Emergency Department Simulation

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Abstract

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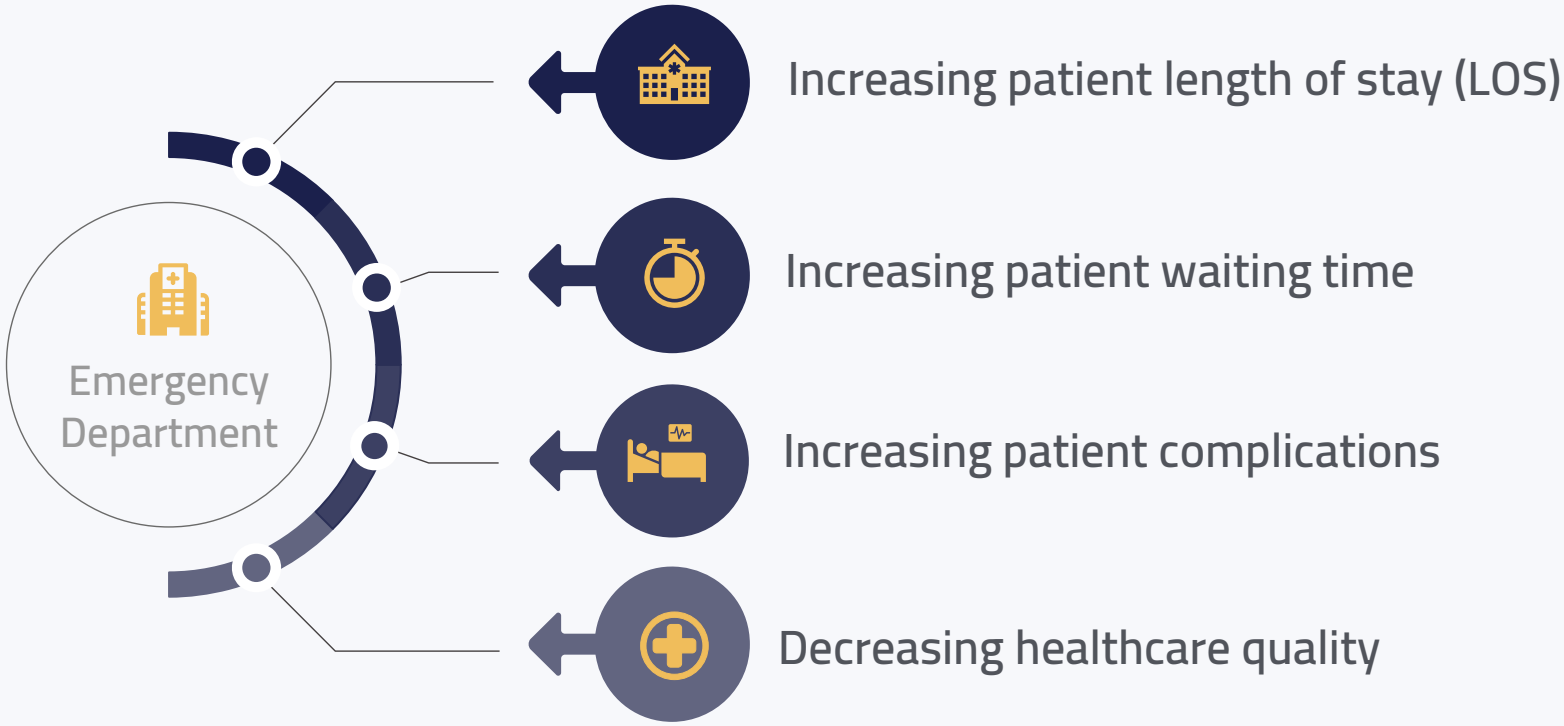
In Emergency departments (EDs), crowding causes a series of negative effects, e.g. medical errors, poor patient treatment, long length of patient stay, and general patient dissatisfaction.

One road for ER departments to perform its functions optimally, is a proper management of resources and personnel as best appropriate for each incident.

A simulation model using Discrete-Event paradigm has been developed to enable intelligent management of resources and lead to a smooth patient flow and lower length of patient stay.

Problem

Overcrowding in emergency departments causes several issues:



Simulation Outcomes

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- Assisting emergency department managers and decision makers to make decisions by analyzing and evaluating different scenarios before implementing them in real life.
- Identifying the full capacity limit in emergency departments
- Identifying root cause of ER department problems
- Identifying areas of improvement
- Decreasing patient waiting time
- Understanding and raising resources utilization
- Support in managing health resources

Building ER Simulation Flow

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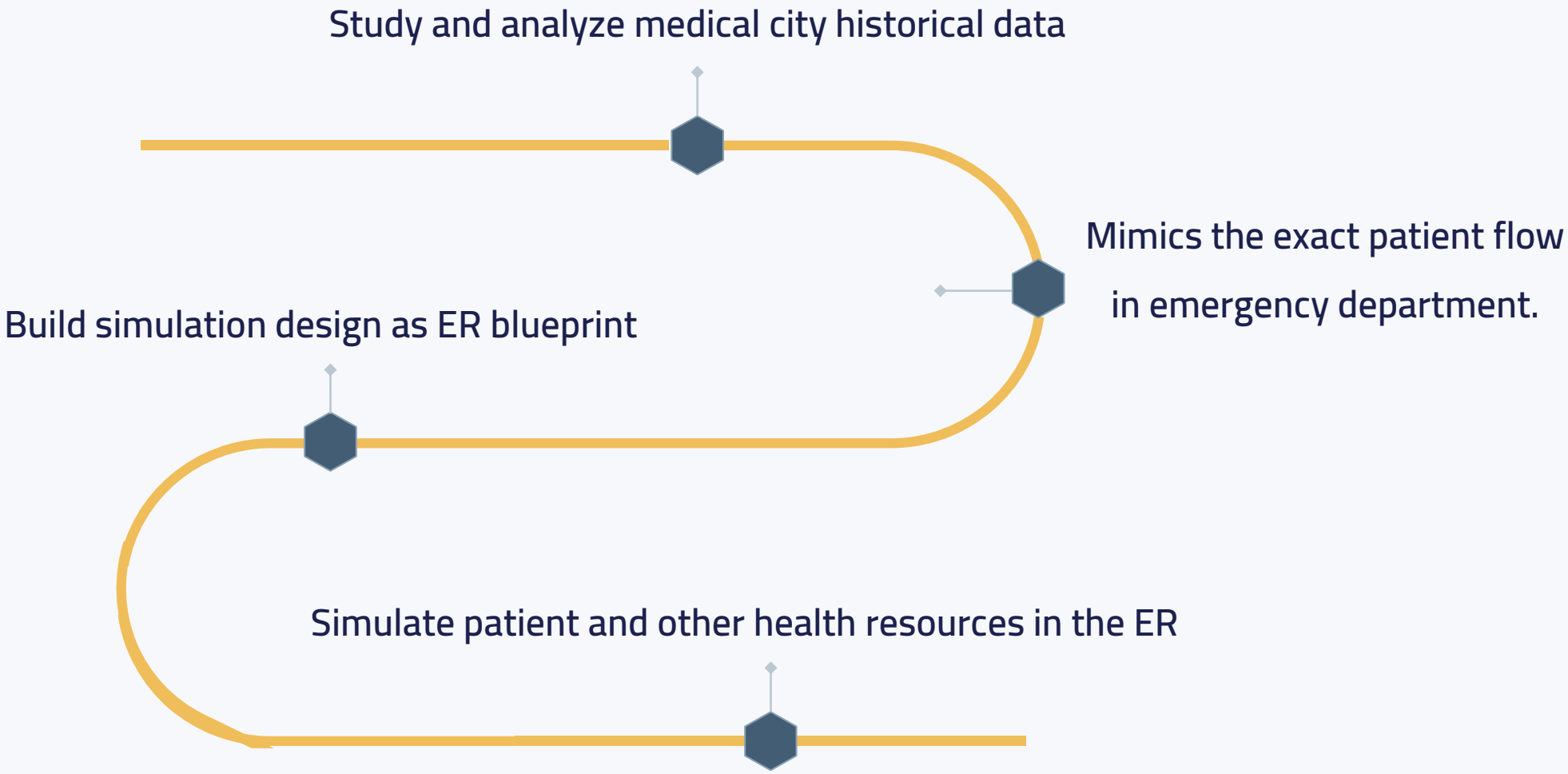

ER Simulation

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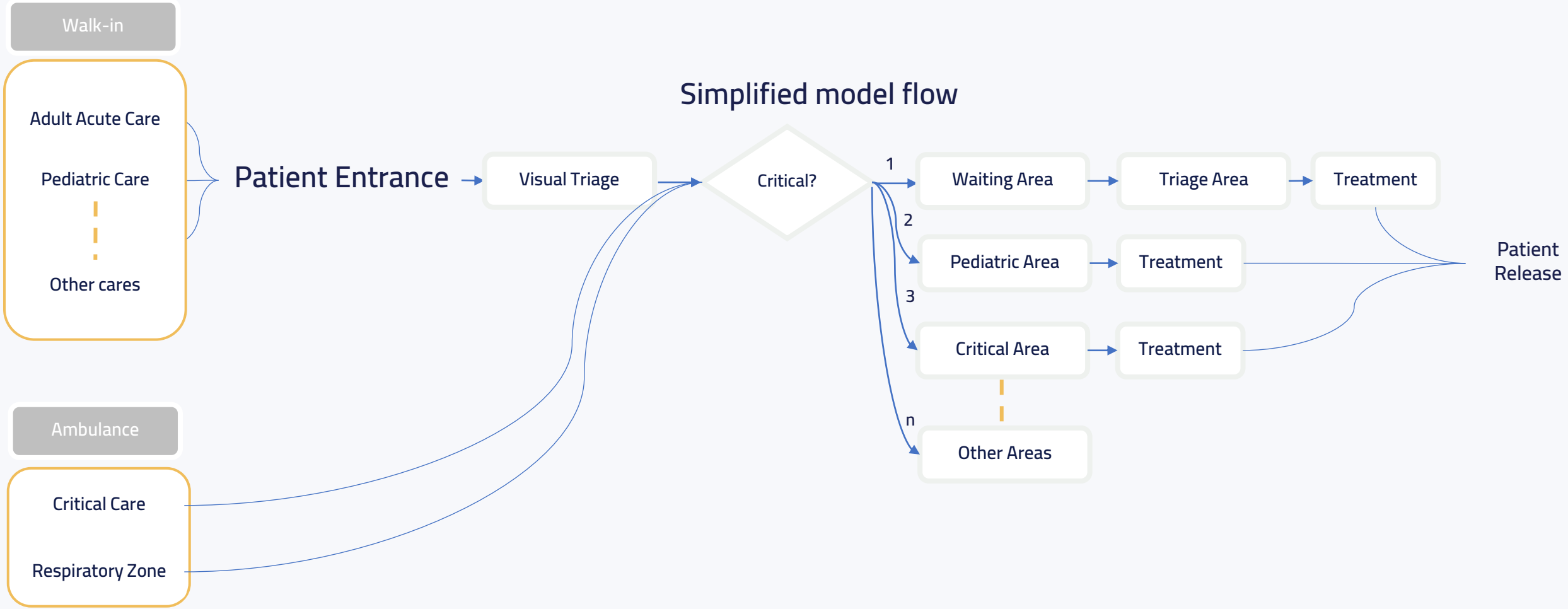
ER Simulation model has been implemented using Discrete-Event Paradigm for modeling the operation of emergency department and modeling patient flows.



ER Simulation Scenarios

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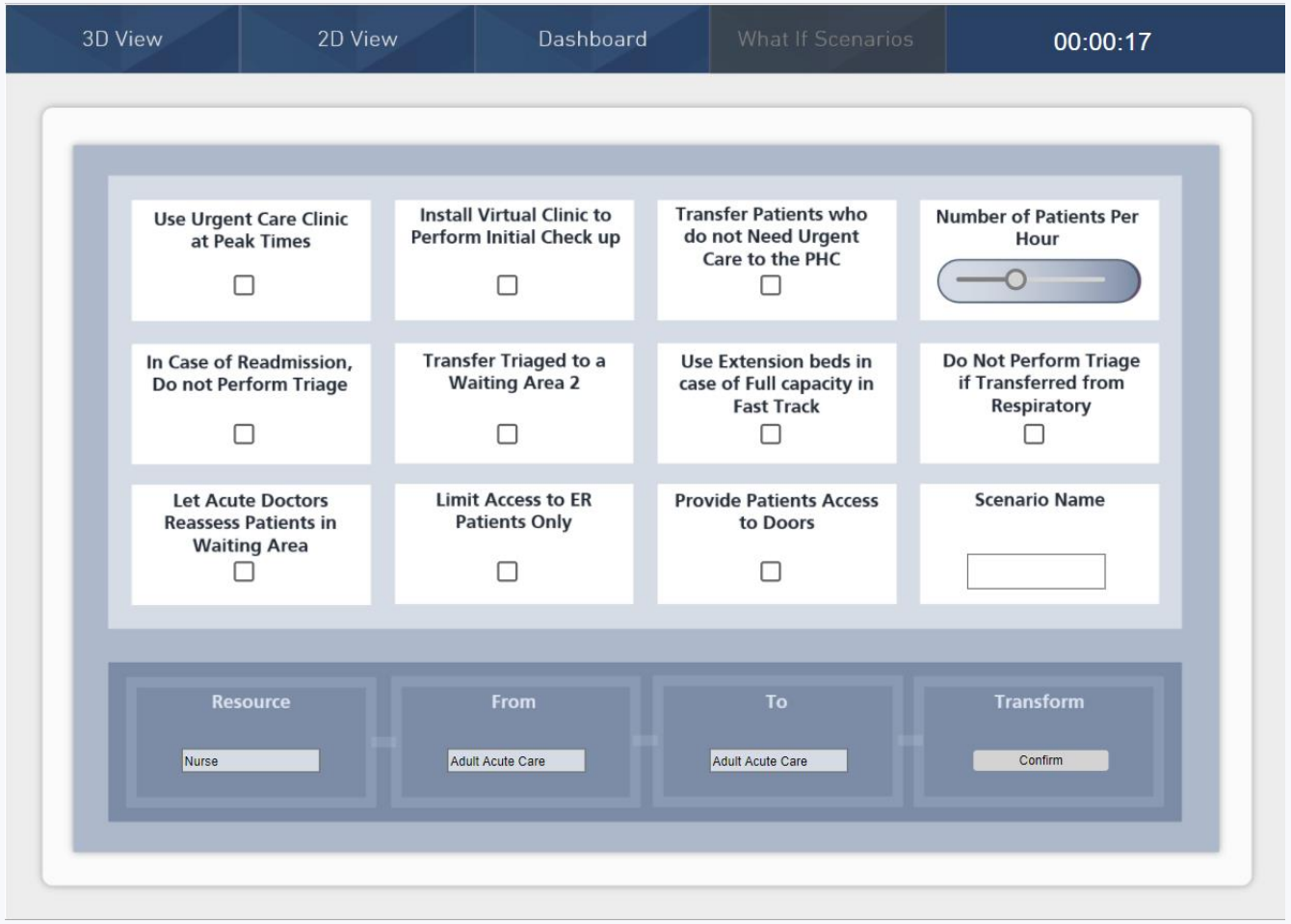
ER Simulation model provide some what-if scenarios to see the changes that when applied, the operation of the ER Department will be affected.



ER Simulation Indicators

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The simulation model will provide some insightful indicators, as it simulates six different areas in emergency department, for each area the simulation will provide:

- Average LOS
- Average utilization
- Average waiting time
- Average Health Resources Utilization
- Average doctor's utilization
- Average nurse utilization
- Average rooms utilization
- Average bed utilization
- Length of stay distribution
- Waiting time distribution
- Current patients and total patients in each care area

Simulation Features

Friendly interface and Expert mode

A well-designed user interface, in a 2D and 3D views, to show the operation of the emergency department and the exact patient flow within the emergency department and run multiple and adjustable scenarios with expert mode capability.

Adoptability

The model can accommodate situations in ER Departments

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