unit. *Future Healthcare Journal*, *6*(Suppl 1), 17–17. https://doi.org/10.7861/futurehosp.6-1-s17