

# Towards Smart Hospitals

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School of Computing and Information Systems  
University of Melbourne

Presented at  
Digital Health Futures, Northern Hospital, Melbourne, 6 March 2020



# Human-Computer Interaction

23 Academics

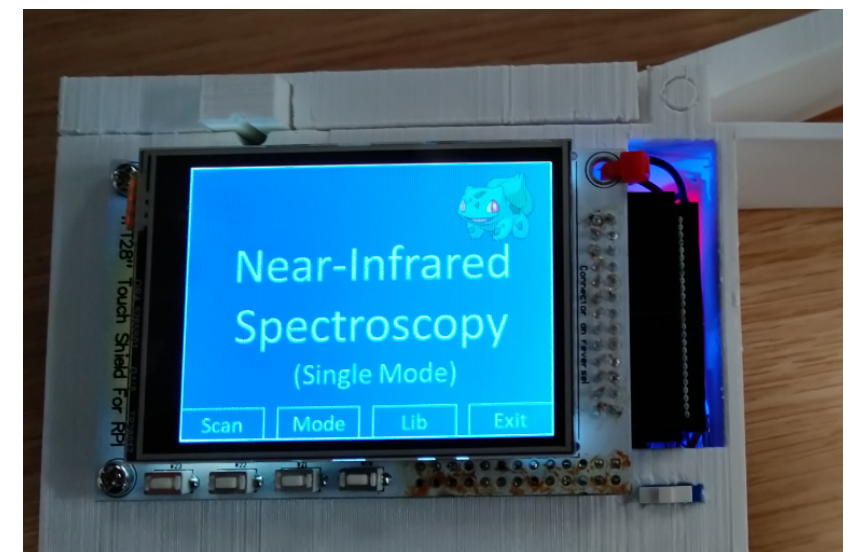
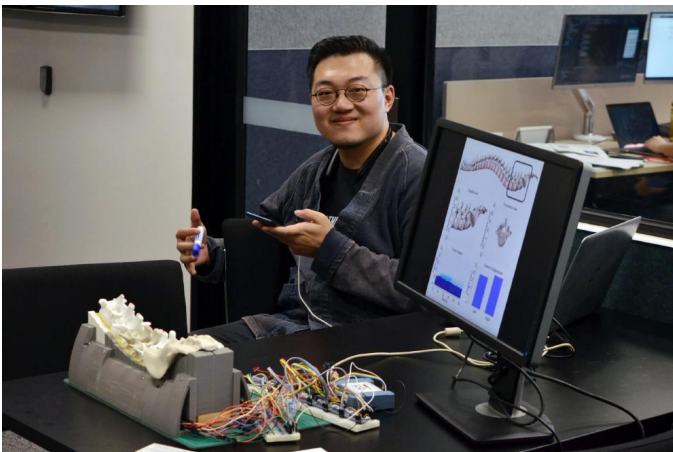
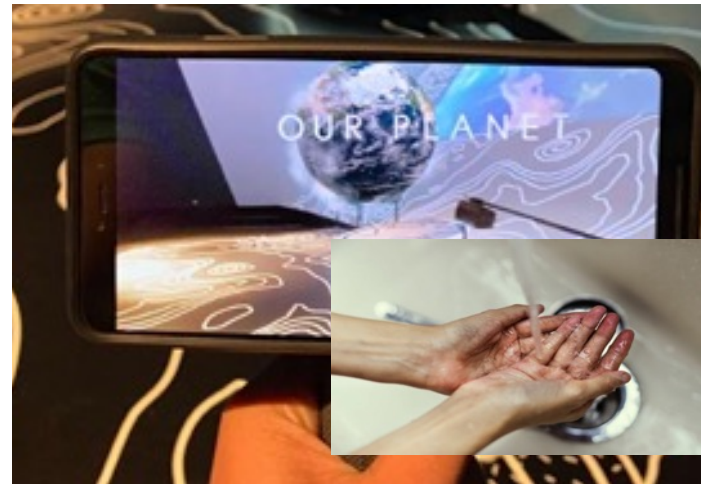
50+ PhD students

\$5 million annual staff costs

Computing  
Psychology  
Design

**Mission:**  
**Create the next generation  
of Interactive Technologies**







# Brief history of computing



1960's



1980's

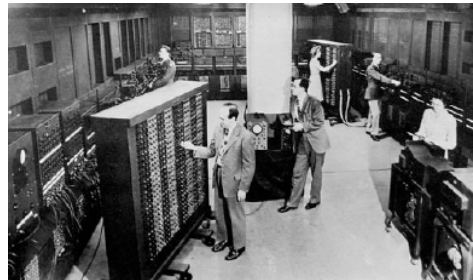


2000's



# 3 “Waves” of computing

1960's



1980's



2000's



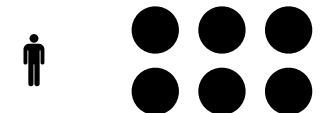
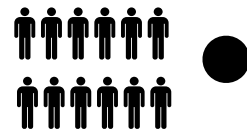
Capabilities



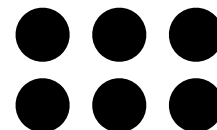
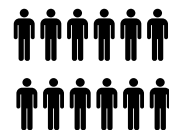
Size

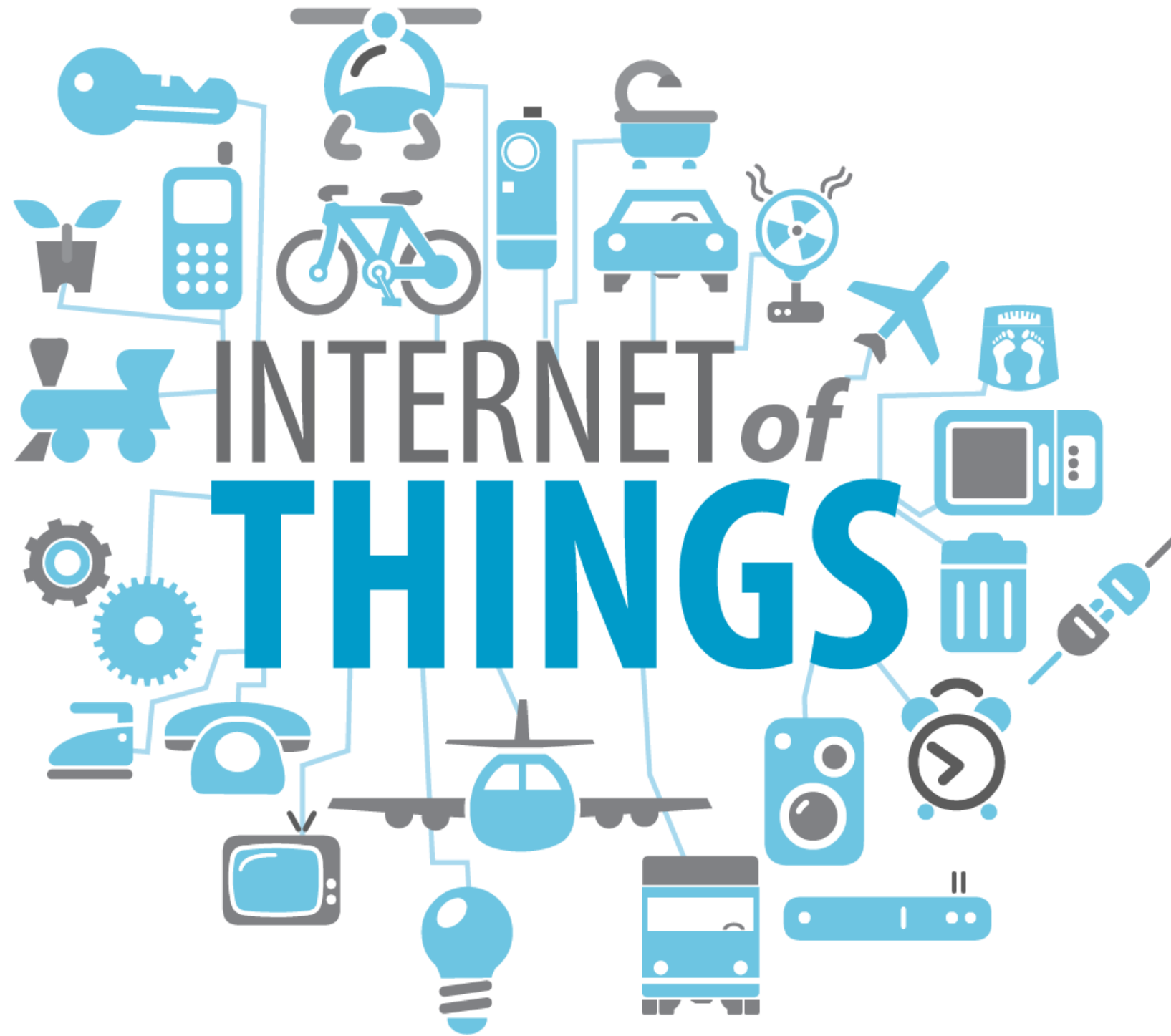


Usage

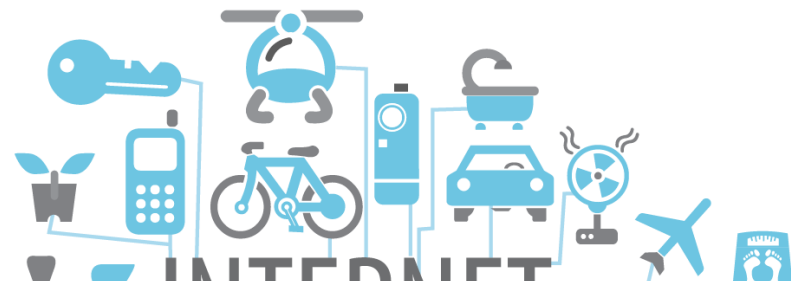


2020's

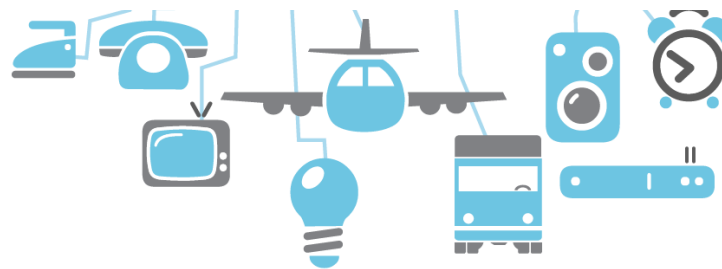




Universities: Technology Push



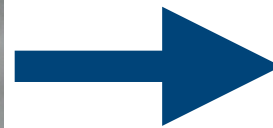
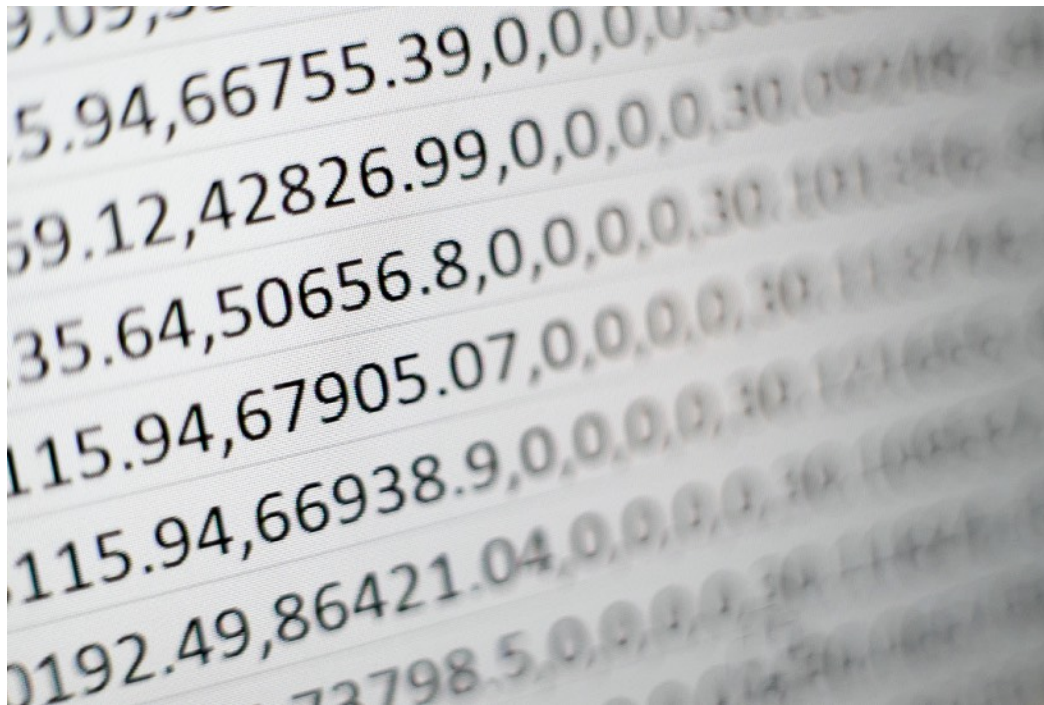
Consumer needs



Industry: Technology Pull

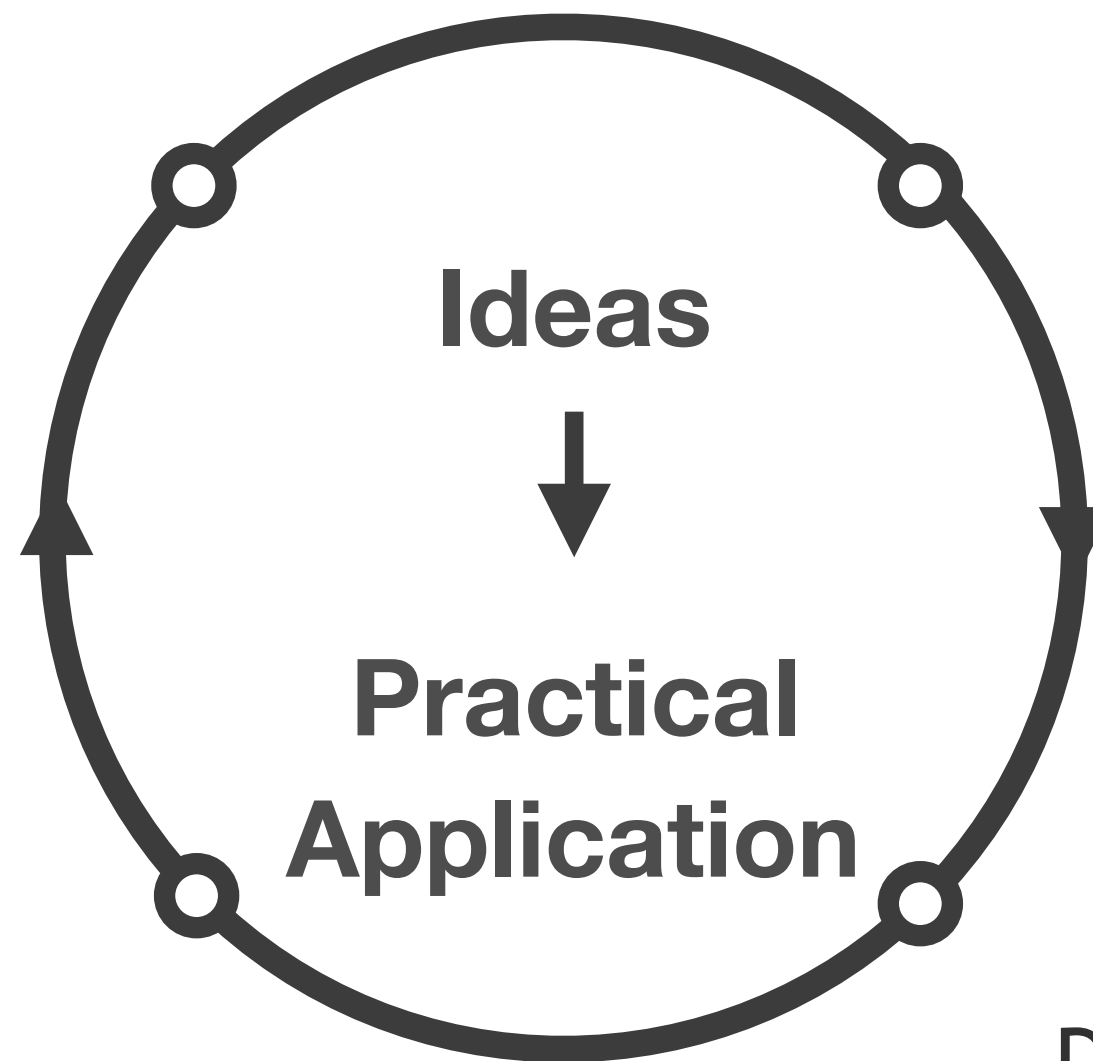


# Current AI spring



Co-create  
with end-users

Explore  
with stakeholders



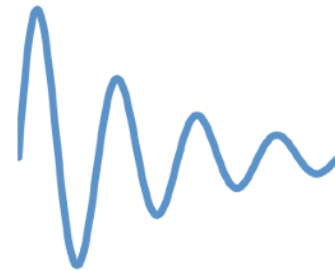
Evaluate &  
collect evidence

Develop & deploy  
prototypes

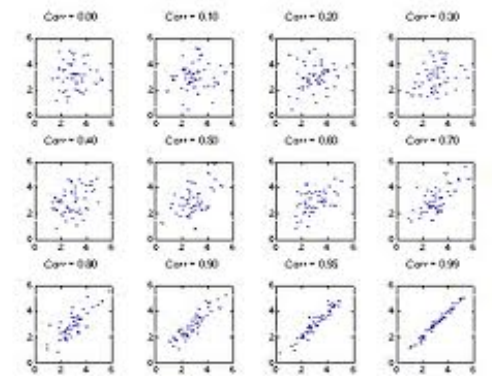
# Making technology “Smart”



Data/Sensors  
 (“Cheap”)



Calculate metrics



Establish correlations  
Describe behaviour



Ground truth: Behaviour,  
needs, ethnography  
 (“Valuable”)

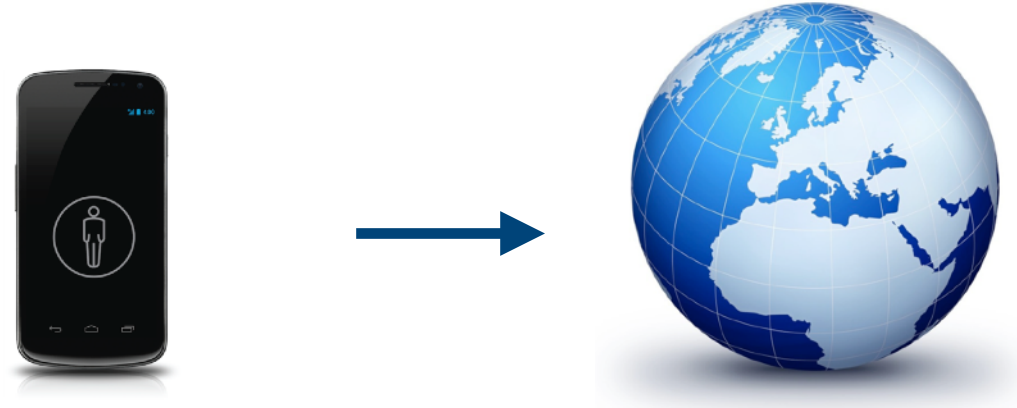


Calculate metrics



## Sources

Social Media  
Phones/gadgets  
Smart city  
Smart building



## Insights

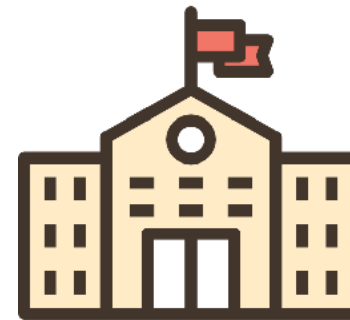
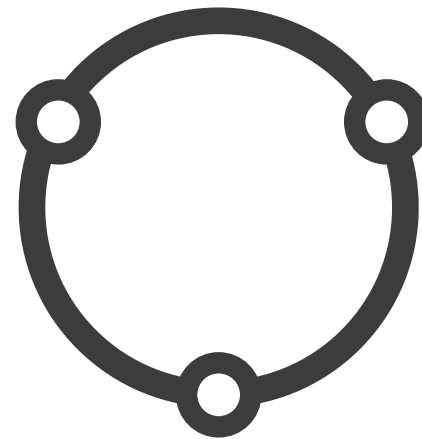
Happiness  
Personality  
Habits  
Exposure

## Methods

Smartphone sensing  
Crowdsourcing  
In-the-wild methods

# Smart Hospital Living Lab

Northern Health  
Royal Children's  
Royal Melbourne



University of Melbourne  
Computing  
Population Health



Department of Health and Human Services  
Government of Victoria















# Smart Hospital Living Lab

## Improve hospital operations

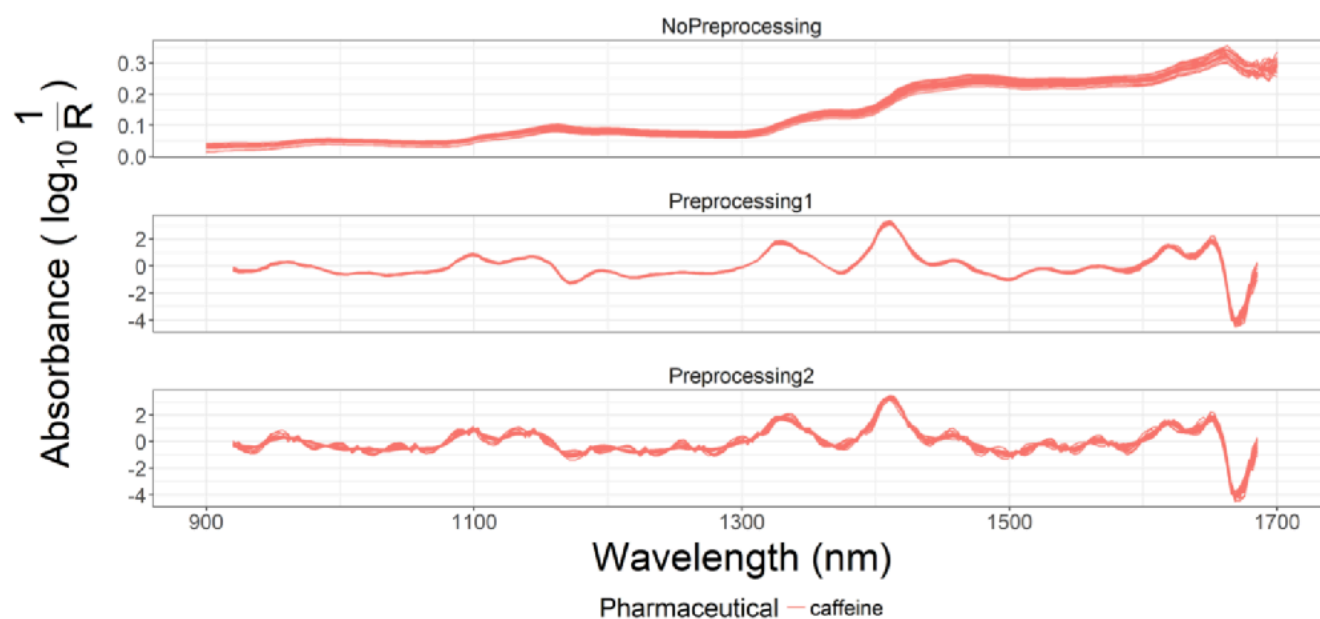
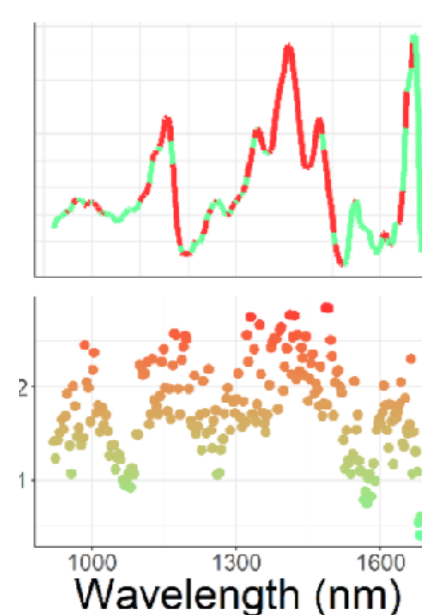
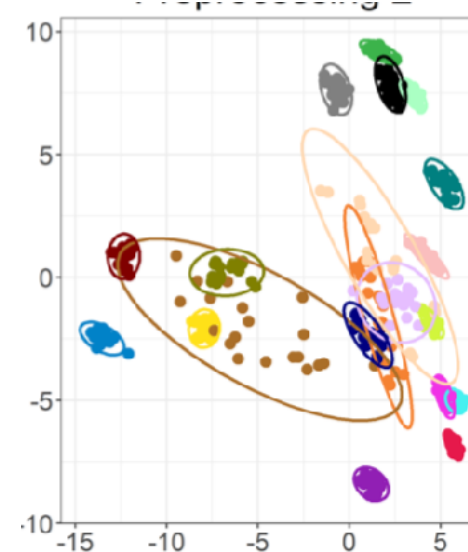
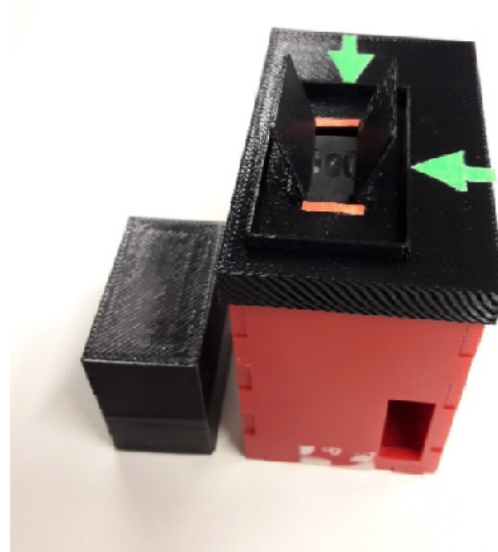
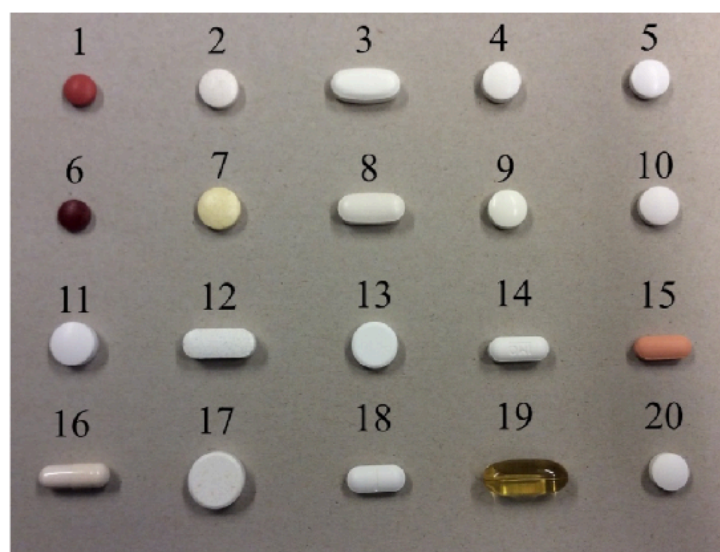
Safety:	reduce errors
Efficiency:	generate insights





## Smart pill box

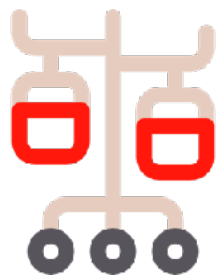
### Identify pills using chemical signatures



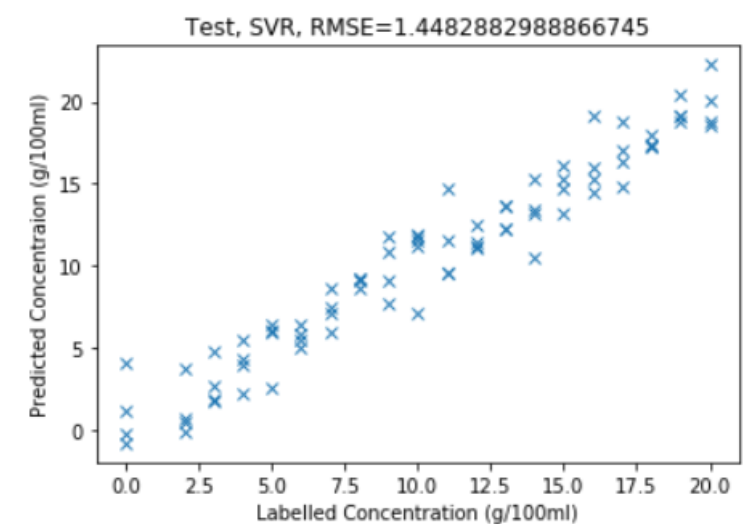
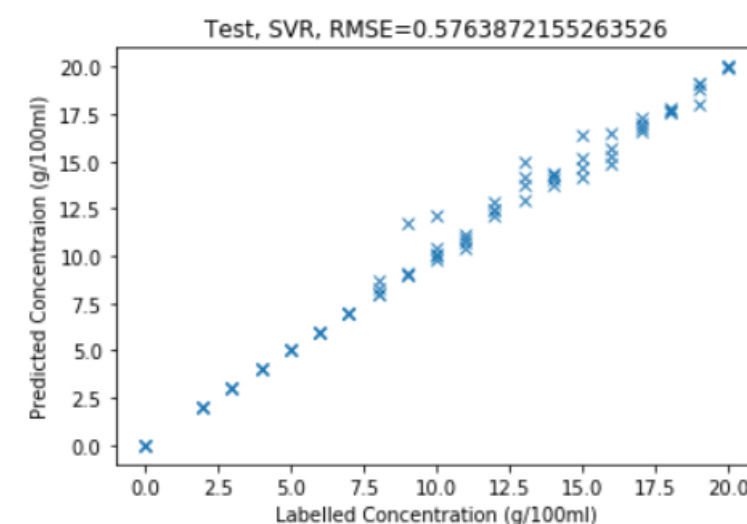
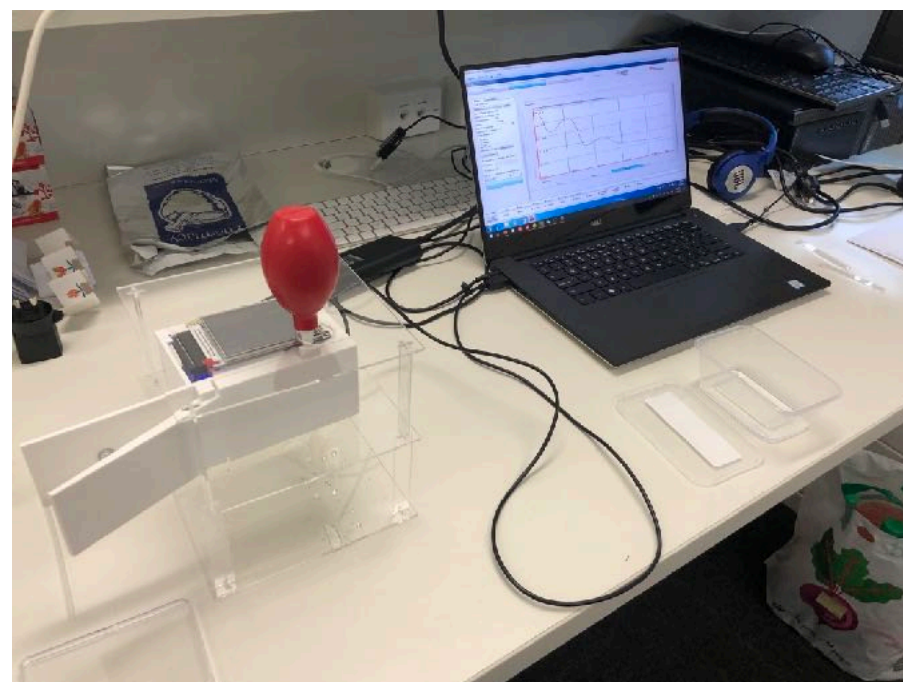
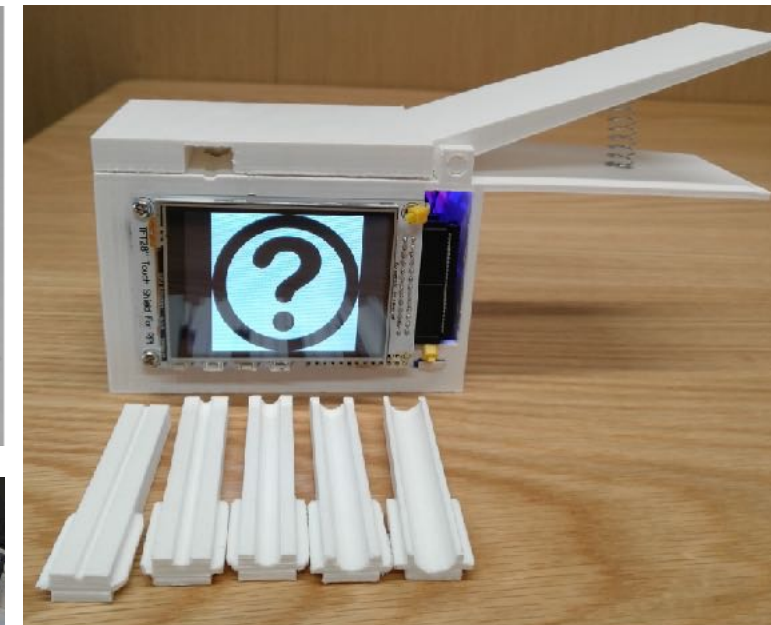
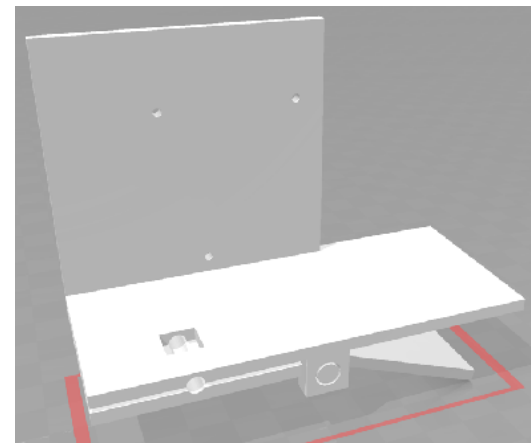








# IV line monitoring Continuous identification of liquids/concentrations in IV line

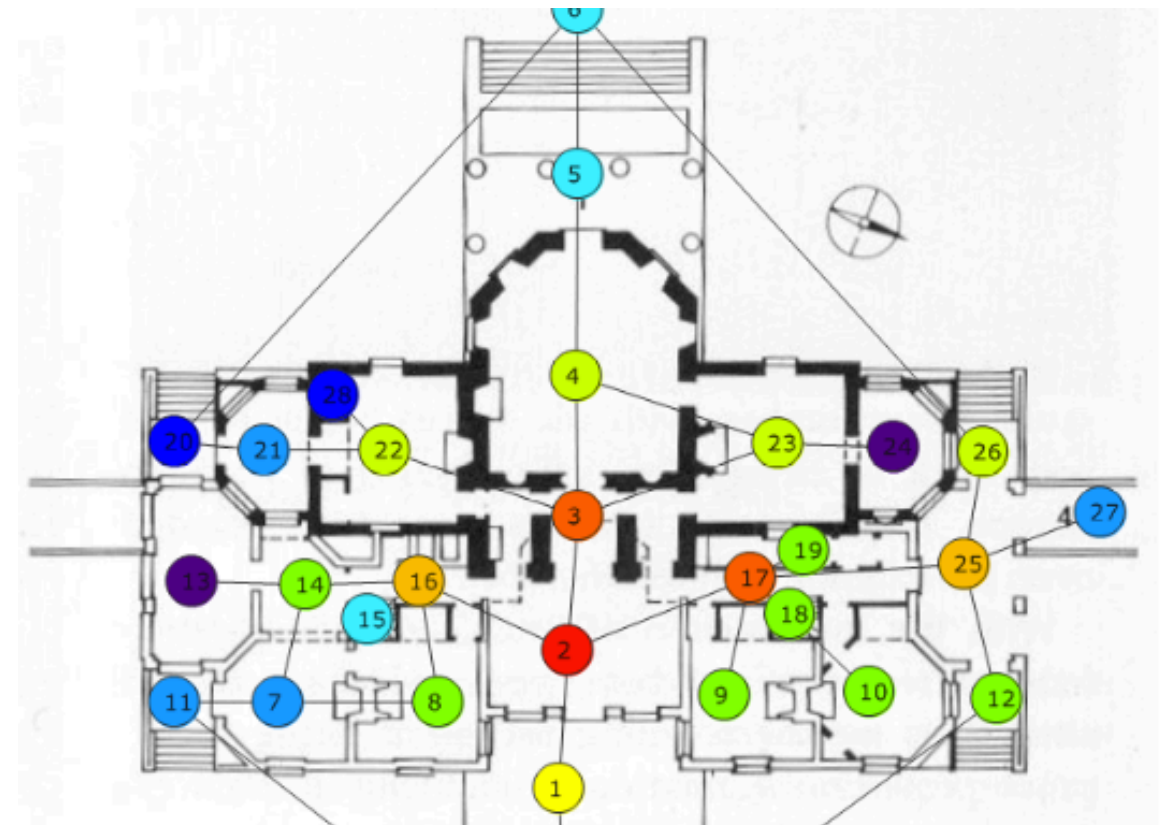
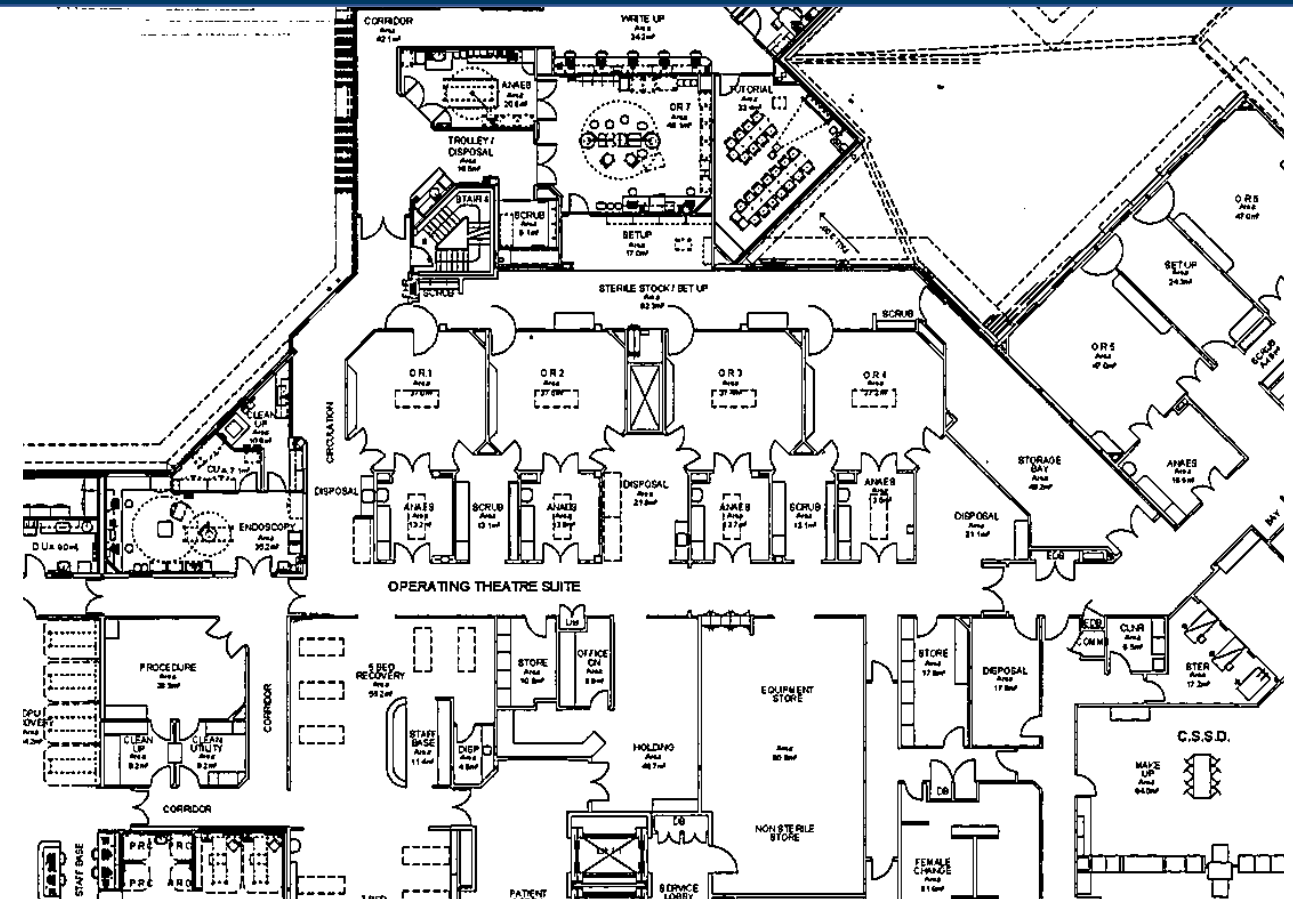






## Operating theatre tracking

Track patients/staff in & out of operating theatres







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3



TECHNICIANS		
0800	Rommel	10:1
0850	Daniel	10:20
0900	Mandi	
ALL NURSES		
0800	Mel Marsh	✓
0800	Pa mei	✓
	Bec Pang	✓
0900	Khim	✓
0900	Paris Zamani	✓
0900	Lu Lu	✓
12	Charmaine	✓
	Kathleen	✓





Human Dermatomes

clinell

IV Stuff

OP Airway  
NP Airway T Bag

Combine Large &  
Small Gauze







OR  
3



THE UNIVERSITY OF  
MELBOURNE

**DO NOT UNPLUG!**

Project: Reliable Operating Rooms (ROR)  
In collaboration with The University of Melbourne

For more information contact:  
Prof. Vassilis Kostakos  
[vassilis.kostakos@unimelb.edu.au](mailto:vassilis.kostakos@unimelb.edu.au)

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OR  
1



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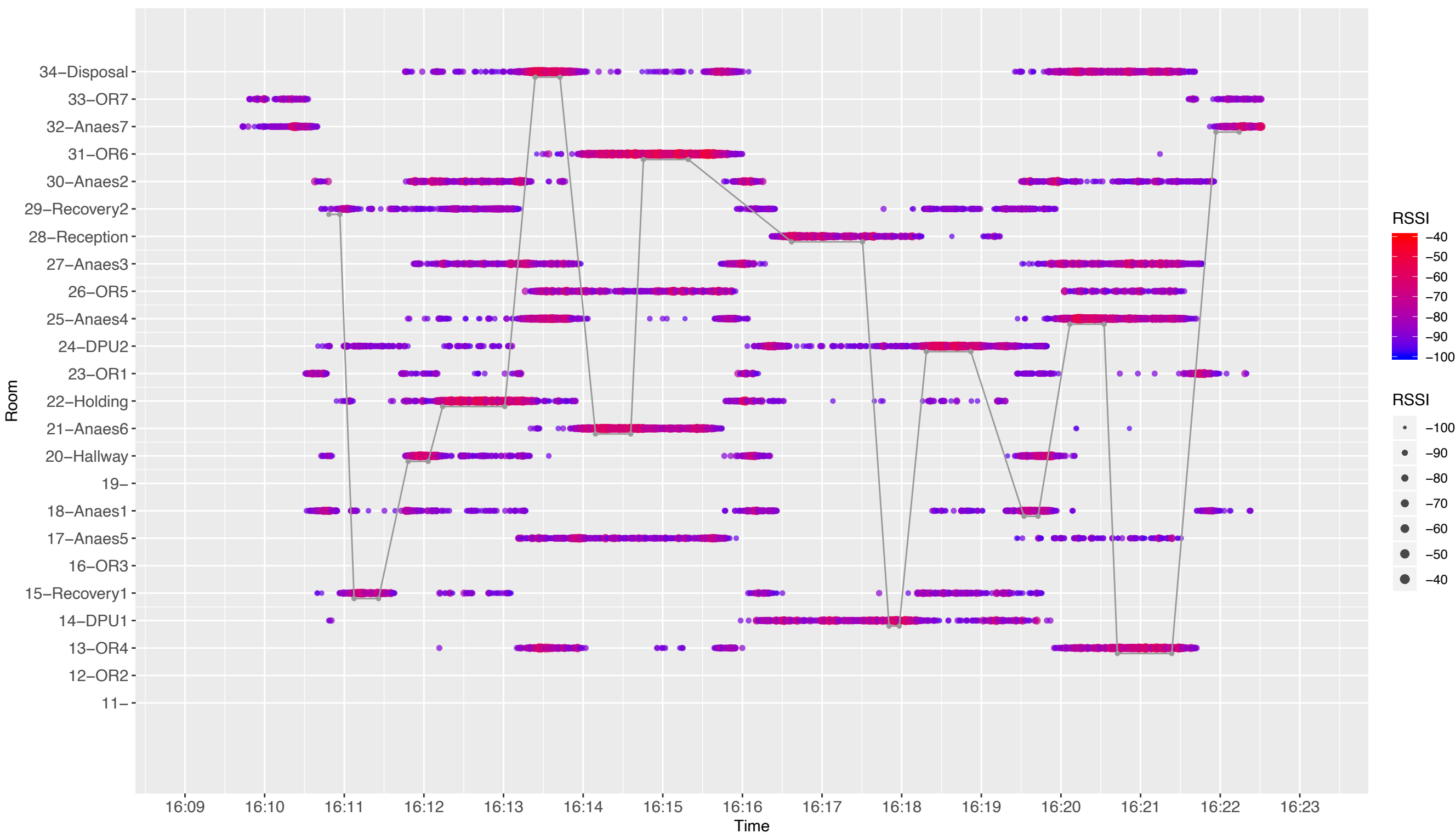


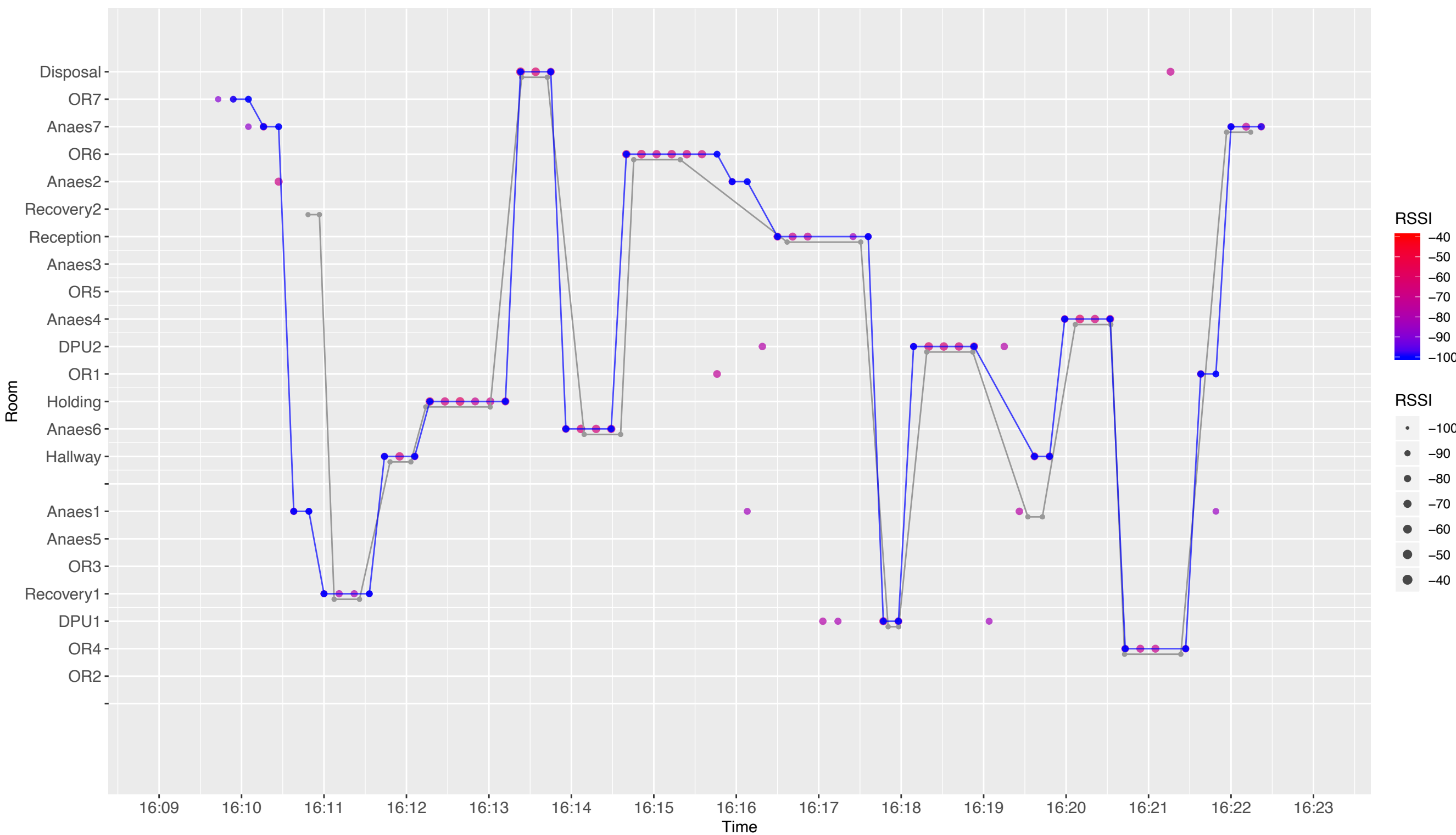






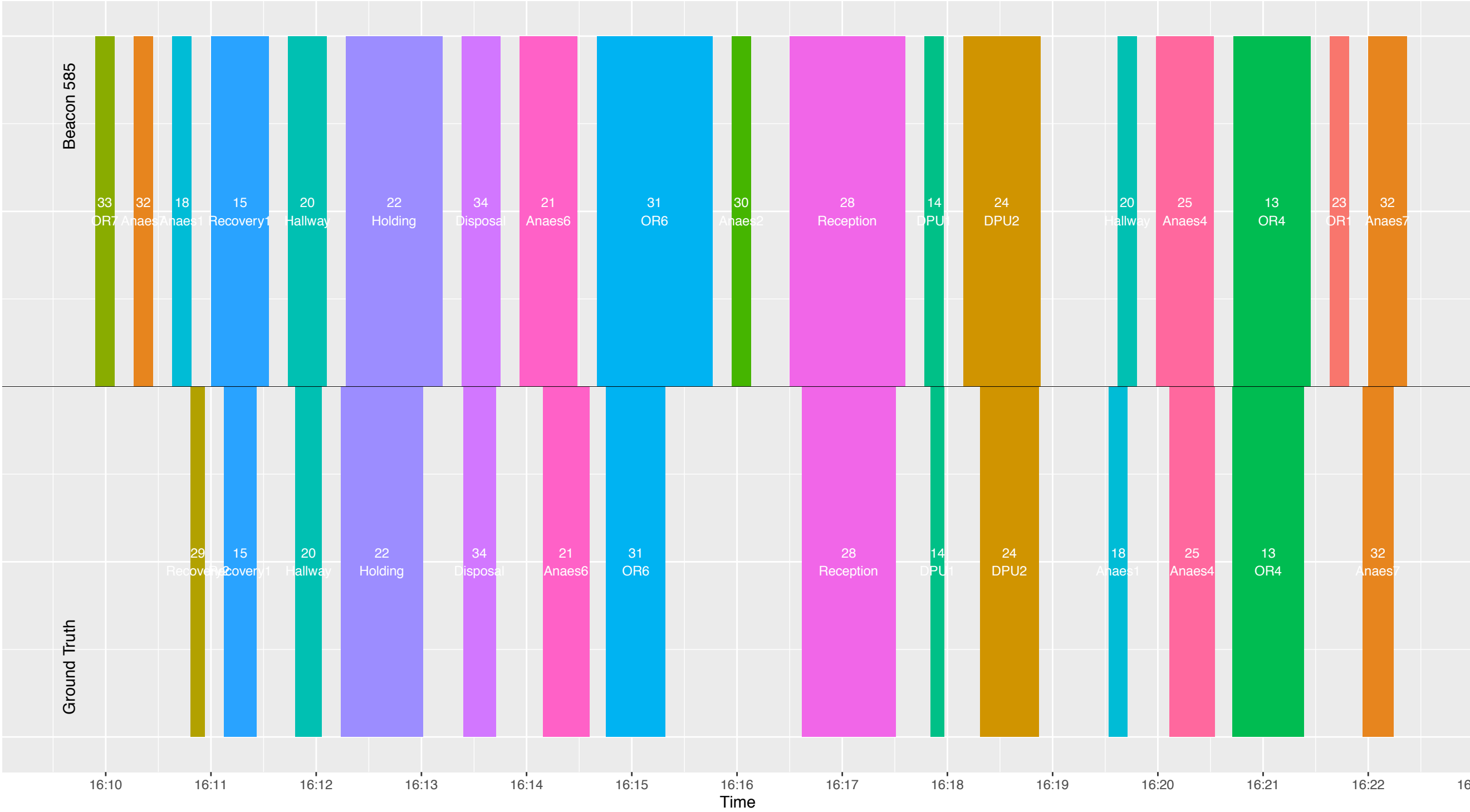




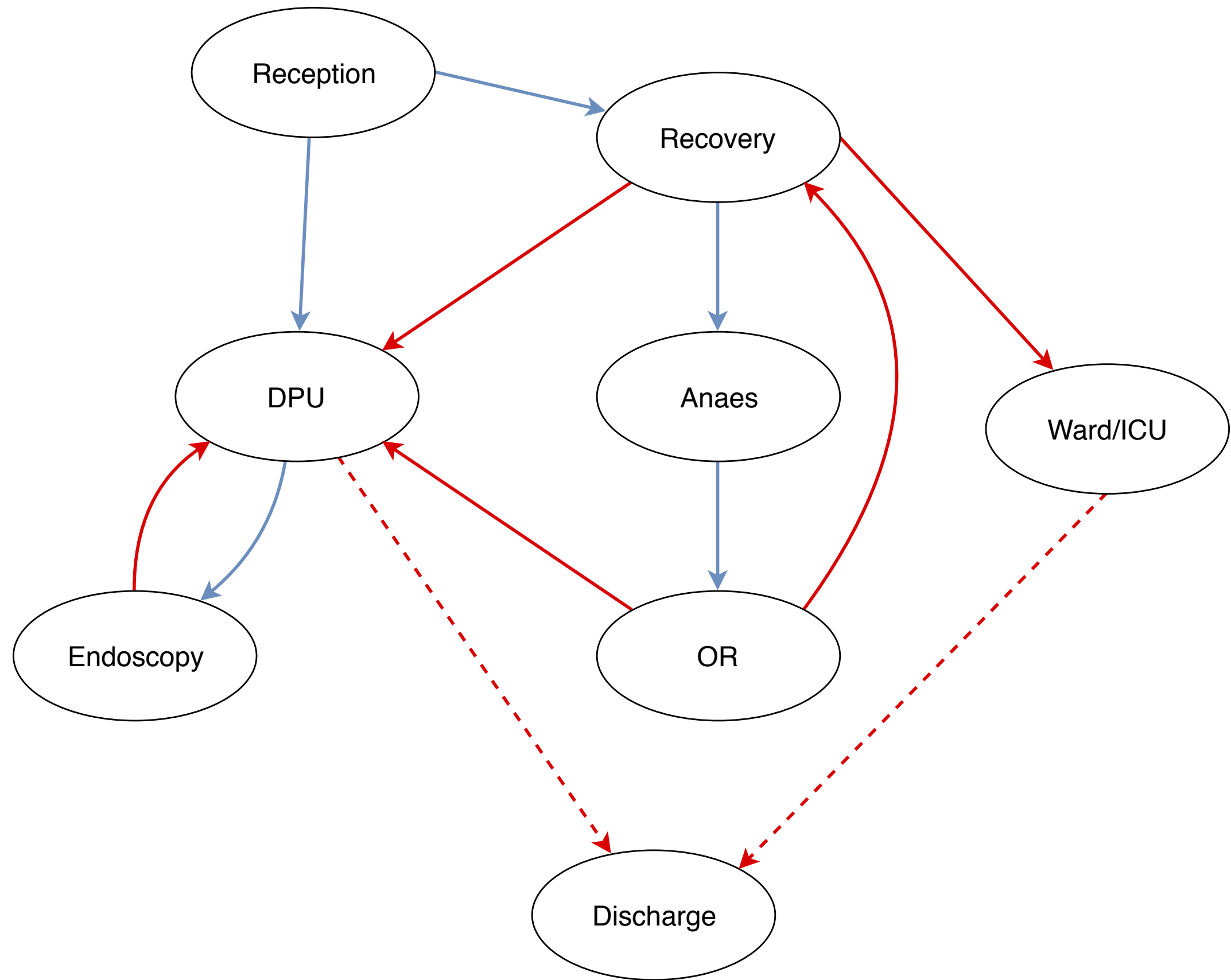




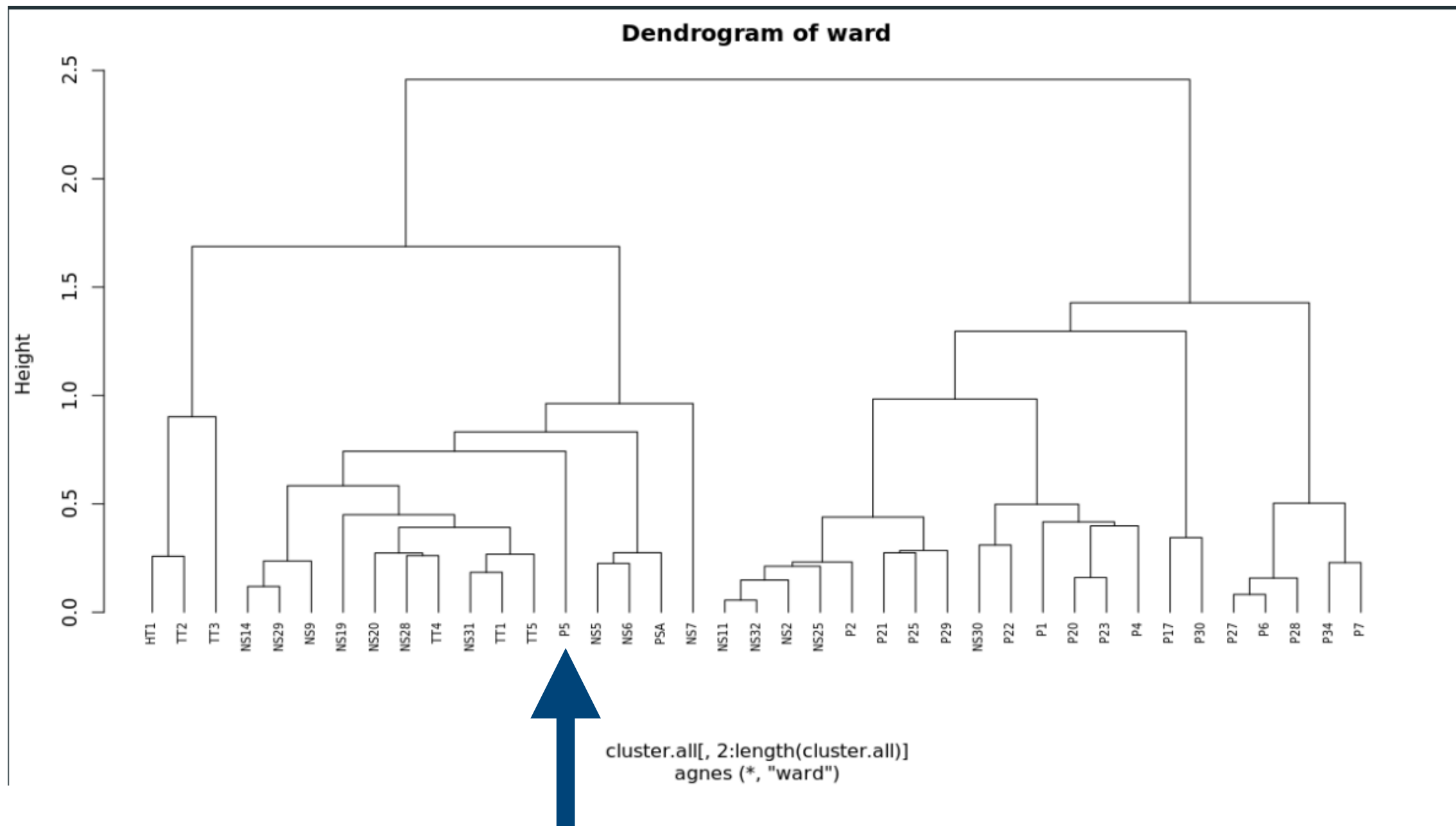
Trace 1 Comparison







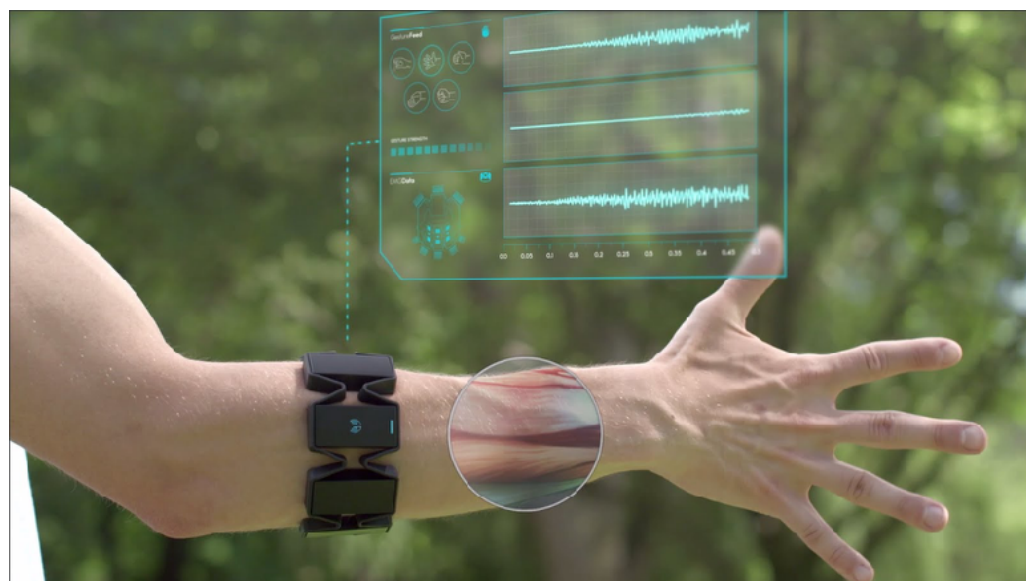
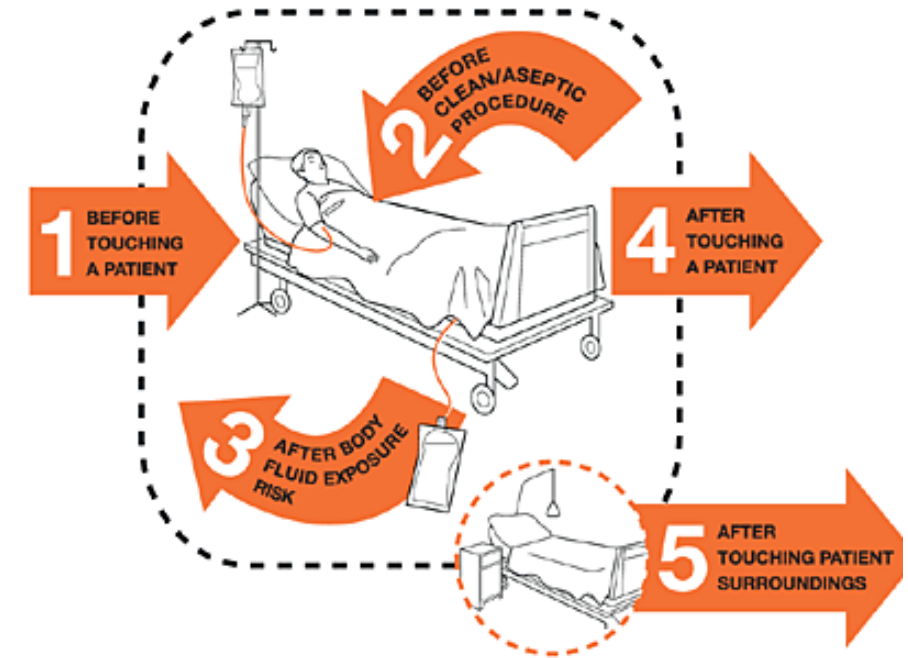








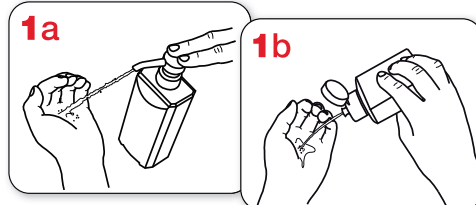
## Hand washing detection Detect (and quantify) hand washing in the hospital



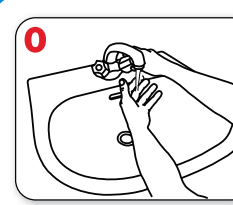


# How to handrub? WITH ALCOHOL-BASED FORMULATION

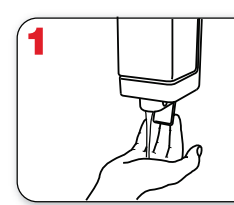
# How to handwash? WITH SOAP AND WATER



Apply a palmful of the product in a cupped hand and cover all surfaces.



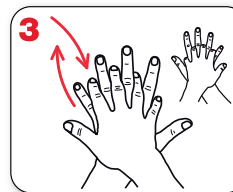
Wet hands with water



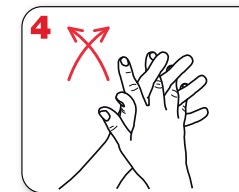
apply enough soap to cover all hand surfaces.



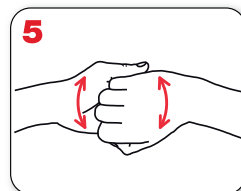
Rub hands palm to palm



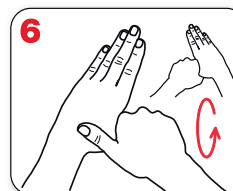
right palm over left dorsum with interlaced fingers and vice versa



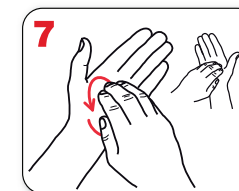
palm to palm with fingers interlaced



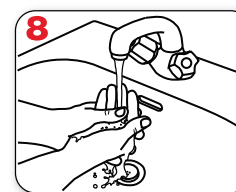
backs of fingers to opposing palms with fingers interlocked



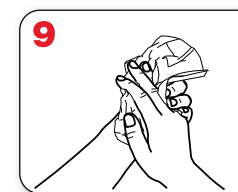
rotational rubbing of left thumb clasped in right palm and vice versa



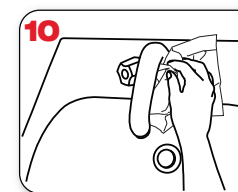
rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa



rinse hands with water



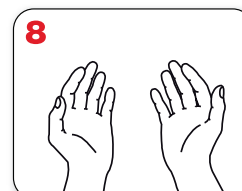
dry thoroughly with a single use towel



use towel to turn off faucet



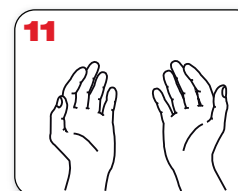
20-30 sec



...once dry, your hands are safe.



40-60 sec



...and your hands are safe.

Design: monofragilis network



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MELBOURNE



WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.



World Health  
Organization

October 2006, version 1.



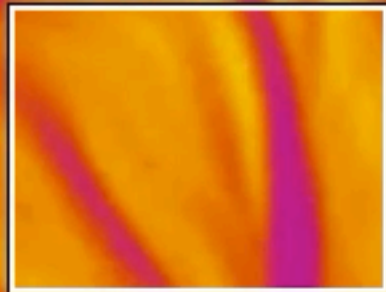








Area 1



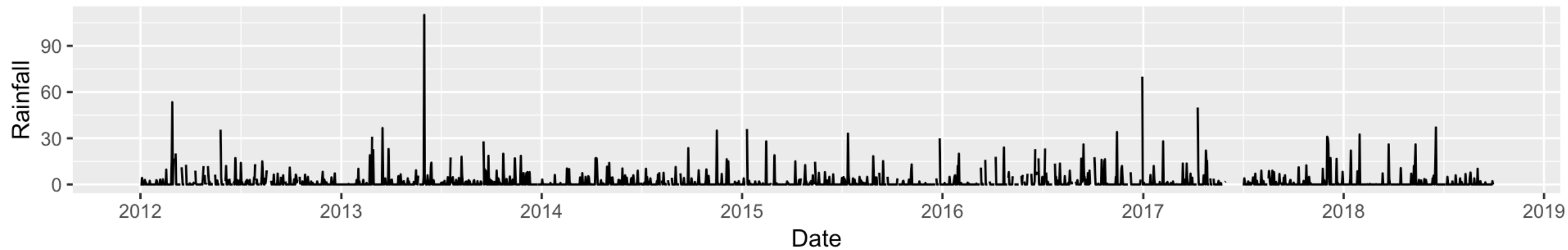
↑ 89.2°F



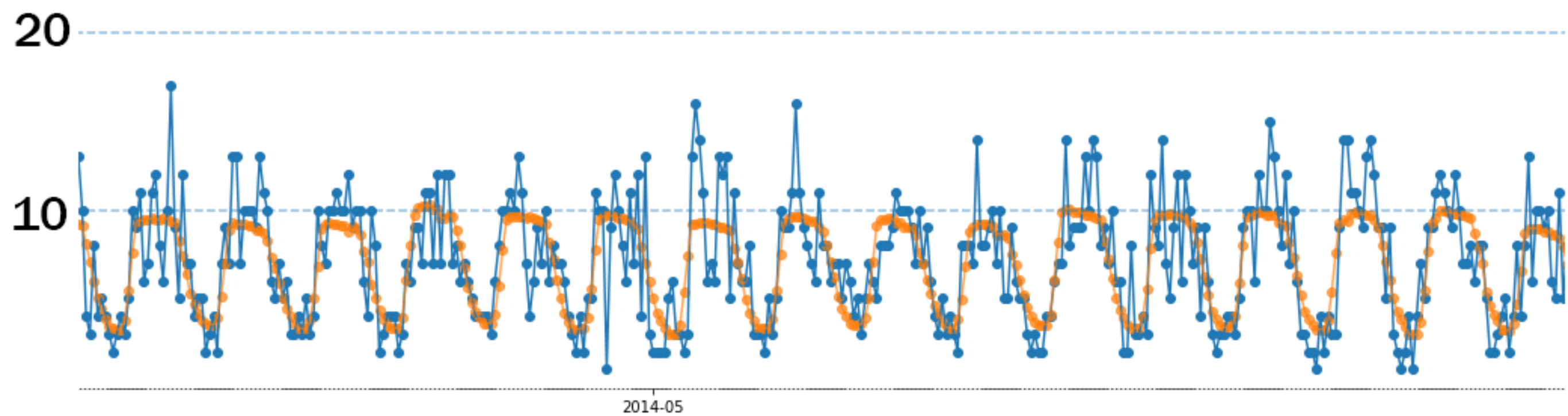
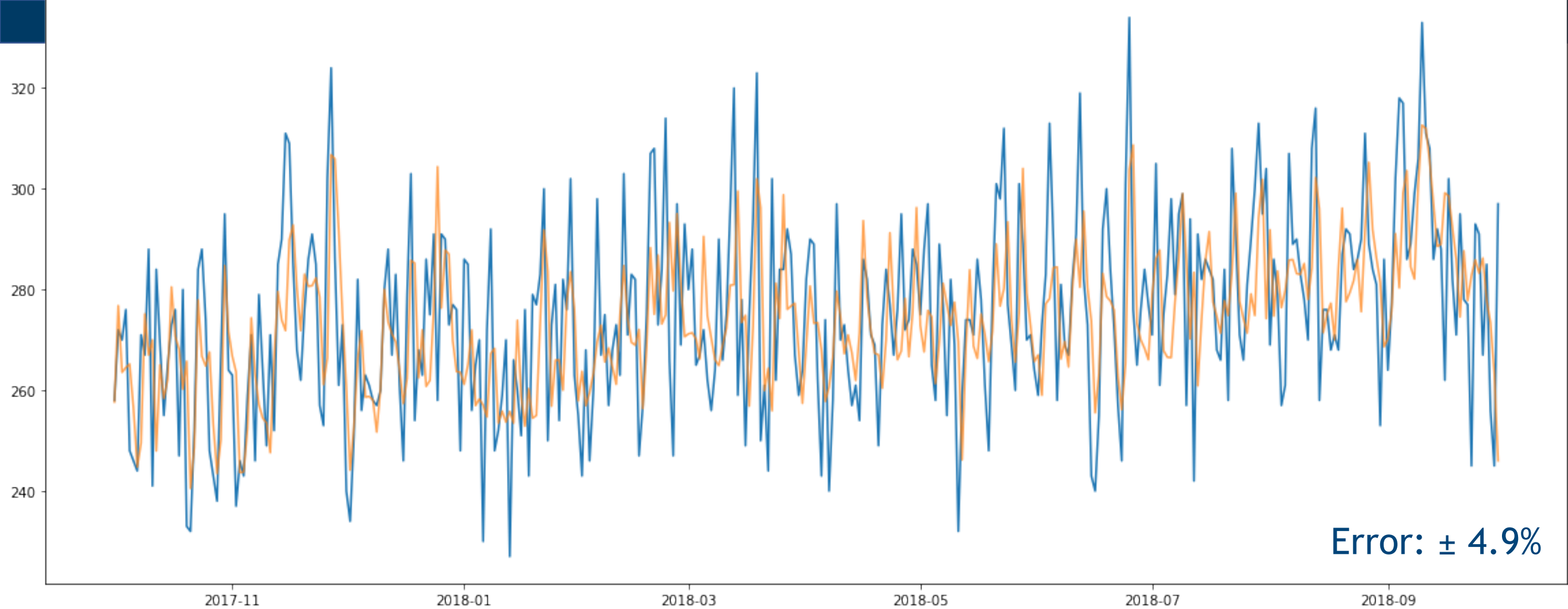


Predict ED arrivals  
Predict people arriving to  
the Emergency Department

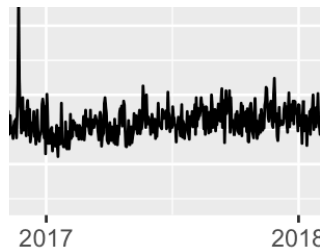
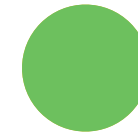
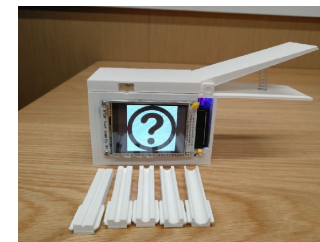
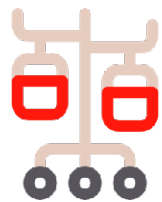
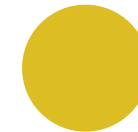
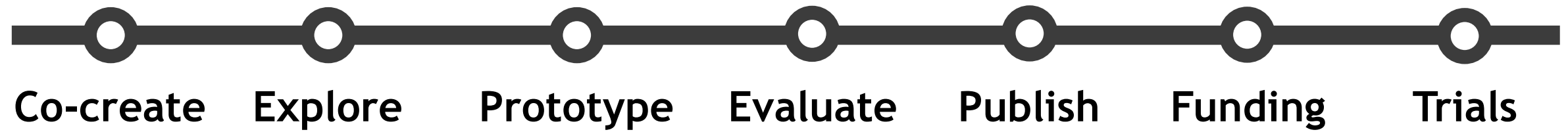
## Rainfall (ml)





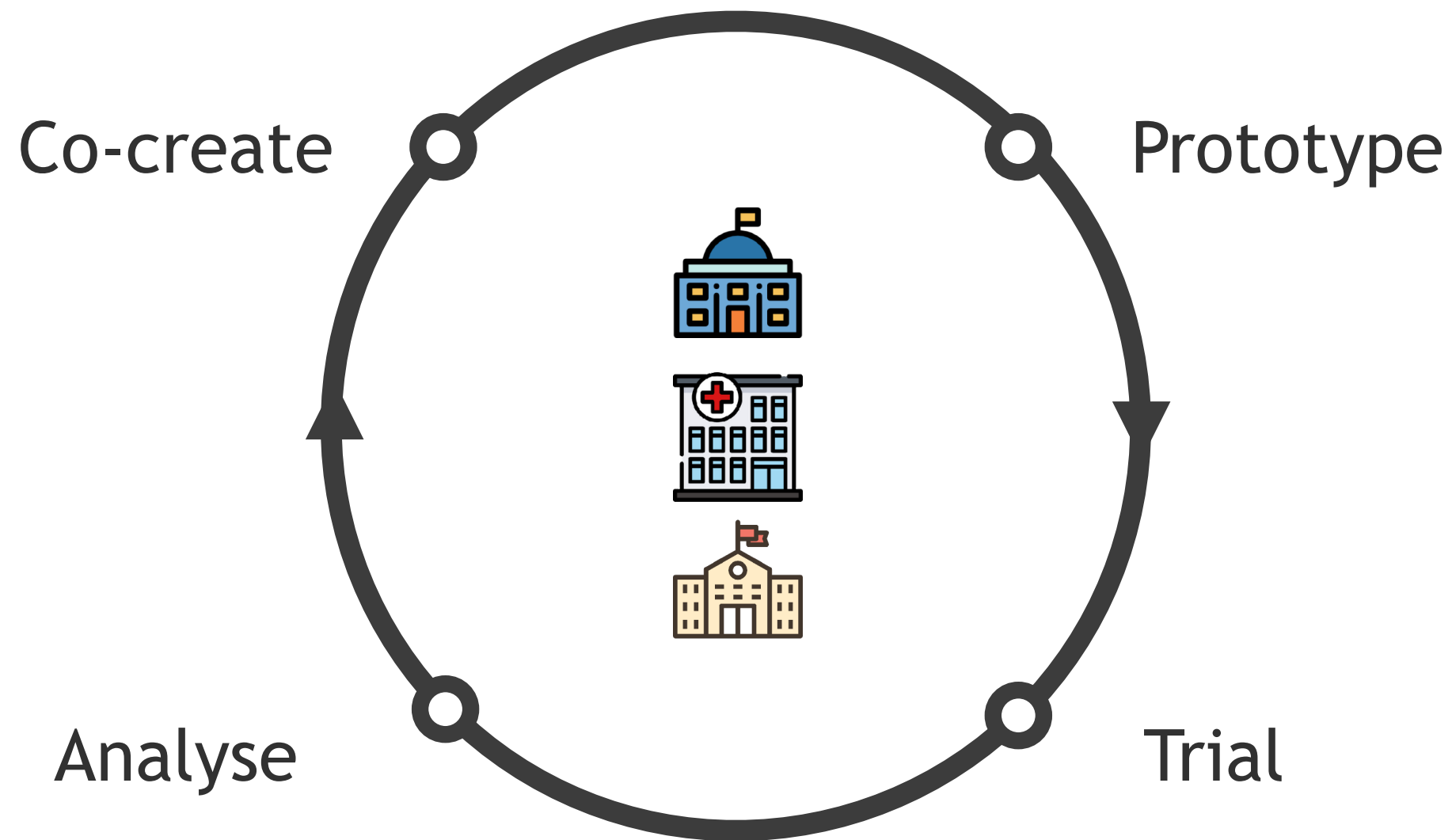








# Living Lab: Continuous Innovation





# Outcomes and benefits



Improved operations



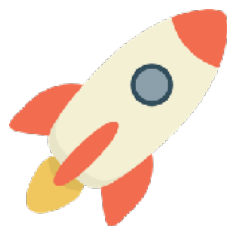
Generalisable solutions



Pathway to funding



Establish critical mass



Innovation beyond hospitals



The ~~end~~ *beginning!*

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