From: Dr. Emily Carter – Chief Operations Officer, **Midwest Health Alliance**
To: ABC Company – Data Engineering Solutions Partner
Subject: Development of a Real-Time Data Platform for Patient Flow & Bed Occupancy Analytics.

1. Business Background

Midwest Health Alliance (MHA) is a network of **7 hospitals** across the Midwest region. We face daily challenges in **patient flow management**, especially during high-demand periods such as seasonal flu outbreaks.
We lack a centralized, real-time data system to monitor **bed occupancy**, **patient admission/discharge patterns**, and **department load**.

2. Business Objectives

- **Monitoring patient admissions** to minimize waiting times.
- **Identify department-level bottlenecks** (e.g., Emergency, Surgery, ICU).
- **Enable gender-based and age-based KPIs** for demographic insights.
- **Automate Alerts in case of failures**.

3. Functional Requirements

1. **Data Sources**
   a. Real-time patient admission/discharge data from hospital registration systems.
   b. Daily batch extracts from Electronic Health Records (EHR) systems.
   c. Department metadata (capacity, staff numbers).
2. **Data Processing & Storage**.
   a. Store data in a **Medallion architecture** (Bronze → Silver → Gold) .
   b. Handle **schema evolution** when new patient attributes are introduced.

c. Implement **Slowly Changing Dimension Type 2 (SCD2)** for patient and department history.
    d. Implement **Star schema** for storing the tables.
3. **Analytics**
    a. Use **Azure Synapse** for analytics queries.
    b. Build **dashboards in Power BI** with KPIs such as:
        i. Current occupancy % by department
        ii. Gender-based occupancy distribution
        iii. Average length of stay per patient
4. **Orchestration & Automation**
    a. Use **Azure Data Factory** to automate:
        i. Daily batch ingestion from EHR
        ii. Real-time processing triggers
        iii. Gold-layer refresh for dashboards
5. **Data Quality**
    a. Simulate realistic dirty data issues (e.g., missing admission times, duplicate patient IDs, wrong timestamps) and handle them in Silver layer processing.
6. **Security & Compliance**
    a. Role-based access control for different hospital departments.

4. Deliverables

- Fully functional Azure-based data pipeline.
- Power BI dashboard connected to live Synapse queries.
- Data quality & validation reports.
- Full project documentation (architecture, data models, Git repo).

5. Success Criteria

- Dashboards refresh often for real-time views.
- All pipelines fully automated via ADF.
- Schema changes do not cause downtime.