EEX5362 Performance Modelling

Deliverable 01

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**Healthcare Delivery Process – System Details and Performance Objectives**

**1. Introduction**

Healthcare delivery is a complex and time-sensitive system that involves multiple stakeholders patients, doctors, nurses, laboratories, and administrative units.  
The effectiveness of this system directly impacts patient satisfaction and the quality of medical outcomes.  
This document focuses on analyzing and improving the Healthcare Delivery Process with measurable performance objectives that can optimize service delivery and resource utilization.

**2. System Overview**

The Healthcare Delivery Process Management System is designed to streamline patient flow in hospitals and clinics.  
It manages patient registration, doctor consultations, laboratory tests, and discharge processes while continuously tracking performance metrics.

The system aims to provide:

* Real-time visibility of patient queues
* Balanced workload distribution among staff
* Optimized appointment and treatment scheduling

By integrating data collection and performance monitoring, this system ensures smoother operations and a better experience for both patients and healthcare professionals.

**3. Problem Definition**

In most healthcare facilities, inefficiencies in scheduling and coordination lead to:

* Prolonged waiting times
* Congestion during peak hours
* Underutilization of certain medical staff or facilities

These challenges contribute to:

* Delays in diagnosis and treatment
* Reduced daily patient handling capacity
* Low satisfaction among patients and staff

The high-level issue is the lack of dynamic management of patient flow and resource allocation, especially when patient inflow fluctuates throughout the day.

**4. Data Set and Attributes**

The system gathers performance data from various operational points such as registration desks, consultation rooms, and treatment wards.

|  |  |
| --- | --- |
| **Field Name** | Description |
| Patient\_ID | Unique code assigned to each patient |
| CheckIn\_Time | Time when the patient arrives at the hospital |
| Registration\_Duration | Time spent completing initial paperwork |
| Consultation\_Start | When the consultation begins |
| Consultation\_End | When the consultation finishes |
| Department | The unit or ward (OPD, Emergency, Pediatrics, etc.) |
| Doctor\_ID | Doctor handling the case |
| Waiting\_Time | Total time the patient waited before seeing a doctor |
| Treatment\_Time | Time taken for diagnosis or procedure |
| Bed\_Occupancy | Availability status of hospital beds |

Sample Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Patient\_ID** | CheckIn\_Time | Consultation\_Start | Consultation\_End | Department | Doctor\_ID | Waiting\_Time (min) | Treatment\_Time (min) |
| P001 | 08:10 | 08:35 | 08:50 | OPD | D05 | 25 | 15 |
| P002 | 08:25 | 08:50 | 09:05 | OPD | D07 | 25 | 15 |
| P003 | 08:30 | 09:00 | 09:20 | Emergency | D09 | 30 | 20 |

This dataset helps in analyzing delays, utilization, and process efficiency within different departments.

**5. Performance Objectives**

The performance analysis for the Healthcare Delivery Process focuses on the following measurable goals:

**Objective 1 – Reduce Waiting Time**

Develop optimized patient scheduling to cut average waiting time before consultation and treatment.

**Objective 2 – Improve Throughput**

Enhance the number of patients served daily without increasing staff workload.

**Objective 3 – Detect Bottlenecks**

Identify stages (e.g., registration, consultation, or testing) that cause delays and propose targeted improvements.

**Objective 4 – Enhance Resource Utilization**

Ensure doctors, nurses, and diagnostic facilities are efficiently distributed across departments.

**Objective 5 – Ensure Scalability**

Enable the healthcare process to function effectively during unexpected surges in patient visits (e.g., flu season, emergencies).

**6. Performance Indicators**

To measure system improvement, the following metrics will be tracked:

* Average patient waiting time (minutes)
* Number of patients treated per hour
* Doctor and nurse workload ratio
* Bed utilization rate (%)
* Average consultation duration

**7. Expected Improvements**

Based on system optimization, the expected outcomes include:

* 60% reduction in patient waiting times
* 25–35% increase in daily patient handling capacity
* Even distribution of work among healthcare staff
* Improved patient satisfaction scores
* Reduced congestion in waiting areas during peak hours

**8. Conclusion**

The Healthcare Delivery Process Optimization approach focuses on data-driven decision-making to enhance hospital performance.  
By continuously monitoring and refining queue management, staff assignment, and scheduling systems, healthcare providers can deliver faster, fairer, and more reliable medical services.  
Ultimately, this leads to higher efficiency, improved scalability, and a better experience for patients and healthcare workers alike.