



# MULTI-DIMENSIONAL DESIGN

IMPLEMENTING AUGMENTED REALITY  
& SIMULATION MODELING

2022 | AIA Ohio Technology Summit



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# LEARNING OBJECTIVES/AGENDA

## **COMMON ISSUES & STRATEGIES**

- Common issues that affect end user well being
- Strategies for promoting an equitable user experience

## **AUGMENTED REALITY & CRITICAL ISSUES**

Augmented reality can improve safety by mapping optimal workflows and locating critical spatial elements

## **RIGHT SIZING & SIMULATION MODELING**

Techniques for program elements using simulation modelling and augmented reality to maximize efficiency.

## **QUESTION & ANSWER | DISCUSSION**



# COMMON ISSUES & STRATEGIES

# LEVELING THE PLAYING FIELD

## **UNINTENDED CONSEQUENCES**


Solving one problem but creating another

## **NOT APPRECIATING THE TRUE SCALE:**

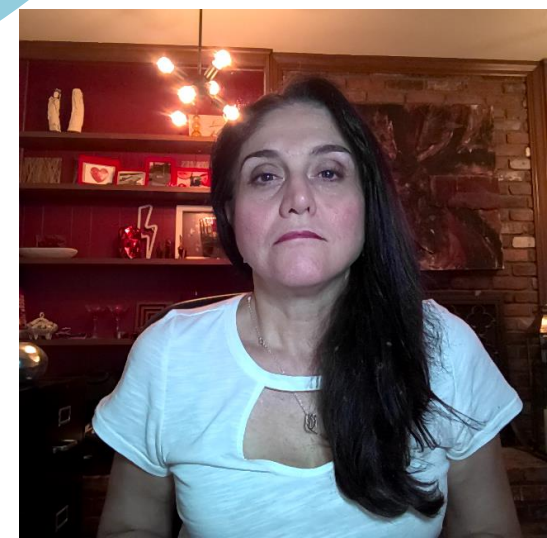
Heights, distances

## **DISCONNECTING OPERATIONAL ROI FROM DESIGN:**

Believing space is only about function and aesthetics



Many clients/users  
don't fully understand  
the implications of  
design decisions



# DESIGNER CONFIRMATION BIAS



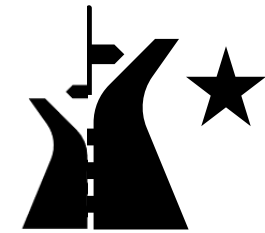
## LEADING THE WITNESS

Driving discussion or showing information that favors a particular strategy or solution



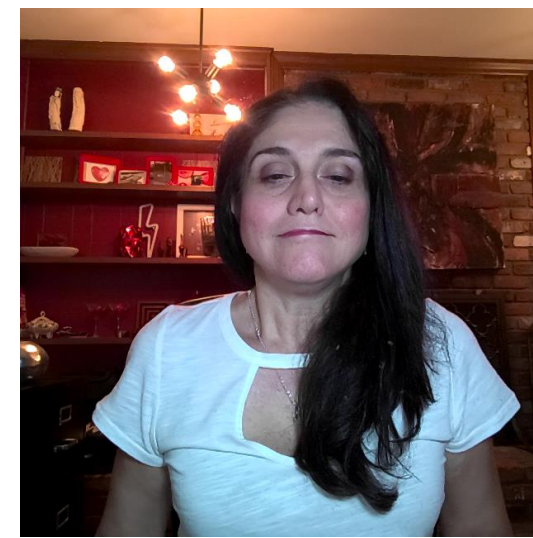
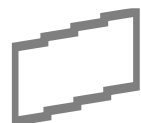
## SELECTIVE LISTENING

Filtering inputs that support what you want to believe is the problem to solve

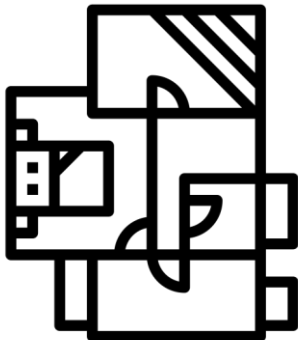


## POST RATIONALIZATION

Ignoring or downplaying the merits of options not chosen and never revisiting them.

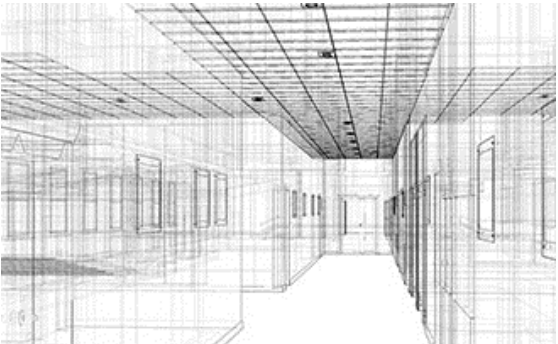


# SPEAKING DIFFERENT LANGUAGES



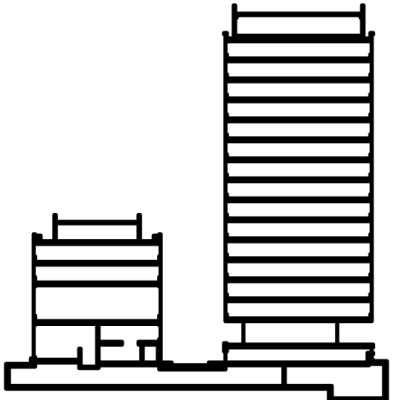
## PLANS

The complex nature of healthcare planning and design makes for a more difficult conversation.



## VOCABULARY

Materiality, Potentiality, spatiality, conditionality, functionality, modernity.

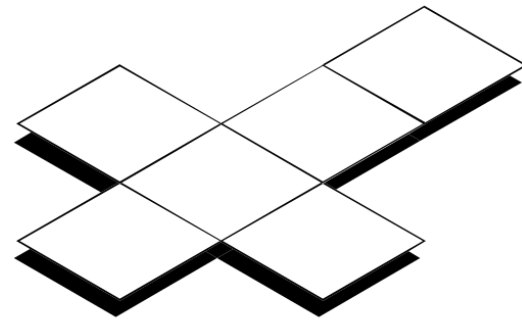


## DOCUMENTS

The use of plans, sections, perspectives and renderings... is architectural documentation a common language?.

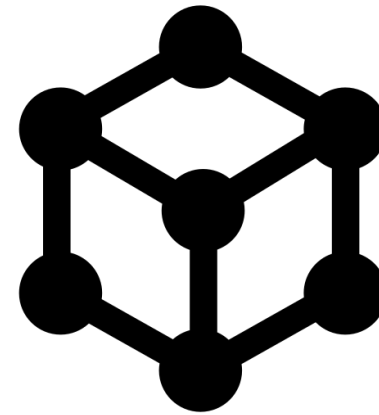


# COMPILING DRAWINGS & VISUALIZING



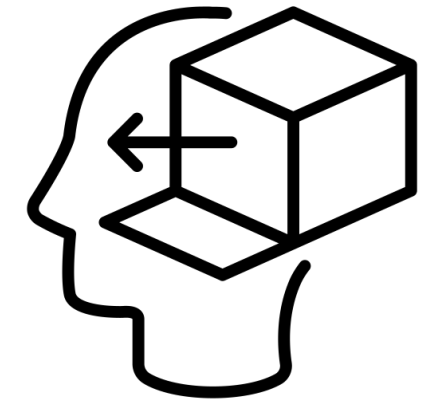
## COMPILING

Taking all the 2D drawings and documents to create a 3D space



## VISUALIZING

Connecting the dots, and creating a picture of the space in your own mind.



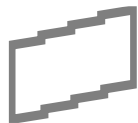
## SCALE

Allowing the mind to put you in the space to understand and feel the size and vastness of what is being expressed

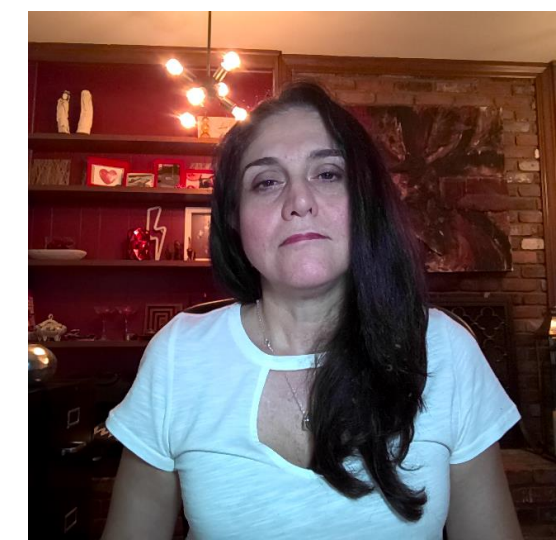
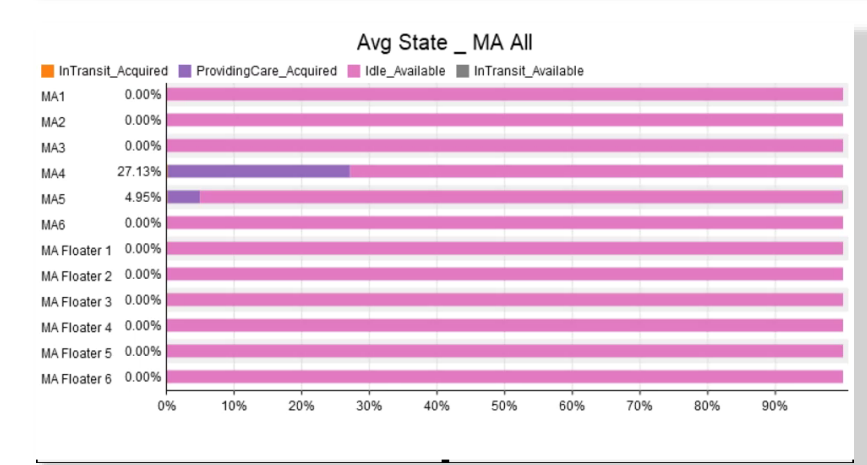
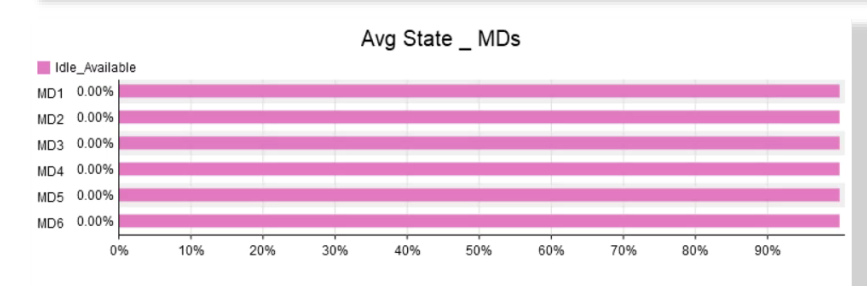




# STRATEGY – AR/VIRTUAL WALK THRU



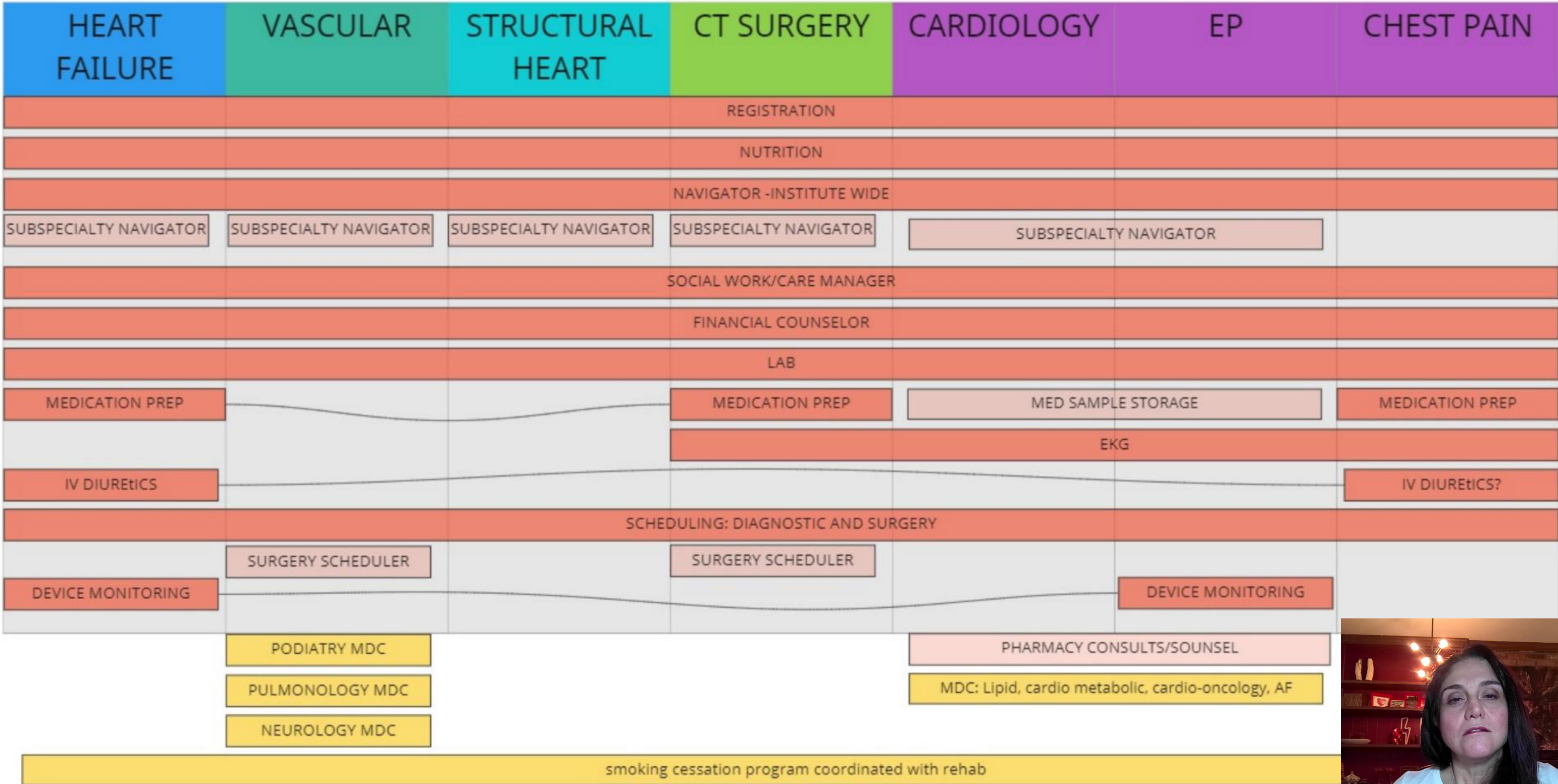




# **RIGHT SIZING & SIMULATION MODELING**

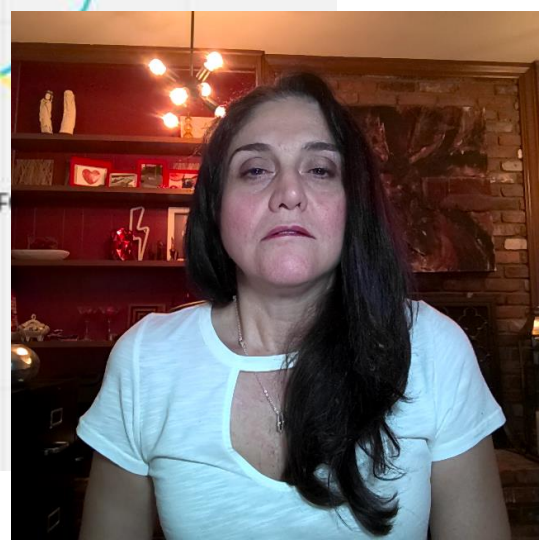
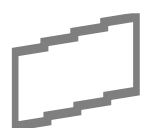
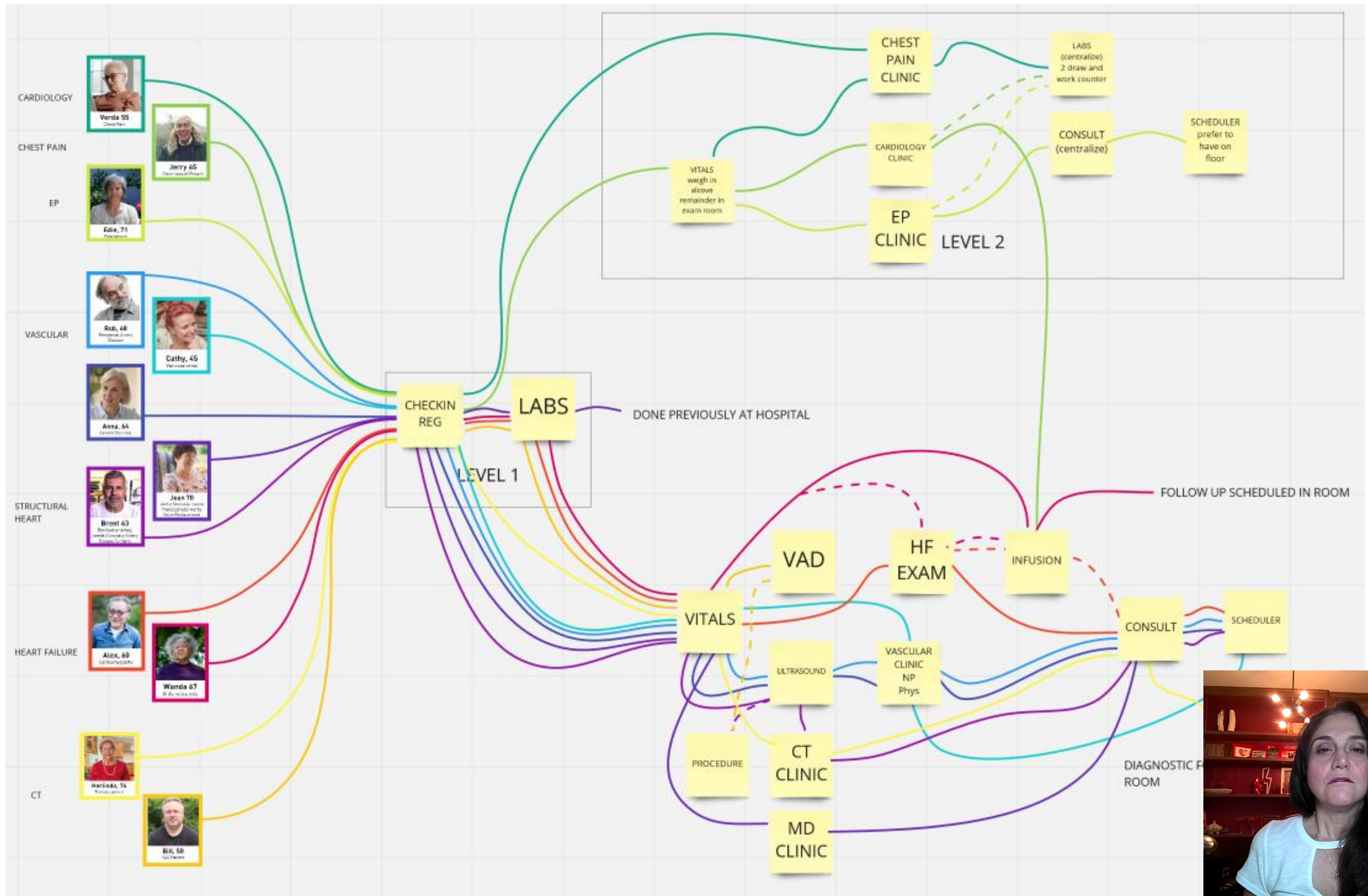


# INSTITUTE MAP





# FLOW DIAGRAMS



# BUILDING THE DATA

## RESOURCES

WHO/WHERE

## SCENARIO ASSUMPTIONS

WHAT/HOW

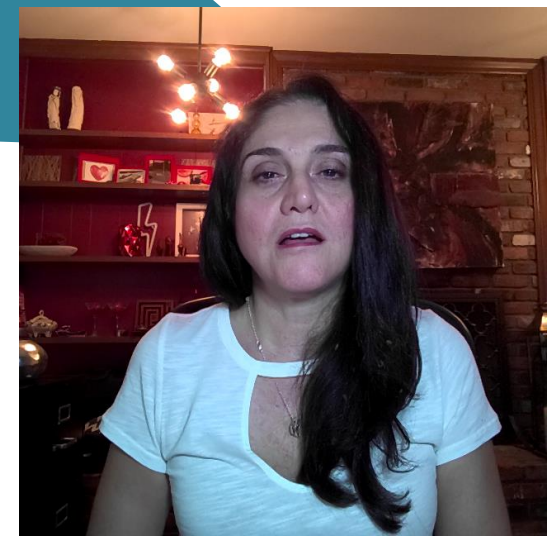
## DURATIONS

WHEN

People

Equipment/Furniture

Rooms



# What do we need to know?

## PROCESS FLOW

- How often do patients enter the model?
- What is the step-by-step process?
- To what percentage of patients does each phase apply?
- What is the processing time for each phase?

## PHYSICAL RESOURCES

- What physical items are used by the patient/staff?
- Where is the 'home' location for each resource?
- What is the maintenance schedule for the item?
- Is this a shared resource or a dedicated resource?

## STAFF RESOURCES

- What staff members are assigned to each phase?
- What are the schedules for each staff member?



# How do we gather this information?

Patient Type	Steps in Process	%	Priority Level (1-10)	Physical resources (Chair, exam Table, Wheel chair, etc.)	Staff Resource (Clerk, MA, Physician, Scheduler, etc.)	Duration in minutes Min/max/avg
Cardiology Patient	<b>Arrival</b>					
	Valet	40	10	Walk-Unassisted	Self	5"-7"-6"
		10	10	Wheel Chair	Family/Clerk	5-10"-6"
	Self Park	40	10	Walk Unassisted	Self	1"-5"-3"
		10	10	Wheel Chair or requires Assistance	Family/Clerk	5-10"-6"
	<b>Registration</b>					
	Full in person	75	10	Chair/Bariatric	Registrar	5"-10"-7"
	Kiosk	25	10		Patient/Registrar	2"-5"-4"
	<b>Lab</b>	10	7	Lab Chair, Exam Table/Recliner	MA/LPN/Phleb.	10"-15"-7"
	<b>Elevator to 2</b>	100	10	Walk or Wheel Chair	Self/Family/Staff	1"-2"-1.5"
	<b>Arrival on 2</b>	100	10	Walk or Wheel Chair	Self/Family/Staff	0"-1"- 1 "
	<b>Vitals</b>					
				Exam Table or		



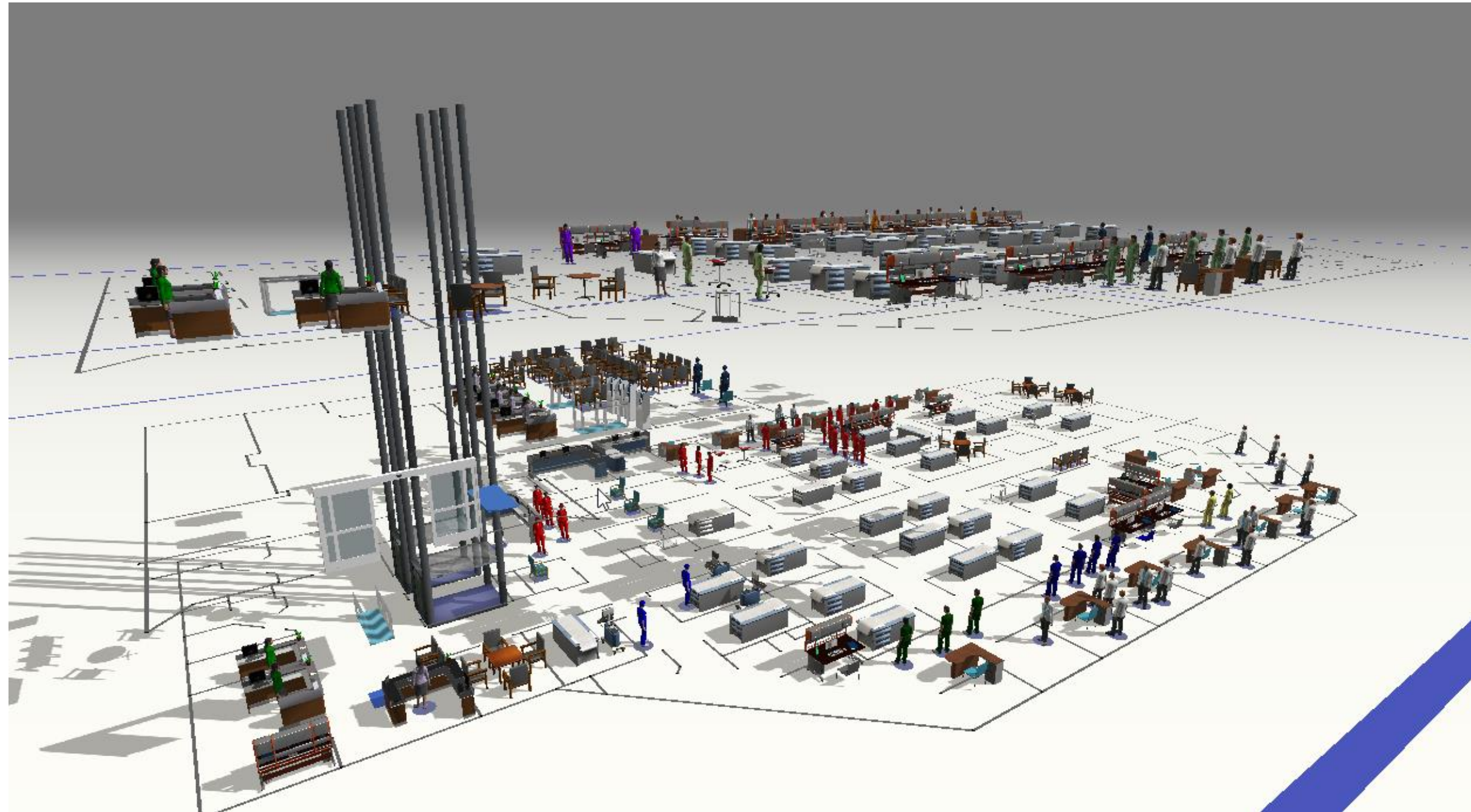


# Build out the Model

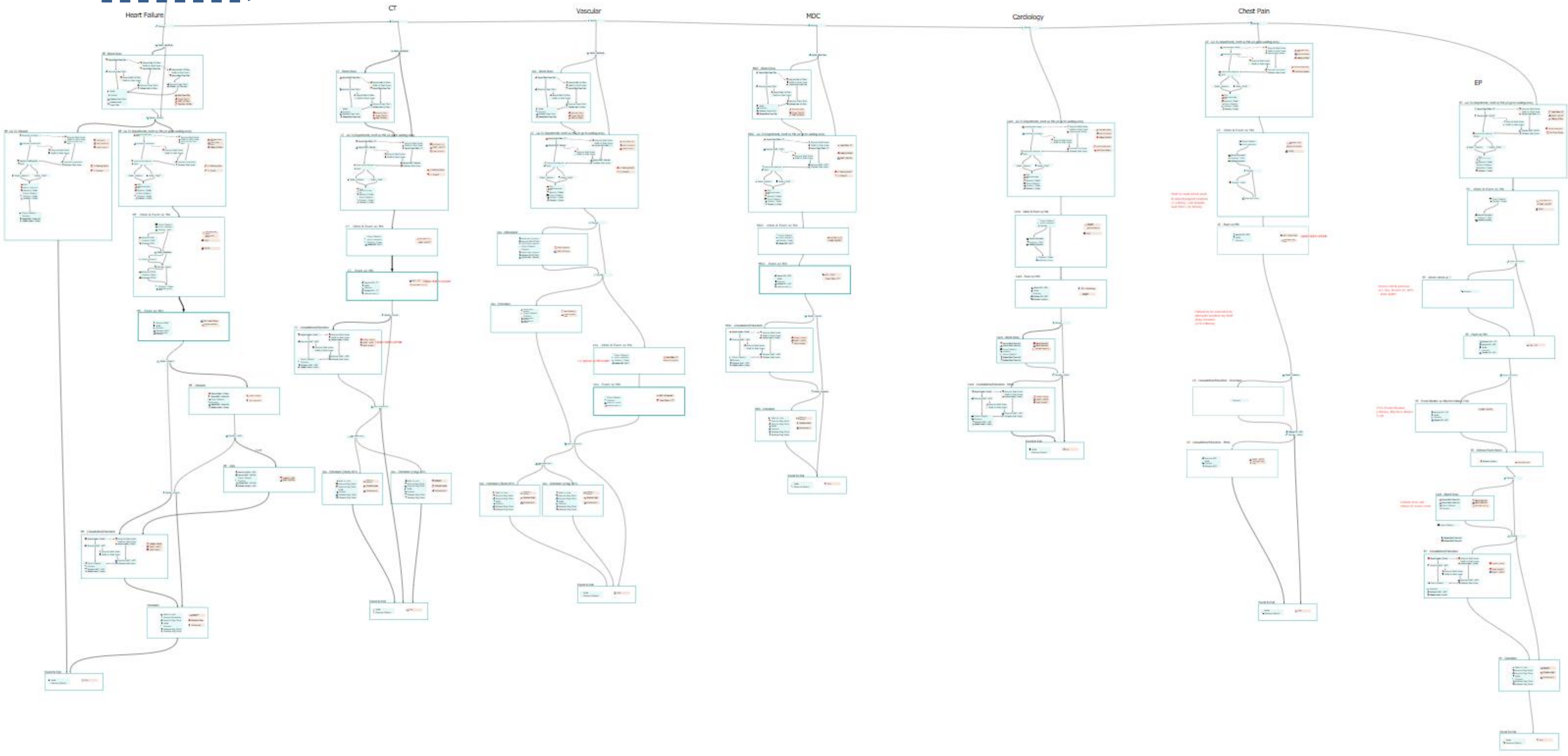
**Level 1** Cardiology,  
Chest Pain, EP, Blood  
Draw, Consultation,  
Scheduling

**Level 0** Entry,  
Registration, Waiting,  
Blood Draw

**Level -1** Heart Failure,  
CT, MDC, Vascular,  
Ultrasound, Scheduling,  
Consultation

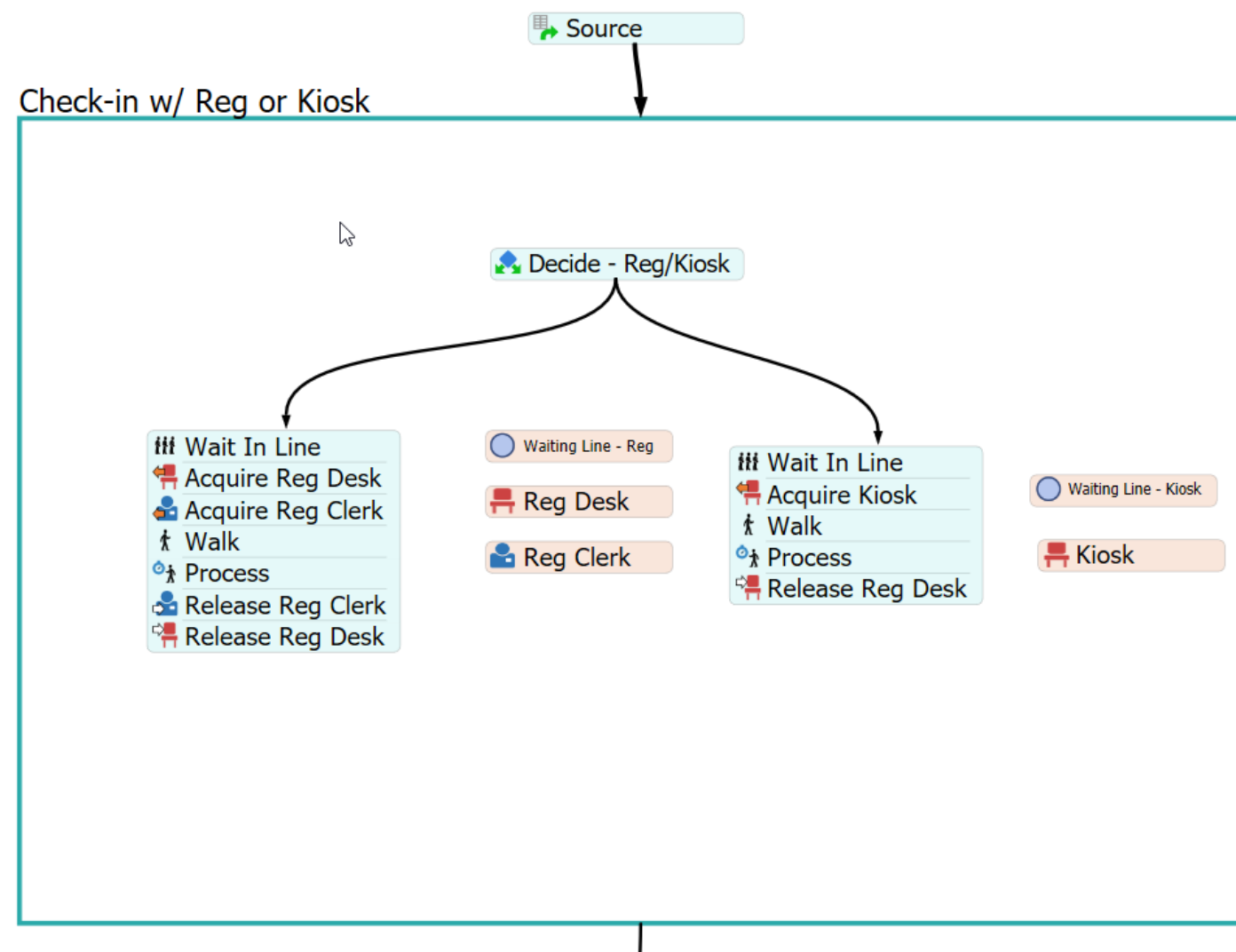


# Process Flow Overview



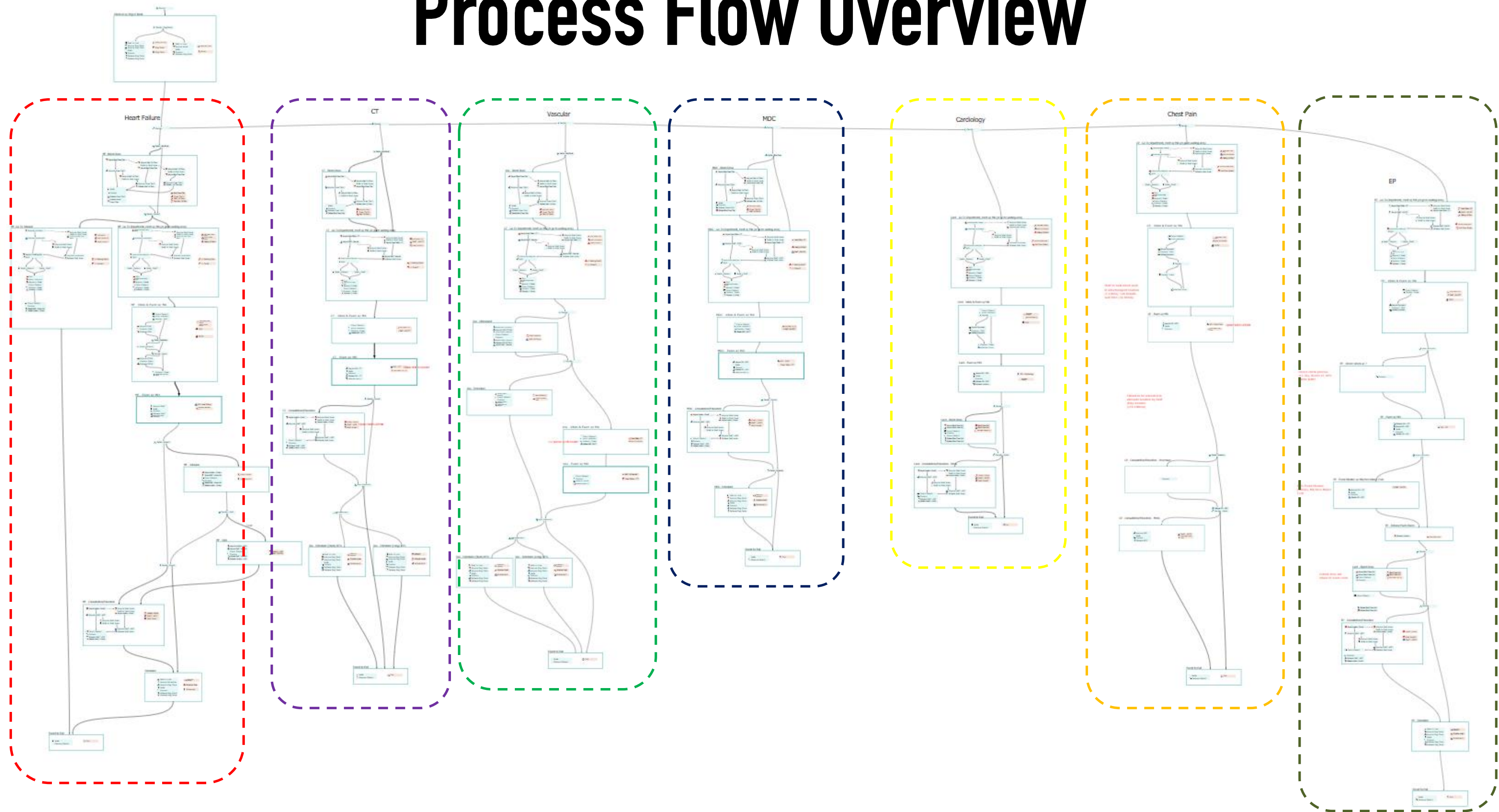
# EXAMPLE: Shared Registration/Waiting

		Physical resources	Staff Resource	Duration in minutes
Steps in Process	%	Priority Level (1-10)	(Chair, exam Table, Wheel chair, etc.)	(Clerk, MA, Physician, Scheduler, etc.)
<b>Registration</b>				
Full in person	75	10	Registration Desk	Registrar
Kiosk	25	10	Kiosk	Patient/Registrar

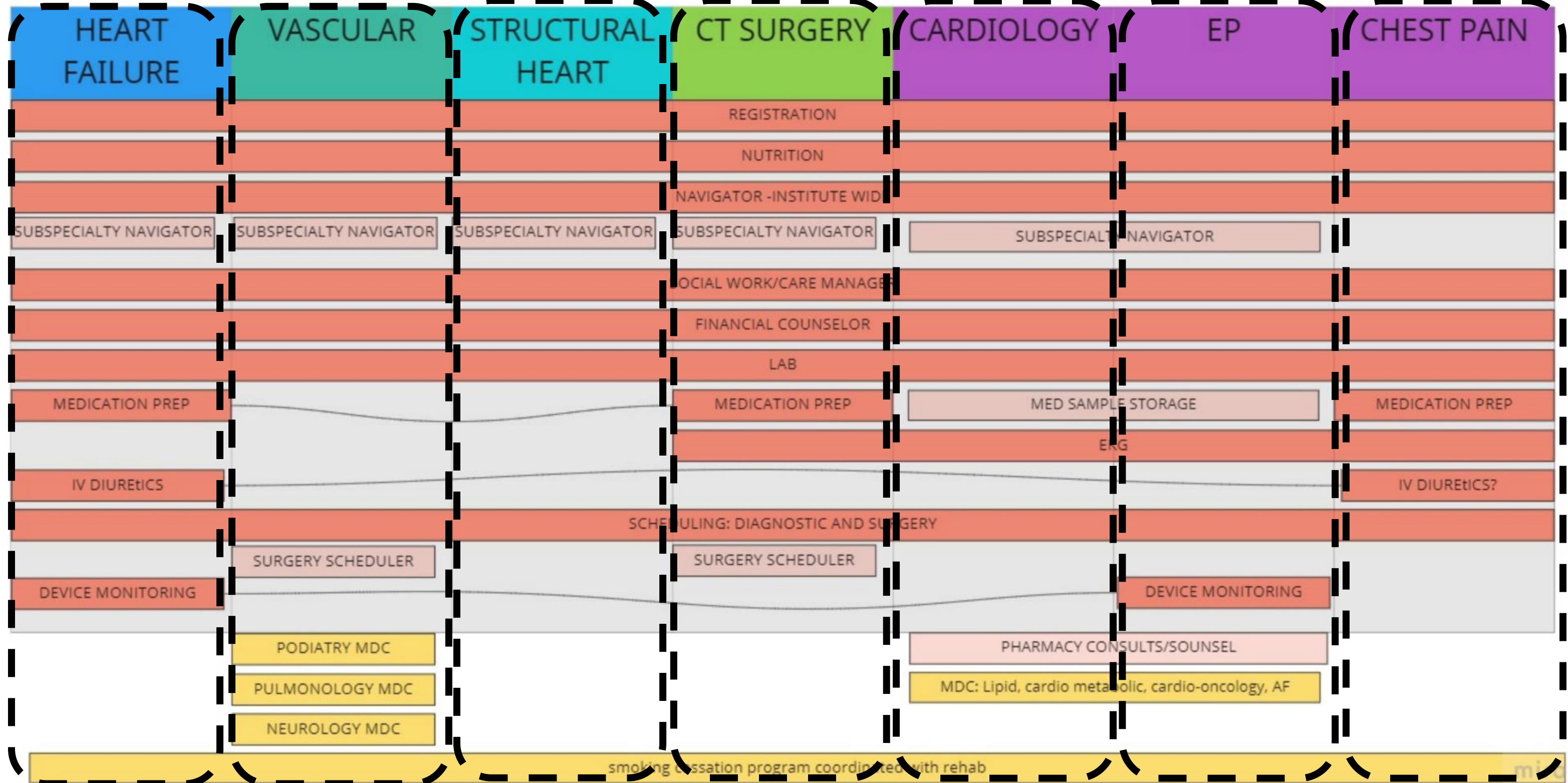




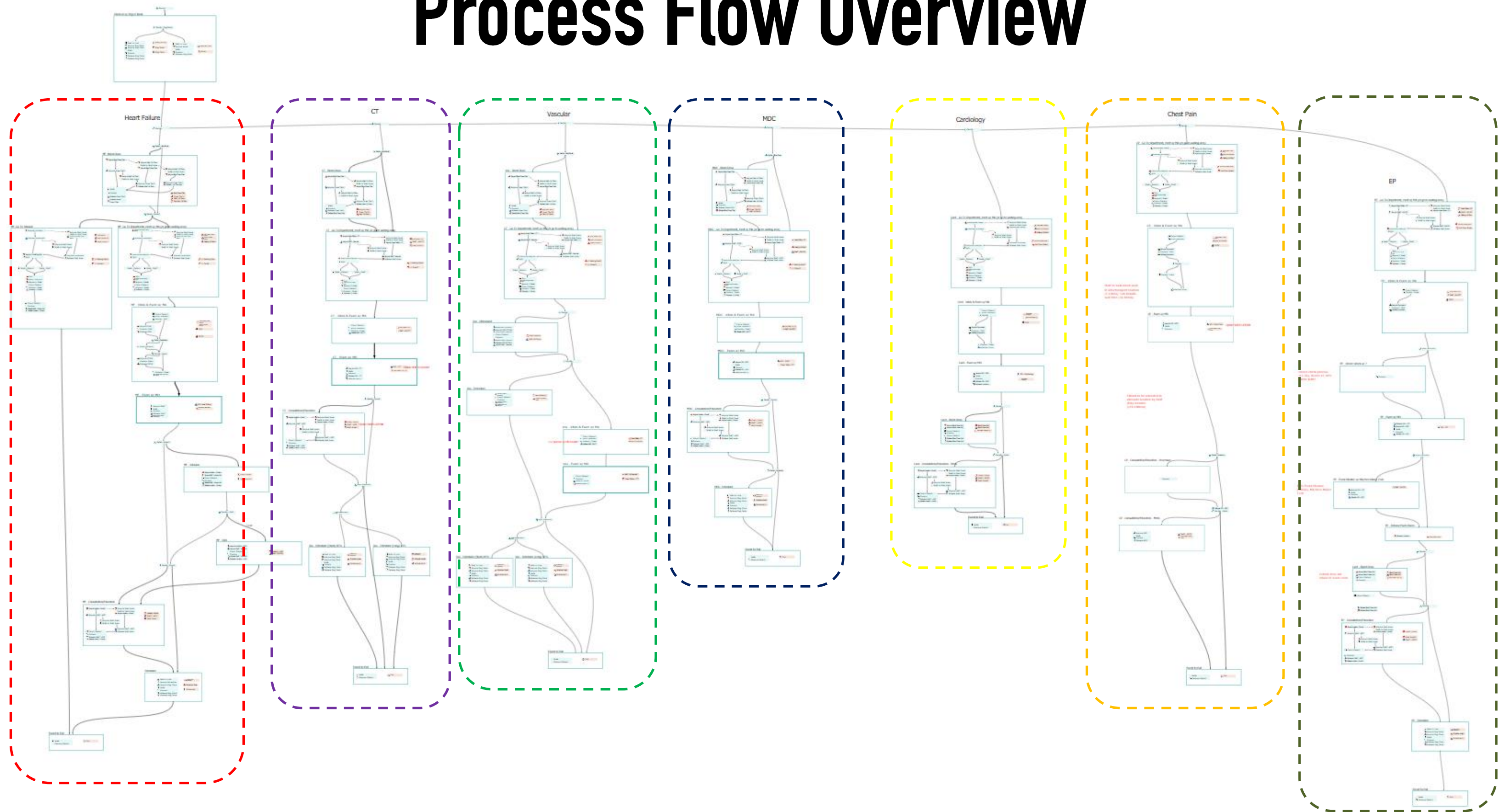
# Process Flow Overview



# INSTITUTE MAP



# Process Flow Overview





# WAITING ROOM BACKUP – WHY?

Subset	Utilization	Idle
Wooden Chair58	85.94%	14.06%
Wooden Chair39	83.79%	16.21%
Wooden Chair19	83.38%	16.62%
Wooden Chair14	80.83%	19.17%
Wooden Chair313	76.91%	23.09%
Wooden Chair18	74.01%	25.99%
Wooden Chair47	73.12%	26.88%
Wooden Chair53	73.09%	26.91%
Wooden Chair42	72.74%	27.26%
Wooden Chair311	72.72%	27.28%
Wooden Chair305	72.47%	27.53%
Wooden Chair309	71.39%	28.61%
Wooden Chair312	71.16%	28.84%
Wooden Chair59	70.98%	29.02%
Wooden Chair40	69.38%	30.62%
Wooden Chair52	69.09%	30.91%
Wooden Chair310	68.70%	31.30%
Wooden Chair25	67.78%	32.22%
Wooden Chair24	67.74%	32.26%
Wooden Chair358	67.19%	32.81%
Wooden Chair56	65.48%	34.52%
Wooden Chair361	65.29%	34.71%
Wooden Chair362	62.83%	37.17%
Wooden Chair41	62.71%	37.29%
Wooden Chair57	62.52%	37.48%
Wooden Chair15	58.62%	41.38%
Wooden Chair46	55.31%	44.69%
Wooden Chair357	55.21%	44.79%
Wooden Chair314	55.04%	44.96%
Wooden Chair315	54.20%	45.80%
Wooden Chair308	53.04%	46.96%
Wooden Chair363	51.61%	48.39%





# REGISTRATION UTILIZATION

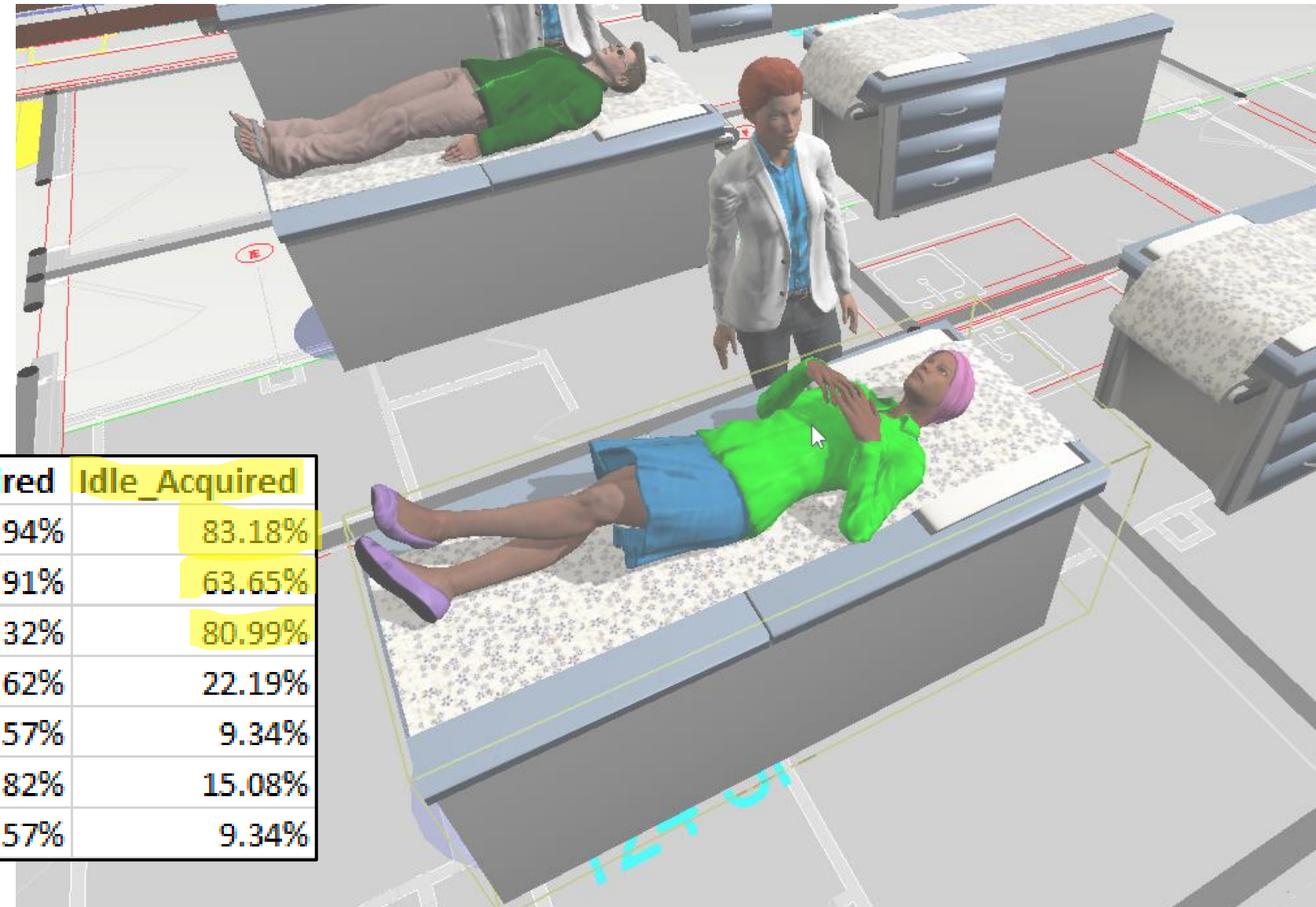


Subset	Hour	Utilization	Subset	Hour	Utilization	Subset	Hour	Utilization	Subset	Hour	Utilization	Subset	Hour	Utilization
Registration01	12:00	77.50%	Registration02	7:00	14.09%	Registration03	7:00	0.00%	Registration04	13:00	73.11%	Registration05	12:00	48.03%
Registration01	7:00	25.31%	Registration02	8:00	79.59%	Registration03	8:00	66.15%	Registration04	7:00	0.00%	Registration05	7:00	0.00%
Registration01	8:00	80.47%	Registration02	9:00	83.12%	Registration03	9:00	70.35%	Registration04	8:00	69.42%	Registration05	8:00	64.52%
Registration01	9:00	90.42%	Registration02	10:00	78.83%	Registration03	10:00	77.81%	Registration04	9:00	72.72%	Registration05	9:00	51.64%
Registration01	10:00	89.56%	Registration02	11:00	38.72%	Registration03	11:00	12.45%	Registration04	10:00	75.72%	Registration05	10:00	71.86%
Registration01	11:00	47.25%	Registration02	12:00	68.60%	Registration03	12:00	70.18%	Registration04	11:00	0.00%	Registration05	11:00	0.00%
Registration01	13:00	83.43%	Registration02	13:00	73.19%	Registration03	13:00	71.32%	Registration04	12:00	58.17%	Registration05	13:00	62.92%
Registration01	14:00	90.59%	Registration02	14:00	71.53%	Registration03	14:00	74.72%	Registration04	14:00	75.94%	Registration05	14:00	56.17%
Registration01	15:00	19.27%	Registration02	15:00	14.08%	Registration03	15:00	0.00%	Registration04	15:00	0.00%	Registration05	15:00	0.00%
Registration01	16:00	0.00%	Registration02	16:00	0.00%	Registration03	16:00	0.00%	Registration04	16:00	0.00%	Registration05	16:00	0.00%
Registration01	17:00	0.00%	Registration02	17:00	0.00%	Registration03	17:00	0.00%	Registration04	17:00	0.00%	Registration05	17:00	0.00%
Registration01	18:00	0.00%	Registration02	18:00	0.00%	Registration03	18:00	0.00%	Registration04	18:00	0.00%	Registration05	18:00	0.00%





# EXAM ROOM UTILIZATION



Subset	Utilization	Idle_Available	Occupied_Acquired	Idle_Acquired
Exam Tables - Heart Failure	16.82%	0.88%	15.94%	83.18%
Exam Tables - EP	36.35%	1.45%	34.91%	63.65%
Exam Tables - Cardiology	19.01%	0.70%	18.32%	80.99%
Exam Tables - Chest Pain	77.81%	7.19%	70.62%	22.19%
Exam Tables_CT	90.66%	4.09%	86.57%	9.34%
Exam Tables - Vascular	84.92%	77.11%	7.82%	15.08%
Exam Tables - MDC	90.66%	4.09%	86.57%	9.34%







# Do We Really Need More Space for Waiting?

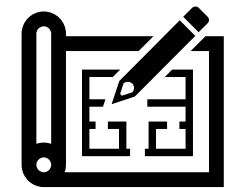
- Improved process flow
- Introduce additional MAs/Navigation Nurse(s)
- Assigned Exam Rooms vs. Shared Rooms



# QUERYING THE RESULTS

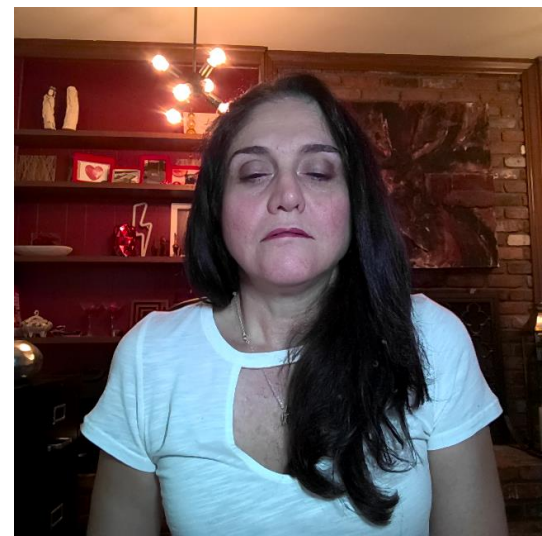
INITIAL  
ASSUMPTIONS

WHAT  
IF...



SUPPORTING • ADDING • VALUE • RIGHT SIZING

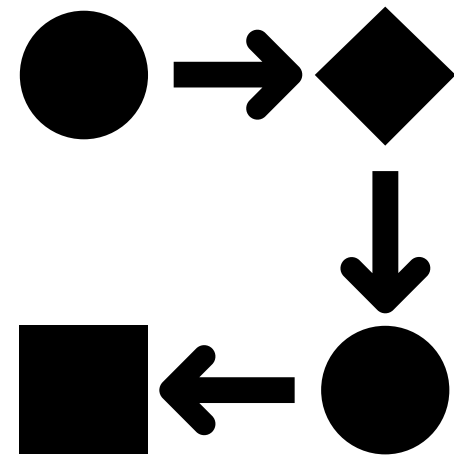
• Clinicians are assigned to specific rooms  
• All rooms are first come, first served  
• Ability to better understand the relationship between spaces and operations  
• Design decisions based on a better understanding of the circumstances in which something will work  
• Registration is centralized  
• Design decisions based on a better understanding of the circumstances in which something will work  
• The waiting room could be smaller due to operational efficiencies?



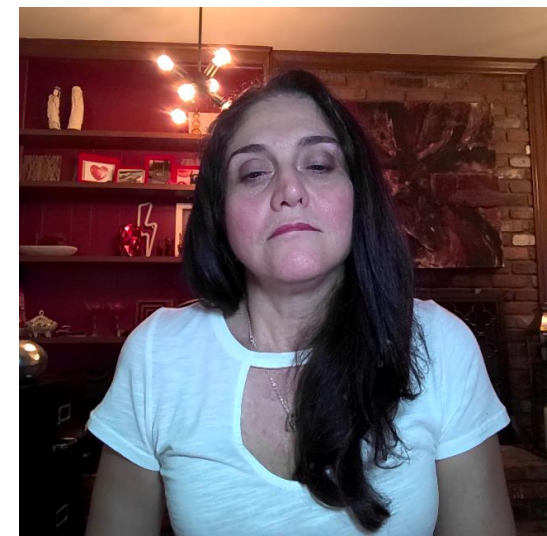
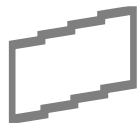
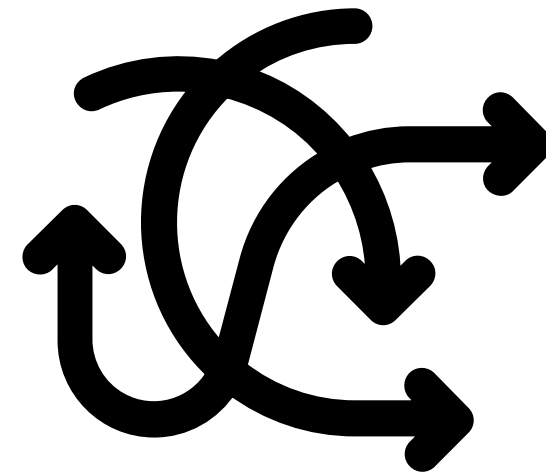


# LESSONS LEARNED

What staff believes  
is their process



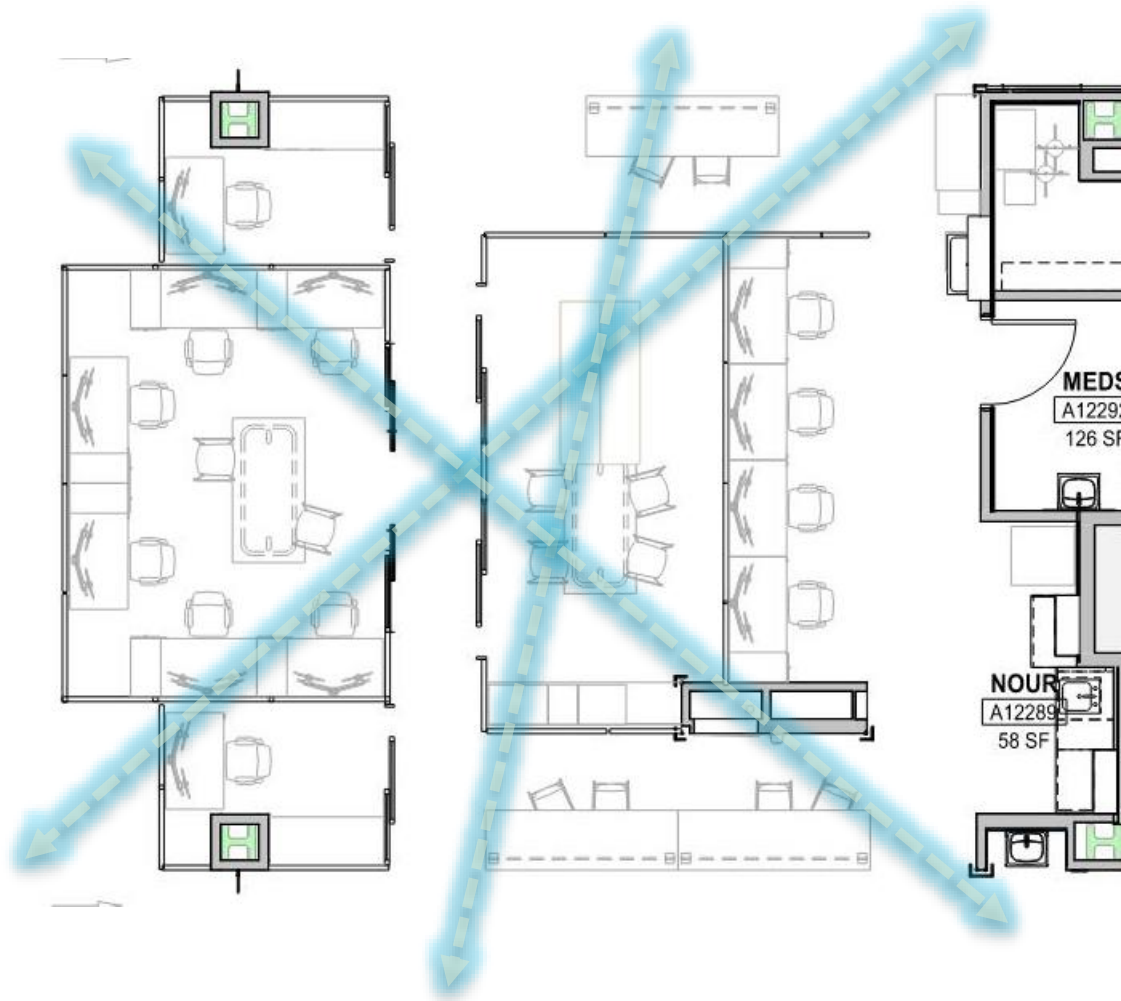
The actual  
process



**AUGMENTED REALITY**  
**& CRITICAL ISSUES**

# DESIGN ISSUE: STAFF ISOLATION

CASE STUDY: UK PAV A – 12<sup>TH</sup> FLOOR

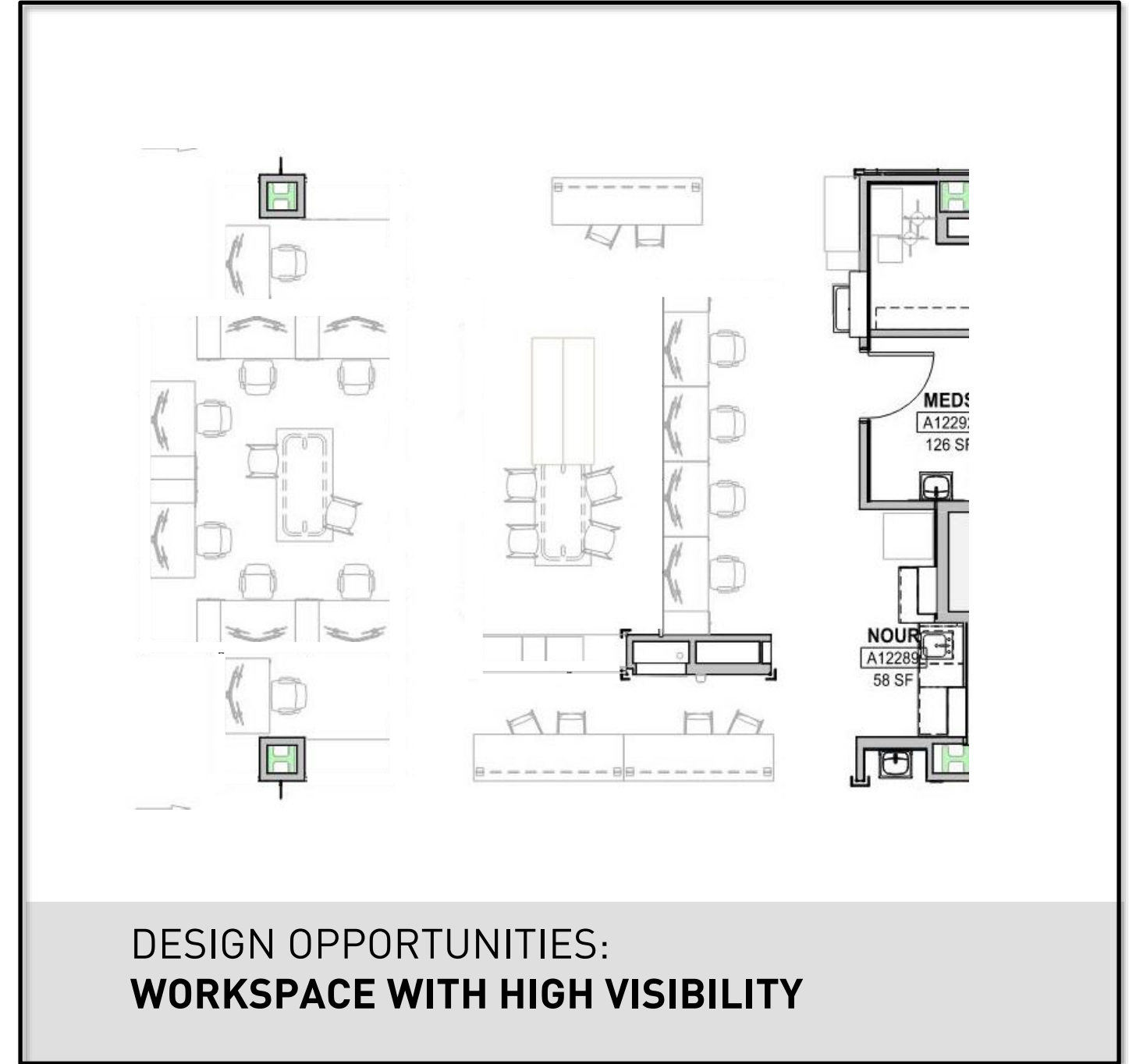


DESIGN OPPORTUNITIES:  
**WORKSPACE WITH HIGH VISIBILITY**



# COMMON ISSUE: **SPEAKING DIFFERENT LANGUAGES**

CASE STUDY: UK PAV A – 12<sup>TH</sup> FLOOR



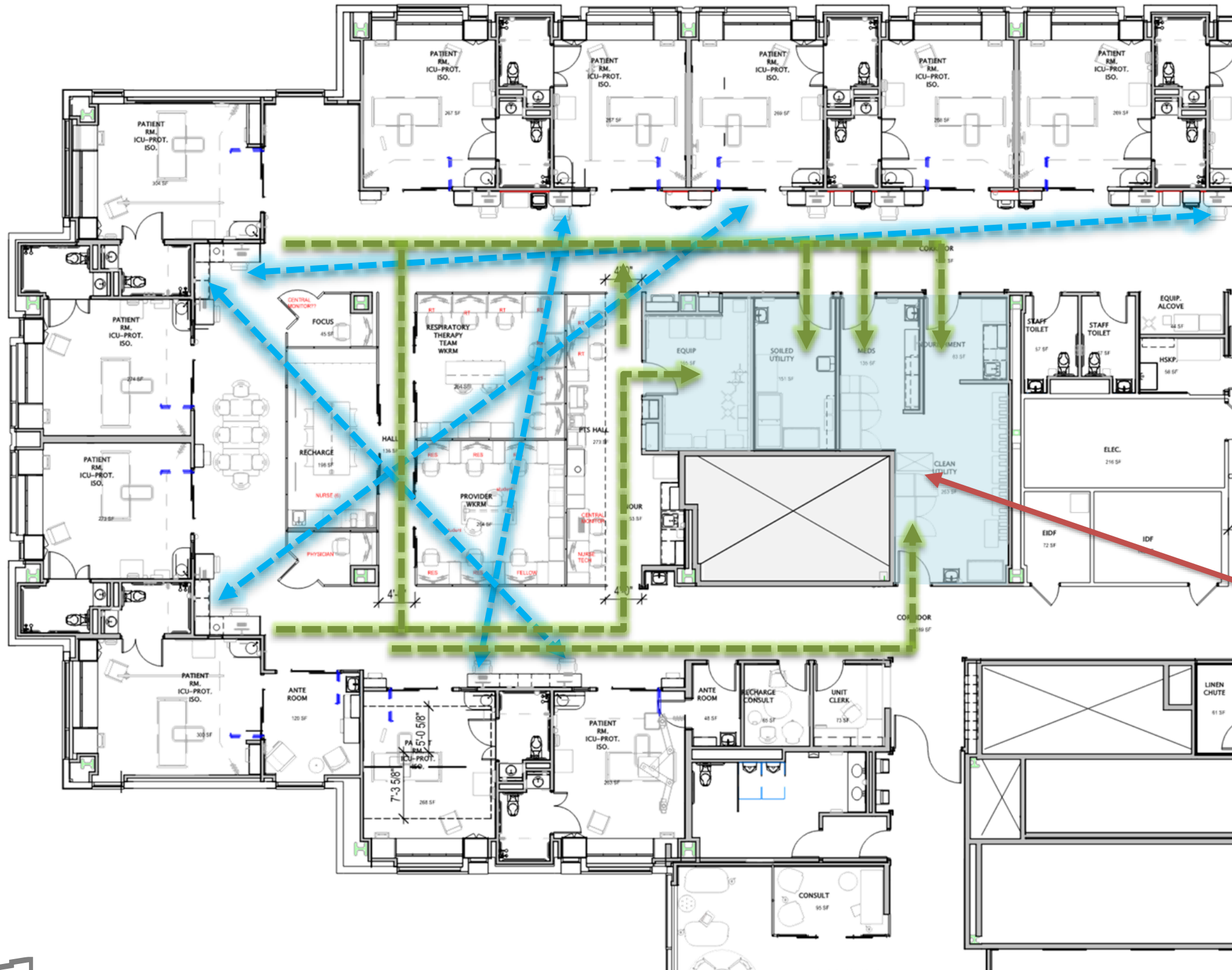
TRADITIONAL  
ARCHITECTURAL DRAWING

HOW DRAWING SHOULD LOOK  
TO CONVEY CONTEXT



# AR: OBJECTIVES

## CASE STUDY: UK PAV A – 12<sup>TH</sup> FLOOR



### OBJECTIVE #1 HIGH VISIBILITY



OBJECTIVE: to illustrate the concept of the high visibility ICU workspace.

### OBJECTIVE #2 SUPPORT SPACES



OBJECTIVE: to confirm the location of rooms and doors into the support spaces

### ADDED OBJECTIVE SUPPORT SPACES

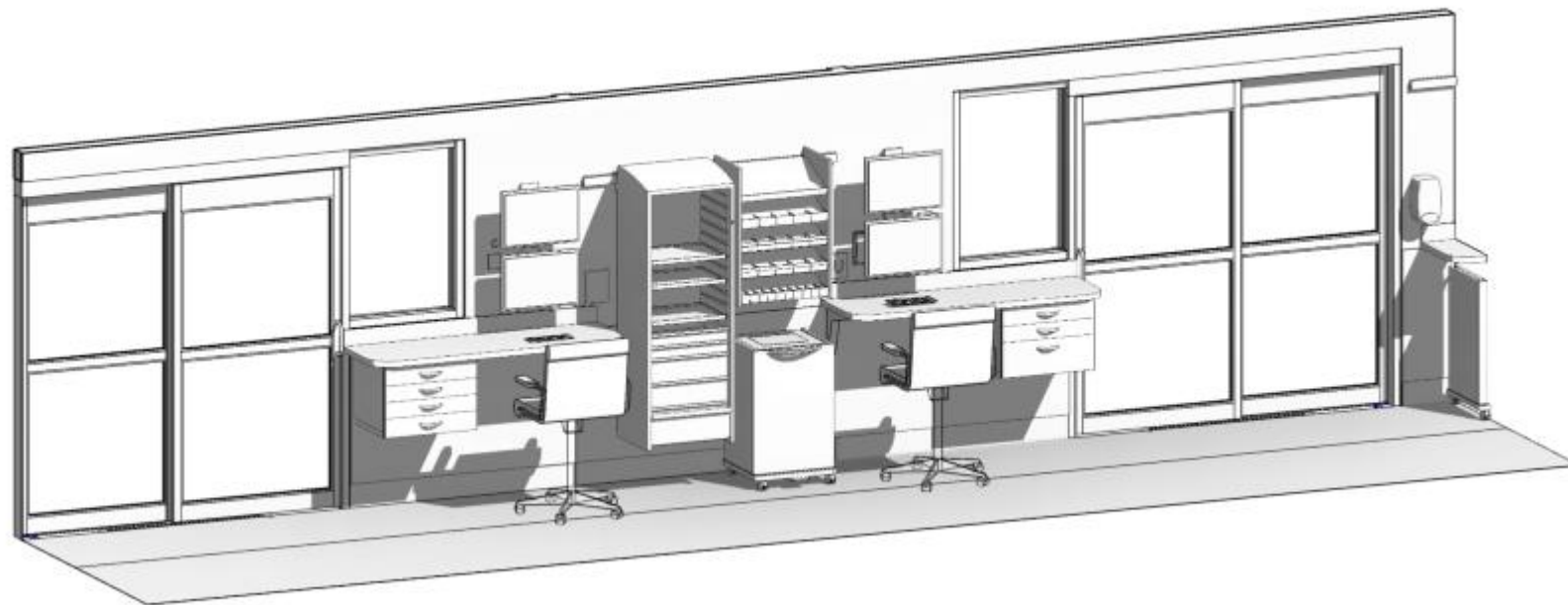
OBJECTIVE: user groups want us to bring back the augmented reality to walk thru the support spaces – Meds, Clean Supply, Nourishment, Equipment. This will supplement the Design Development review, and can be viewed as a sign-off





# 12<sup>th</sup> FLOOR MICU: DECENTRALIZED CHARTING STATION

OBJECTIVE #5

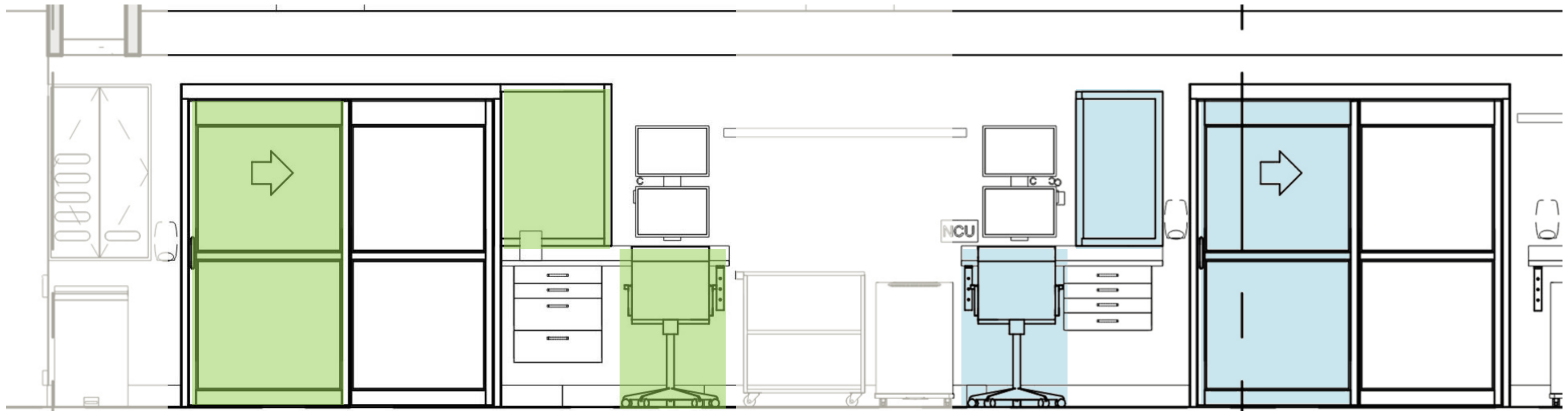


# 12<sup>th</sup> FLOOR MICU: DECENTRALIZED CHARTING STATION

## OBJECTIVE #5

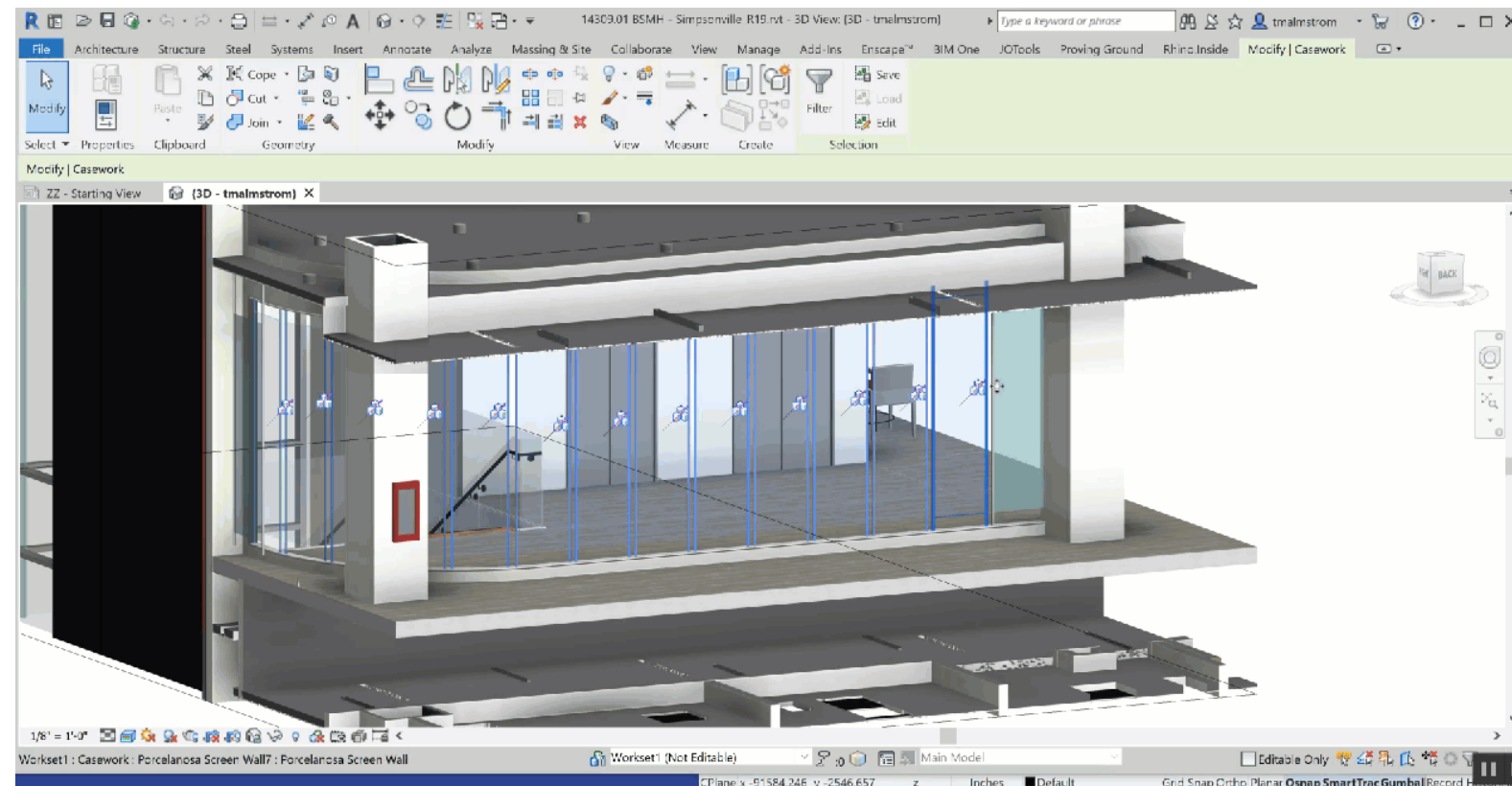
### DECENTRALIZED CHARTING STATIONS ADDED OBJECTIVE

OBJECTIVE: user groups want us to bring back the augmented reality back to the space to review and facilitate the discussion of entrance into the room.



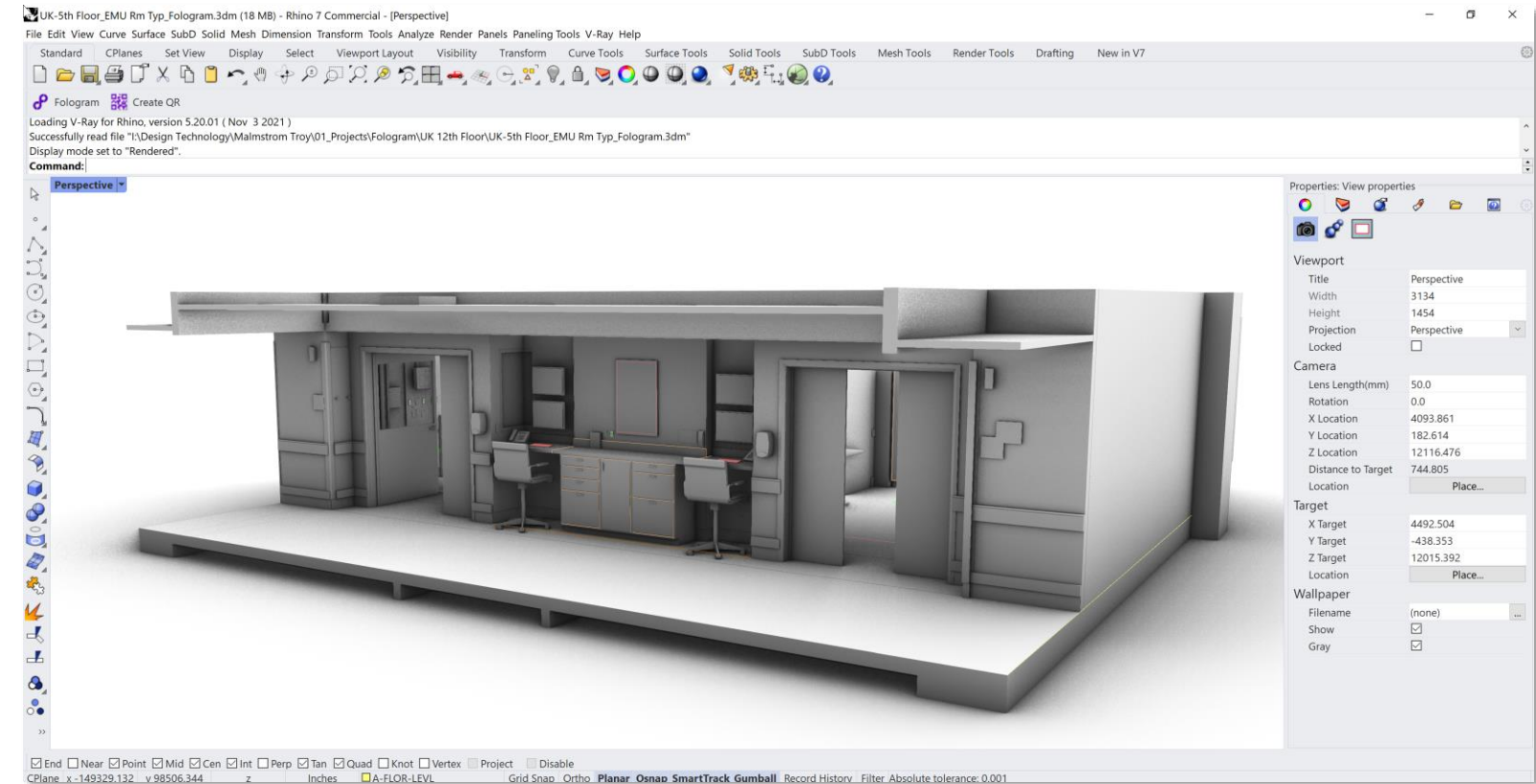
# WHAT IS NEEDED

## PROCESS



1. Infrastructure (WiFi Network)
2. Equipment needed

## RESULT



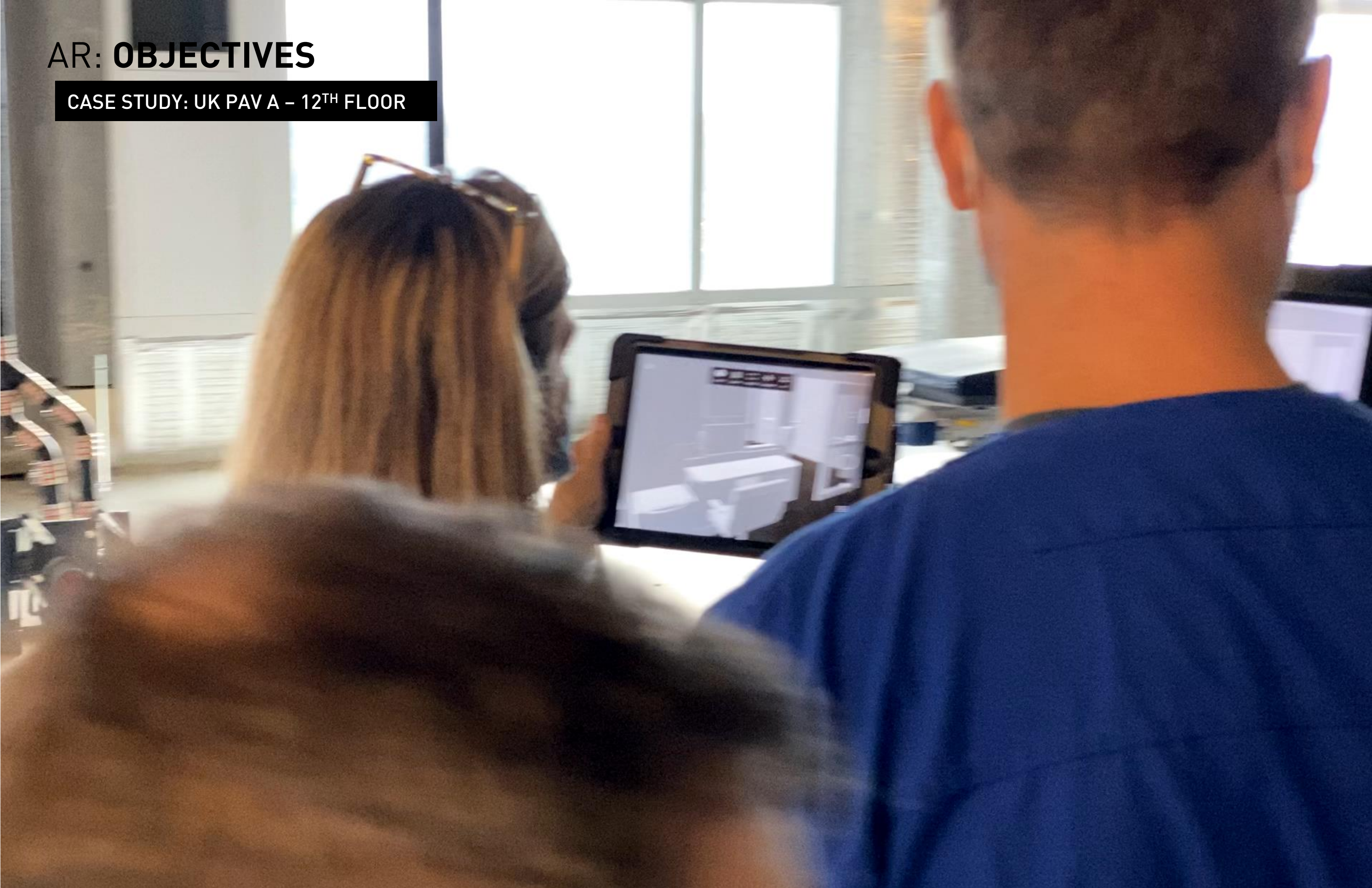
3. Rhino to Revit prepwork
4. Space
5. QR Code



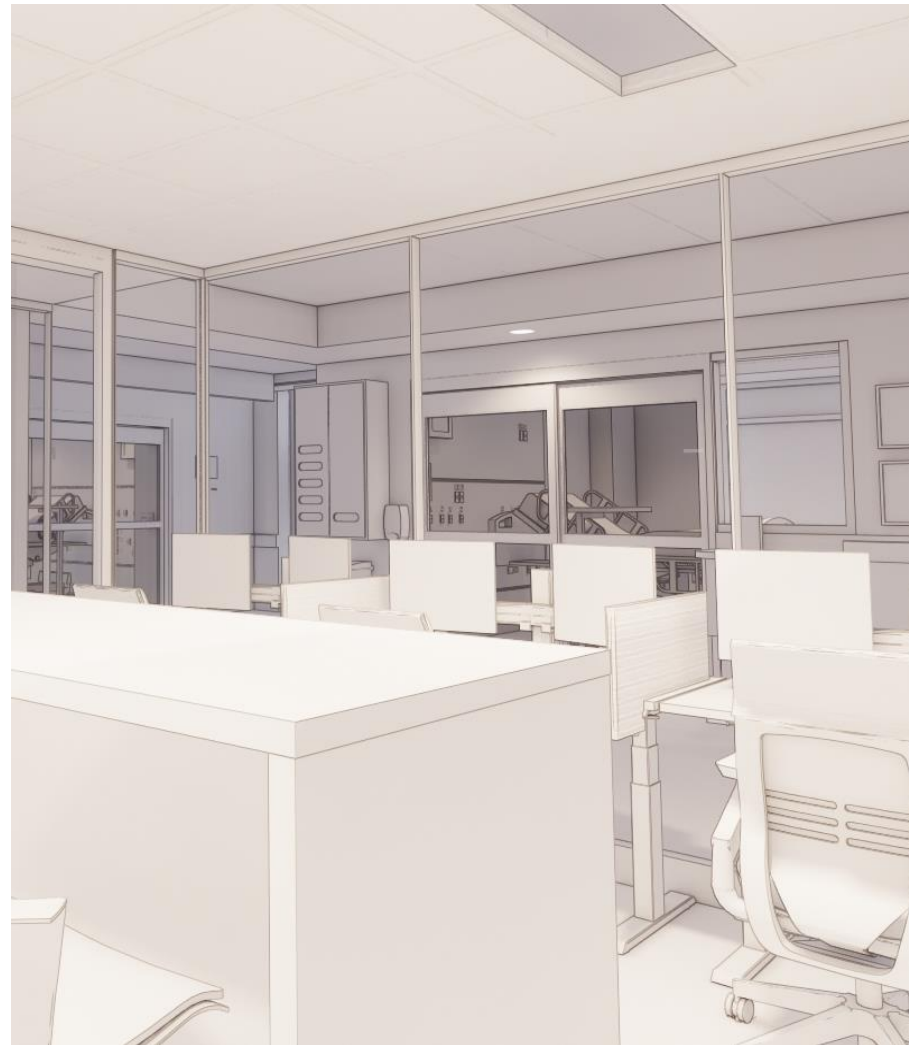
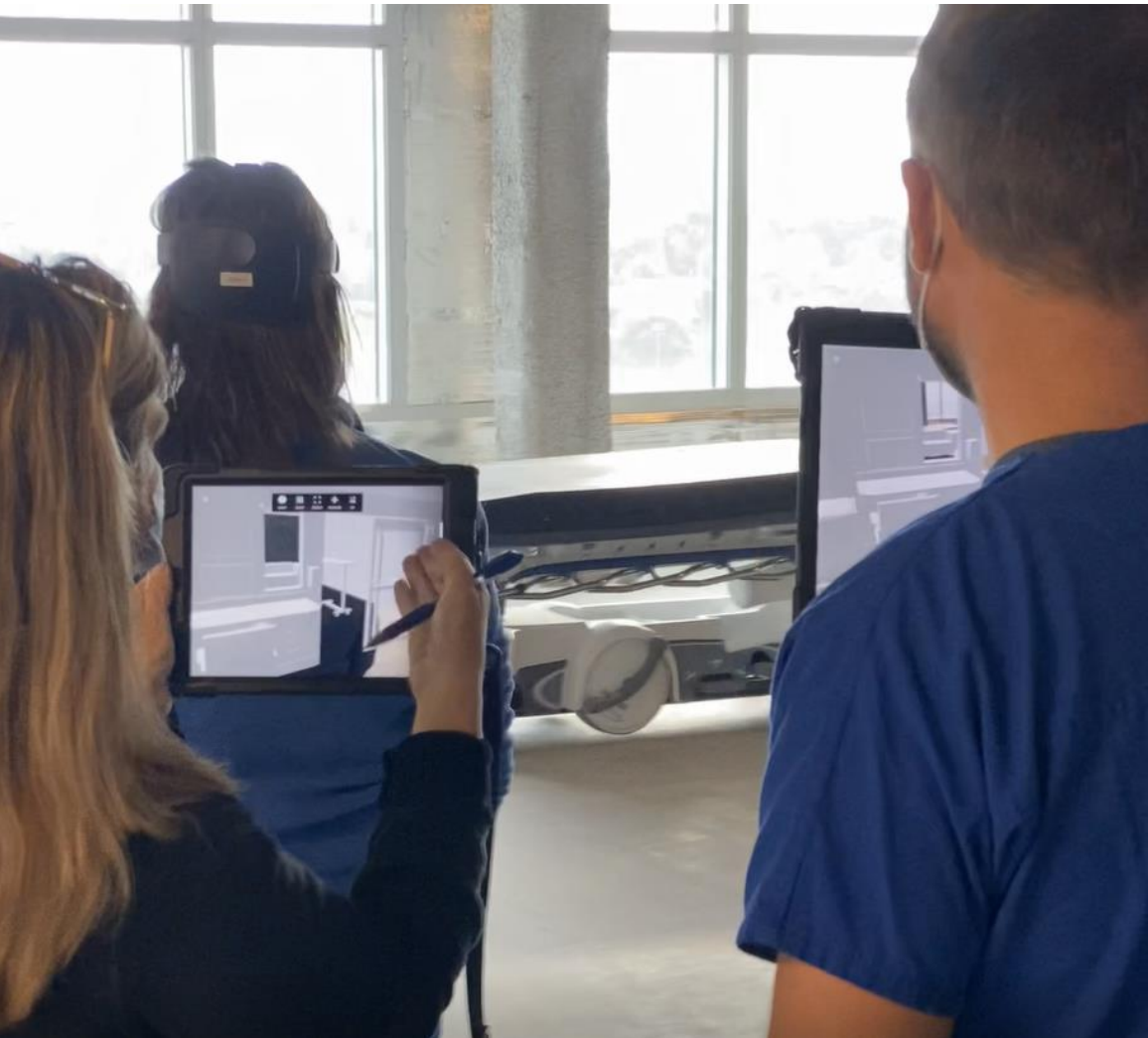


# AR: OBJECTIVES

CASE STUDY: UK PAV A – 12<sup>TH</sup> FLOOR











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