

DGHPSim: Performance modelling of general hospitals

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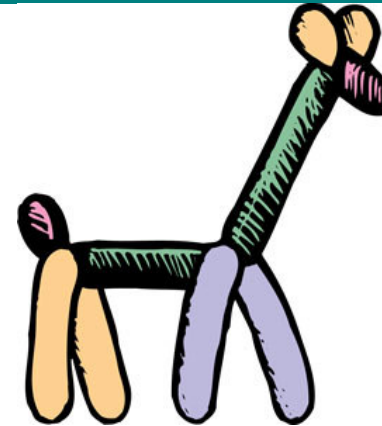


Why smart thinking is needed



Many hospitals are like balloons....

... or ...



squeeze them hard in one place and



What sort of smart thinking?

- Important to meet targets (e.g. 18-week RTT)
 - But beware the side effects
- Important to understand how one decision affects another
 - E.g. Meet 18-week RTT but this could worsen other PIs or degrade service quality
- Explore the decision space
- Need tools that support holistic thinking

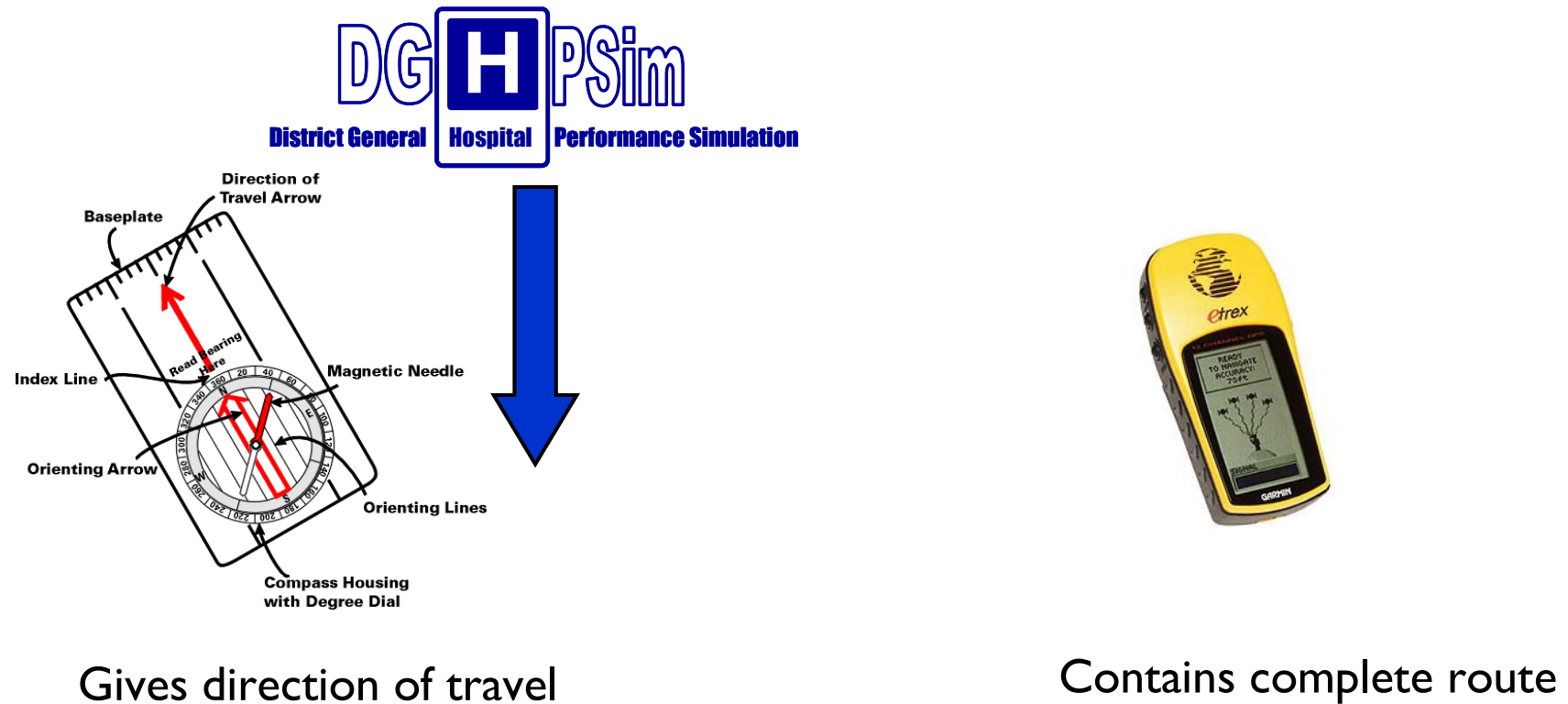
DGHPSim Project

- EPSRC funded www.hospitalsimulation.info
- Objectives
 - To evaluate feasibility of English NHS performance targets and their interactions
 - To build a whole hospital simulation model with generic features
 - Change parameter values to fit individual hospitals
- Approach: model individual patient flows



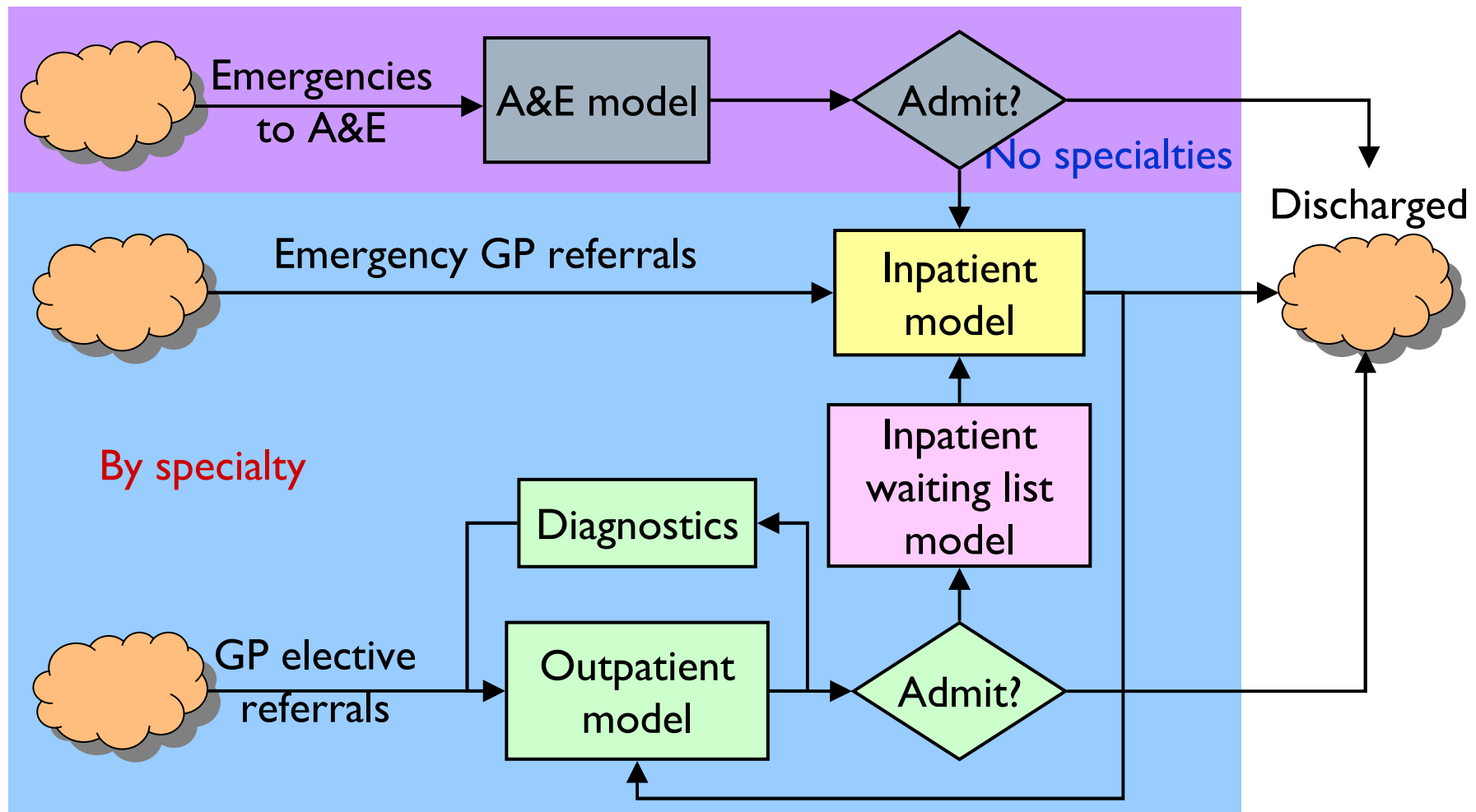
If you squeeze hard in one place, what happens elsewhere?

Locating DGHPSim on a model use spectrum

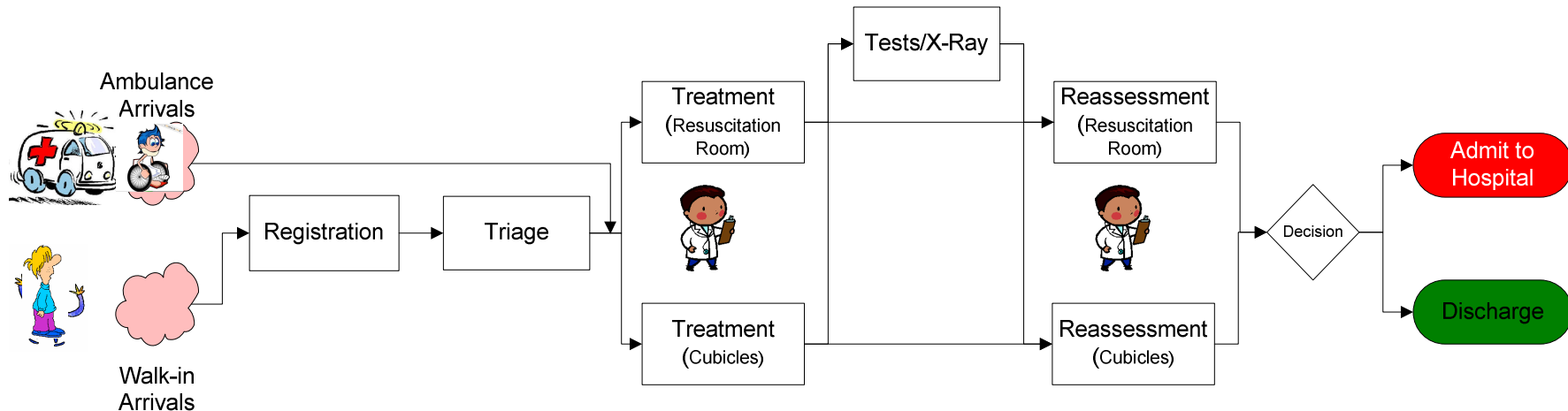


Compass or GPS?

DGHPSim suite: 4 linked models



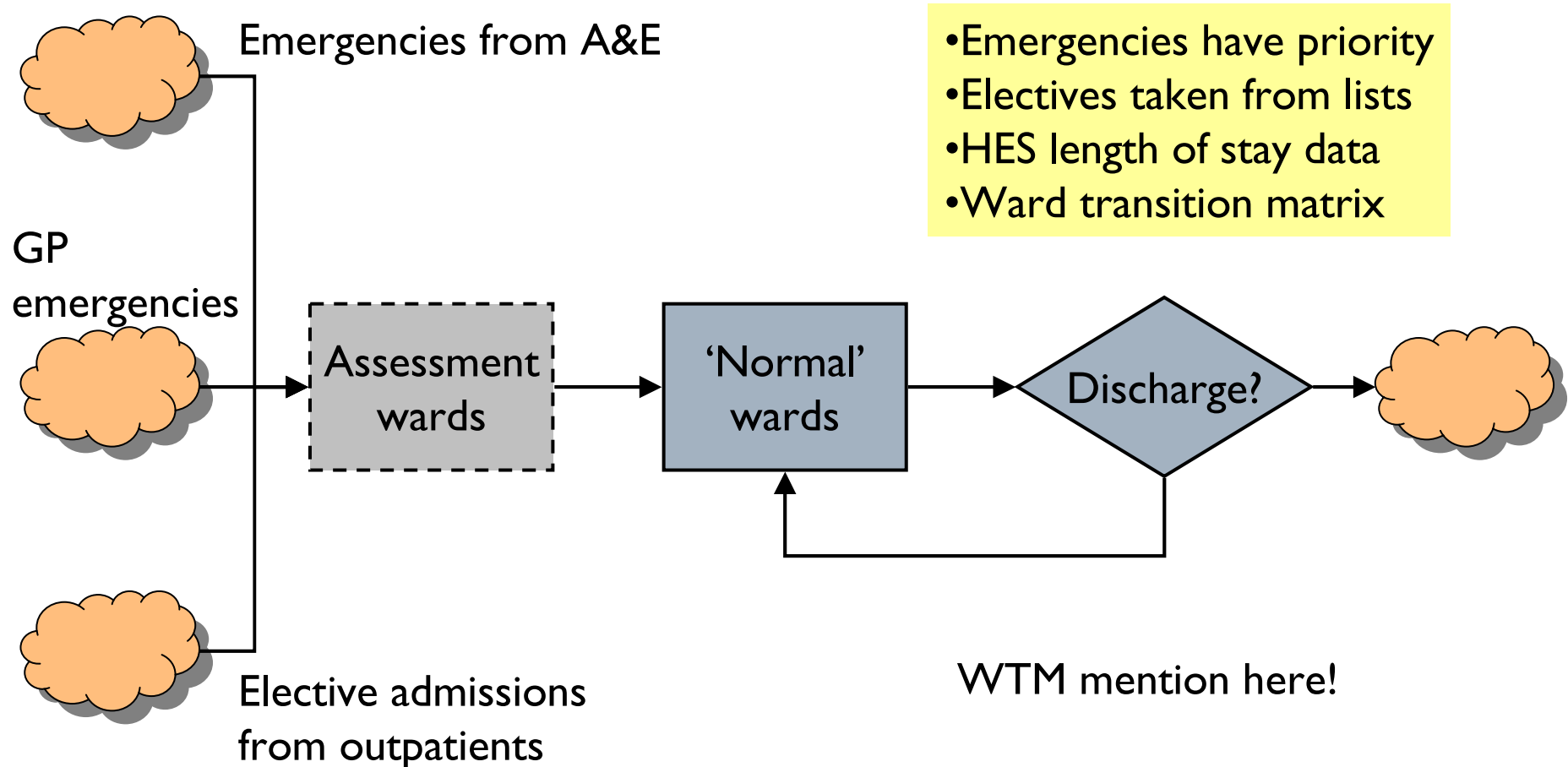
DGHPSim patient flows: e.g. A&E model



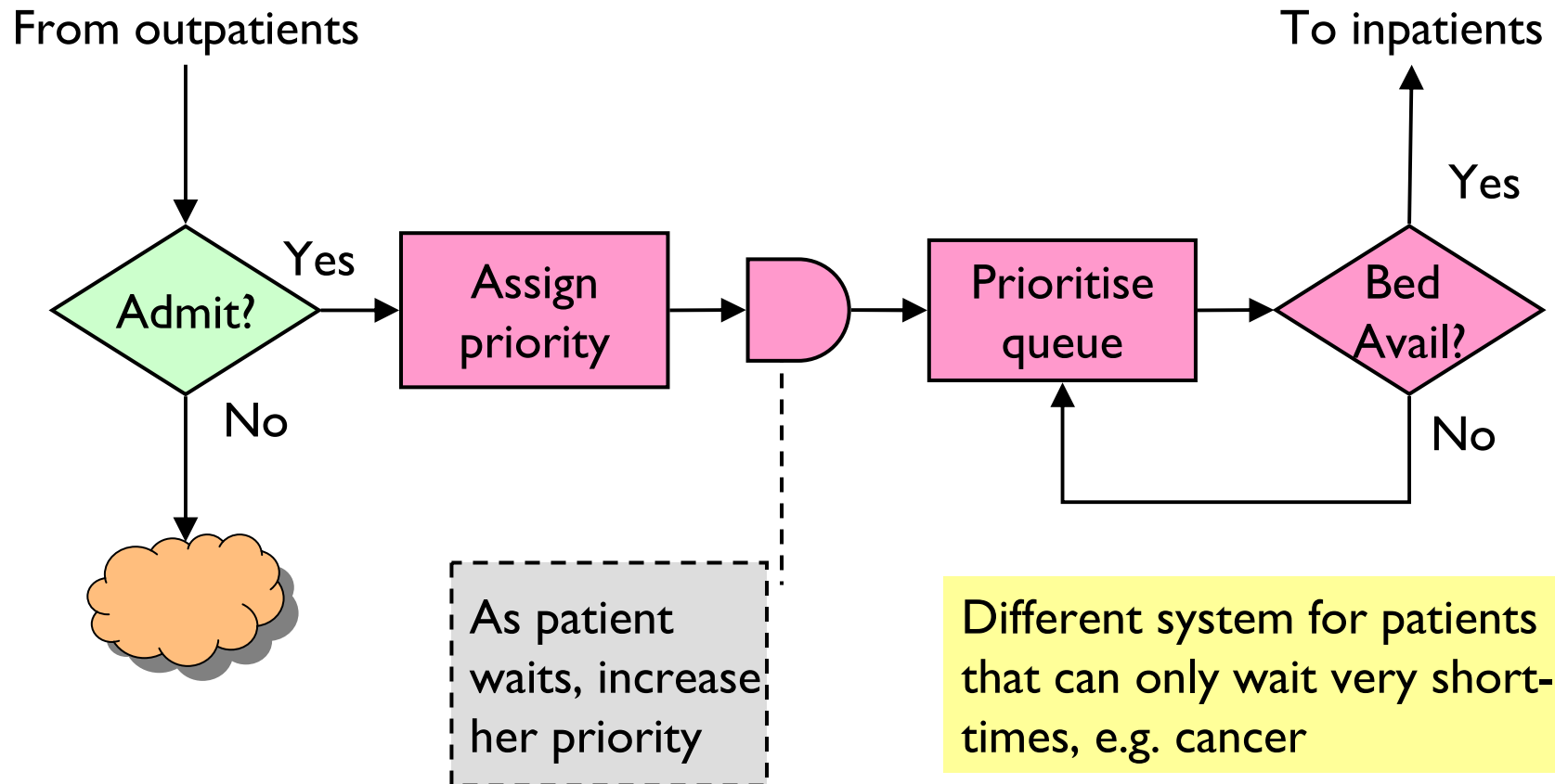
Patient flows

- Individual
- Consume resources as they occur (e.g. doctor time)
- Based on statistical models
- Provide much more than just average values

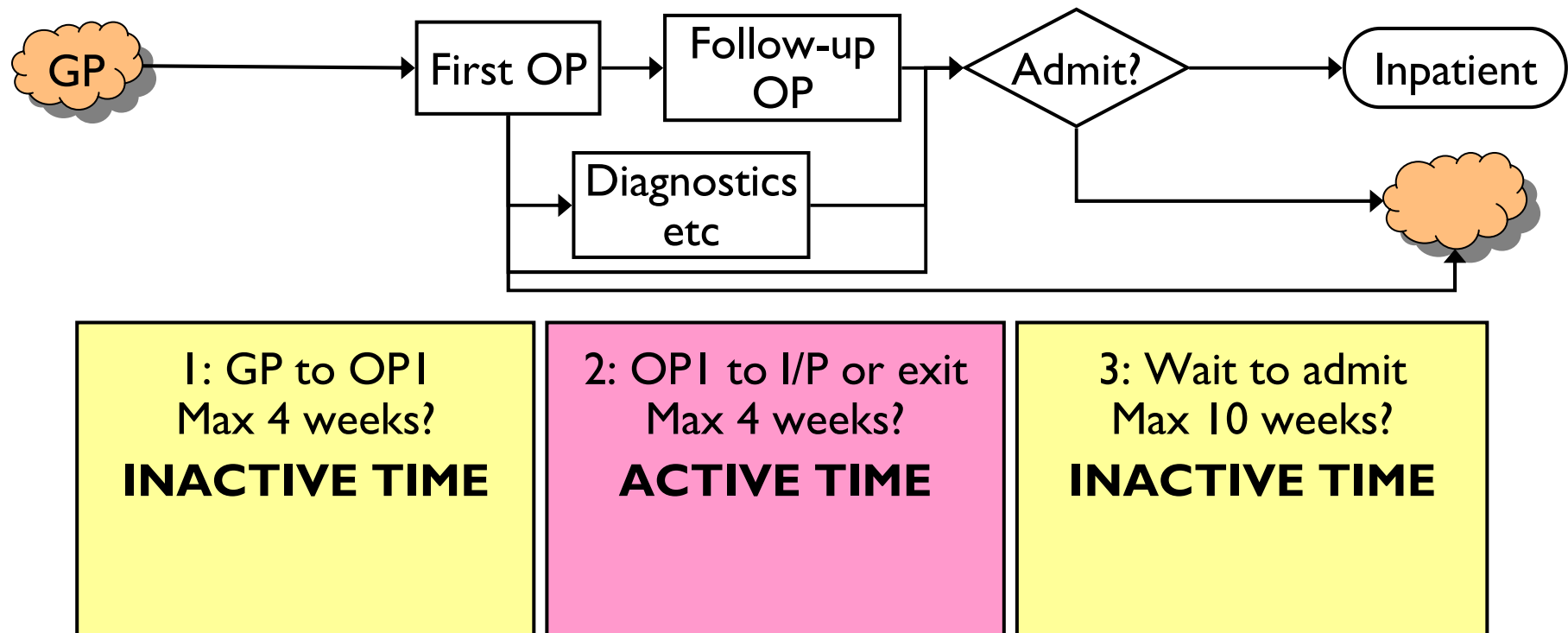
Inpatient Model – schematic



Elective inpatient waiting list model

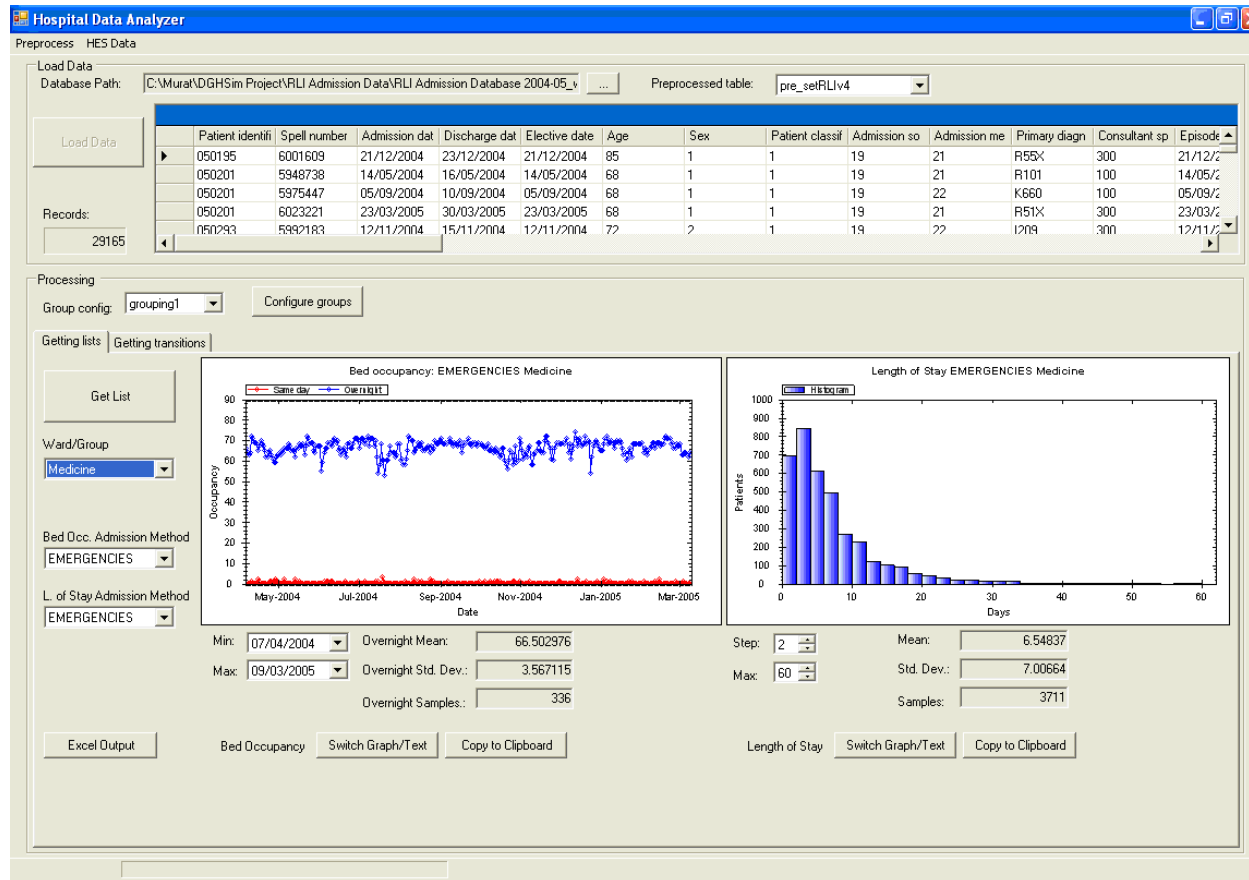


Outpatients: | 8-week RTT



Likely to be relaxed from 100%
Distinguish between admitted & non-admitted?

Hospital Activity Data Analyzer (HADA)



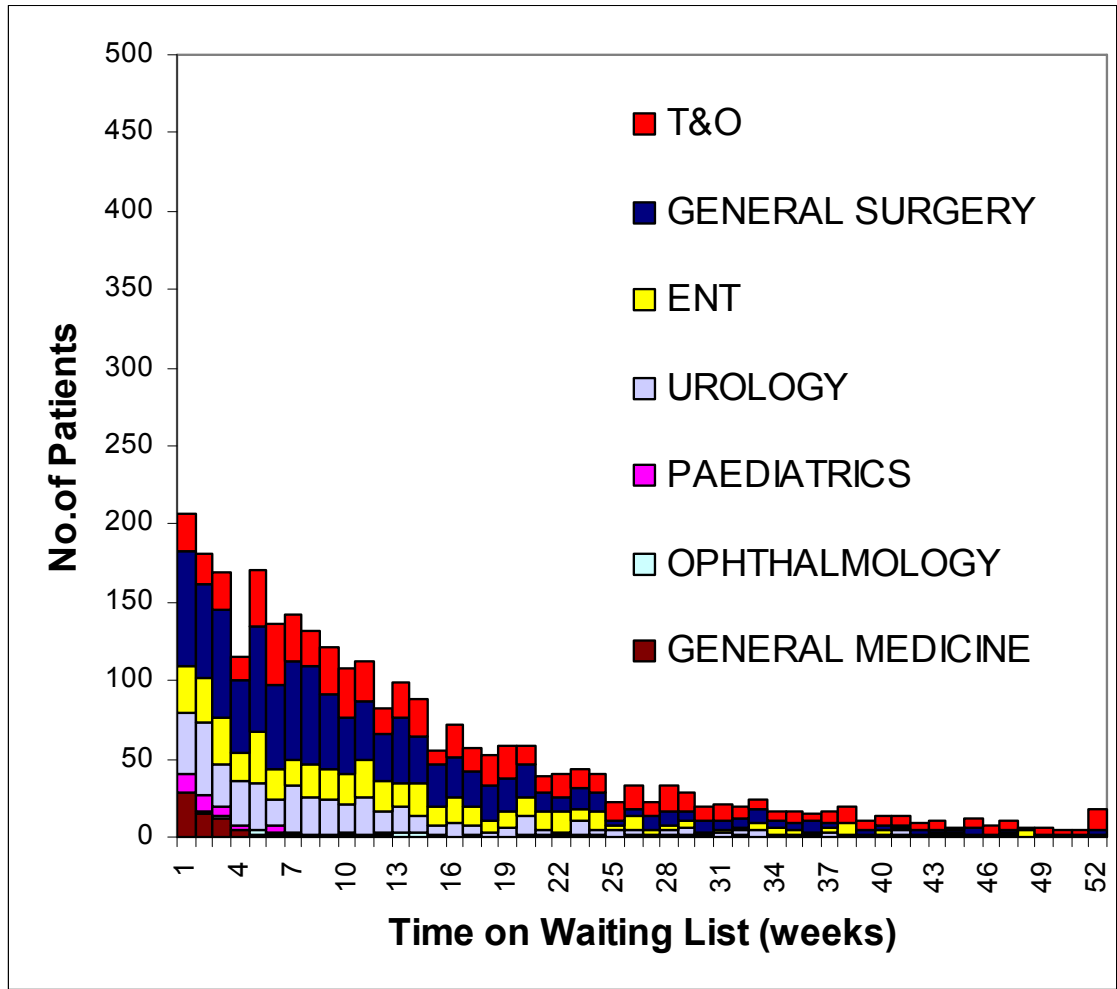
Data Sources

- Hospital's Patient Administration System (PAS)
- National Hospital Episode Statistics (HES)

Some example DGHPSim experiments

- Examine 3 separate options for change, across all specialties
 - Reduce average LoS by 20%
 - Keep bed total constant, allocate 30% more to electives (Total beds: 427, Elective beds: 128 (up from 96))
 - 1100 Extra day-cases (12% increase), hence fewer standard admissions
 - Based on old 04/05 data
 - Today, focus only on stage 3 elective waits (wait to admit)
 - Model actually copes with all 3 stages
 - Could also look at
 - Emergency/elective interactions
 - Resource swapping (e.g. beds)
 - Combined options for change
 - Individual specialties
-

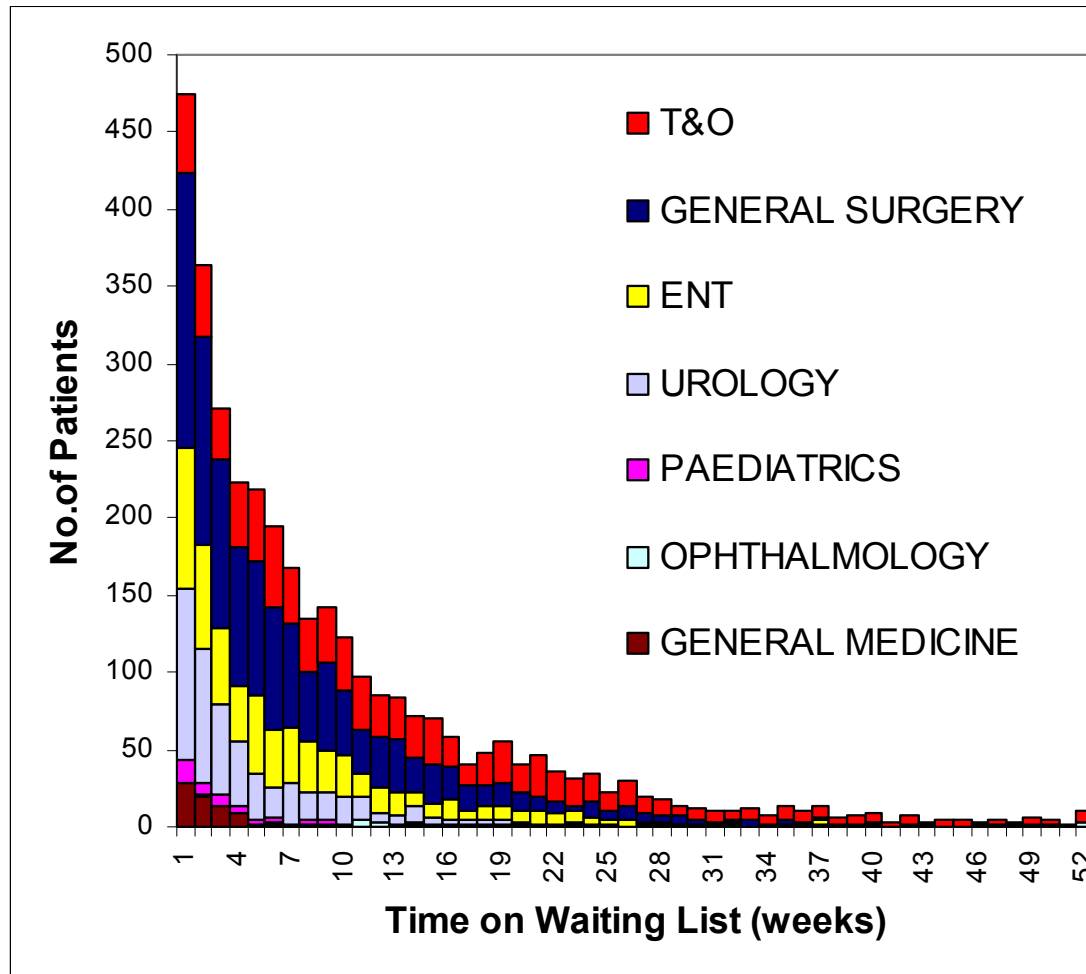
Base model: as-was 2004/05



SIMULATION OUTPUT	
%age of patients waited	
>5 weeks	72.6
>8 weeks	58.4
>10 weeks	46.8
>18 weeks	28.5

	Elect Cancel.	Emerg Outliers
Count	90	469
Total Patients	2880	15713
%age	3.1	3.0

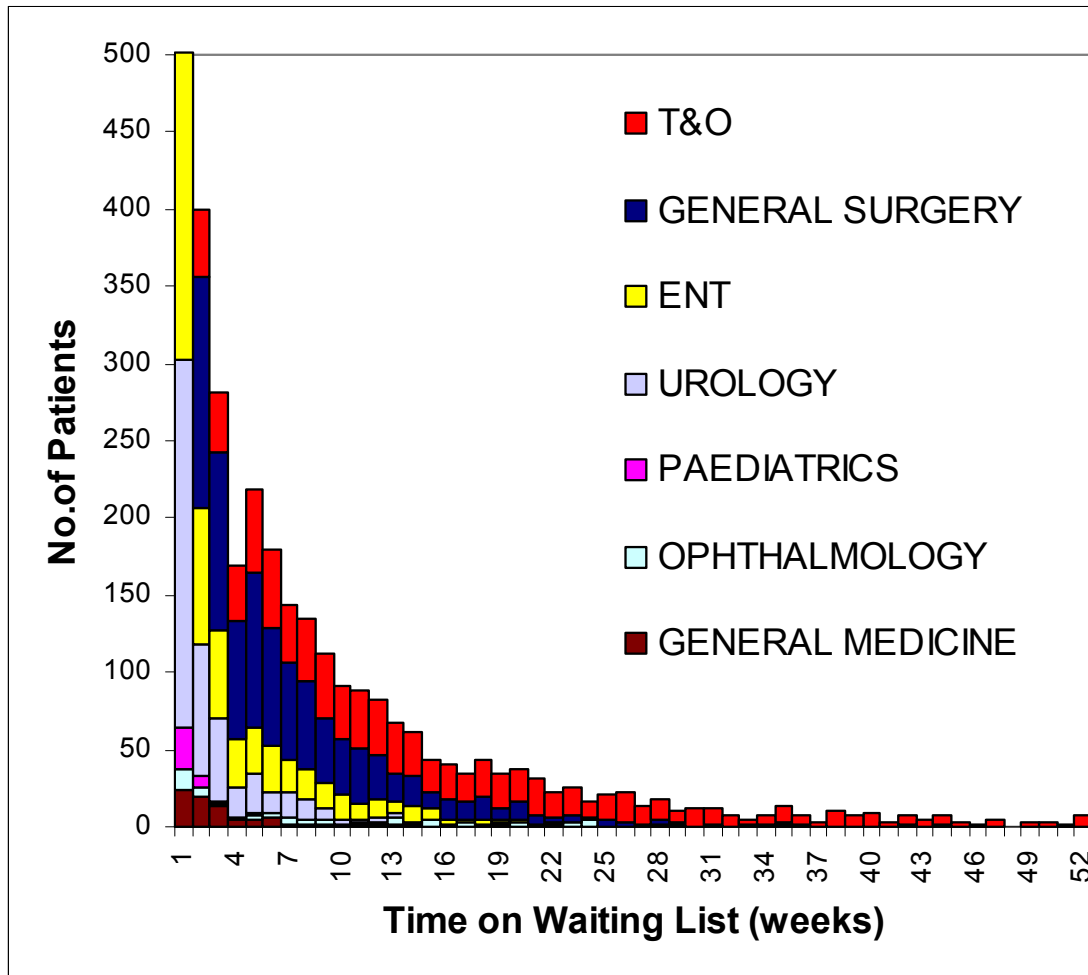
Scenario I: 20% reduced LoS



SIMULATION OUTPUT	
%age of patients waited	
>5 weeks	58.7
>8 weeks	43.8
>10 weeks	33.1
>18 weeks	17.6

	Elect Cancel.	Emerg Outliers
Count	73	405
Total Patients	3396	15618
%age	2.1	2.7

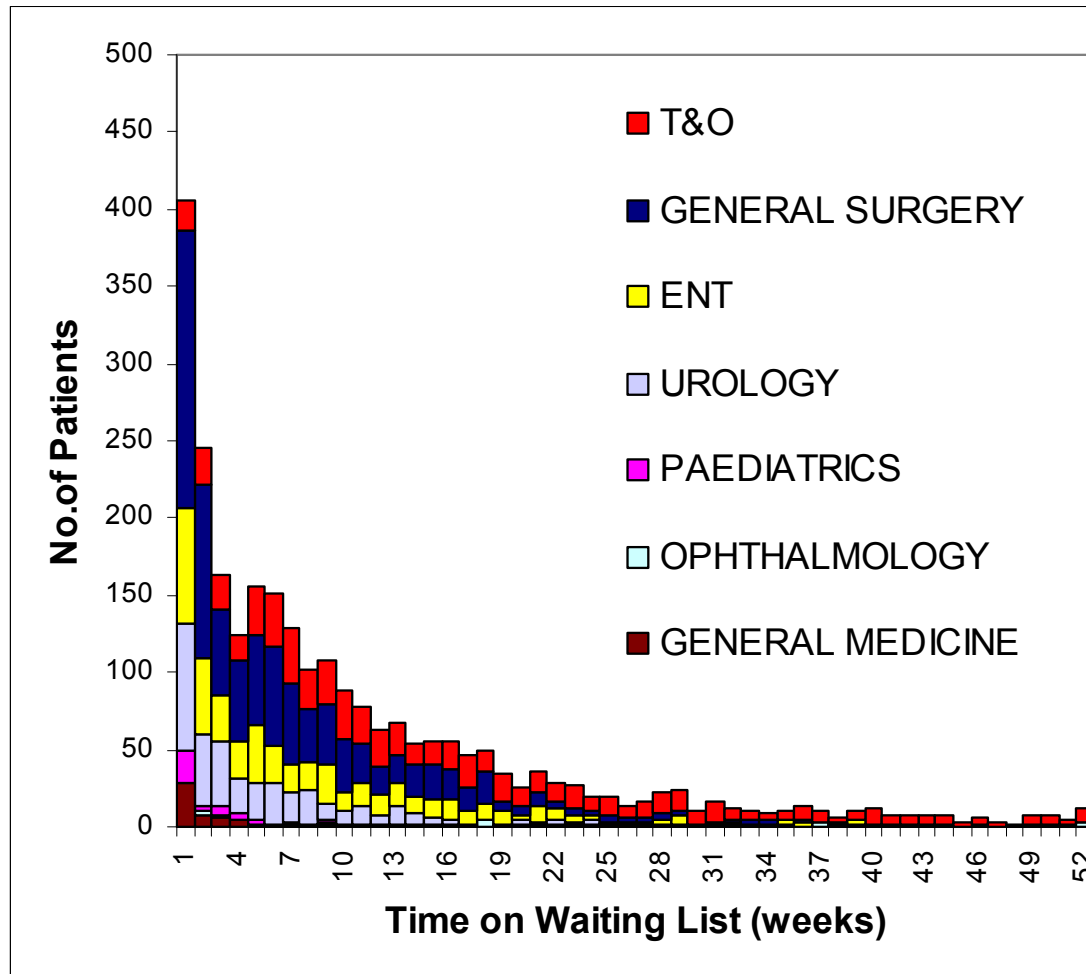
Scenario 2: Keep bed total constant, allocate 30% more to electives



SIMULATION OUTPUT	
%age of patients waited	
>5 weeks	48.1
>8 weeks	34.7
>10 weeks	25.5
>18 weeks	13.4

	Elect Cancel.	Emerg Outliers
Count	114	505
Total Patients	3490	15693
%age	3.9	4.0

Scenario 3: 12% increase in day-cases (1100 extra)



SIMULATION OUTPUT	
% 'age of patients waited	
>5 weeks	62.4
>8 weeks	48.2
>10 weeks	37.4
>18 weeks	22.2

	Elect Cancel.	Emerg Outliers
Count	51	469
Total Patients	2654	15711
% 'age	2.5	3.2

Looking across the experiments

	Base
% wait > 5 wks	72.6
% wait > 8 wks	58.2
% wait > 10 wks	46.8
% wait > 18 wks	28.5
Elect patients	2880
Elect cancelled	90 (3.1%)
Emerg outliers	469 (3%)

Uses for the DGHPsim suite

- Resources needed to meet target
 - e.g. 18 week RTT
- Waiting times achievable given specific resources
- Effect of trading elective admissions against emergencies
- Waits for admitted v/s non-admitted patients
- Testing proposals for change
 - E.g. from Modernisation Agency/NHS III
- Commissioning acute care with changing demands

Acknowledgements

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- Funded by EPSRC
- NHS Trusts
 - University Hospitals of Morecambe Bay NHS Trust
 - Royal Preston Hospital
 - Salford Royal NHS Foundation Trust
 - Worthing and Southlands Hospitals NHS Trust
 - Barts and The London NHS Trust
 - Central Manchester & Manchester Children's University Hospitals NHS Trust

Extras

Inpatient model: ward transition matrix

Represents patient journeys inside the hospital after admission
e.g.

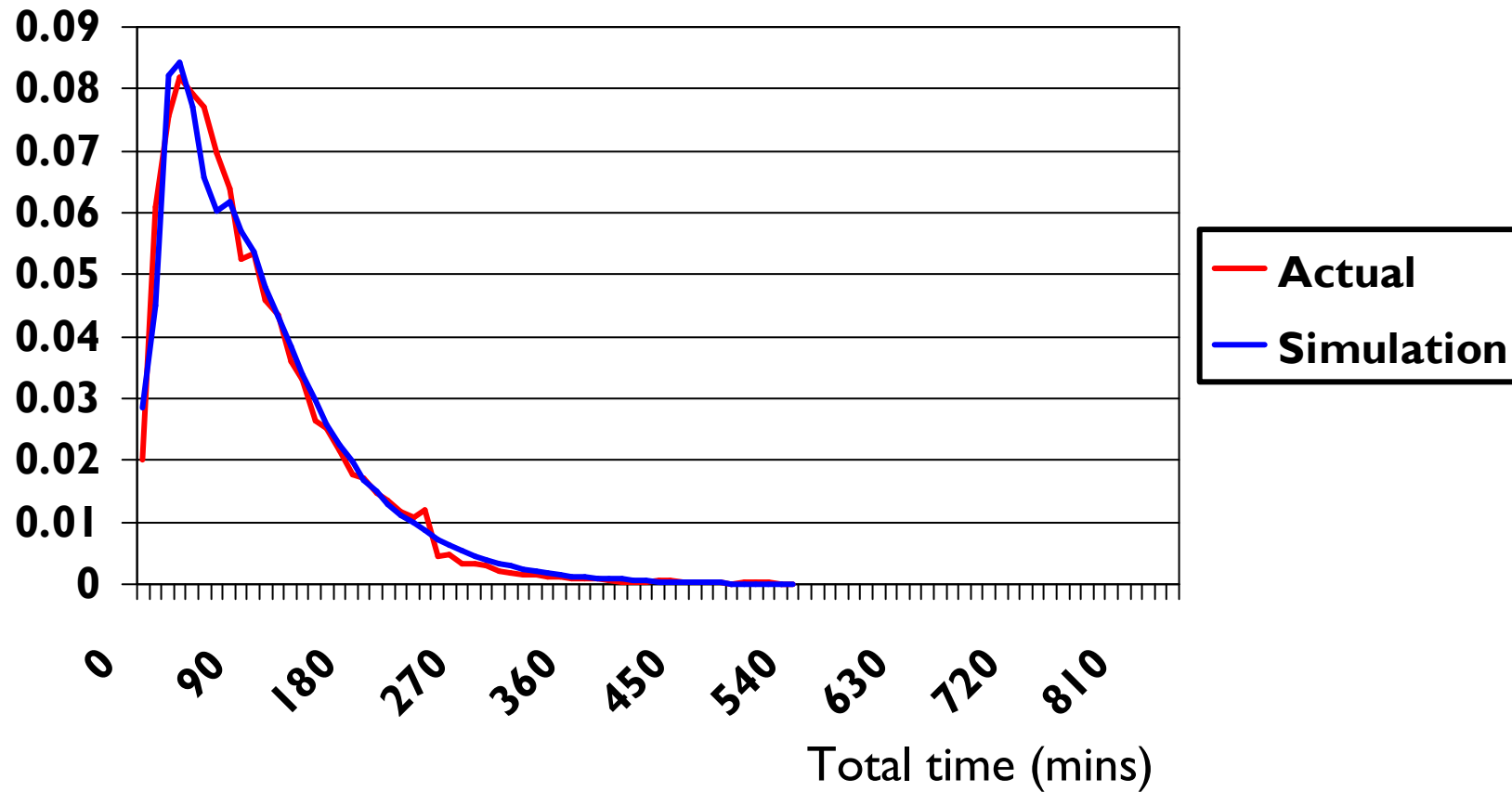
Emergency										
	Gate	GMED	GSUR	GCRI	GSPE	GELD	GWOC	GASM	Disc	Row Total
Gate		0.069	0.002	0.080	0.001	0.001	0.001	0.846		1.000
GMED		0.090	0.052	0.011	0.007	0.069	0.021	0.003	0.746	1.000
GSUR		0.034	0.086	0.022	0.003	0.037	0.015		0.802	1.000
GCRI		0.357	0.025	0.016		0.007		0.032	0.564	1.000
GSPE		0.135	0.054		0.135	0.027			0.649	1.000
GELD		0.043	0.017	0.009		0.088		0.009	0.835	1.000
GWOC		0.010	0.031			0.010	0.041		0.907	1.000
GASM		0.525	0.025	0.019	0.003	0.052	0.006	0.012	0.358	1.000
Disc										

DGHPSim – inputs and data sources

- PAS (Patient Admission System) Hospitals' local database
 - Ward/Unit and clinic capacities
 - Performance parameters (First/Follow-up rate, initial waiting list size, DNA, etc.)
 - For each patient episode
 - Length of stay (on wards)
 - Ward transitions
- HES (Hospital Episode Statistics) National data
 - For each patient episode
 - Outpatient state transitions (GP-OPI-OP2-IPDC-IPOR-POP)
 - Inpatient state transitions
 - Weekly arrival volumes
- For A&E detail: may need manual data analysis

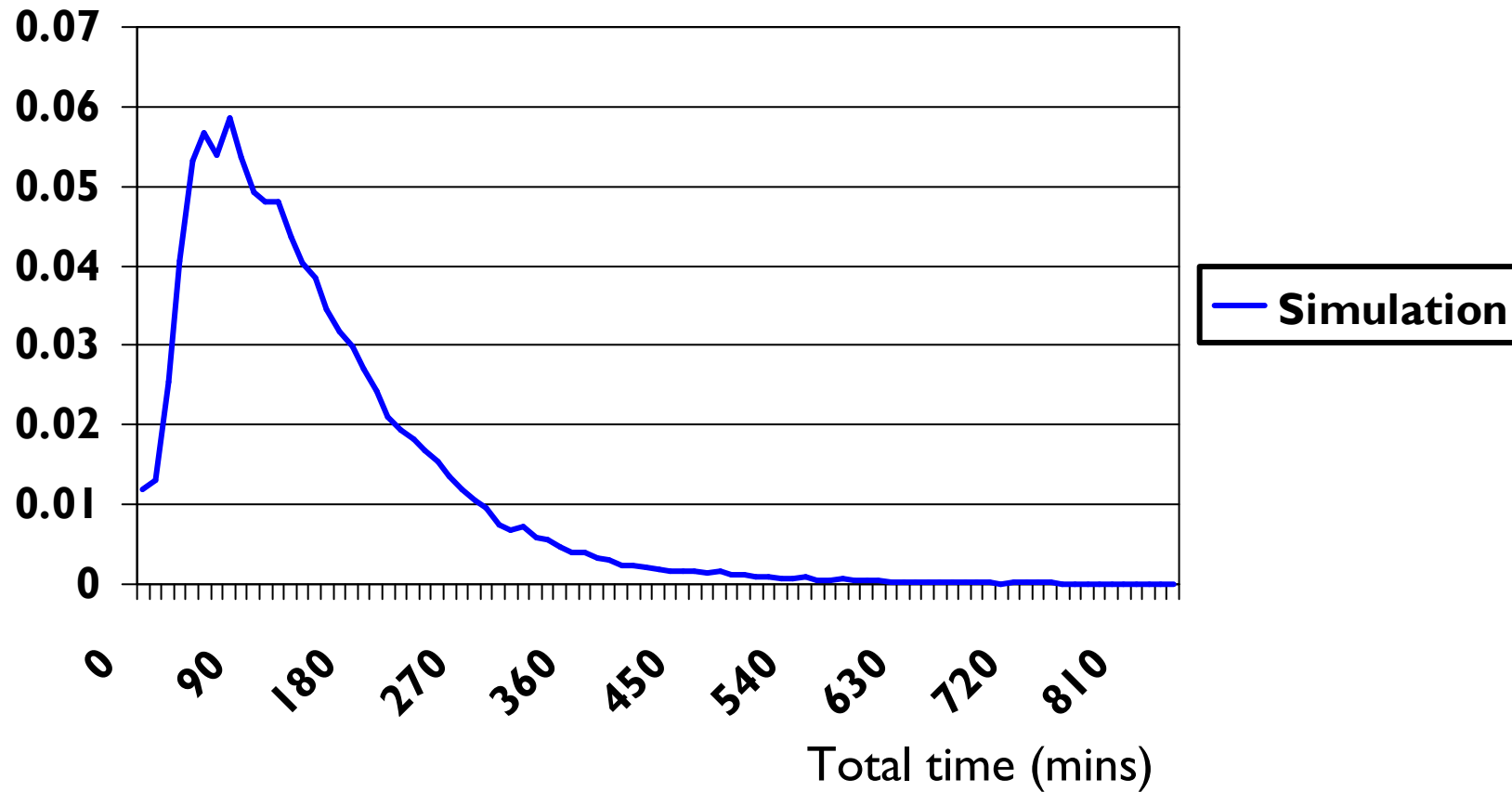
A&E Department: Royal Lancaster Infirmary

Propn patients



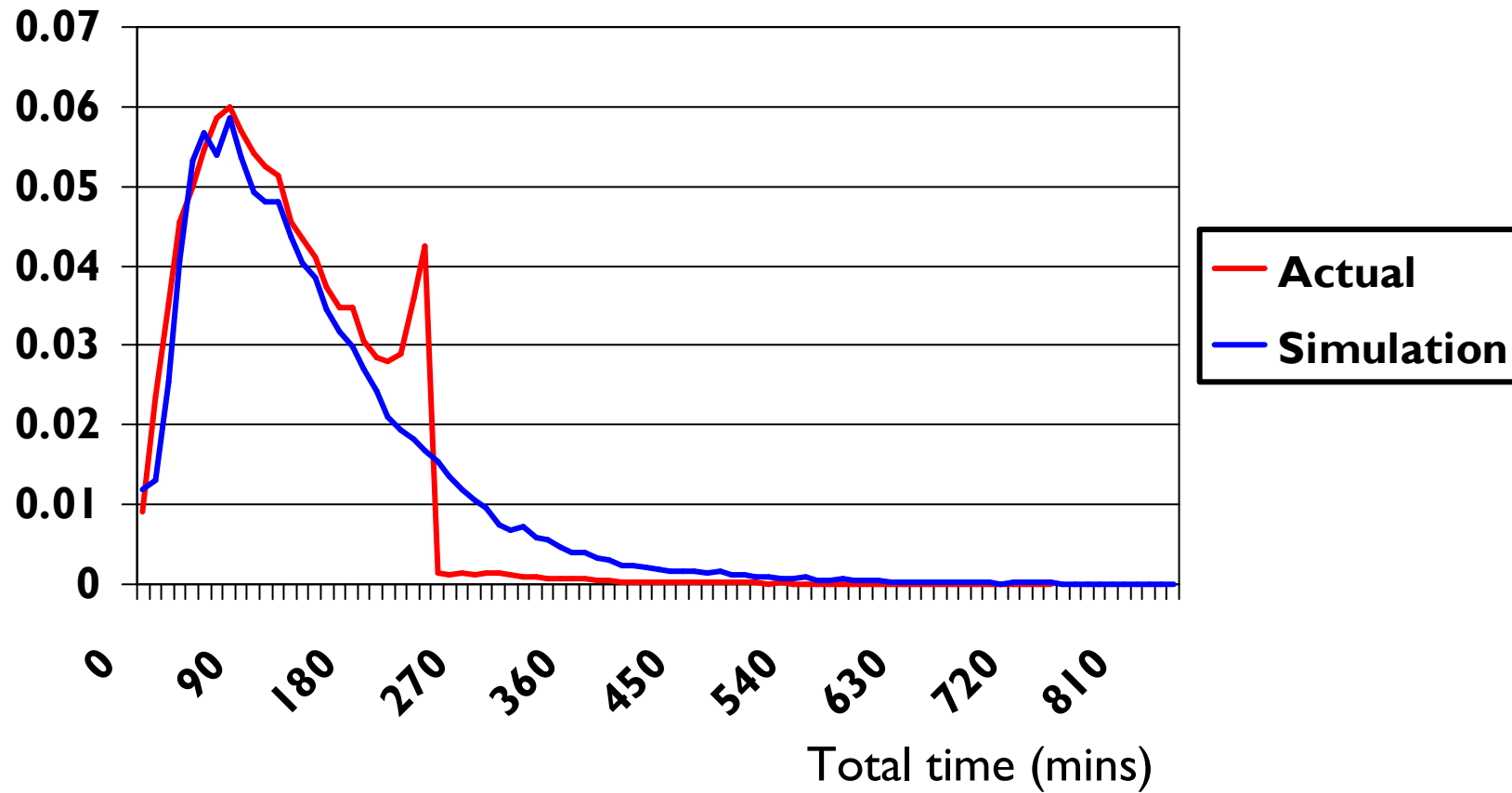
A&E Department II

Propn patients



A&E Department II

Propn patients



A&E Department II

No. patients

