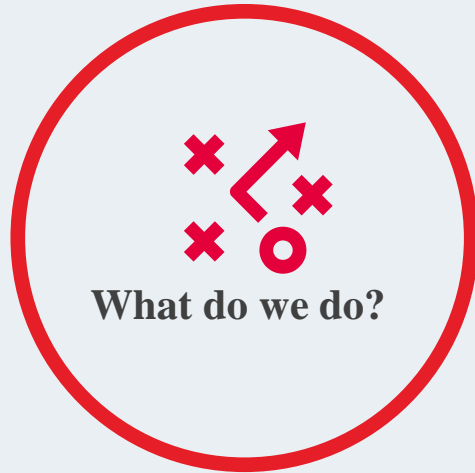


Using people movement simulation to scenario test the resilience of healthcare facilities

Tony Nichol – People Movement Specialist at Arup



What is people movement?



Help understand planned designs better by considering who will use the space, and how



Design based on experience and observation can transform people's relationship with the built environment

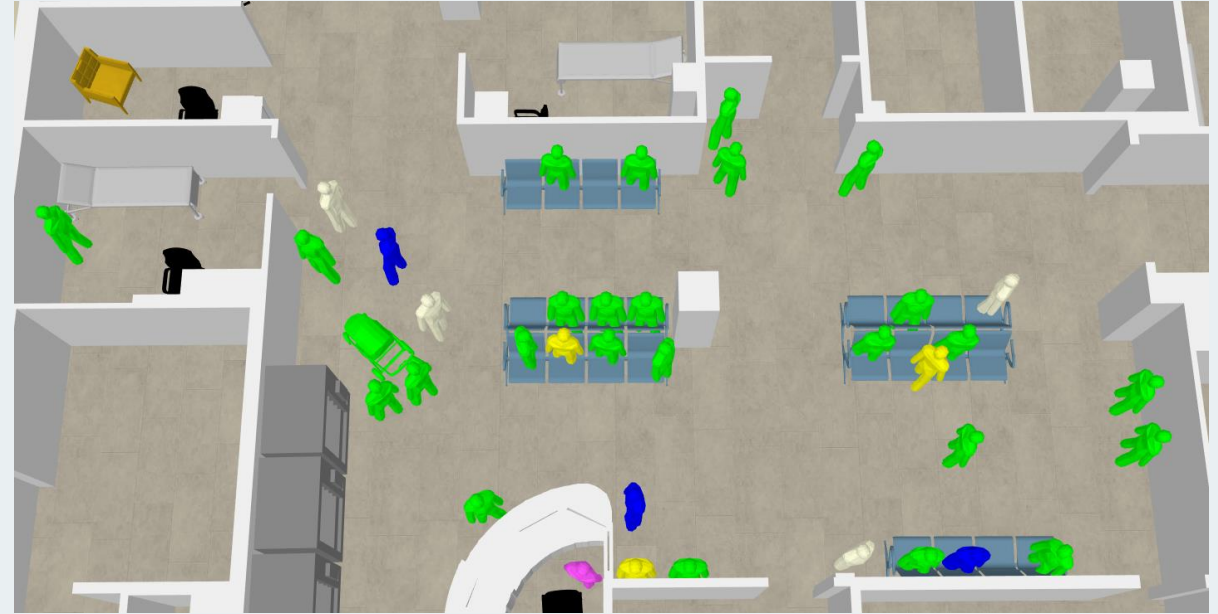


Merge traditional with the use of cutting-edge, industry leading technology such the Arup in-house MassMotion 3D modelling to understand and visualise how people move and interact with the built environment

What is people movement simulation?

MassMotion

- Developed in-house through our software arm of the company - Oasys
- 3D simulation and evacuation tool for people movement/modelling
- Agent-based modelling and social forces whereby individual 'agents' act independently
- Routing choice is based on distance, congestion, gradient, obstacles (among other factors)



MassMotion

ADVANCED PEDESTRIAN SIMULATION SOFTWARE

Resilient healthcare case study: Whittington hospital

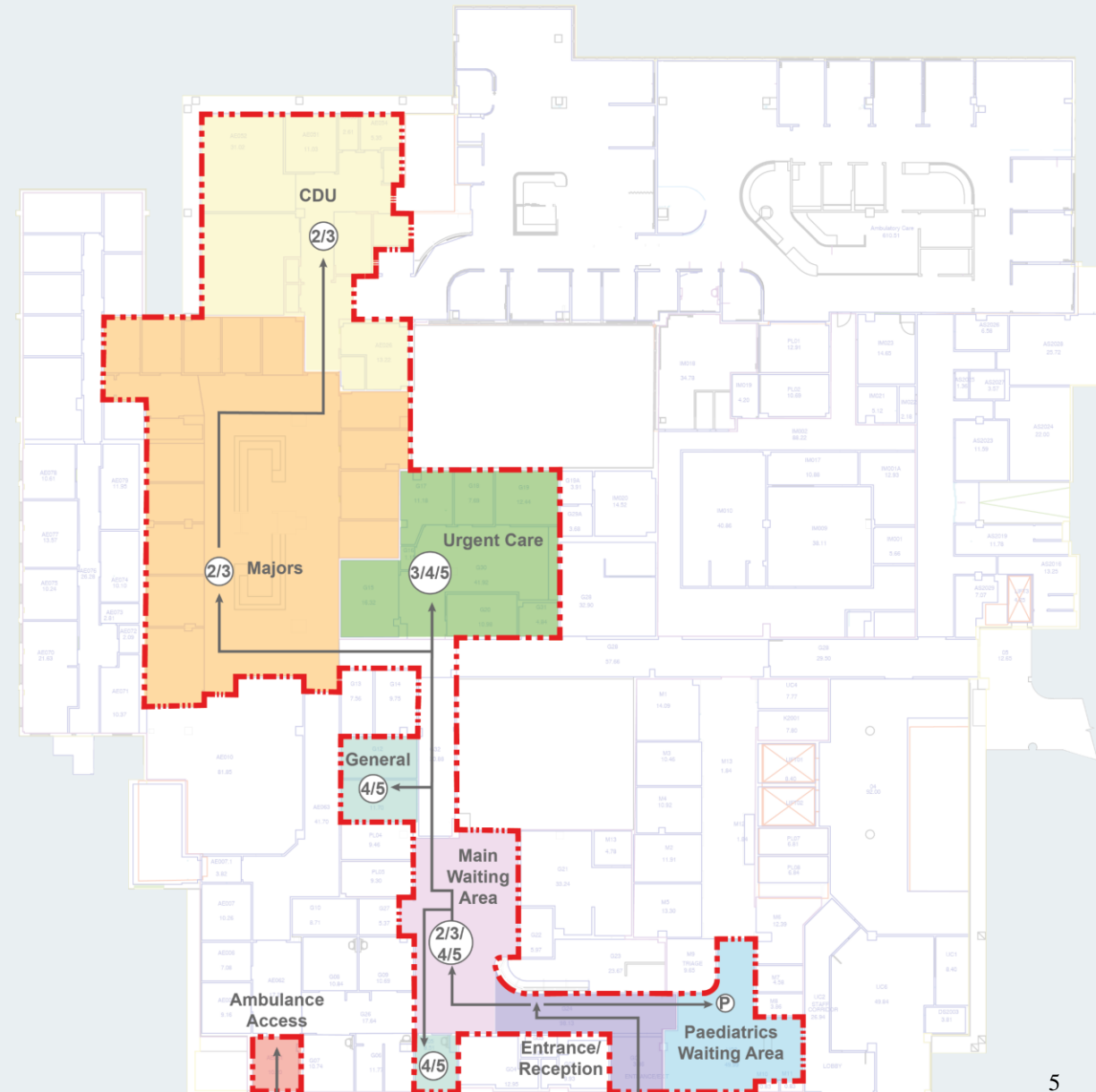
Setting the scene: Autumn 2020

- Non-Covid emergency department attendances significantly reduced due to Covid-19
- Usual seasonal rise in emergency attendances expected for winter 2020
- Concerns of a second wave of Covid-19 in winter 2020
- Social distancing guidelines in place to protect staff and the public

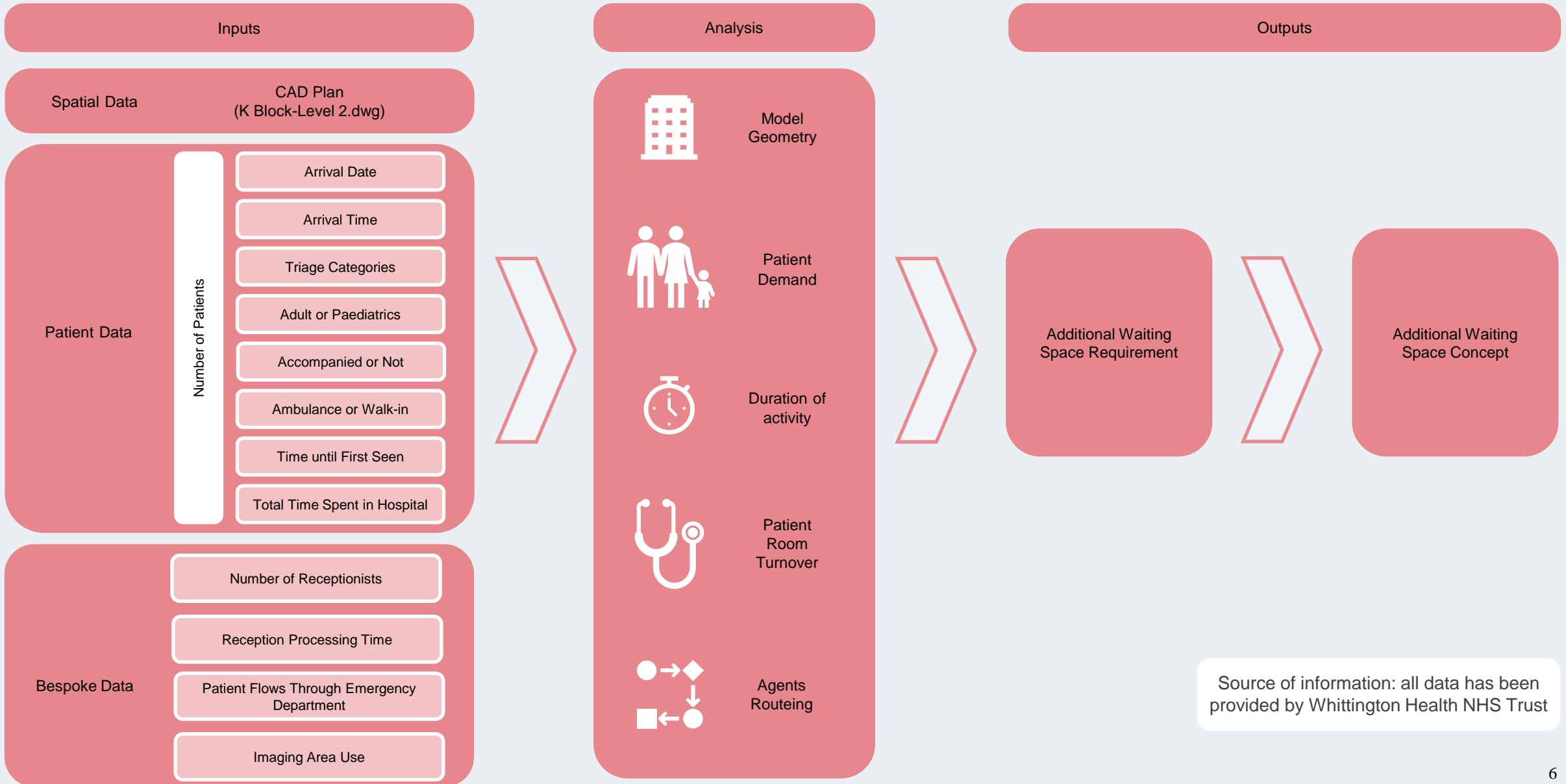


Approach

- Undertake analysis of Trust data to derive the busiest day of the year in terms of the intake of adult and paediatric patients
- Complete a modelling exercise of patient flow using MassMotion, to assess the operation of the Adult Emergency Department waiting area under normal and socially distanced (i.e. reduced capacity) conditions
- Establish the impact of the peak level of patient demand that can be expected in the waiting room during Winter 2020
- Identify potential solutions to enable people to socially distance during busy periods



Data & Information



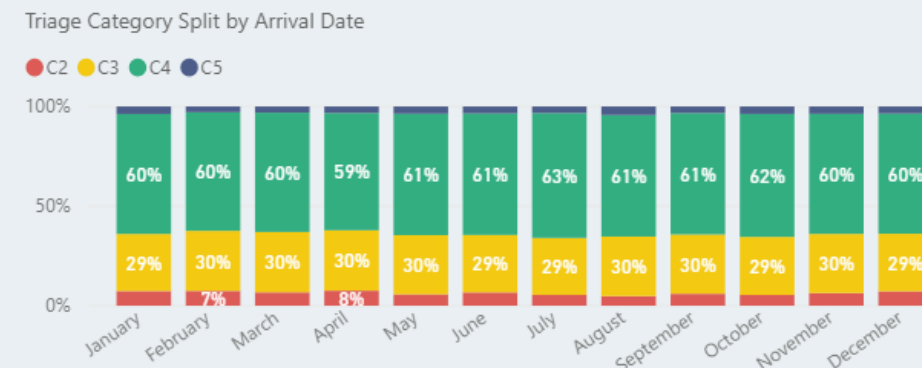
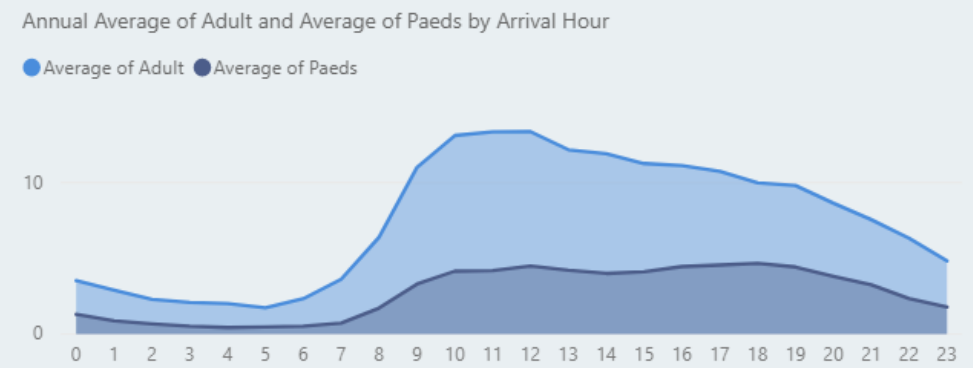
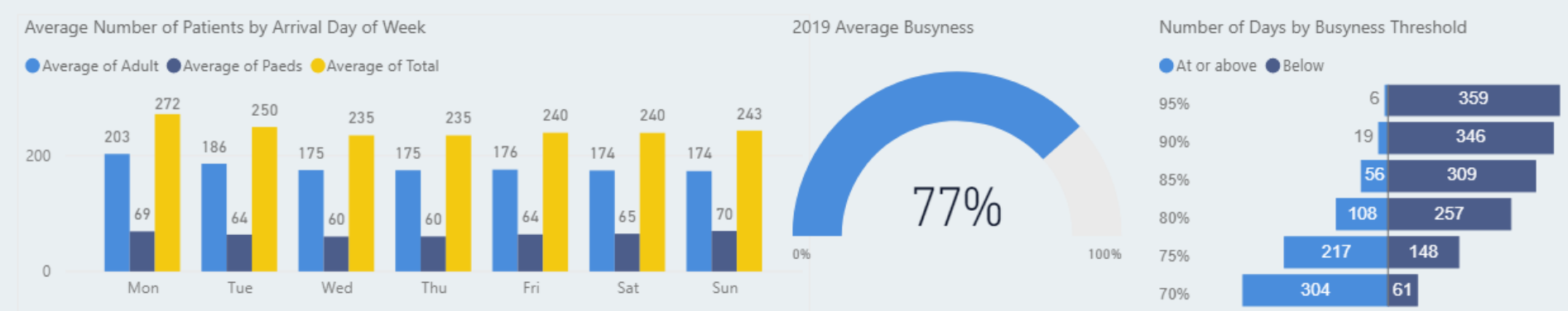
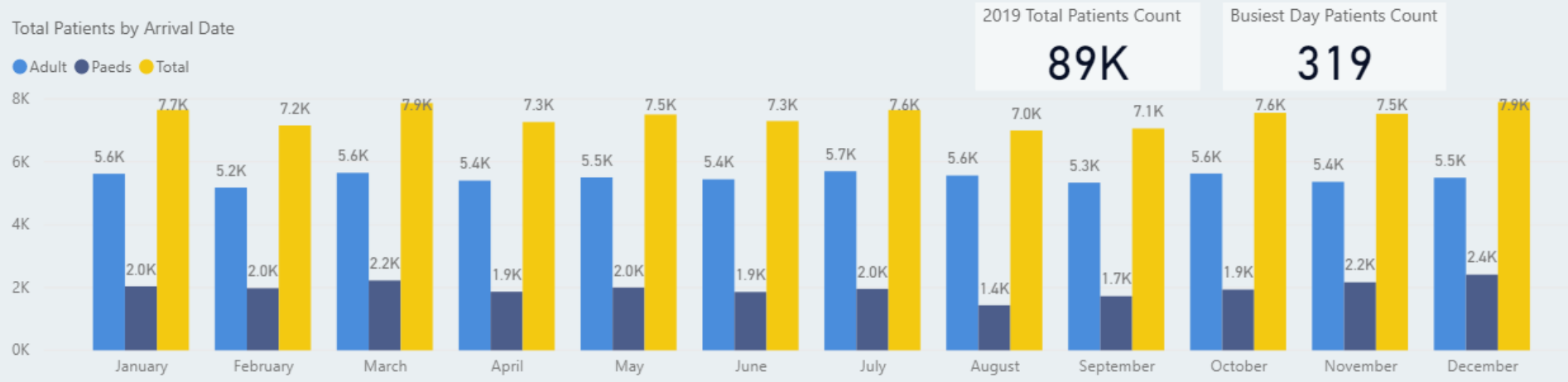
Source of information: all data has been provided by Whittington Health NHS Trust

Data Summary

2019 patient arrival data

This data covers 'walk-in' patient admissions only i.e. triage categories 2-5

Triage category 1 are admitted to the hospital via the ambulance entry point, and therefore don't use the Emergency Department waiting area



Data Summary

Busiest day

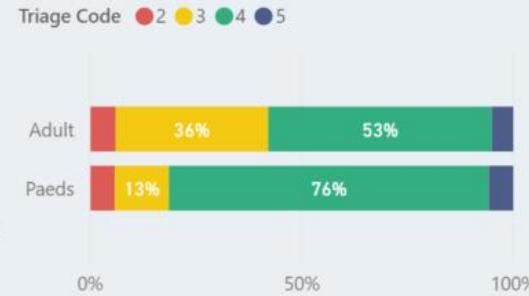
Our interactive dashboard, copied to the left, provides a breakdown for 25 November 2019 data (the busiest day).

2019 Baseline (i)

Patients by Stream

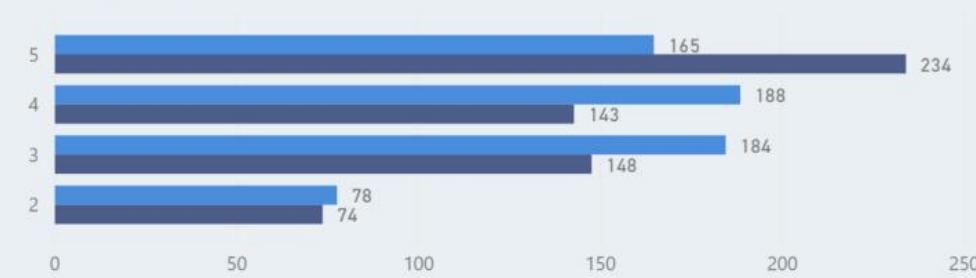


Patients by Stream and Triage Code



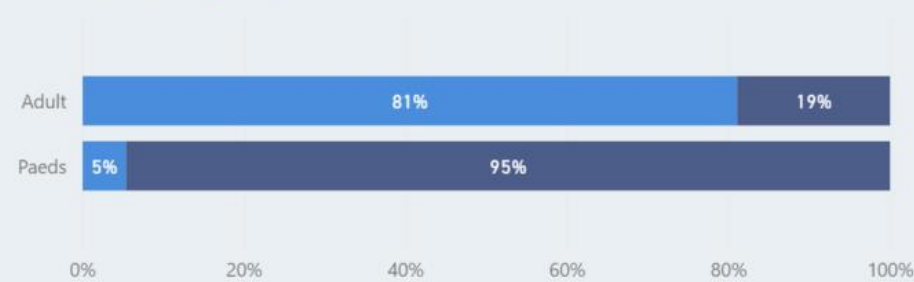
Average of Arrival To 1st Seen (Mins) by Triage Code and Stream

Stream ● Adult ● Paeds



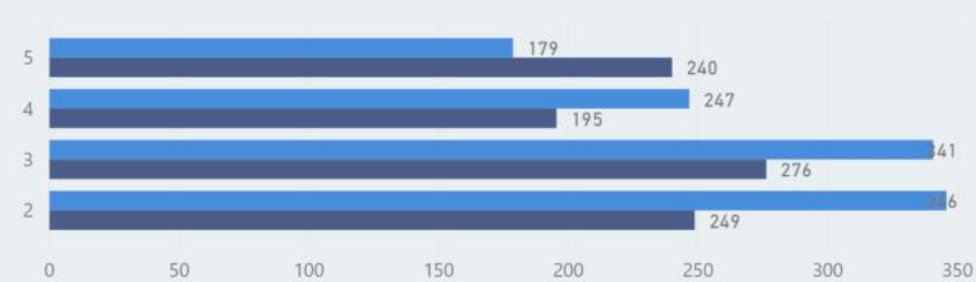
Count of Attendance Num. by Stream and Patient Accompanied

Patient Accompanied ● No ● Yes



Average of Arrival to Departure (Mins) by Triage Code and Stream

Stream ● Adult ● Paeds



2019 Patients by Arrival Hour and Stream

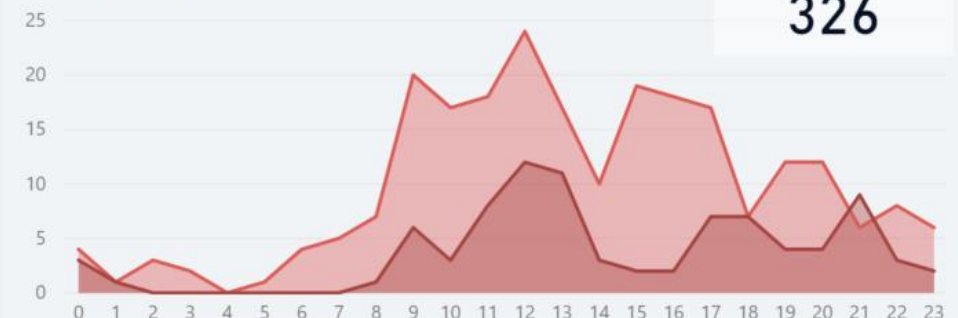
Stream ● Adult ● Paeds



2020 Future Baseline (2% growth) (i)

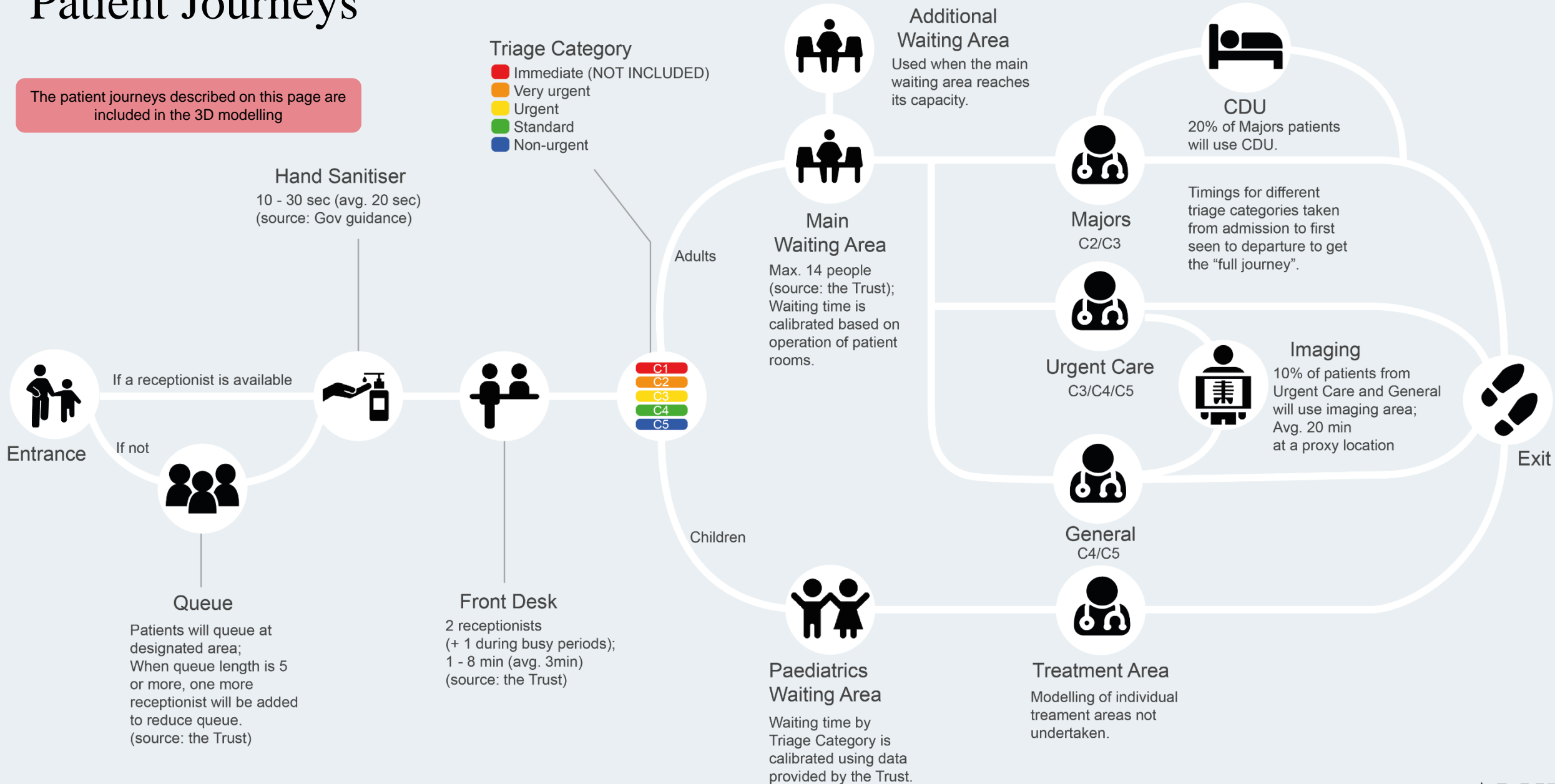
2020 Patients by Arrival Hour and Stream

Stream ● Adult ● Paeds



Patient Journeys

The patient journeys described on this page are included in the 3D modelling



NHS Whittington Emergency Department

The following video shows a MassMotion © model of the NHS Whittington Hospital, assessing the patient flow and number of people in the Emergency Department waiting room under normal and social distancing conditions.

Results

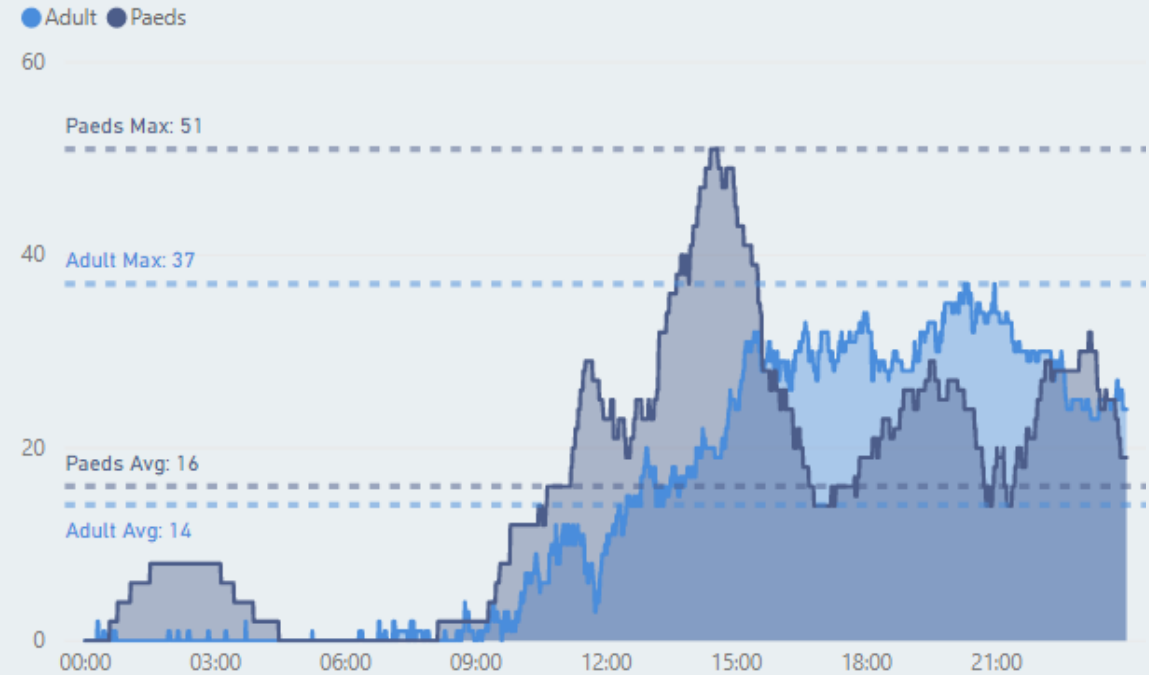
Adult Waiting Area

The analysis showed that the demand for the adult waiting area could exceed its current 14-person capacity by approximately 20 people for large parts of the busiest day.

Paediatric Waiting Area

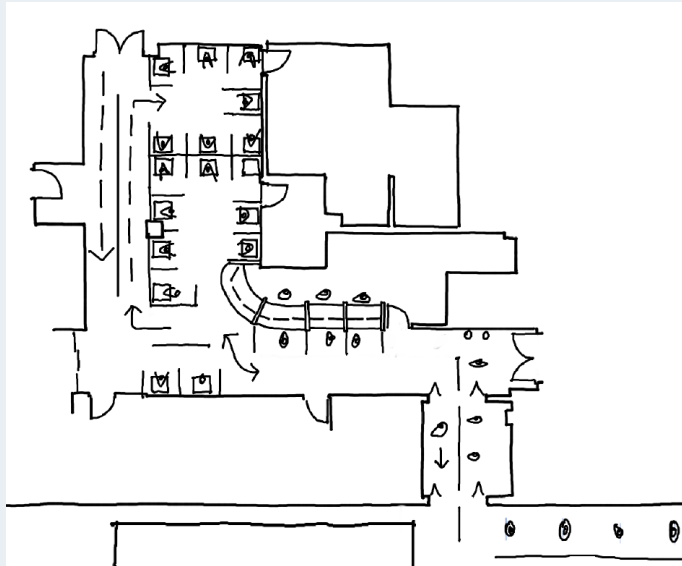
There are approximately 50 people waiting in the paediatric area during the busiest time of the day. This exceeds its (socially distanced) capacity significantly. Part of this additional demand is created because 95% of paediatric patients are accompanied. Although the paediatric waiting room has not been assessed in detail as part of this study, additional waiting space is recommended for the paediatric waiting area*

Main and Paediatrics Waiting Areas Population

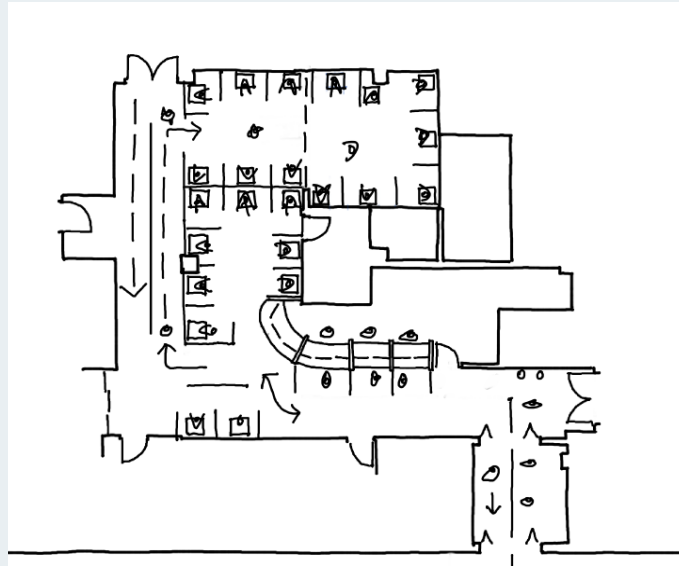


Operational and Spatial Interventions

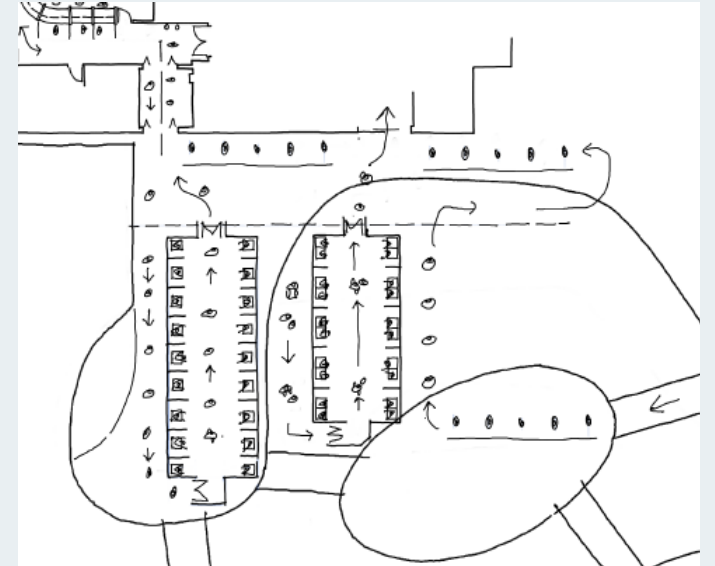
Option 1: Re-plan current layout



Option 2: Reconfigure adjacent area as waiting space



Option 3: Create external waiting pods



Future applications

Department	Potential
General	Scenario testing to look at real-time implications of events Testing of rapid alteration of spaces (Pandemic response) Journey time and way-finding.
Endoscopy	Efficiency of space transition Testing of spaces to avoid cross contamination
Outpatient	Efficiency of space transition to limit sub-waiting Space transition to critical adjacencies
Inpatient	Efficiency of space transition to limit sub-waiting Space transition to critical adjacencies
Medical assessment	Testing arrangements to determine efficiency of patient flows (similar to Emergency Department)
Imaging	Efficiency of space transition to limit sub-waiting areas Testing of space shape and size to maintain dignity
Theatres	Test arrangements of spaces to limit size Testing of spaces to avoid cross contamination



ARUP