What is System Dynamics?

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Aims of this introduction

- System dynamics methodology
  - Tool for modelling healthcare systems

- Explain system dynamics with a simple model of planned inpatient activity
  - …. model hospital waiting lists, change in behaviour

What is system dynamics?

- Grew out of Industrial Dynamics 1950s - 1970s
  - based on systems theory ideas
  - Originator was Jay Forrester

- Key features
  - Model structure
  - Causal connections
  - Delays

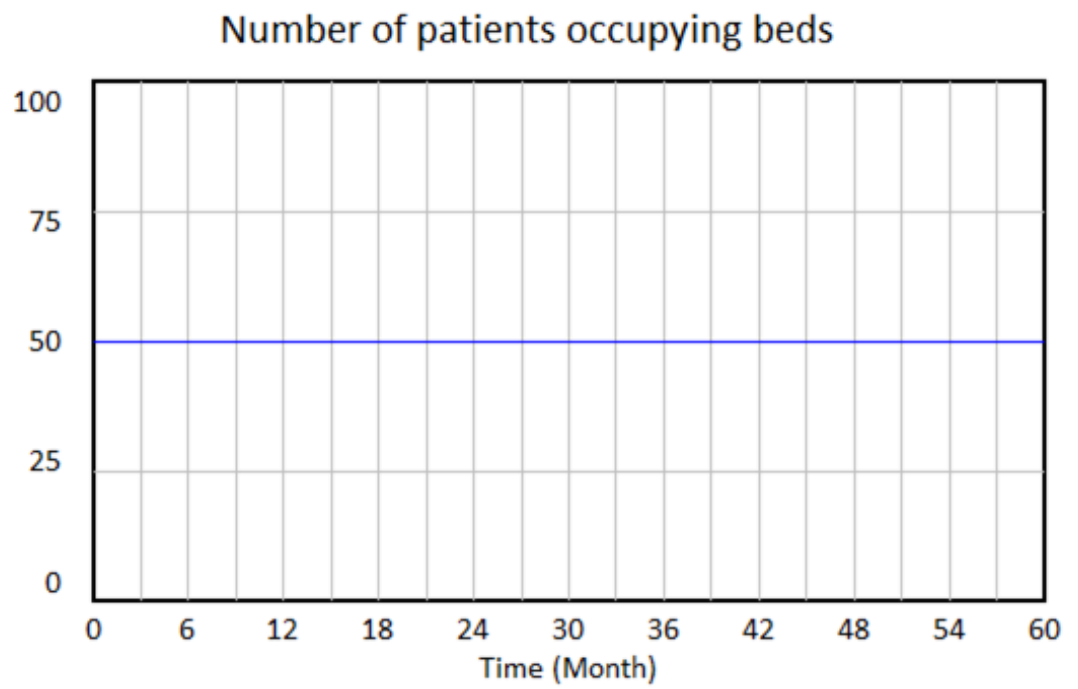
- System structure determines behaviour
- Feedback and control

Stock

Variable

Number of people in beds in a ward

Remains the same unless something changes

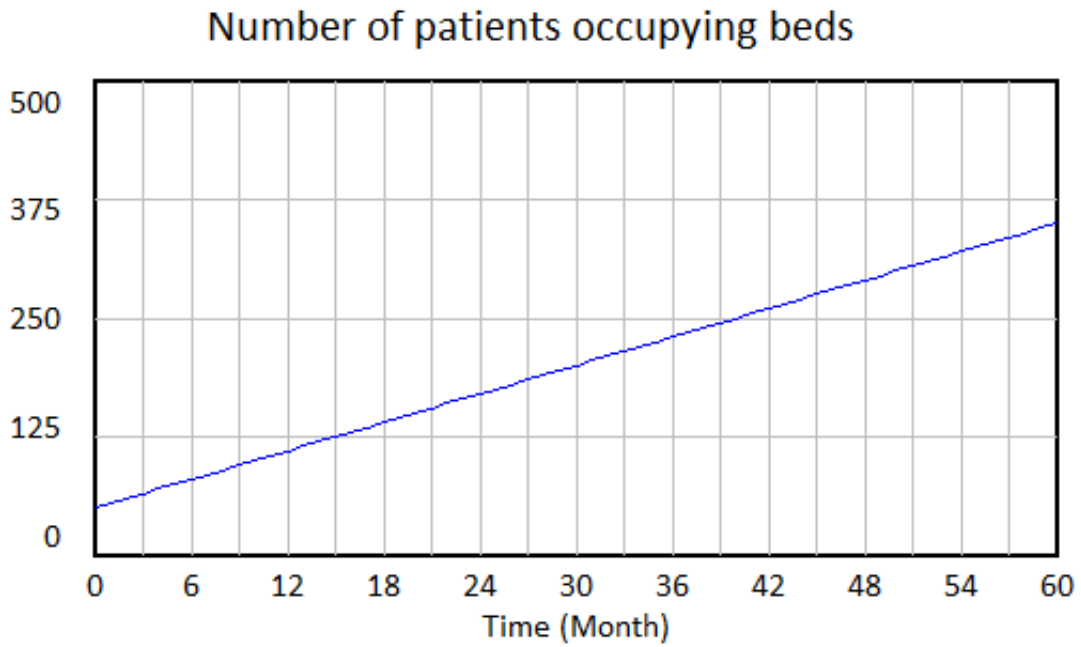


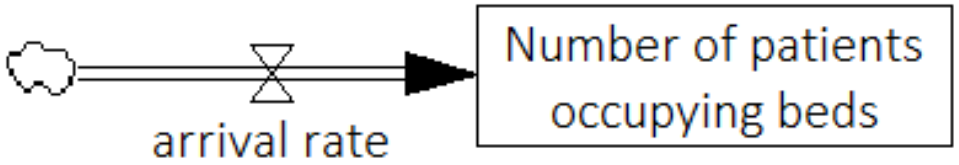
Number of patients occupying beds

Flow

Adds to stock

"per month" (per time unit)

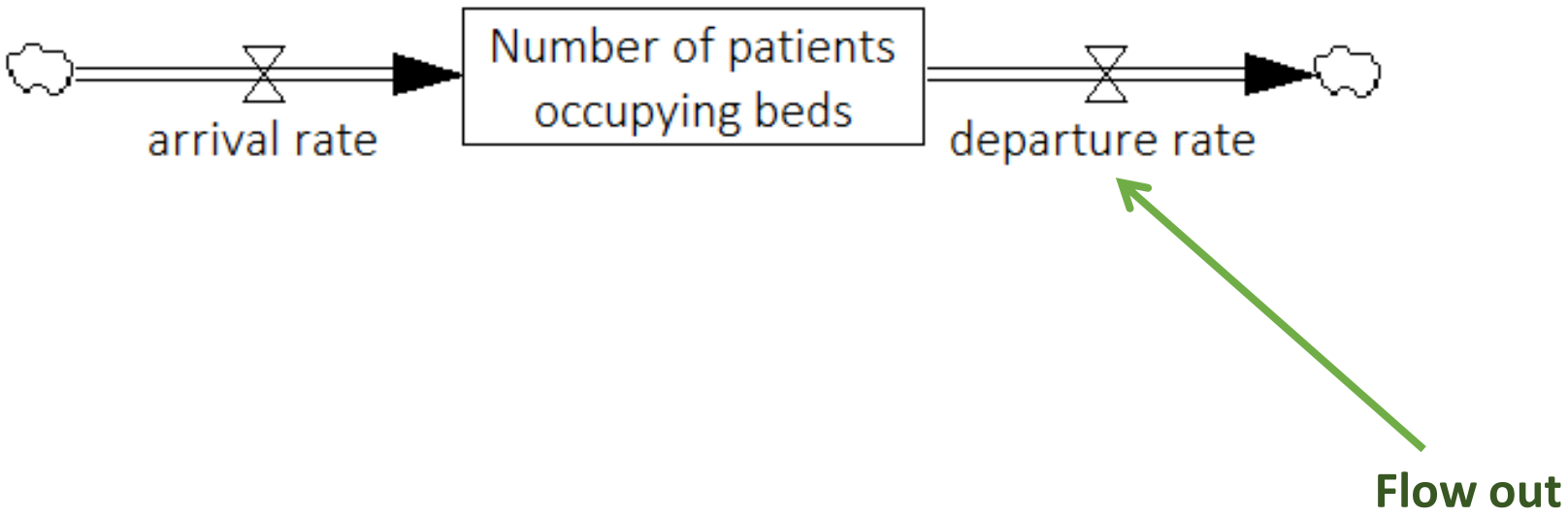




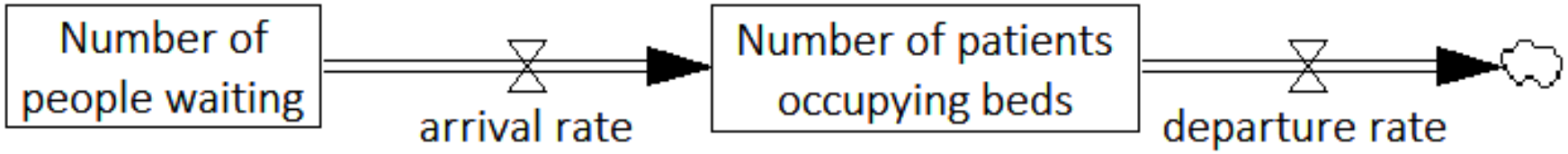
Flow in

Hypothesis:	5 new arrivals each month
Structure:	Constant recruitment
Behaviour:	Straight line growth

Building the waiting list structure: stocks & flows



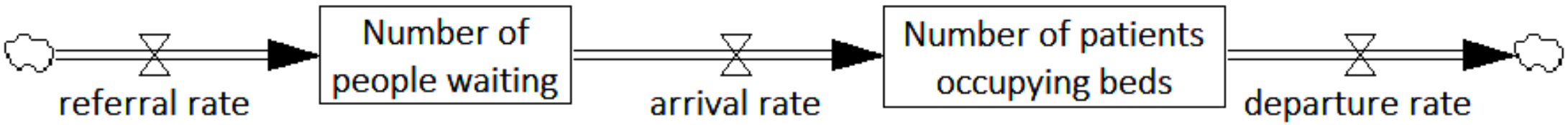
Building the waiting list structure: stocks & flows



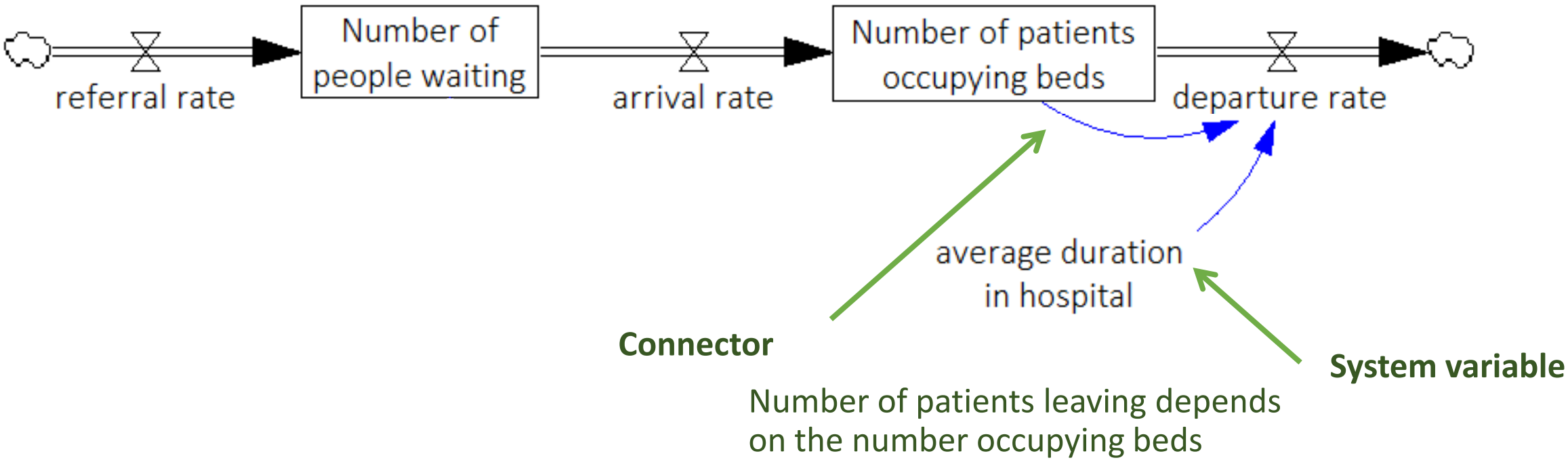
Stock:

Flow in from … waiting list

Building the waiting list structure: stocks & flows

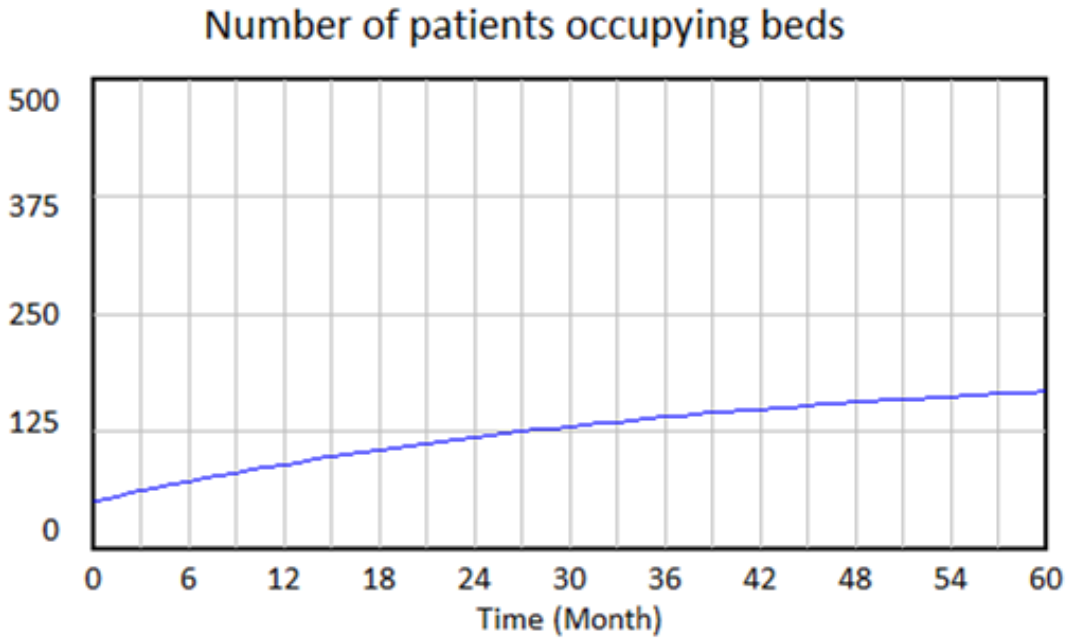


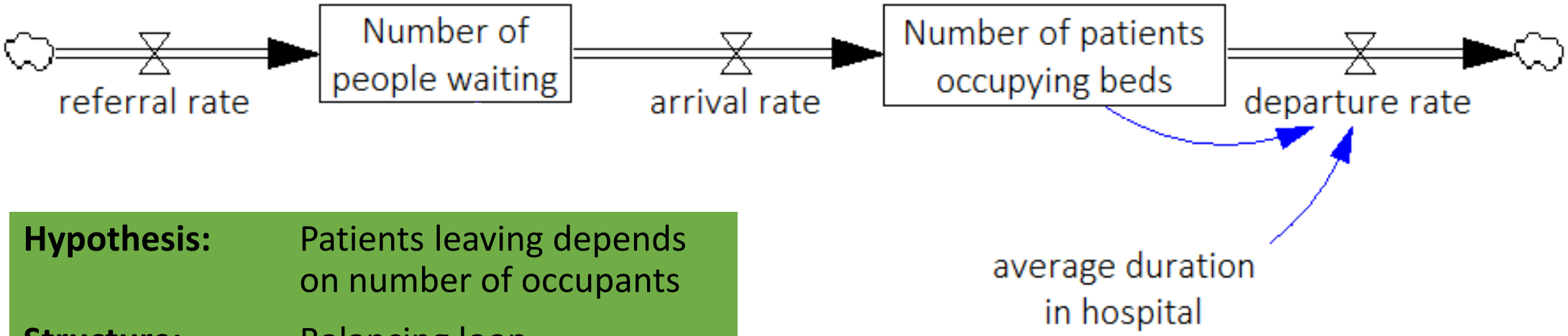
Connector
(information flow)



Balancing Feedback Loop

Hypothesis → Structure → Behaviour

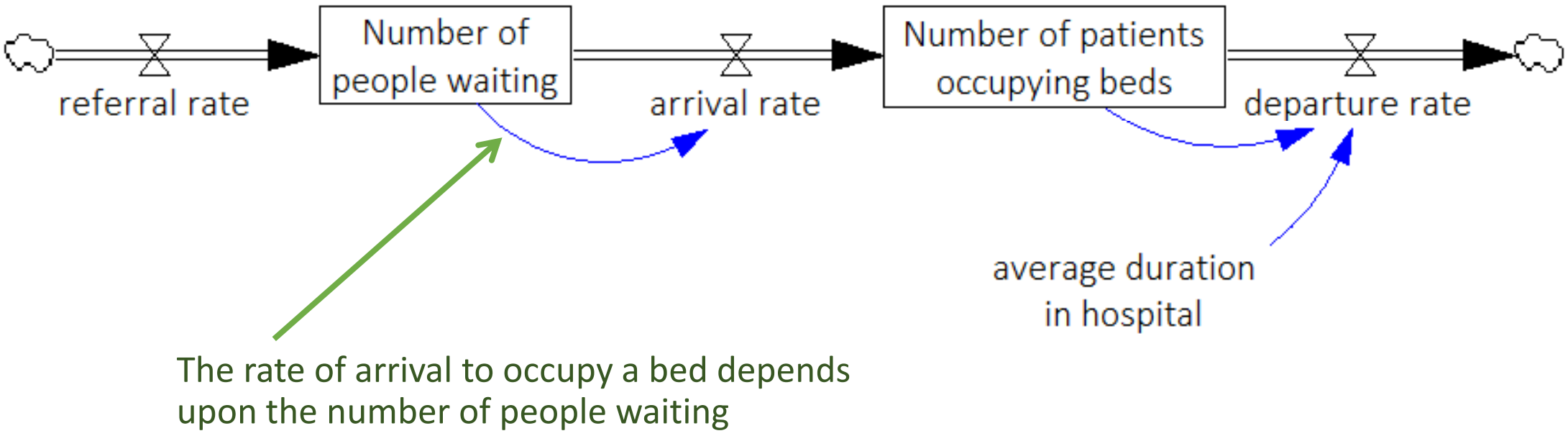




Hypothesis:	Patients leaving depends on number of occupants
Structure:	Balancing loop
Behaviour:	Slowing growth

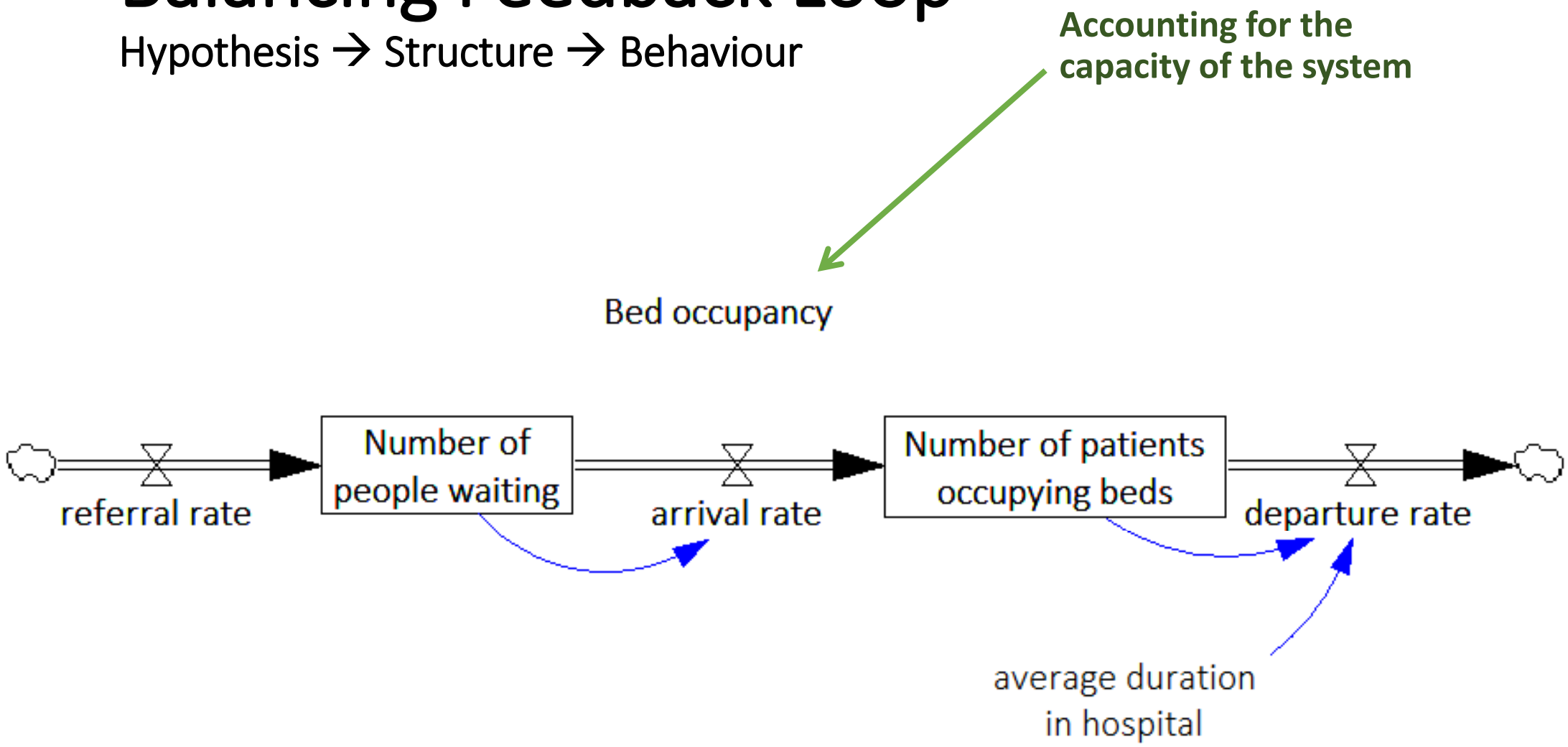
Reinforcing Feedback Loop

Hypothesis → Structure → Behaviour



Balancing Feedback Loop

Hypothesis → Structure → Behaviour



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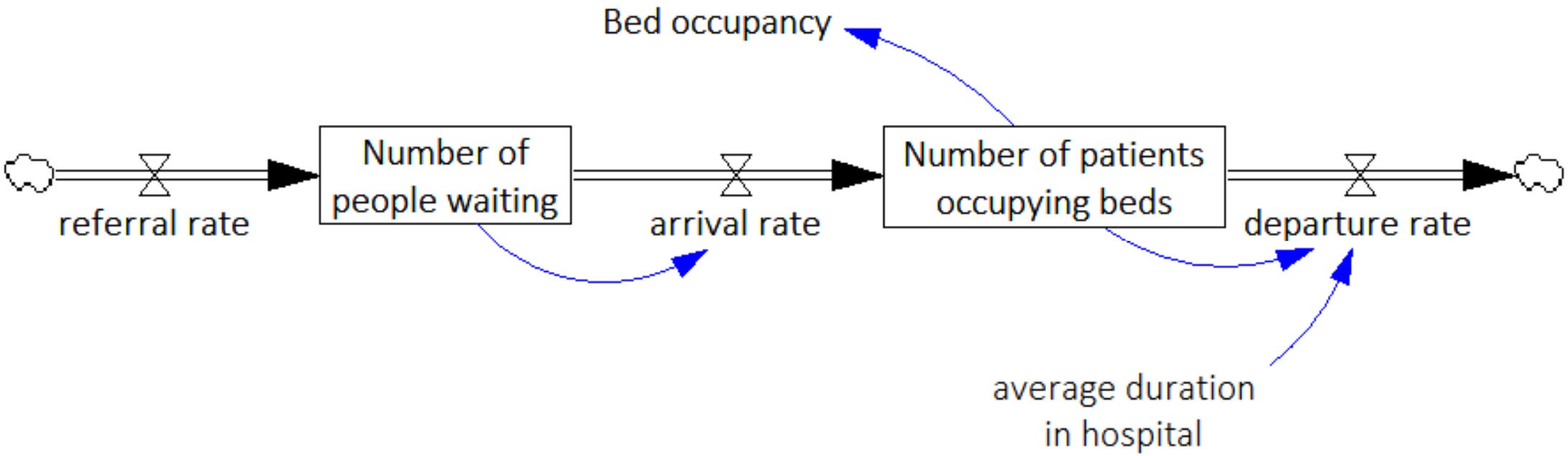

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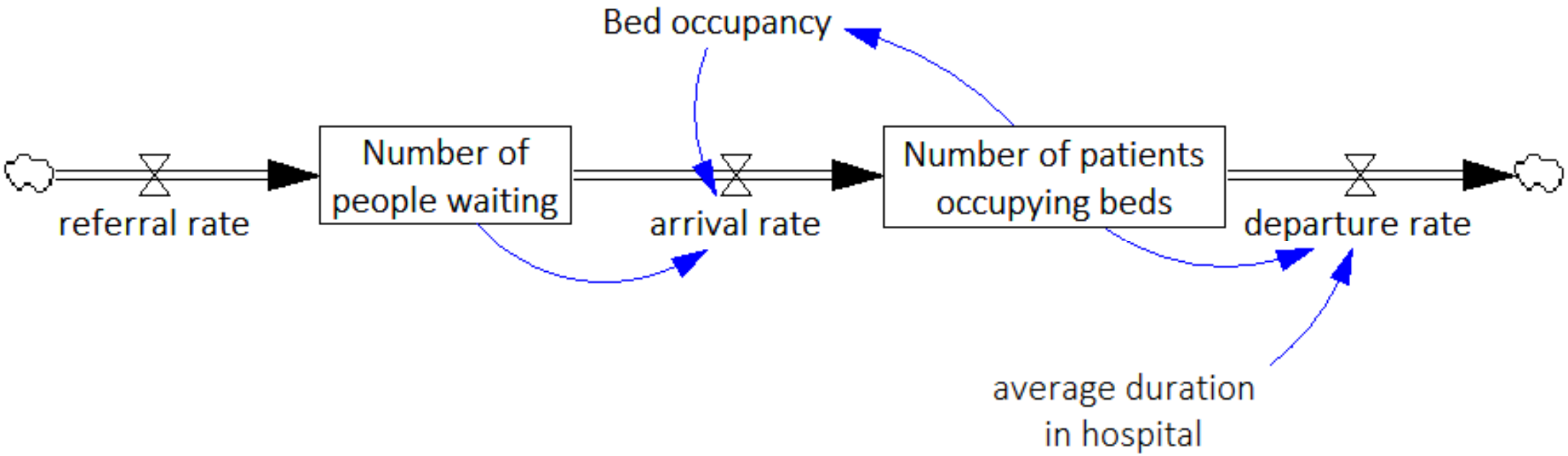


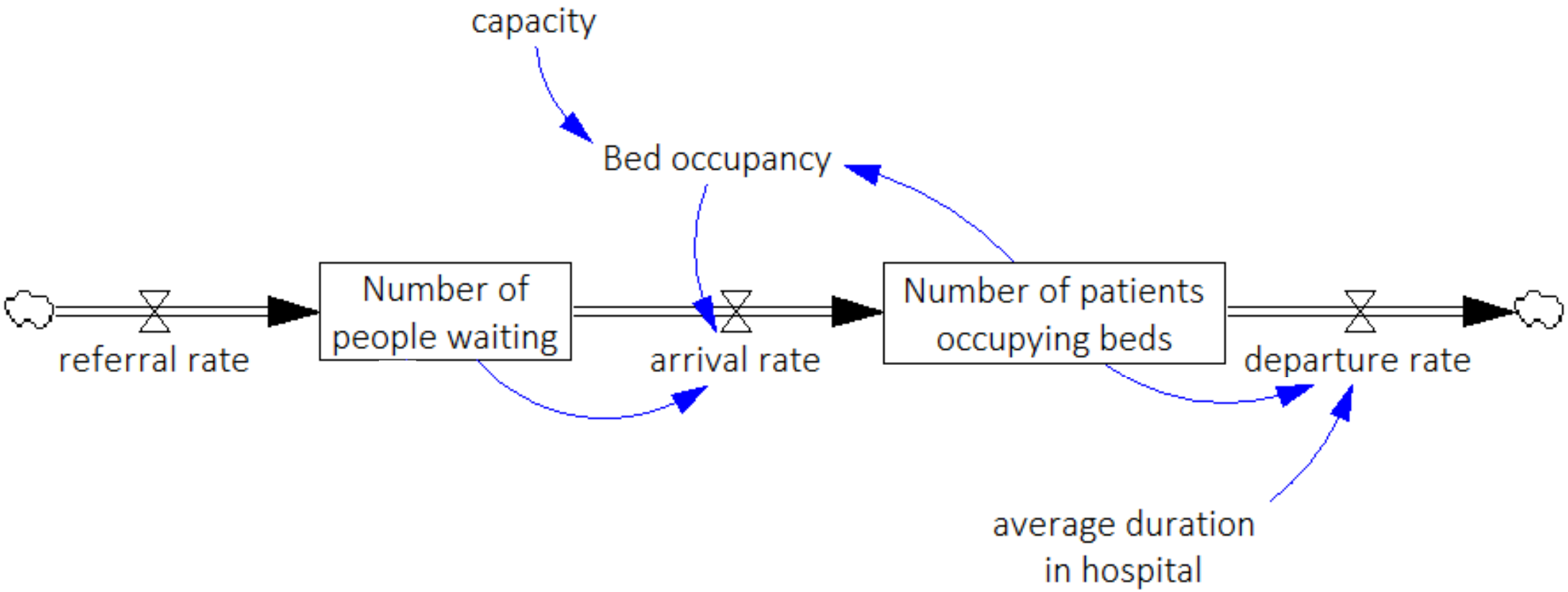
Balancing Feedback Loop

Hypothesis → Structure → Behaviour

Referral rate > departure rate

Inflow > outflow

Exponential growth of waiting list



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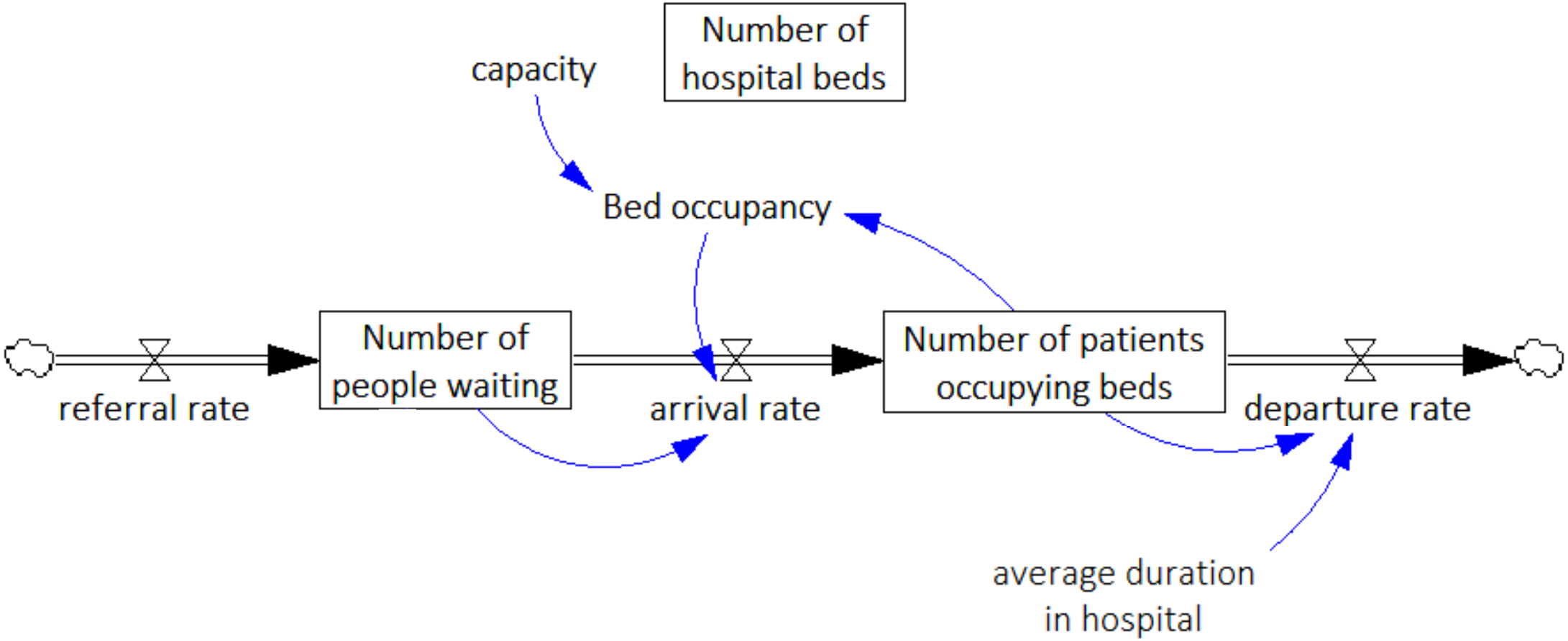

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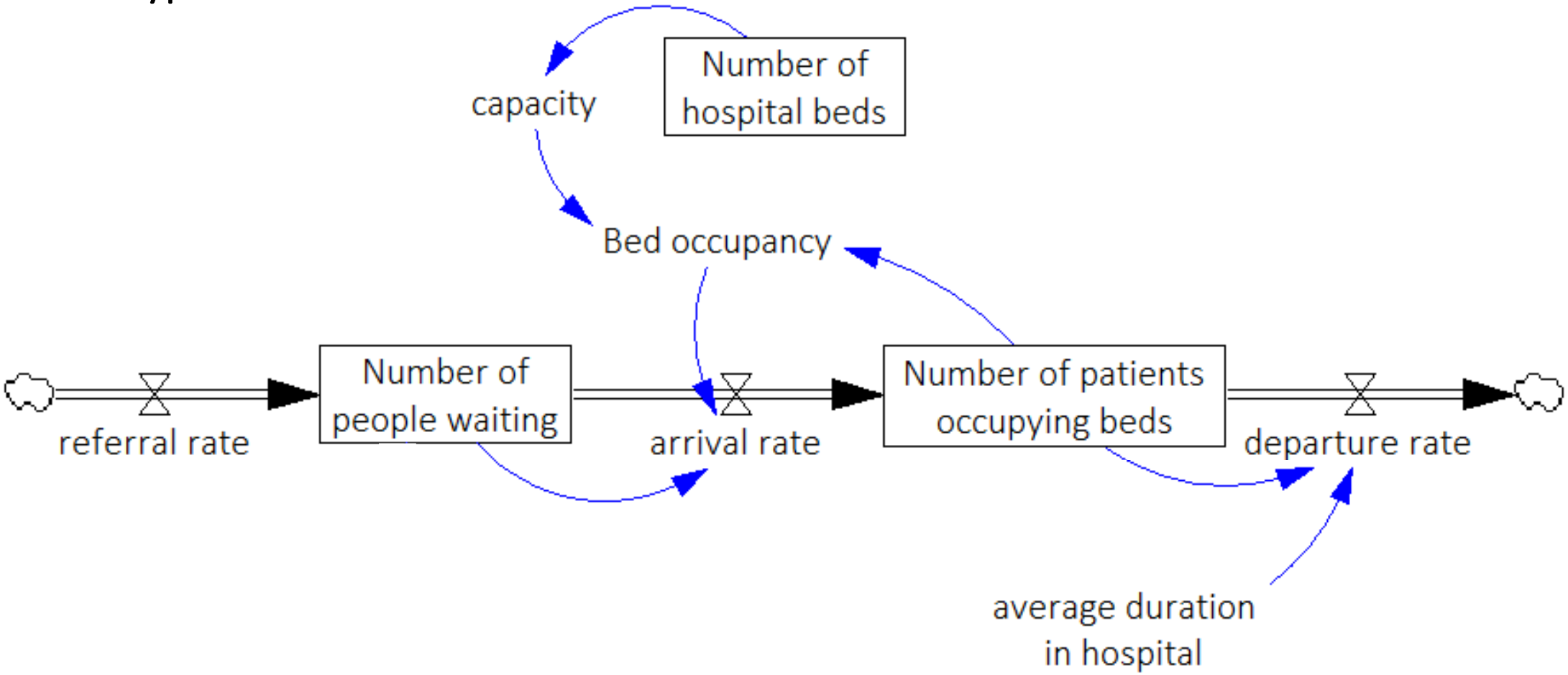
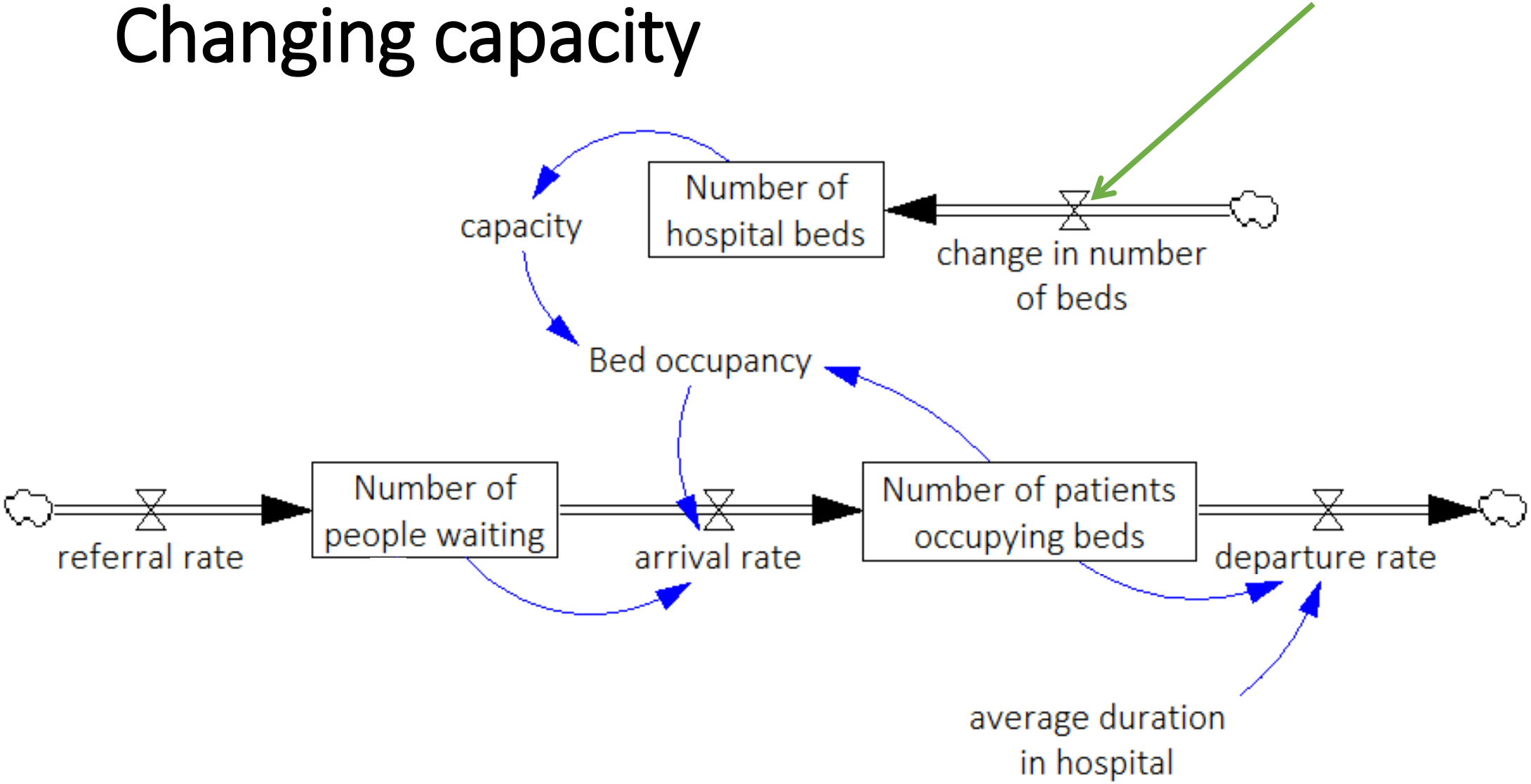
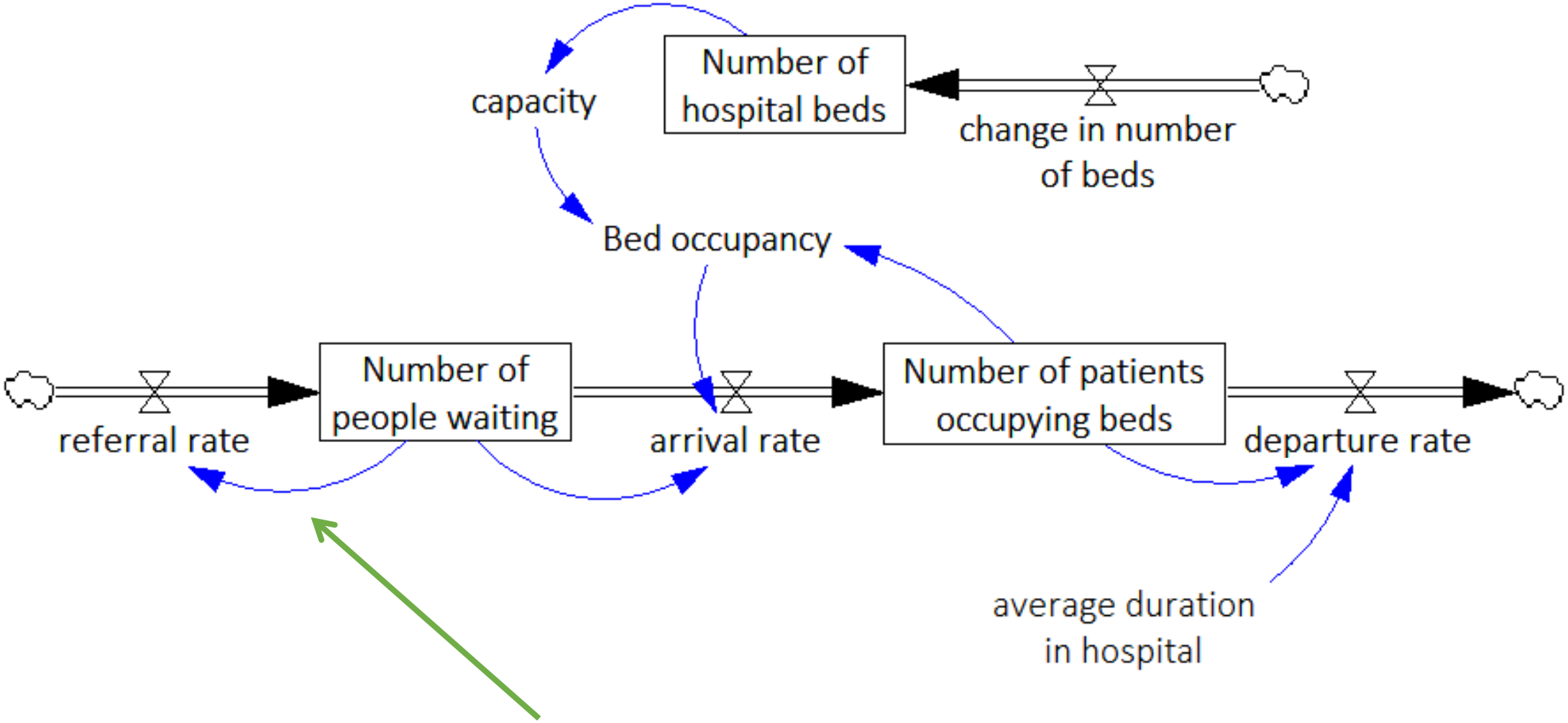
Hypothesis → Structure → Behaviour



Changing capacity



Behavioural response to waiting list size



Resources

http://systemdynamics.org.uk/wp-content/uploads/Making-an-impact-with-SD-1-HSC.pdf

http://systemdynamics.org.uk

UK conference

THEME : System dynamics for developing strategy in the real world

VENUE: The Shard, London

DATE: **Thursday 14th April – Friday 15th April**