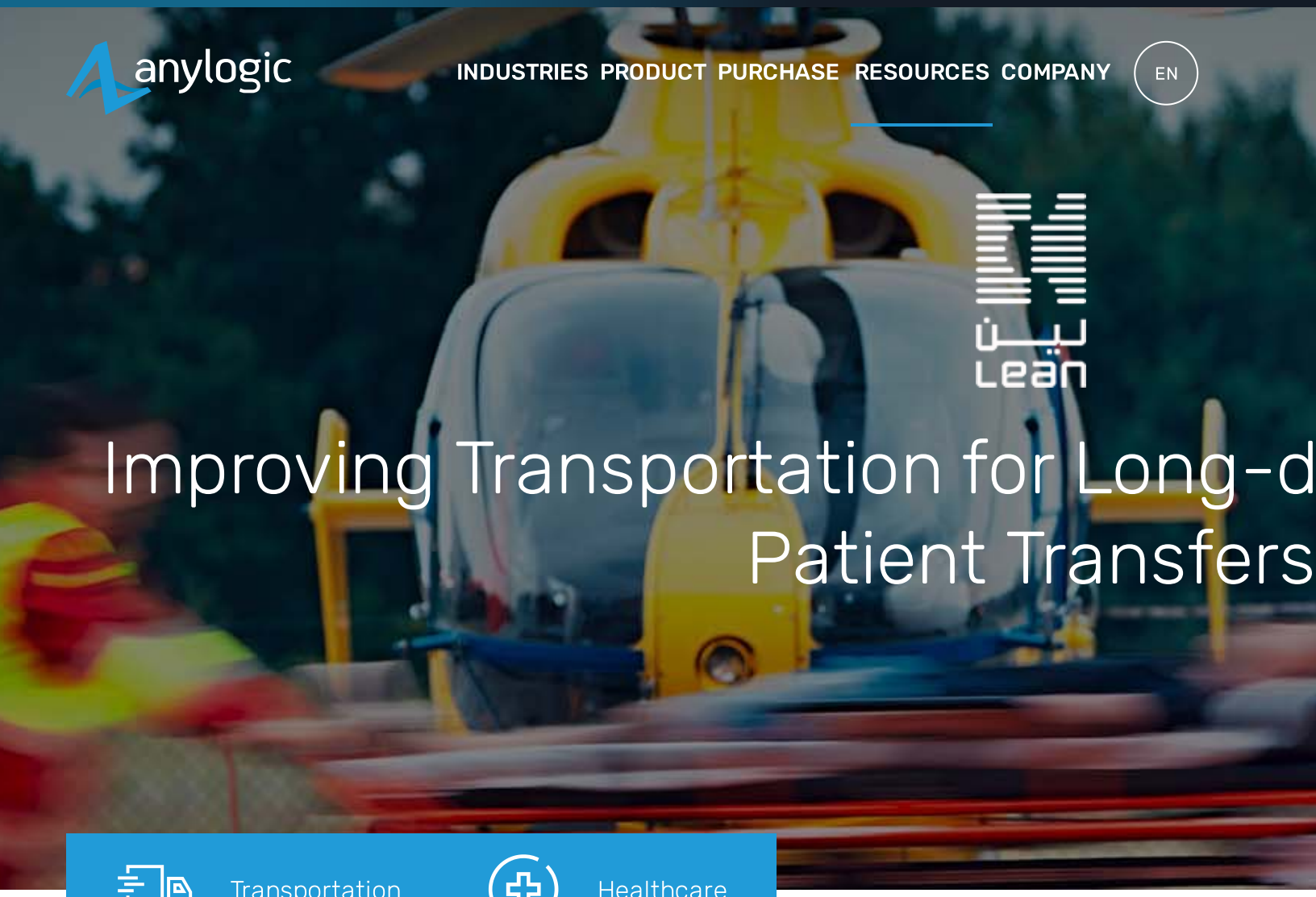


# Improving Transportation for Long-d Patient Transfers

Transportation Healthcare

Lean Business Services is a government-owned company in Saudi Arabia and the leader in serving and developing innovations for the health sector. The company focuses on digitizing the Saudi health ecosystem and improving healthcare resource utilization.

## Problem

- Difficulties for people with serious health conditions

The simulation of medical transfers using AnyLogic as a transportation logistics software was aimed at helping improve patient transportation by tackling ambulance transfer problems. Also, as healthcare analytics software, AnyLogic defined the impact of each major variable and evaluated different scenarios and possibilities, so that decision-makers could develop KPI for each case.

# Solution

The proposed solution for patient transportation was to supplement or replace road ambulances with aircraft. Three transfer scenarios were considered when building the model:

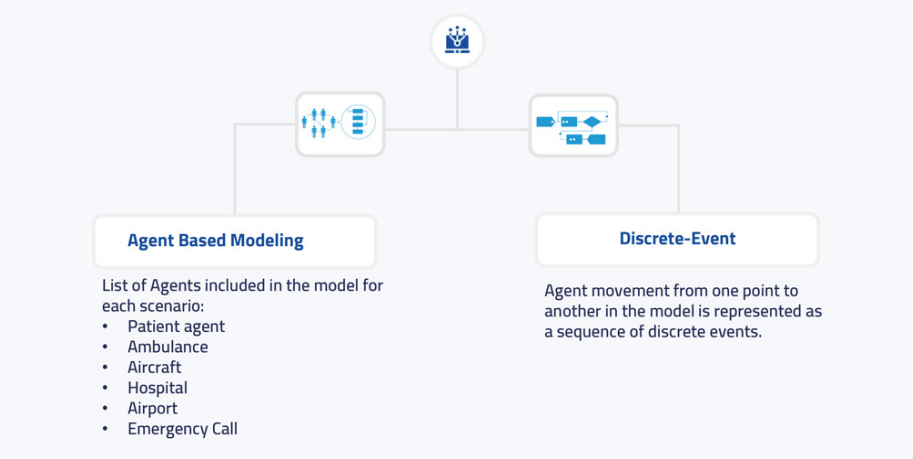
- Air transfer between airports only
- Air transfer from hospital to receiving airport
- Air transfer from hospital to hospital


Transfer scenarios for the model

(click to enlarge)

Modeling these scenarios would help study the impact of each scenario compared to the actual 'as-is' state of road-only transport.

Lean Business Services developed a hybrid model that employed both agent-based and discrete event




Simulation of medical transports diagram (click to enlarge)

Patients are also represented as agents and have parameters relating to their location, date, and time. The journeys between locations, however, are modeled as discrete event processes because they are best described as a sequence of separate events.

How the agents behave during a simulation run provides insights into the effectiveness of different scenarios. When the model is run and an emergency call is received, results for each transfer scenario are calculated for the KPI and to provide insights. In this way, it is possible to discover the effectiveness of each transfer scenario when faced with many different patient situations.

utilization:

- Number of doctors, nurses, ambulance drivers, or other health workers
- Cost of patient transportation
- Night-flight bans
- Short distance air transfer permissions

The simulation model developed by Lean Business Services also contains a GIS map that shows the patient transfer process.


GIS map showing patient transfer process (click to enlarge)

Overall, the company was able to analyze many strategic indicators:

- Average transport duration
- Average number of unavailable medical staff
- Total cost of transportation
- Number of aircraft by type

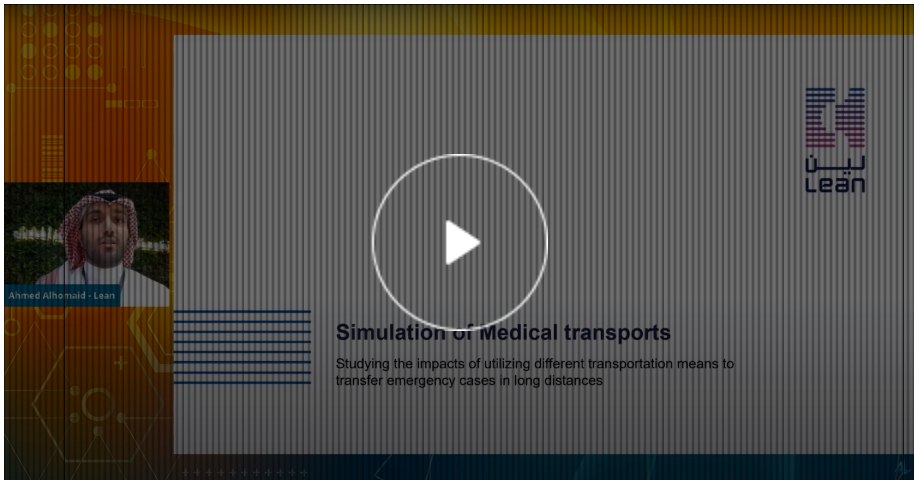
Based on the outcome of the simulations, the transfer of patients using aircraft for the direct hospital-to-hospital scenario was recommended for three main reasons:

- Low implementation cost
- Lowest average trip time
- Lowest average for the number of unavailable medical staff

Combining discrete event and agent-based simulation paradigms allowed the simulation engineers to make an easily scalable model. It could accommodate the addition of alternative scenarios from transportation logistics software as they were developed, such as changing patient transportation modes, and the addition of new resources at locations.

The case study was presented by Ahmed Alhomaid, of Lean Business Services, at the AnyLogic Conference 2021.

The slides are available as a PDF >>



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