

# Design & Design Research

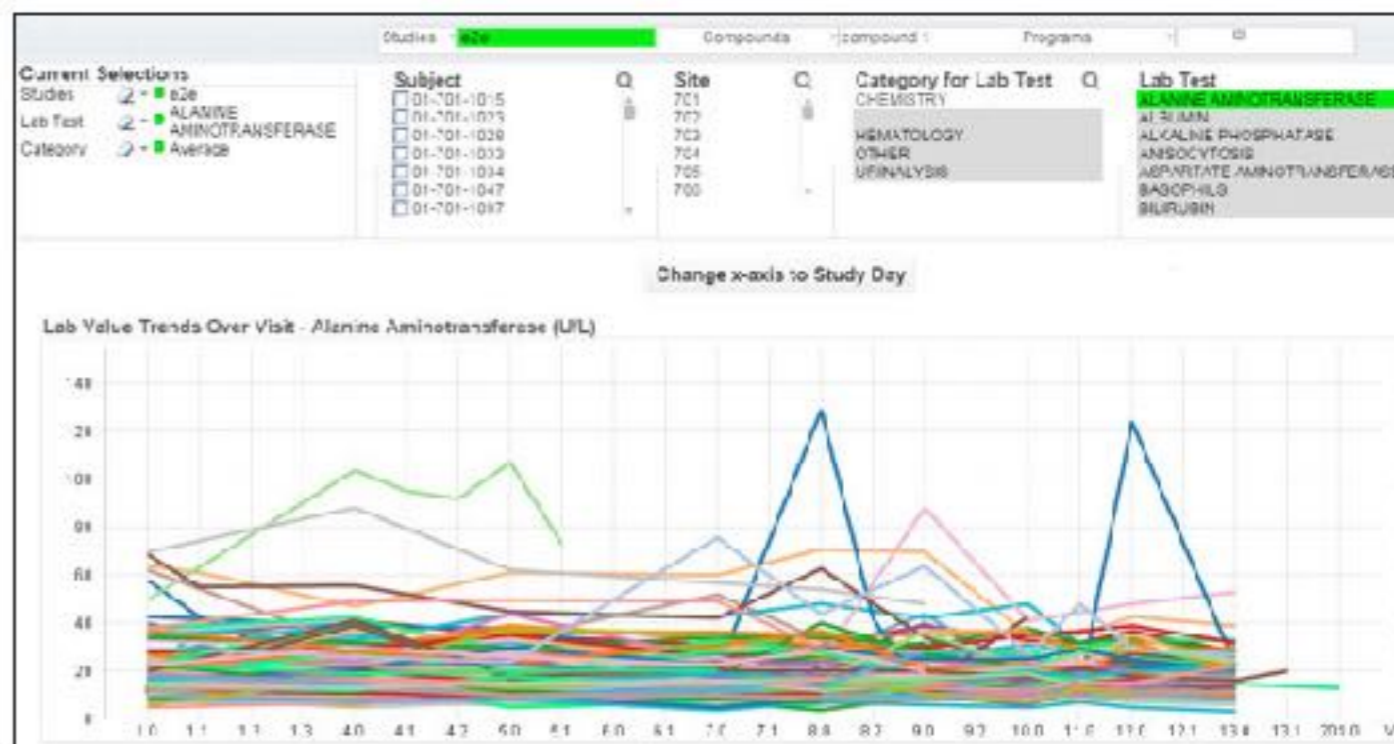
“To design is much more than simply to assemble, to order, or even to edit: it is to add value and meaning, to illuminate, to simplify, to clarify, to modify, to dignify, to dramatize, to persuade, and perhaps even to amuse. To design is to transform prose into poetry.”

*-Paul Rand*

Jim Agutter  
[agutterja@design.utah.edu](mailto:agutterja@design.utah.edu)  
144 Sill Center

What is the work we are engaged in?

|      |      |      |      |      |      |      |       |
|------|------|------|------|------|------|------|-------|
| 121  | 498  | 890  | 234  | 678  | 978  | 457  | 326   |
| 124  | 498  | 890  | 234  | 678  | 978  | 457  | 326   |
| 234  | 3678 | 8765 | 2435 | 876  | 457  | 9689 | 346   |
| 9023 | 8734 | 789  | 283  | 472  | 5692 | 852  | 2596  |
| 23   | 8960 | -78  | 3759 | 3648 | 489  | 926  | 678   |
| 48   | 65   | 665  | 6622 | 65   | 15   | 115  | 1155  |
| 7    | 678  | 890  | 2345 | 67   | 899  | 978  | 457   |
| 5678 | 908  | 234  | 6789 | 2678 | 789  | 457  | 326   |
| 886  | 652  | 62   | 6522 | 655  | 688  | 188  | 622   |
| 8960 | -588 | 3759 | 3648 | 489  | 926  | 678  | 37378 |
| 5511 | 552  | 5552 | 851  | 54   | 333  | 1558 | 4568  |
| 598  | 564  | 654  | 321  | 51   | 3134 | 556  | 569   |
| 734  | 789  | 283  | 472  | 5687 | 853  | 3686 | 518   |
| 2    | 322  | 322  | 1118 | 5528 | 5528 | 399  | 399   |
| 633  | 63   | 8553 | 899  |      |      |      |       |



**INFUSING**  
 Total infused 2 mL | 28 mg  
 SYRINCE B.D. 3C  
**STOP FUMP** **BOLUS**  
**PROPOFOL** 10 mg/mL **200** mg/kg/hr  
 PACT FUTURE  
 Probability of Succumbance **0.2%**  
 Probability of Succumbance **0.8%**

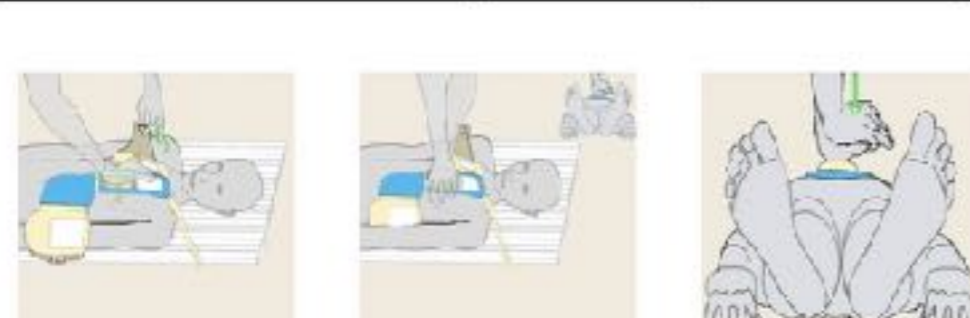
**STOPPED**  
**START INFUSION**  
**STOPPED**  
**START INFUSION**  
**SET MEDICATION** **SET RATE**  
**STOPPED**  
**START INFUSION**  
 Dosing Method: **mg/kg/hr**  
 Choose Rate: **100 mg/kg/hr**  
 Dosing Weight: **100kg**

**Variable Tracking**  
**Hemodynamics**  
**Oxygenation**  
**Ventilation**  
**Acid Base**  
**More Acid Base**  
**Clarity**  
**Hematology**

**Electric Activity?**  
**YES** - Got to (10 PRSSESS ELECTRICAL ACTIVITY PCA ALGORITHM)  
**NO** - Got to (8 AGYSTOLE ALGORITHM) (1ml/min)  
**IR 80**  
**BP 120/80**  
**SpO2 96**

**Society for Safe Sedation**  
**Module 02: Continuum of Sedation - Conference Room**  
 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
 16 17 18 19 20

**INFORMATION**  
**RELIABILITY**  
**RELEVANCE**  
**URGENCY**  
**TASK 1**  
**TASK 2**  
**TASK 3**  
**TASK 4**



**SVR N/A**  
**CO N/A**  
**HR 86**  
**CVP 11**  
**HAP 95**  
**SpO2 97**  
**7.36**  
**26.00**

**550**  
**13**  
**38**  
**33**  
**0.0**  
**0.0**  
**0.0**

Who is this work for?



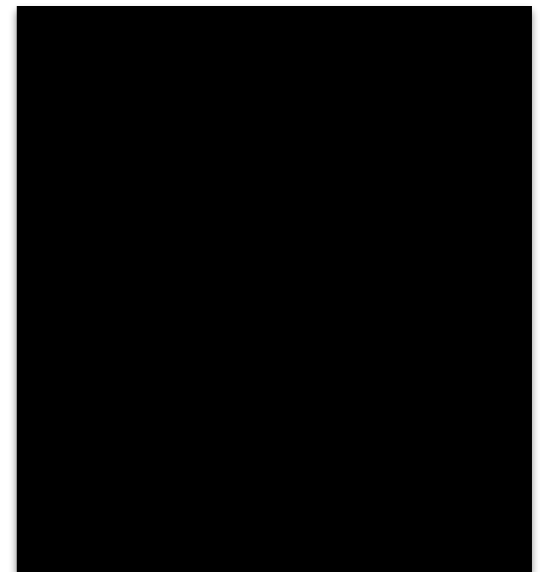
Tool Builders



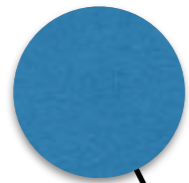
Users



Tool



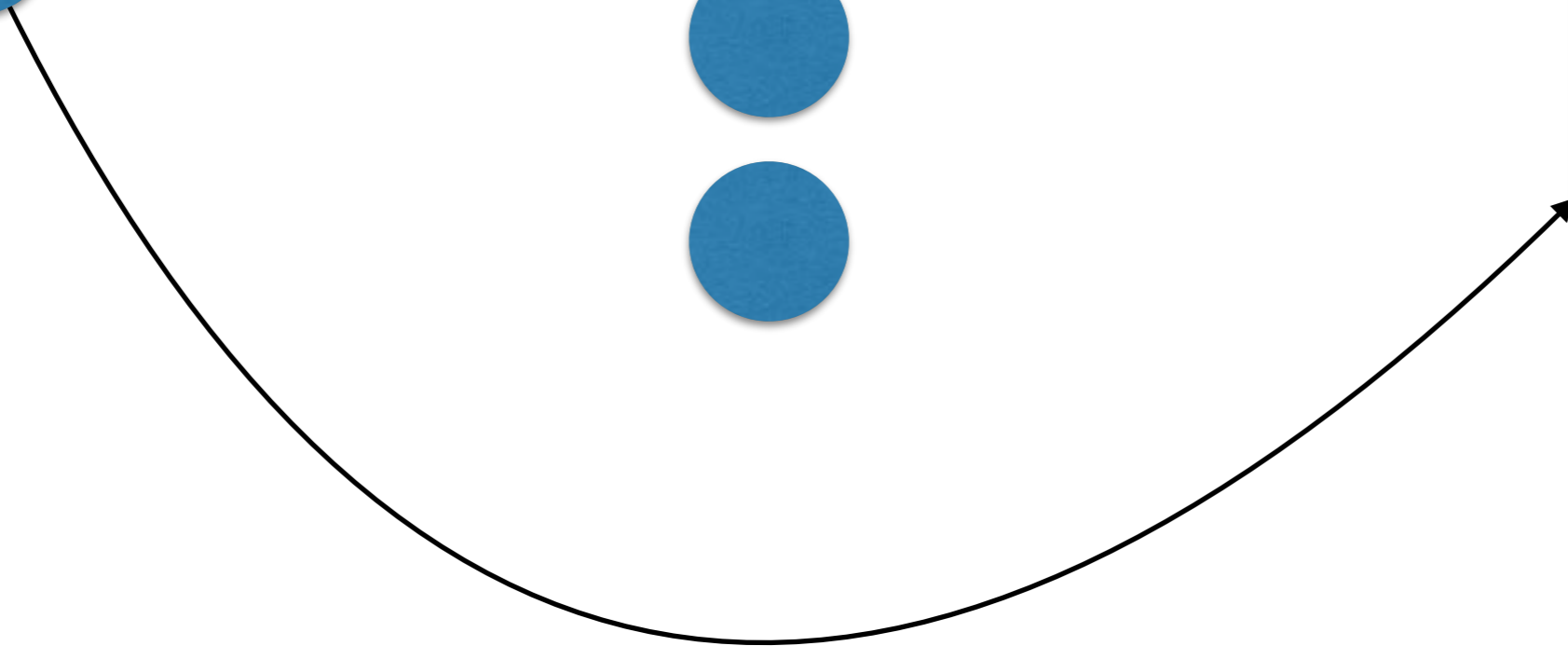
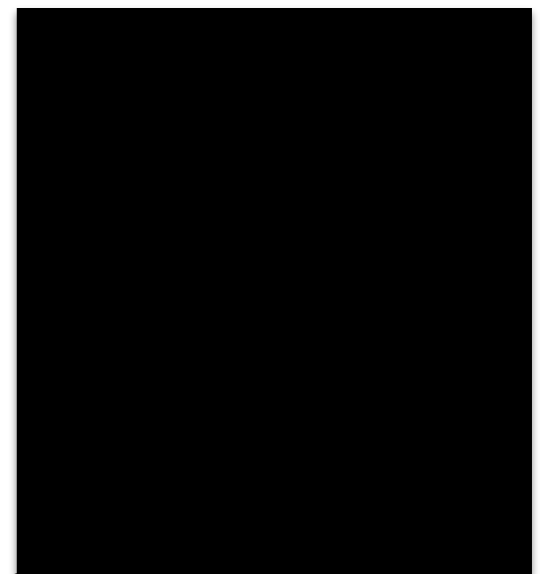
Tool Builders



Users

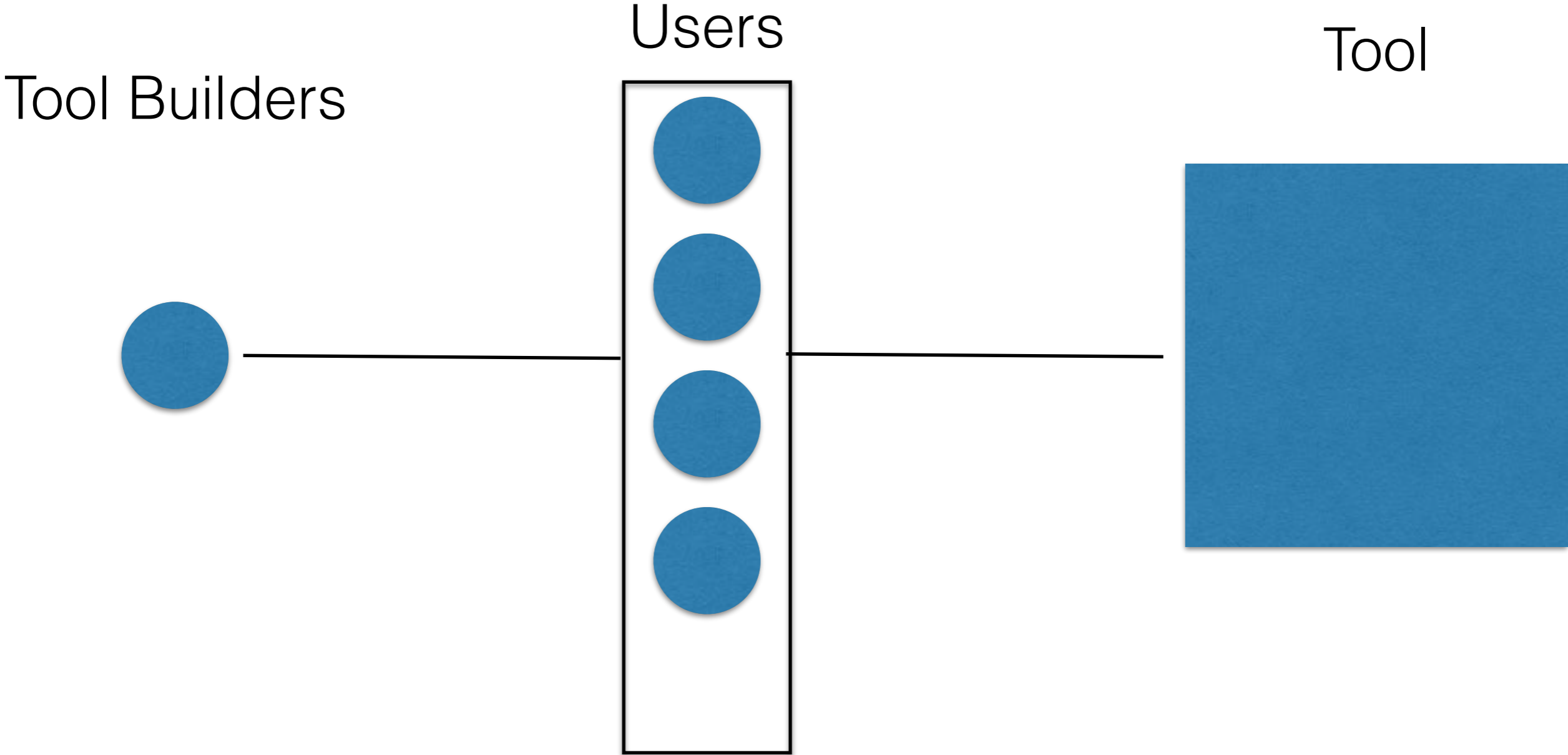


Tool





# Human Centeredness

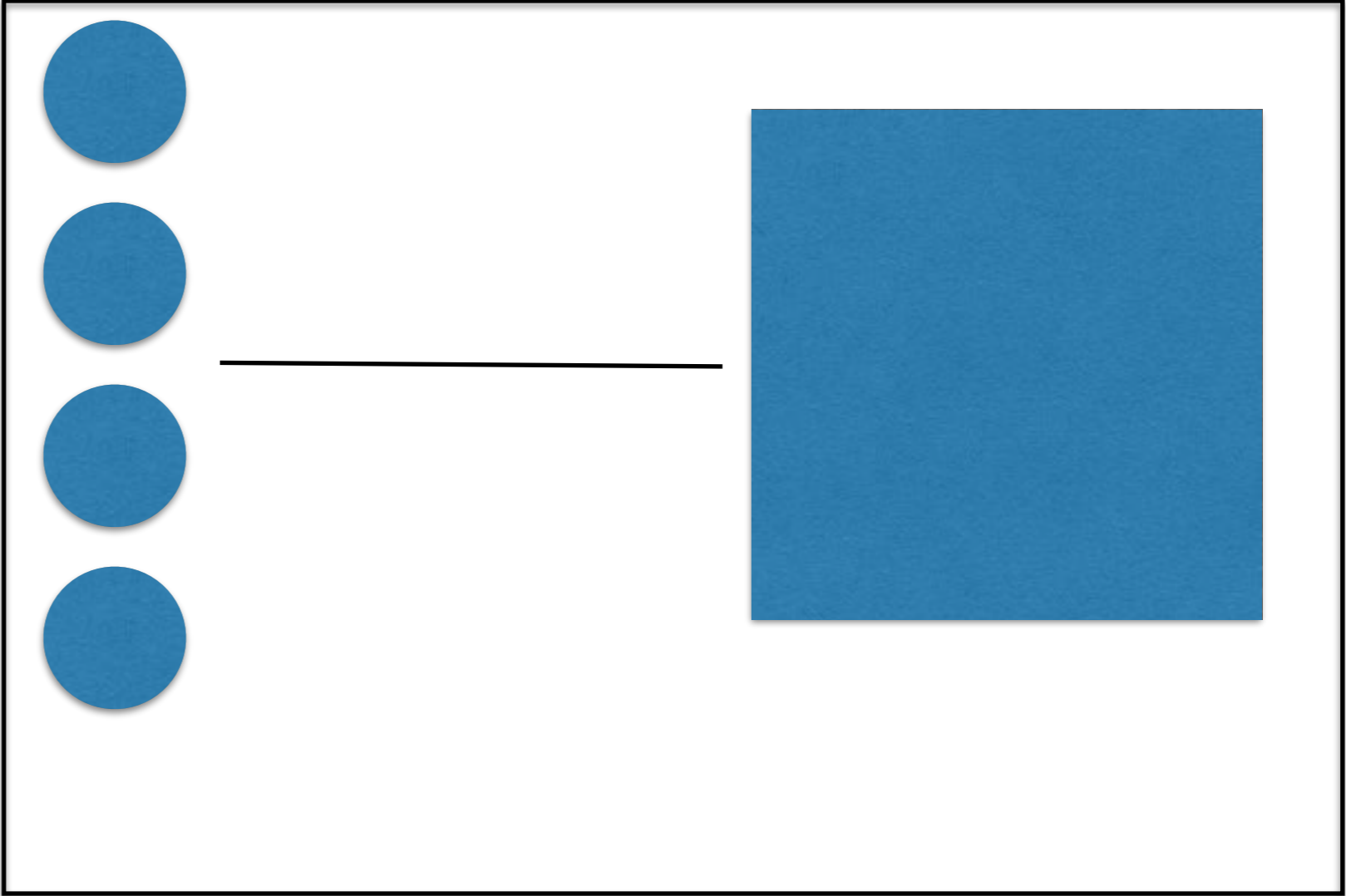


# Human Centeredness

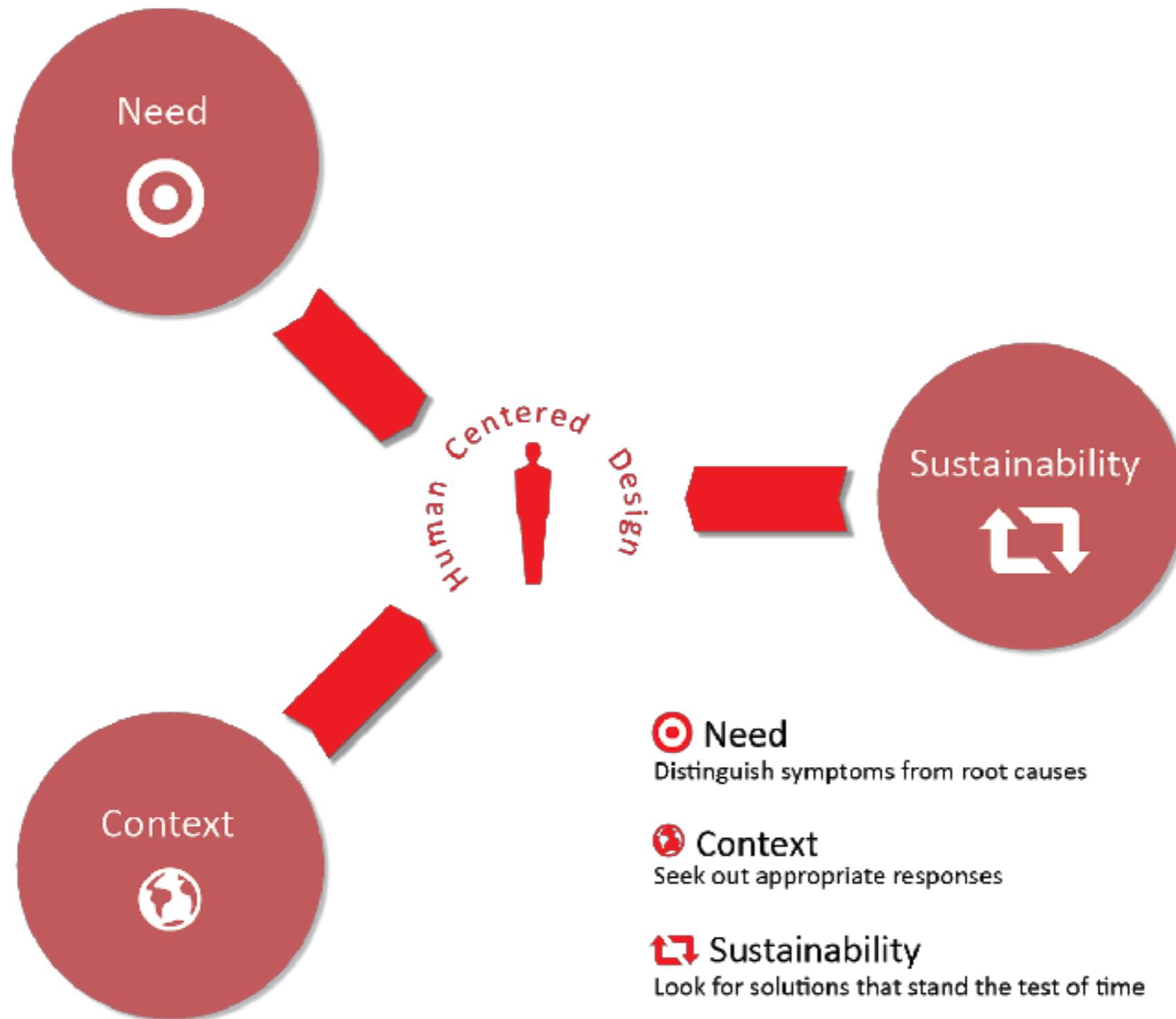
Users

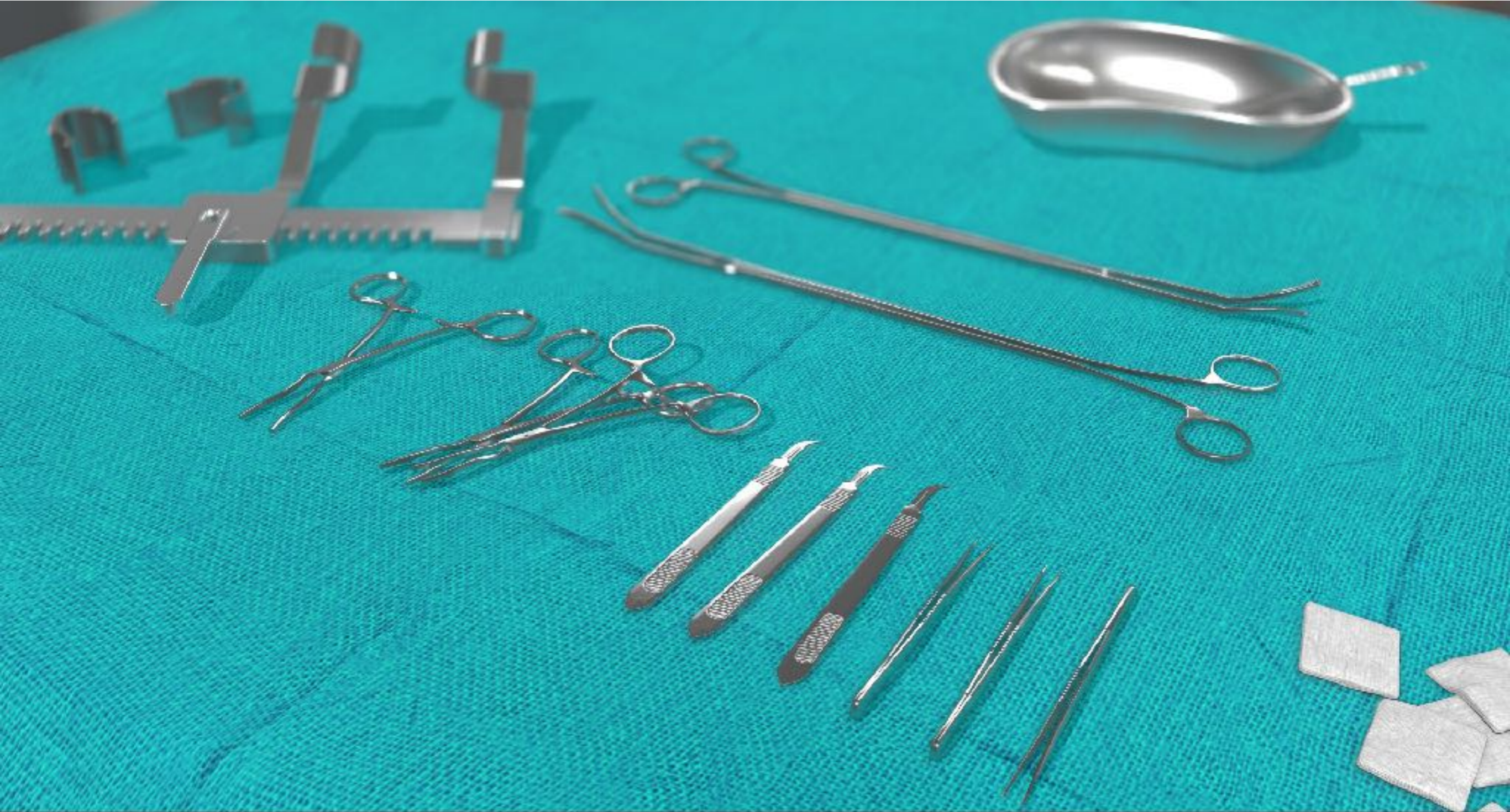
Tool

Tool Builders



Design Research



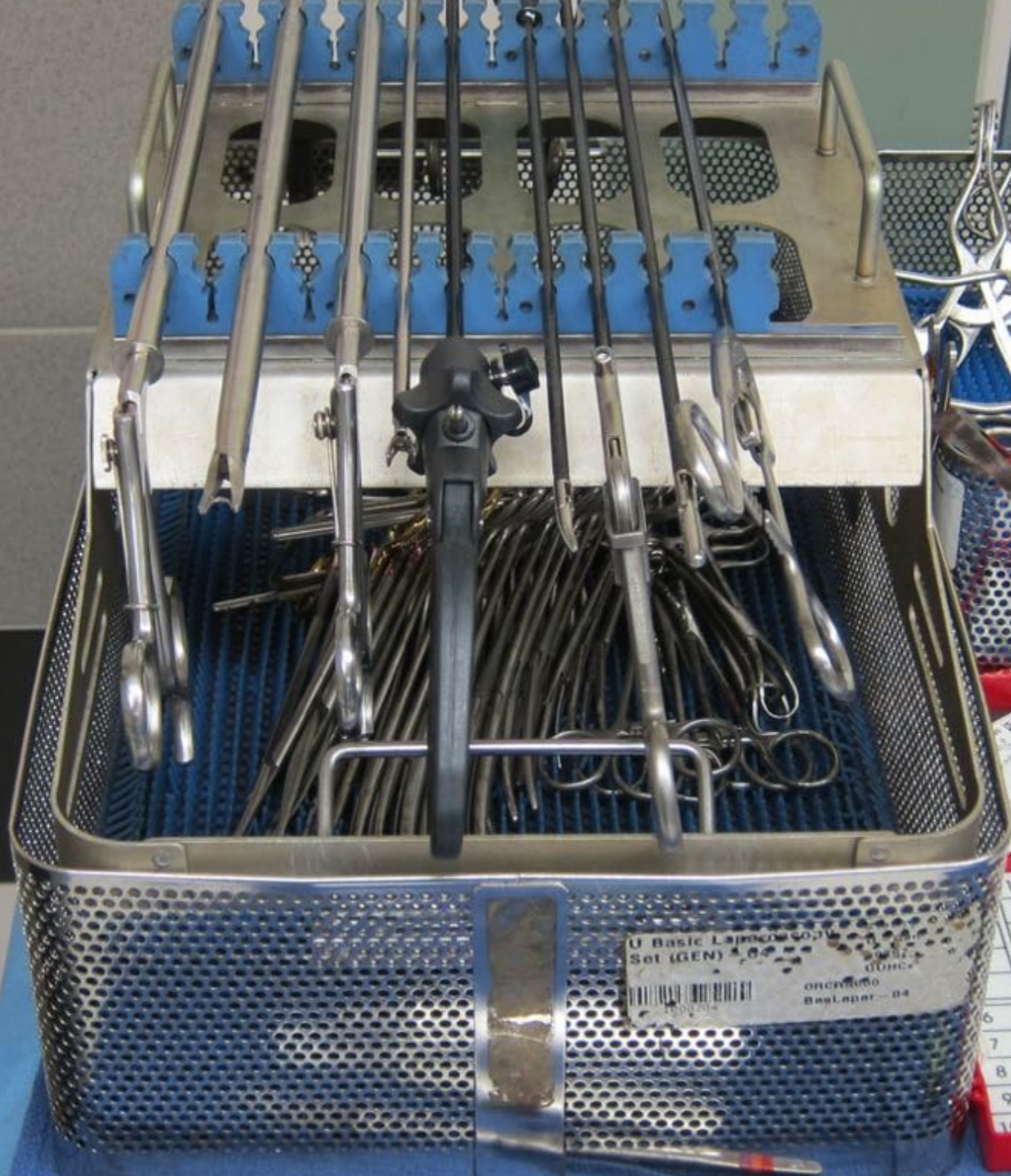




U Abdominal Minor Instruments - 10  
Sterile  
USA - General  
USA  
UN3300  
SPCC100  
AbdMinor - 10

|   |    |    |    |
|---|----|----|----|
| 1 | 11 | 21 | 31 |
| 2 | 12 | 22 | 32 |
| 3 | 13 | 23 | 33 |
| 4 | 14 | 24 | 34 |
| 5 | 15 | 25 | 35 |
| 6 | 16 | 26 | 36 |
| 7 | 17 | 27 | 37 |
| 8 | 18 | 28 | 38 |
| 9 | 19 | 29 | 39 |
| 0 | 20 | 30 | 40 |





U Basic Laparoscopic  
Set (GEN)

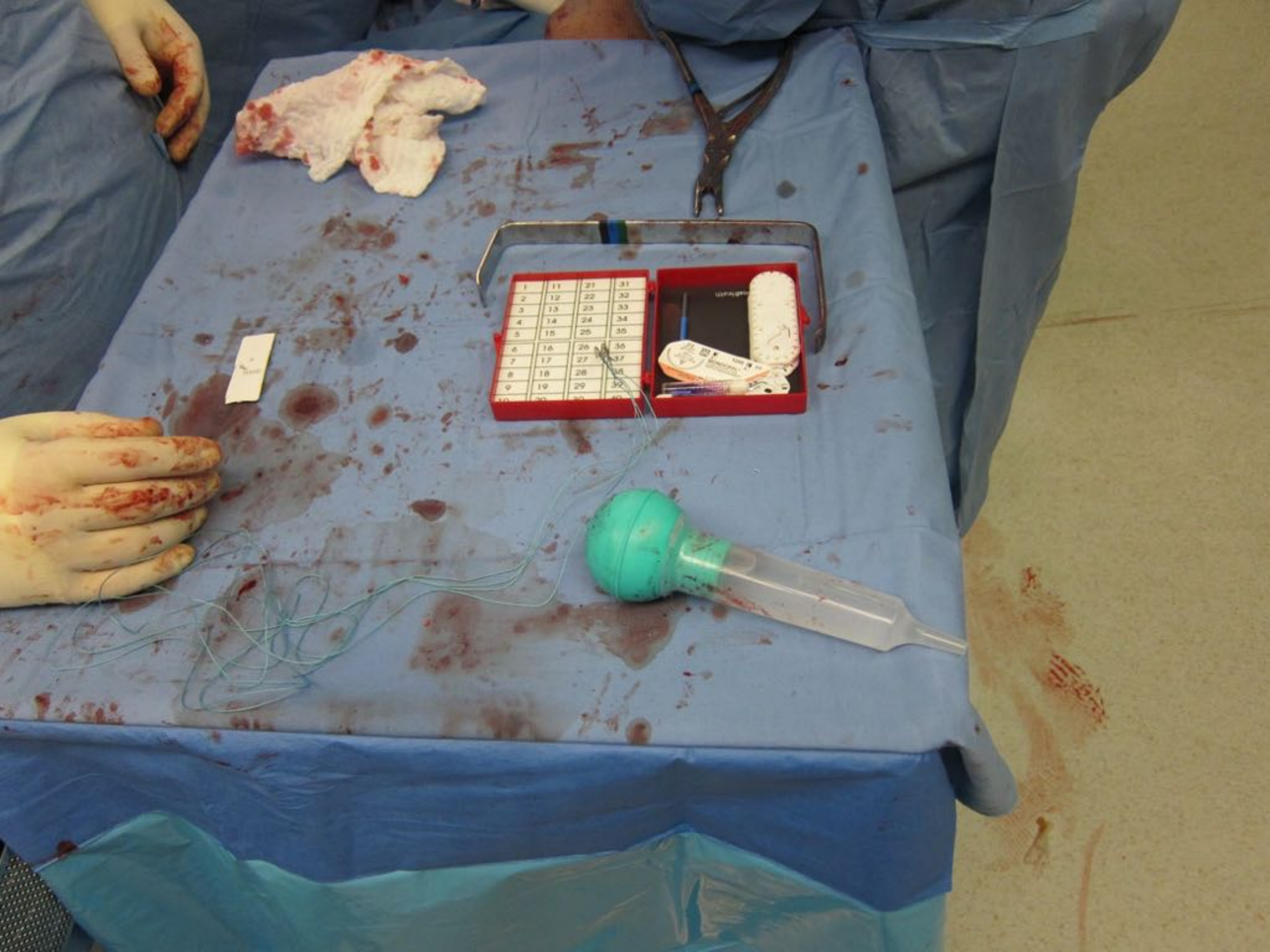


онснрлдо  
BasLapar-04

|    |    |    |    |
|----|----|----|----|
| 11 | 21 | 31 |    |
| 12 | 22 | 32 |    |
| 13 | 23 | 33 |    |
| 14 | 24 | 34 |    |
| 15 | 25 | 35 |    |
| 6  | 16 | 26 | 36 |
| 7  | 17 | 27 | 37 |
| 8  | 18 | 28 | 38 |
| 9  | 19 | 29 | 39 |
| 10 | 20 | 30 | 40 |

U Abd  
Instru





|    |    |    |    |
|----|----|----|----|
| 1  | 11 | 21 | 31 |
| 2  | 12 | 22 | 32 |
| 3  | 13 | 23 | 33 |
| 4  | 14 | 24 | 34 |
| 5  | 15 | 25 | 35 |
| 6  | 16 | 26 | 36 |
| 7  | 17 | 27 | 37 |
| 8  | 18 | 28 | 38 |
| 9  | 19 | 29 | 39 |
| 10 | 20 | 30 | 40 |



Small white label with illegible text.

So why **Design** Research?



# What is Research?

In the broadest sense of the word, the definition of research includes any gathering of data, information and facts for the advancement of knowledge.

# What is Research?

The strict definition of scientific research is performing a methodical study in order to prove a **hypothesis** or answer a specific **question**.

# What is Research?

**methodical** study to prove a **hypothesis** or answer a specific **question**.

# What is Research?

a way of **knowing**

# REASONING

what + how leads to result  
*(thing)* *(working principle)* *(observed)*

Dorst "The nature of design thinking"

# DEDUCTIVE REASONING

what + how leads to ????

*(thing)* *(working principle)* *(observed)*

# INDUCTIVE REASONING

what + ????? leads to result  
*(thing)* *(working principle)* *(observed)*

Dorst "The nature of design thinking"

# What is Design?

## mak·ing

/'mākiNG/ 

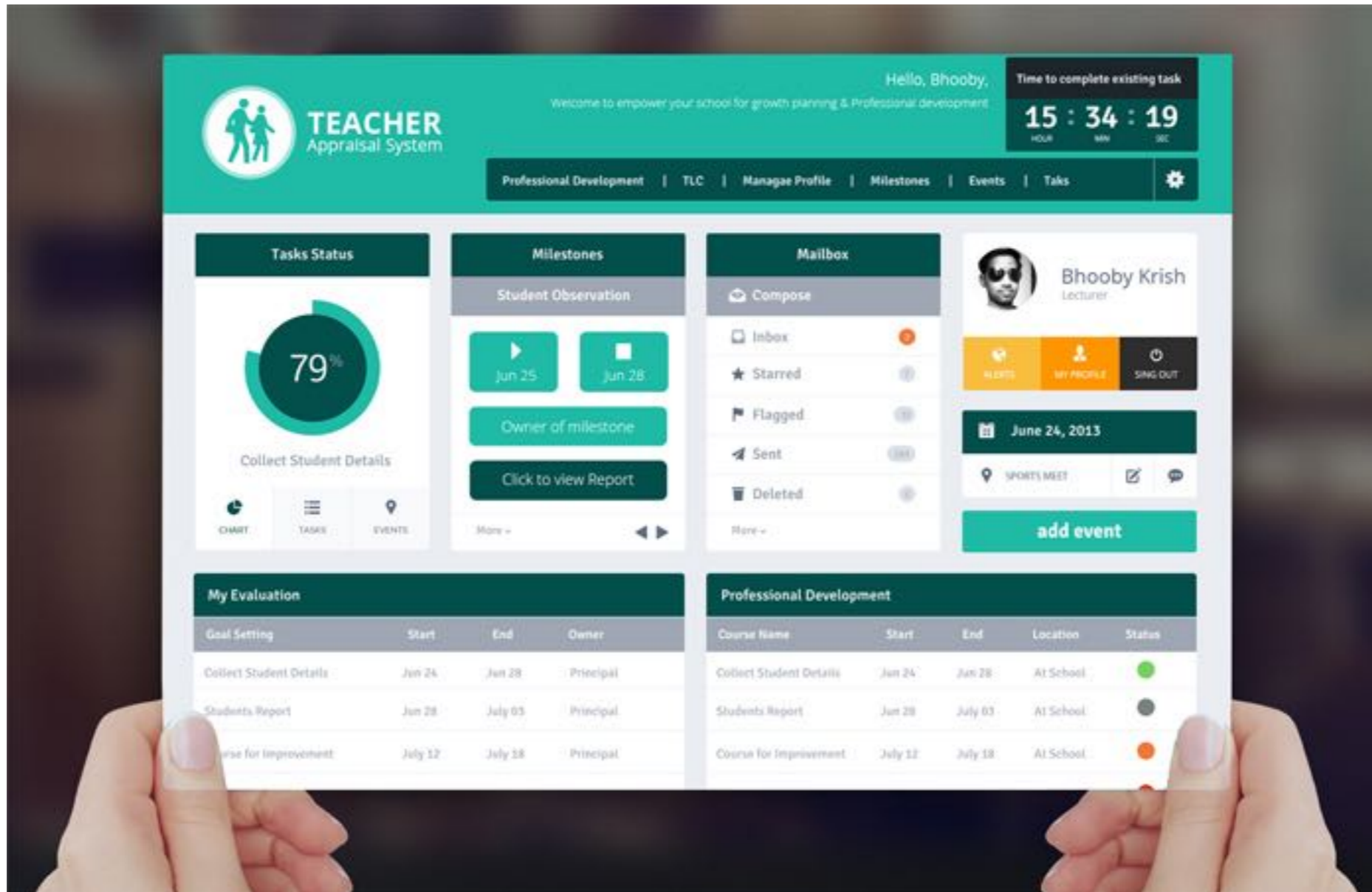
*noun*

1. the process of making or producing something.  
"the making of videos"  
*synonyms:* manufacture, mass-production, building, construction, assembly, production, creation, putting together, fabrication, forming, molding, forging  
"the making of cars"
2. *informal*  
money made; earnings or profit.



# What is Design?

**Tangible, creative manifestation** of an idea through an **intentional** process that is to be consumed by **humans** that blends both the **emotional**, and cultural with the **scientific**, and rational.



actual soft solutions

What is Design?

a way of **doing**

# What is Design?

Bringing something into the world

# INDETERMINATE

- No definitive conditions or limits
- No exhaustive list of operations
- Depend on the perspective of the solver or user
- Nested problems (more complex)
- Are always unique
- Solver takes ownership of the solution
- Supports human activities

## ABDUCTIVE REASONING

what + how leads to value  
*(thing)* *(scenario)* *(aspired)*

Dorst "The nature of design thinking"

# ABDUCTIVE | REASONING

?????? + how leads to value  
(thing) (scenario) (aspired)

Dorst "The nature of design thinking"

## ABDUCTIVE 2 REASONING

what + ????? leads to value  
(thing) (scenario) (aspired)

Dorst "The nature of design thinking"



# ABDUCTIVE REASONING

what + how leads to value  
*(thing)* *(scenario)* *(aspired)*

frames

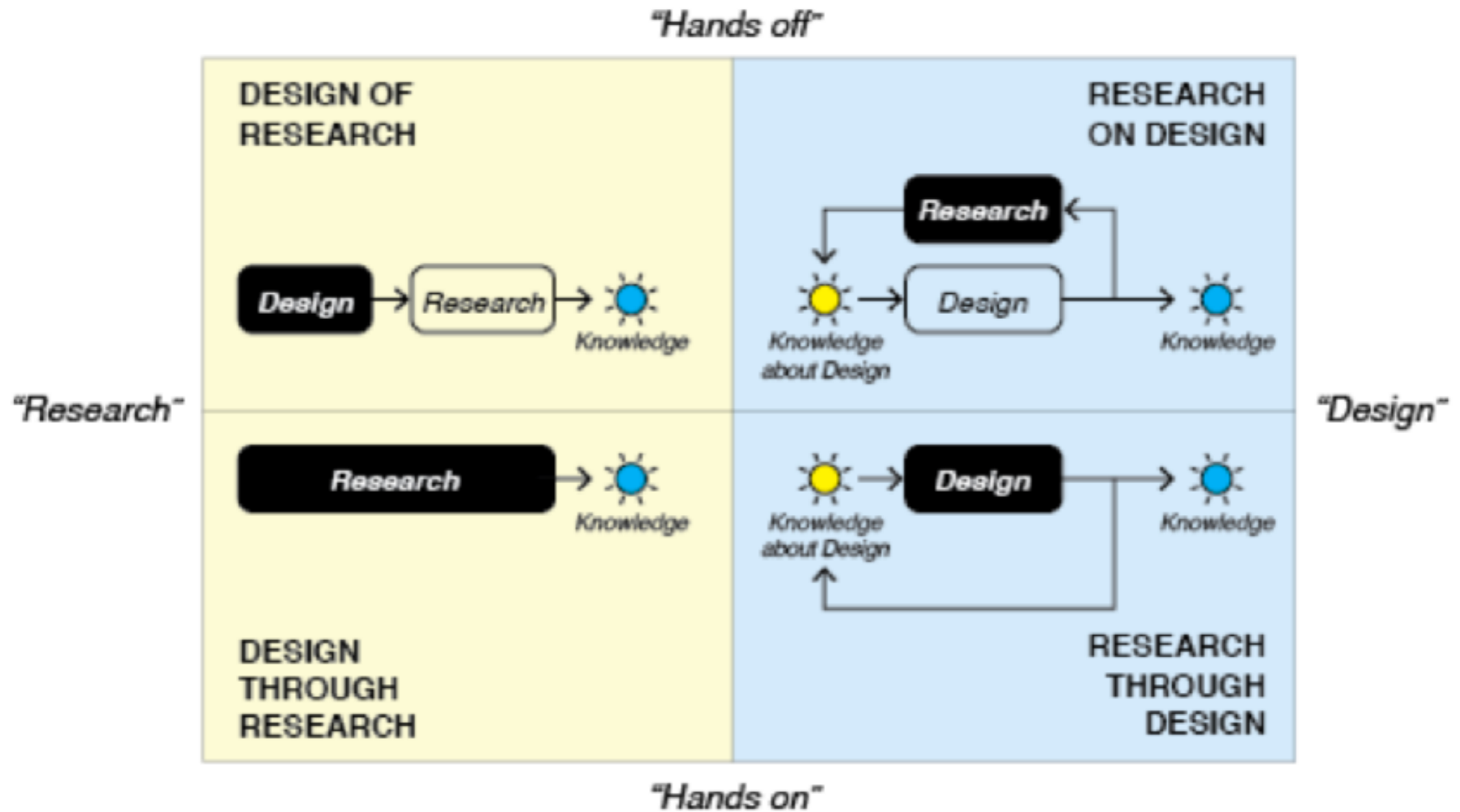
Dorst "The nature of design thinking"

a way of knowing through doing

# What is Design Research?

A **strategic** and **methodical** study to gain **insight** and answer specific **questions** during the process of design addressing **indeterminate** problems.

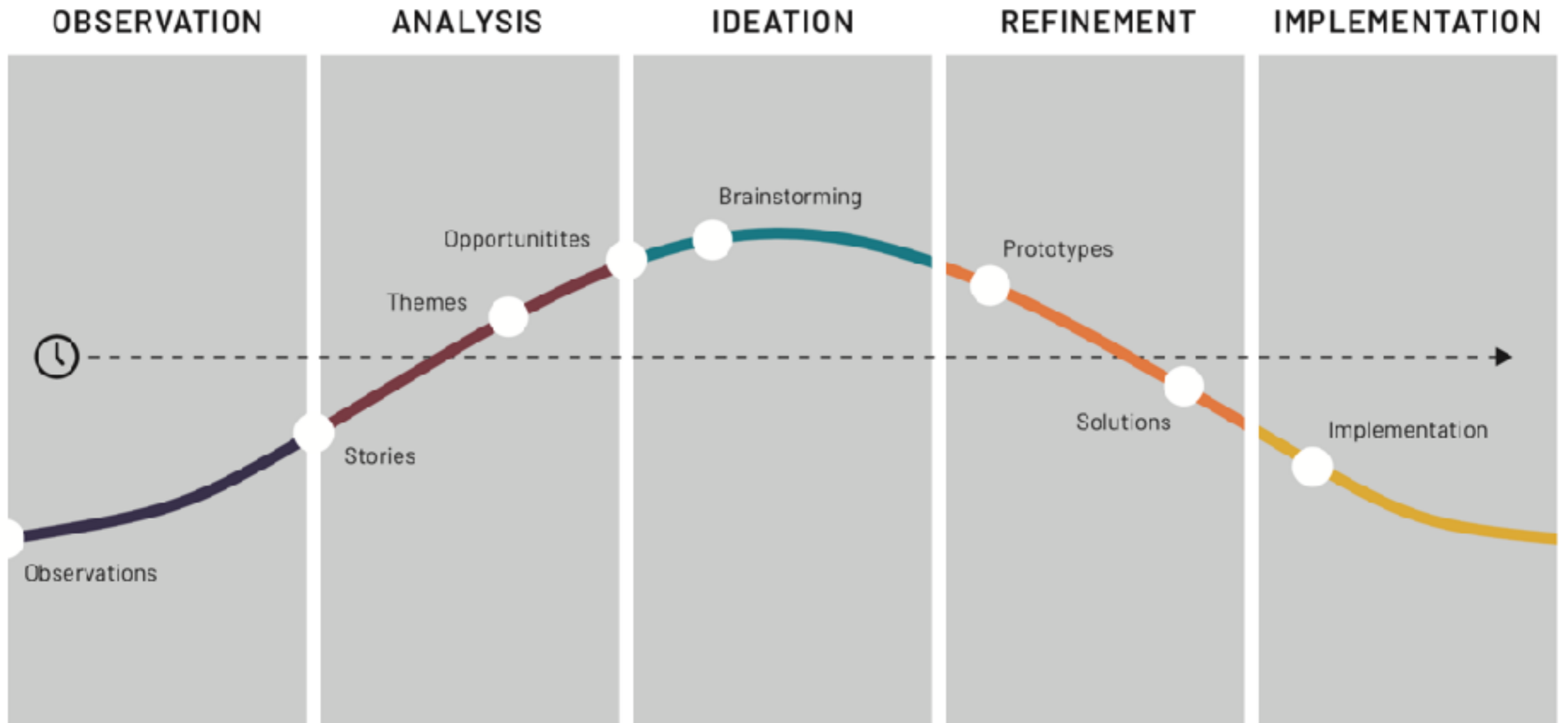
# Research through Design



# What is Design Research?



# Stages of Design



# Stages of Design



## Observation

*Collecting Materials*

The action or process of observing something or someone carefully in order to gain information.



## Analysis

*Finding Patterns and Insights*

Detailed examination of the elements or structure of something, typically as a basis for interpretation.



## Ideation

*Solution Exploration*

The formation of ideas and concepts.



## Refinement

*Narrowing Ideas and Concepts*

The improvement or clarification of something by the making of small changes.



## Implementation

*Communication*

The process of putting a decision or plan into effect.

# OBSERVATION

*Defined as:*

1. The action or process of observing something or someone carefully or in order to gain information.  
"She was brought into the hospital for observation."
2. A remark, statement, or comment based on something one has seen, heard or noticed.  
"He made a telling observation about Hugh."

## Approach

The observation phase focuses on accurate need assessments and developing a holistic understanding of the problem. Students build an understanding of the problem by cataloging environmental factors, understanding stakeholder perspectives, and researching multidisciplinary applications of related concepts. It's a Look, Listen and Learn phase. This is accomplished through a variety of activities that are focused on deep learning and seeing. We utilize three different perspectives in these activities. We use a first-person perspective to immerse ourselves in the experience. We employ a second-person perspective to learn from another. We use a third person perspective to understand what others are saying about the experience through literature reviews.

## Outcomes

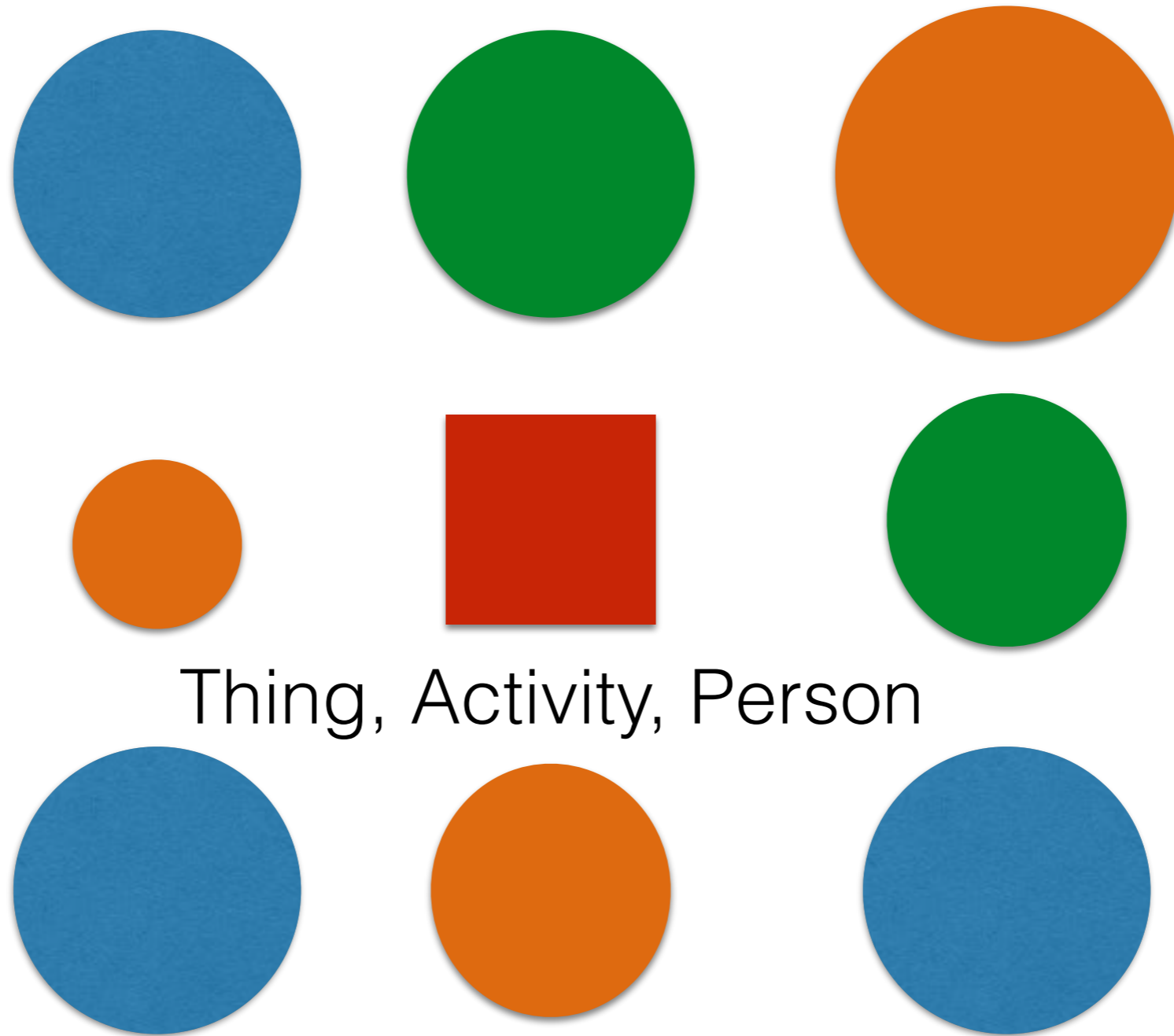
Rich and robust set of materials and data to understand the issue from the three perspectives. A repository of data that can be used throughout the process to validate, relate, and connect with the design work.

## Methods

Timeline (First person)  
Artifact Gathering (First person)  
POACE (First person)  
5 Human Factors (Second person)  
Stakeholder Map (Second person)  
Sticky Note (First person)  
Literature Review (Third person)  
AEIOU (First person)

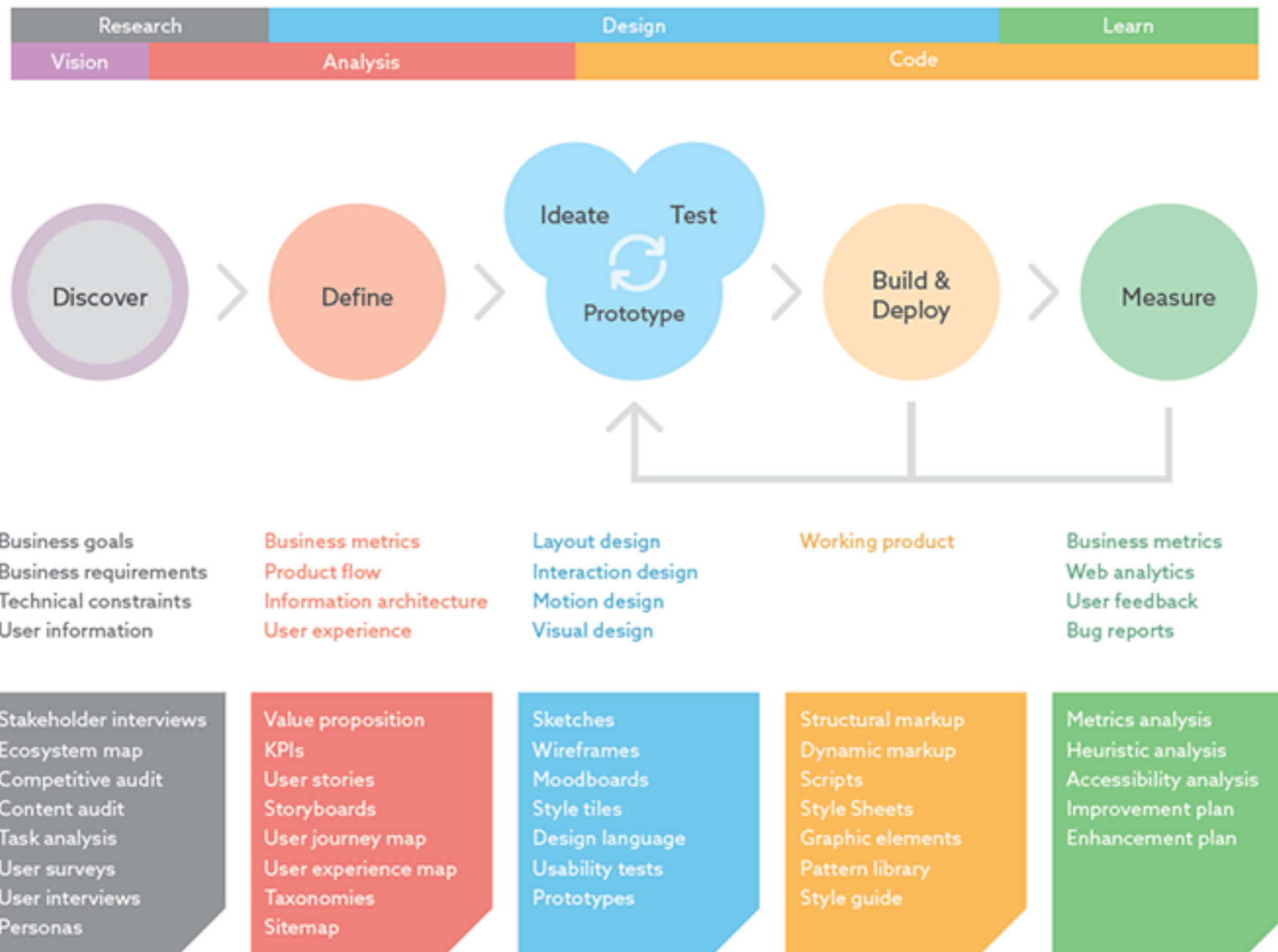


What is the goal?



Thing, Activity, Person

# UX Design Process



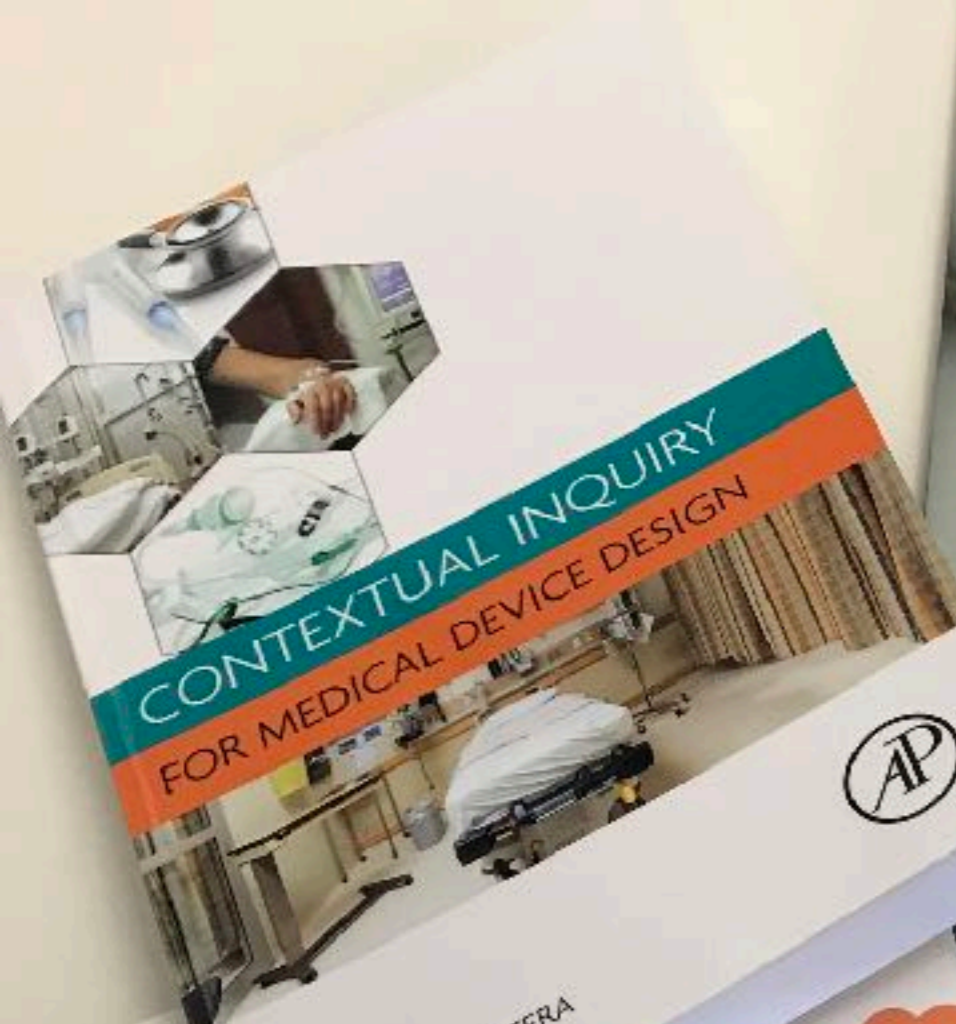
How do you do it?



First person

Second person

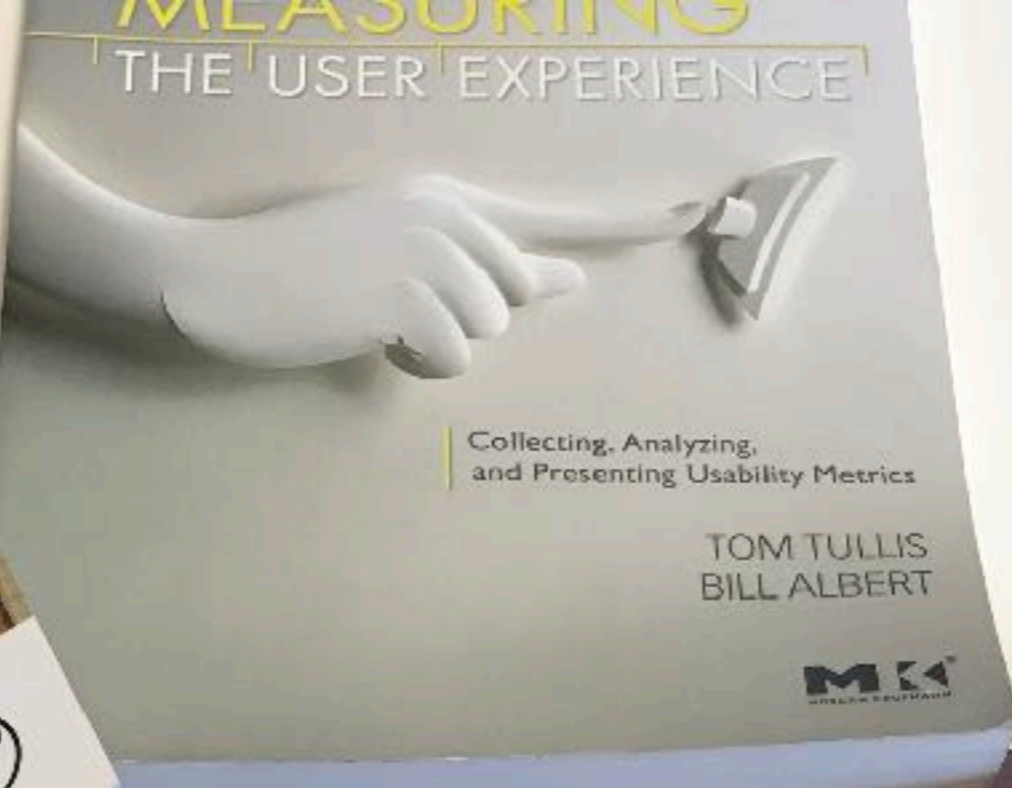
Third person



# CONTEXTUAL INQUIRY FOR MEDICAL DEVICE DESIGN



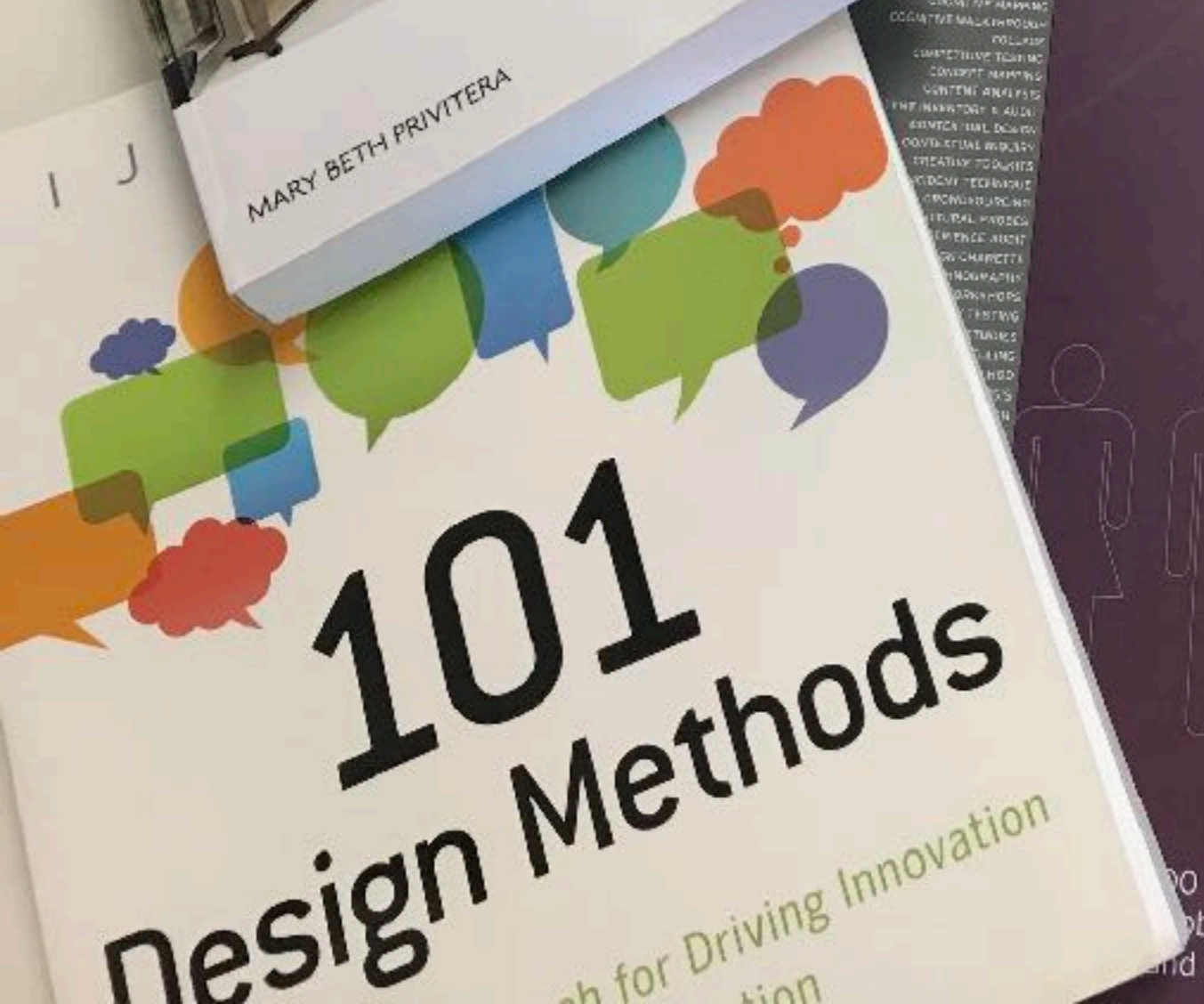
MARY BETH PRIVITERA



# MEASURING THE USER EXPERIENCE

Collecting, Analyzing,  
and Presenting Usability Metrics

TOM TULLIS  
BILL ALBERT



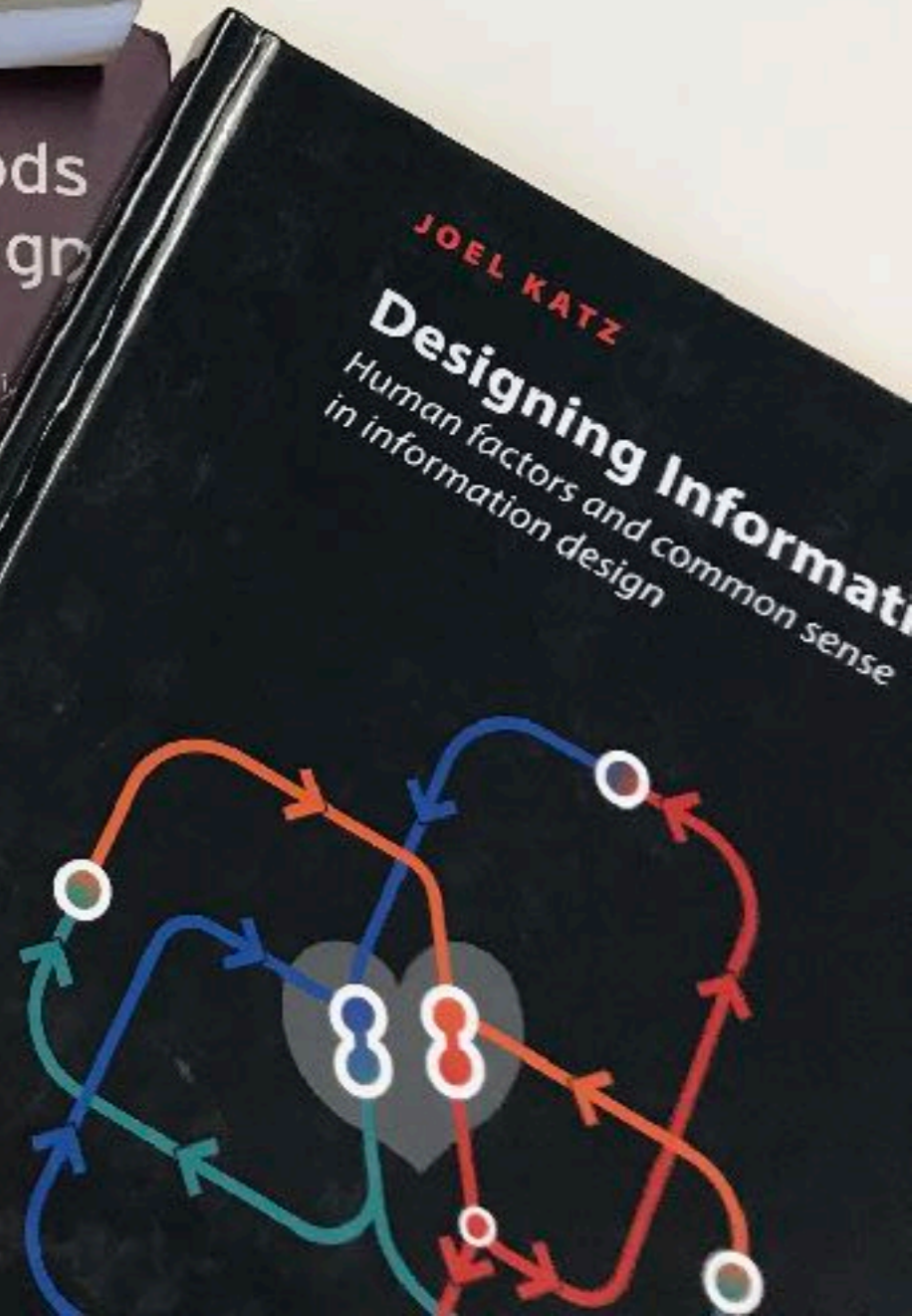
# 101 Design Methods

Book for Driving Innovation



# Universal Methods of Design

Bella Martini  
Bruce Hanington



JOEL KATZ

# Designing Information

Human factors and common sense  
in information design

# Contents

& design phases 1 2 3 4 5

|  |     |   |   |   |   |   |
|--|-----|---|---|---|---|---|
| INTRODUCTION.....                      | 6   |   |   |   |   |   |
| 01. A/B Testing.....                   | 8   | 1 | 2 | 3 | 4 | 5 |
| 02. AEIOU.....                         | 10  | 1 | 2 | 3 | 4 | 5 |
| 03. Affinity Diagramming.....          | 12  | 1 | 2 | 3 | 4 | 5 |
| 04. Artifact Analysis.....             | 14  | 1 | 2 | 3 | 4 | 5 |
| 05. Automated Remote Research.....     | 16  | 1 | 2 | 3 | 4 | 5 |
| 06. Behavioral Mapping.....            | 18  | 1 | 2 | 3 | 4 | 5 |
| 07. Bodystorming.....                  | 20  | 1 | 2 | 3 | 4 | 5 |
| 08. Brainstorm Graphic Organizers..... | 22  | 1 | 2 | 3 | 4 | 5 |
| 09. Business Origami.....              | 24  | 1 | 2 | 3 | 4 | 5 |
| 10. Card Sorting.....                  | 26  | 1 | 2 | 3 | 4 | 5 |
| 11. Case Studies.....                  | 28  | 1 | 2 | 3 | 4 | 5 |
| 12. Cognitive Mapping.....             | 30  | 1 | 2 | 3 | 4 | 5 |
| 13. Cognitive Walkthrough.....         | 32  | 1 | 2 | 3 | 4 | 5 |
| 14. Collage.....                       | 34  | 1 | 2 | 3 | 4 | 5 |
| 15. Competitive Testing.....           | 36  | 1 | 2 | 3 | 4 | 5 |
| 16. Concept Mapping.....               | 38  | 1 | 2 | 3 | 4 | 5 |
| 17. Content Analysis.....              | 40  | 1 | 2 | 3 | 4 | 5 |
| 18. Content Inventory & Audit.....     | 42  | 1 | 2 | 3 | 4 | 5 |
| 19. Contextual Design.....             | 44  | 1 | 2 | 3 | 4 | 5 |
| 20. Contextual Inquiry.....            | 46  | 1 | 2 | 3 | 4 | 5 |
| 21. Creative Toolkits.....             | 48  | 1 | 2 | 3 | 4 | 5 |
| 22. Critical Incident Technique.....   | 50  | 1 | 2 | 3 | 4 | 5 |
| 23. Crowdsourcing.....                 | 52  | 1 | 2 | 3 | 4 | 5 |
| 24. Cultural Probes.....               | 54  | 1 | 2 | 3 | 4 | 5 |
| 25. Customer Experience Audit.....     | 56  | 1 | 2 | 3 | 4 | 5 |
| 26. Design Charette.....               | 58  | 1 | 2 | 3 | 4 | 5 |
| 27. Design Ethnography.....            | 60  | 1 | 2 | 3 | 4 | 5 |
| 28. Design Workshops.....              | 62  | 1 | 2 | 3 | 4 | 5 |
| 29. Desirability Testing.....          | 64  | 1 | 2 | 3 | 4 | 5 |
| 30. Diary Studies.....                 | 66  | 1 | 2 | 3 | 4 | 5 |
| 31. Directed Storytelling.....         | 68  | 1 | 2 | 3 | 4 | 5 |
| 32. Elito Method.....                  | 70  | 1 | 2 | 3 | 4 | 5 |
| 33. Ergonomic Analysis.....            | 72  | 1 | 2 | 3 | 4 | 5 |
| 34. Evaluative Research.....           | 74  | 1 | 2 | 3 | 4 | 5 |
| 35. Evidence-based Design.....         | 76  | 1 | 2 | 3 | 4 | 5 |
| 36. Experience Prototyping.....        | 78  | 1 | 2 | 3 | 4 | 5 |
| 37. Experience Sampling Method.....    | 80  | 1 | 2 | 3 | 4 | 5 |
| 38. Experiments.....                   | 82  | 1 | 2 | 3 | 4 | 5 |
| 39. Expository Research.....           | 84  | 1 | 2 | 3 | 4 | 5 |
| 40. Eyetracking.....                   | 86  | 1 | 2 | 3 | 4 | 5 |
| 41. Flexible Modeling.....             | 88  | 1 | 2 | 3 | 4 | 5 |
| 42. Fly-on-the-Wall Observation.....   | 90  | 1 | 2 | 3 | 4 | 5 |
| 43. Focus Groups.....                  | 92  | 1 | 2 | 3 | 4 | 5 |
| 44. Generative Research.....           | 94  | 1 | 2 | 3 | 4 | 5 |
| 45. Graffiti Walls.....                | 96  | 1 | 2 | 3 | 4 | 5 |
| 46. Heuristic Evaluation.....          | 98  | 1 | 2 | 3 | 4 | 5 |
| 47. Image Boards.....                  | 100 | 1 | 2 | 3 | 4 | 5 |
| 48. Interviews.....                    | 102 | 1 | 2 | 3 | 4 | 5 |
| 49. KJ Technique.....                  | 104 | 1 | 2 | 3 | 4 | 5 |
| 50. Kano Analysis.....                 | 106 | 1 | 2 | 3 | 4 | 5 |
| 51. Key Performance Indicators.....    | 108 | 1 | 2 | 3 | 4 | 5 |
| 52. Laddering.....                     | 110 | 1 | 2 | 3 | 4 | 5 |
| 53. Literature Reviews.....            | 112 | 1 | 2 | 3 | 4 | 5 |

สำหรับงานศึกษาและวิจัยเท่านั้น  
 For educational use and reference only

RESEARCH METHOD

# 45 Graffiti Walls

Graffiti walls provide an open canvas on which participants can freely offer their written or visual comments about an environment or system, directly in the context of use.

The graffiti walls method encourages participation through natural means of facilitating casual, anonymous remarks about an environmental space, system, or facility. Large-format paper is temporarily adhered to a wall or other surface, with markers tied to a string or otherwise made readily available for open-ended comments to be posted. The paper may be left blank, or a guiding question may be posed to direct comments on a particular theme. Depending on the environment, the materials are typically posted in an intentionally casual way.

The method can be used almost anywhere, but it is particularly useful in environments or for situations in which it may be challenging to collect information through traditional methods such as interview or observation; for instance, where respect for privacy or personal behaviors may present an ethical issue. The method has been used effectively for design research projects on public bathrooms, eliciting candid feedback on behaviors and perceptions of current spaces, specific issues such as sanitation, and desires for change. The method is also effective here owing to the natural context of graffiti in public bathrooms.

Photos of each graffiti wall should be taken at regular, daily intervals, as the paper may often deteriorate, or may be mistaken for vandalism and removed by maintenance staff, depending on location. The graffiti wall itself is removed at the end of the study and can be analyzed as a research artifact, for inspiration, comparison, consultation with "walls" collected from other locations, and content analysis.

Graffiti walls are a low-cost and time-efficient method with which to easily collect information from a range of participants, typically requiring no more materials than large-format paper and pens, and a camera for documenting results. Limitations of the method are that there is little control over who participates in the method, and a lack of clear knowledge about who has contributed to the information collected. However, as an informal method triangulated with other means of exploratory research, graffiti walls are ideal for collecting/baseline information and guiding design inspiration.

Further Reading

Harrington Bruce, "Methods in the Making: A Perspective on the State of Human Research in Design," *Design Issues* 16, no. 4 (Autumn 2000).



Graffiti walls are an ideal method for capturing informal opinions about an environment directly in the context of use. Here the method has been used effectively for research on perceptions and attitudes about public bathrooms, by facilitating an opportunity for participants to express themselves. Walls collected from various locations can be compared and consolidated to look for common themes and patterns.

Image based on work from Park Place Partners



|             |              |             |             |                |
|-------------|--------------|-------------|-------------|----------------|
| Behavioral  | Quantitative | Innovative  | Exploratory | Participatory  |
| Attitudinal | Qualitative  | Adapted     | Generative  | Observational  |
|             |              | Traditional | Evaluative  | Self-reporting |
|             |              |             |             | Expert review  |
|             |              |             |             | Design process |

Behavioral  
Attitudinal

Quantitative  
Qualitative

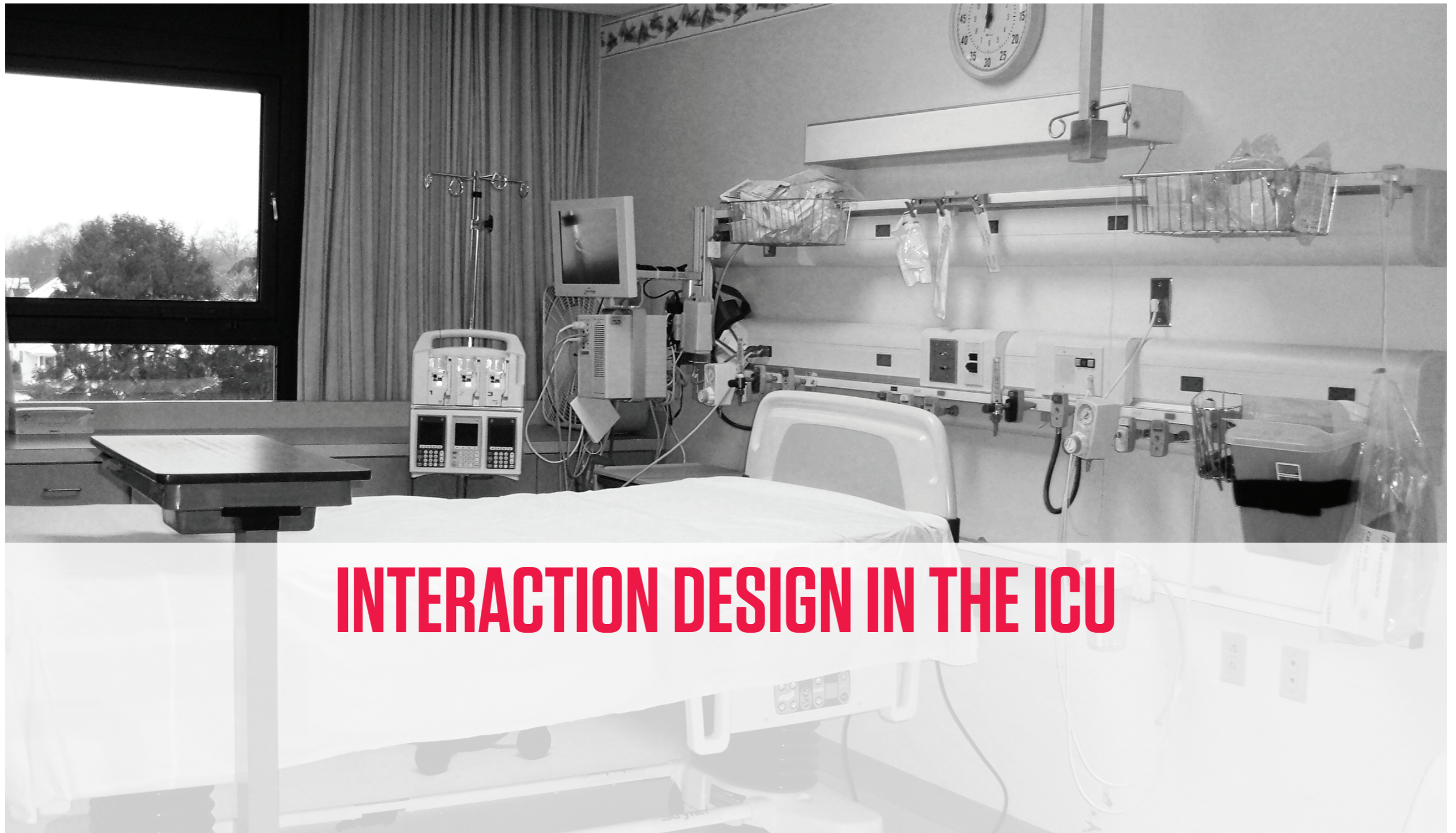
Innovative  
Adapted  
Traditional

Exploratory  
**Generative**  
Evaluative

Participatory  
Observational  
Self reporting  
Expert review  
Design process

160 **Universal Methods of Design**

# Examples



## INTERACTION DESIGN IN THE ICU



# INTERACTION DESIGN IN THE ICU PROCESS :

RESEARCH



SYNTHESIS



DESIGN



VALIDATION



CONCLUSION



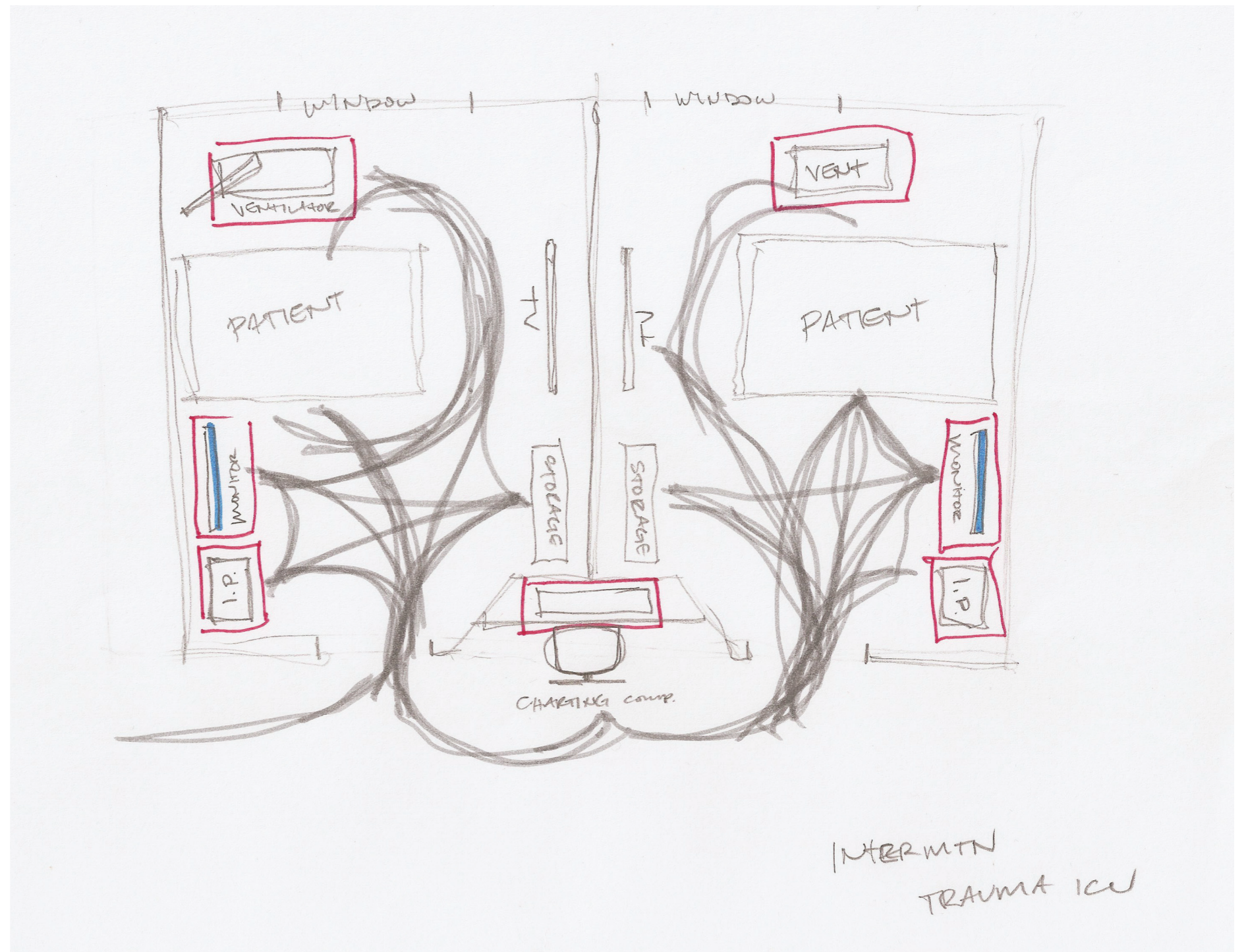
# RESEARCH

CONTEXTUAL OBSERVATION



# RESEARCH

## WORKFLOW MAPPING



# RESEARCH DOCUMENTATION

|      |   |   |   |              |                          |
|------|---|---|---|--------------|--------------------------|
| un10 | Checks urine output   | o | R | Monitoring   | Urine Output             |
| un10 | Check urine output  | o | R | Monitoring   | Urine Output             |
| un10 | Checking Vitals on Computer (assessment): updates Vitals by clicking at top of column.  | o | O | Organization | Charting                 |
| un10 | Number for pain ranking are subjective, but he charts it anyway.  | o | O | Organization | Charting                 |
| un10 | Notes on chart that patient said she was in pain but didn't want pain meds.   | o | O | Organization | Charting                 |
| un10 | Emar: Charts Heparin. Marks time and where med was administered (on body).  | o |   | Organization | Charting                 |
| un10 | Charts assessment   | o | O | Organization | Charting                 |
| un10 | Gets syringe to suck air out of the IV line.  | o | R | Organization | Equipment                |
| un10 | Computer said that he needed to give the patient a med but it conflicted with a med the pharmacy had just ordered so he marked the old med as not given and made a note of why it wasn't given.   | o |   | Organization | Medication               |
| un10 | Check s sliding scale on computer to see what level of insulin patient needs with her blood sugar level.  | o | O | Organization | Medication               |
| un10 | Double checks (assistant's) written chart to make sure the patients blood sugar level was correct in the computer so that he knows he is getting the right amount of insulin.   | o | O | Organization | Medication               |
| un10 | Goes to med room to get insulin.  | o | O | Organization | Medication               |
| un10 | Prints off information about all of the meds that need to be administered throughout the day, and keeps notes on that paper   | o | R | Organization | Pocket Notes             |
| un10 | Gets out notepad to write down temp.  | o | R | Organization | Pocket Notes             |
| un10 | Writes down urine output  | o | R | Organization | Pocket Notes             |
| un10 | Notes urine output on paper.  | o | R | Organization | Pocket Notes             |
| un10 | Administering Meds: (Heparin) Asks patient how she is feeling, asks her to rate her pain (1 to 10) is that comfortable?, she says no. He asks if she wants something for the pain, she says no. Puts on his gloves. Got out saringe, got specified amount out of bottle, walked around the bed and connected it to the IV. Tells the patient "thank you".   | o | R | Task         | Administering Medication |
| un10 | Assessment: tells patients he is going to listen to her heart. Gets out stethoscope. Listens to heart. Asks her easy questions, what hospital she's in and what month it is. Listens to lungs, bowels, pupils, fingers, pulses. Replaces sheet on patient. Takes temperature.   | o | R | Task         | Assessment               |
| un10 | Assessment: Gets out stethoscope, listens to lungs, listens to bowels, asks patient to squeeze his fingers, "give me the peace sign", asks patient to wiggle toes, checks pulses in feet. Prepares patient for flashlight in eyes, checks pupils. Ask patient to open his eyes. Takes patients temp (after getting new ear cap).  | o | R | Task         | Assessment               |
| un10 | Bathing: puts on gloves, checks urine output while other nurse gets bucket with water and towels ready. Nurse removes patients bed pan and takes it to the disposing room. Adjust the fan for her. Begins wiping patient down. Other nurse returns. Asks if she wants her feet washed or not. Dips towel in water and washes her off (new towel every time). Bring laundry basket for towels to a better location. Patient is awake enough to roll and turn for them (makes it easier). Asks patient how she is doing. Change sheets and adjust patient to make her more comfortable. | o | R | Task         | Bathing                  |
| un10 | Goes to the computer to chart. Charts insulin.  | o | R | Task         | Charting                 |
| un10 | Flushes out the IV: Gets the syringe with saline, plugs the IV line and injects the saline. Screws off Syringe, throws it away, resets the IV.  | o | R | Task         | Flush Out IV             |
| un10 | Oral care: (every 4 hours when patient is sedated). Gets pack off the wall. Silences ventilator, raises to 100% oxygen, explains what is going on to the patient. Cleans around tubes and inside the mouth, alarm sounds and he asks patient if he is in pain. Resets alarm. Turns off feeding tube (which can choke patient when oral cleaning is going on). Throws away tooth brush. Lets patient know that he is going to suction out his breathing tube.  | o | R | Task         | Oral Care                |
| un10 | Patient asks for apple sauce, nurse remembers her diet restrictions (didn't pass swallow test), he offers to get her some nectar.   | o | R | Task         | Patient Comfort Measures |
| un10 | Knocks on patients door, tells her they only had apple. Pours it into a cup. Looks for a spoon but cannot find one. Looks in food room for spoon. Didn't know where to look. Finds one and brings it to patient. Starts raising the bed up, explaining to her that she has to be at 90 degrees to drink liquid. Tries to feed patient but she doesn't want him to. Hands cup to husband.  | o | R | Task         | Patient Comfort Measures |
| un10 | Nurse walks into the room to check out respiratory tubes.   | o | R | Task         | Patient Comfort Measures |
| un10 | Nurse gets washcloth for RT.  | o | R | Task         | Patient Comfort Measures |
| un10 | Repositioning patient: Finds nurse to help reposition patient, put on gloves, unstrap patients arms, lower bed so that it is totally flat, pull patient to one side and remove pillows that were underneath him, lay patient flat again. Inform the patient that they are repositioning him, push patient to other side, move around pillows, tied straps back down.  | o | R | Task         | Patient Comfort Measures |
| un10 | Asks patient if he is hot and whether or not he wants a cool wash cloth.  | o | R | Task         | Patient Comfort Measures |
| un10 | Leaves to go get a washcloth from the linen room. Grabs washcloth and enters the room. Family is praying so he leaves the room. Returns when the family is finished. Gets washcloth wet, places it on patients forehead and walks out.  | o | R | Task         | Patient Comfort Measures |
| un10 | Suctioning: lets him know what he is doing. Pushes button down, suction. "Sorry". States he'll moisturize patients mouth, asks if he likes that, asks if he would like to be suctioned out again, patient say yes. He does it. "Sorry".   | o | R | Task         | Suctioning               |

# RESEARCH DOCUMENTATION

|      |   |   |   |              |                          |
|------|---|---|---|--------------|--------------------------|
| un10 | Checks urine output   | o | R | Monitoring   | Urine Output             |
| un10 | Check urine output  | o | R | Monitoring   | Urine Output             |
| un10 | Checking Vitals on Computer (assessment): updates Vitals by clicking at top of column.  | o | O | Organization | Charting                 |
| un10 | Number for pain ranking are subjective, but he charts it anyway.  | o | O | Organization | Charting                 |
| un10 | Notes on chart that patient said she was in pain but didn't want pain meds.   | o | O | Organization | Charting                 |
| un10 | Emar: Charts Heparin. Marks time and where med was administered (on body).  | o |   | Organization | Charting                 |
| un10 | Charts assessment   | o | O | Organization | Charting                 |
| un10 | Gets syringe to suck air out of the IV line.  | o | R | Organization | Equipment                |
| un10 | Computer said that he needed to give the patient a med but it conflicted with a med the pharmacy had just ordered so he marked the old med as not given and made a note of why it wasn't given.   | o |   | Organization | Medication               |
| un10 | Check s sliding scale on computer to see what level of insulin patient needs with her blood sugar level.  | o | O | Organization | Medication               |
| un10 | Double checks (assistant's) written chart to make sure the patients blood sugar level was correct in the computer so that he knows he is getting the right amount of insulin.   | o | O | Organization | Medication               |
| un10 | Goes to med room to get insulin.  | o | O | Organization | Medication               |
| un10 | Prints off information about all of the meds that need to be administered throughout the day, and keeps notes on that paper   | o | R | Organization | Pocket Notes             |
| un10 | Gets out notepad to write down temp.  | o | R | Organization | Pocket Notes             |
| un10 | Writes down urine output  | o | R | Organization | Pocket Notes             |
| un10 | Notes urine output on paper.  | o | R | Organization | Pocket Notes             |
| un10 | Administering Meds: (Heparin) Asks patient how she is feeling, asks her to rate her pain (1 to 10) is that comfortable?, she says no. He asks if she wants something for the pain, she says no. Puts on his gloves. Got out saringe, got specified amount out of bottle, walked around the bed and connected it to the IV. Tells the patient "thank you".   | o | R | Task         | Administering Medication |
| un10 | Assessment: tells patients he is going to listen to her heart. Gets out stethoscope. Listens to heart. Asks her easy questions, what hospital she's in and what month it is. Listens to lungs, bowels, pupils, fingers, pulses. Replaces sheet on patient. Takes temperature.   | o | R | Task         | Assessment               |
| un10 | Assessment: Gets out stethoscope, listens to lungs, listens to bowels, asks patient to squeeze his fingers, "give me the peace sign", asks patient to wiggle toes, checks pulses in feet. Prepares patient for flashlight in eyes, checks pupils. Ask patient to open his eyes. Takes patients temp (after getting new ear cap).  | o | R | Task         | Assessment               |
| un10 | Bathing: puts on gloves, checks urine output while other nurse gets bucket with water and towels ready. Nurse removes patients bed pan and takes it to the disposing room. Adjust the fan for her. Begins wiping patient down. Other nurse returns. Asks if she wants her feet washed or not. Dips towel in water and washes her off (new towel every time). Bring laundry basket for towels to a better location. Patient is awake enough to roll and turn for them (makes it easier). Asks patient how she is doing. Change sheets and adjust patient to make her more comfortable. | o | R | Task         | Bathing                  |
| un10 | Goes to the computer to chart. Charts insulin.  | o | R | Task         | Charting                 |
| un10 | Flushes out the IV: Gets the syringe with saline, plugs the IV line and injects the saline. Screws off Syringe, throws it away, resets the IV.  | o | R | Task         | Flush Out IV             |
| un10 | Oral care: (every 4 hours when patient is sedated). Gets pack off the wall. Silences ventilator, raises to 100% oxygen, explains what is going on to the patient. Cleans around tubes and inside the mouth, alarm sounds and he asks patient if he is in pain. Resets alarm. Turns off feeding tube (which can choke patient when oral cleaning is going on). Throws away tooth brush. Lets patient know that he is going to suction out his breathing tube.  | o | R | Task         | Oral Care                |
| un10 | Patient asks for apple sauce, nurse remembers her diet restrictions (didn't pass swallow test), he offers to get her some nectar.   | o | R | Task         | Patient Comfort Measures |
| un10 | Knocks on patients door, tells her they only had apple. Pours it into a cup. Looks for a spoon but cannot find one. Looks in food room for spoon. Didn't know where to look. Finds one and brings it to patient. Starts raising the bed up, explaining to her that she has to be at 90 degrees to drink liquid. Tries to feed patient but she doesn't want him to. Hands cup to husband.  | o | R | Task         | Patient Comfort Measures |
| un10 | Nurse walks into the room to check out respiratory tubes.   | o | R | Task         | Patient Comfort Measures |
| un10 | Nurse gets washcloth for RT.  | o | R | Task         | Patient Comfort Measures |
| un10 | Repositioning patient: Finds nurse to help reposition patient, put on gloves, unstrap patients arms, lower bed so that it is totally flat, pull patient to one side and remove pillows that were underneath him, lay patient flat again. Inform the patient that they are repositioning him, push patient to other side, move around pillows, tied straps back down.  | o | R | Task         | Patient Comfort Measures |
| un10 | Asks patient if he is hot and whether or not he wants a cool wash cloth.  | o | R | Task         | Patient Comfort Measures |
| un10 | Leaves to go get a washcloth from the linen room. Grabs washcloth and enters the room. Family is praying so he leaves the room. Returns when the family is finished. Gets washcloth wet, places it on patients forehead and walks out.  | o | R | Task         | Patient Comfort Measures |
| un10 | Suctioning: lets him know what he is doing. Pushes button down, suction. "Sorry". States he'll moisturize patients mouth, asks if he likes that, asks if he would like to be suctioned out again, patient say yes. He does it. "Sorry".   | o | R | Task         | Suctioning               |

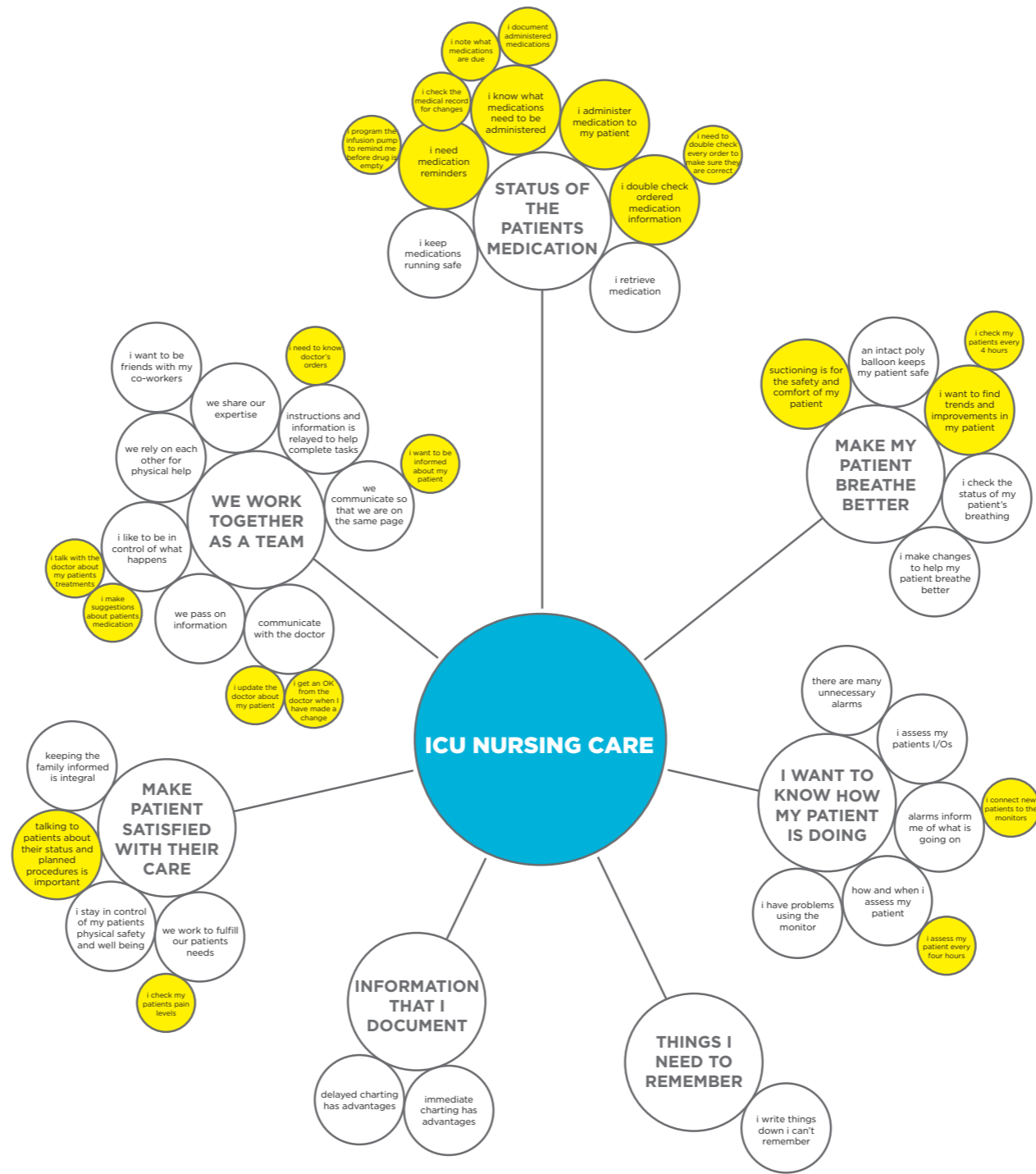
# SYNTHESIS

## AFFINITY DIAGRAM



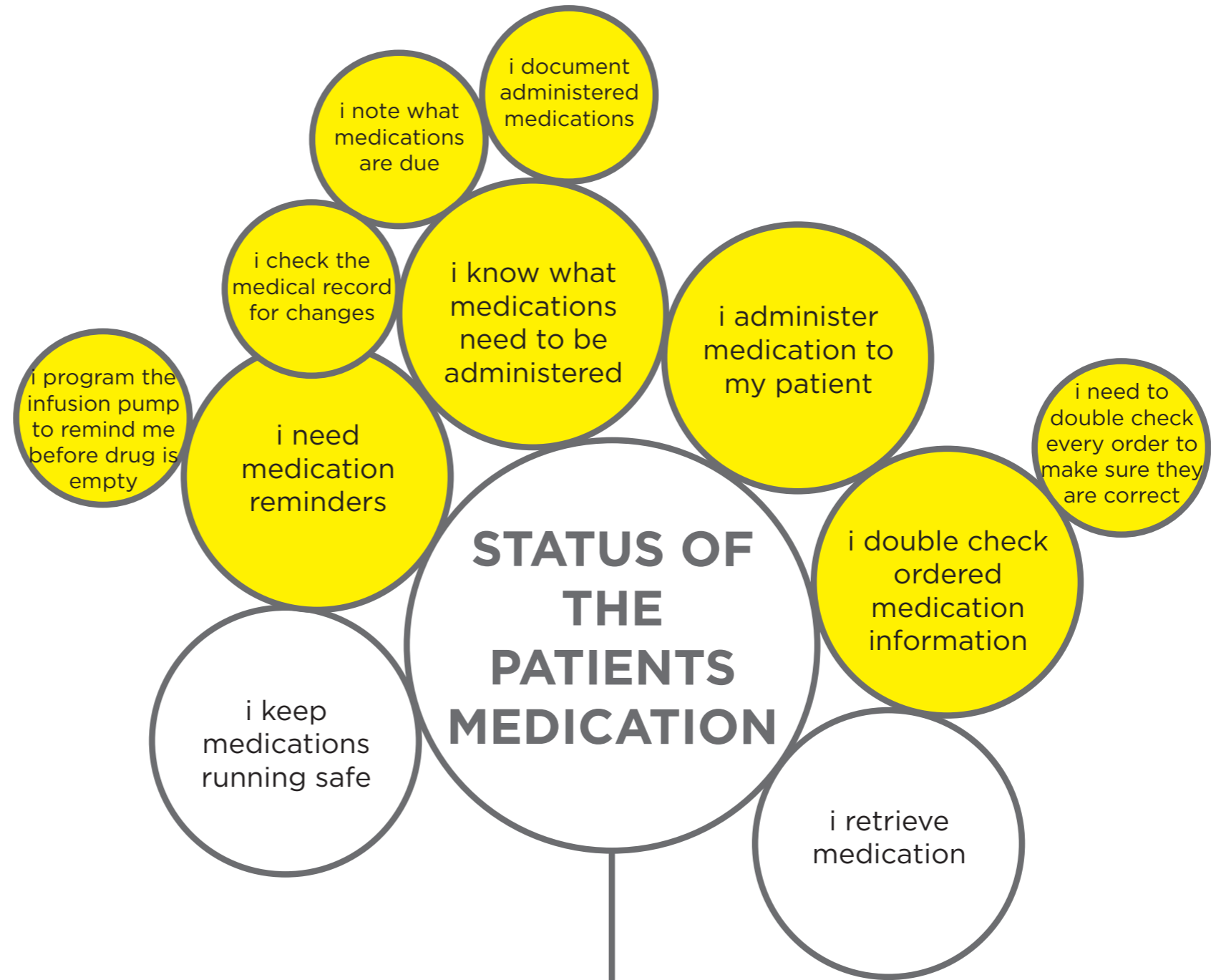
# SYNTHESIS

## AFFINITY DIAGRAM



# SYNTHESIS

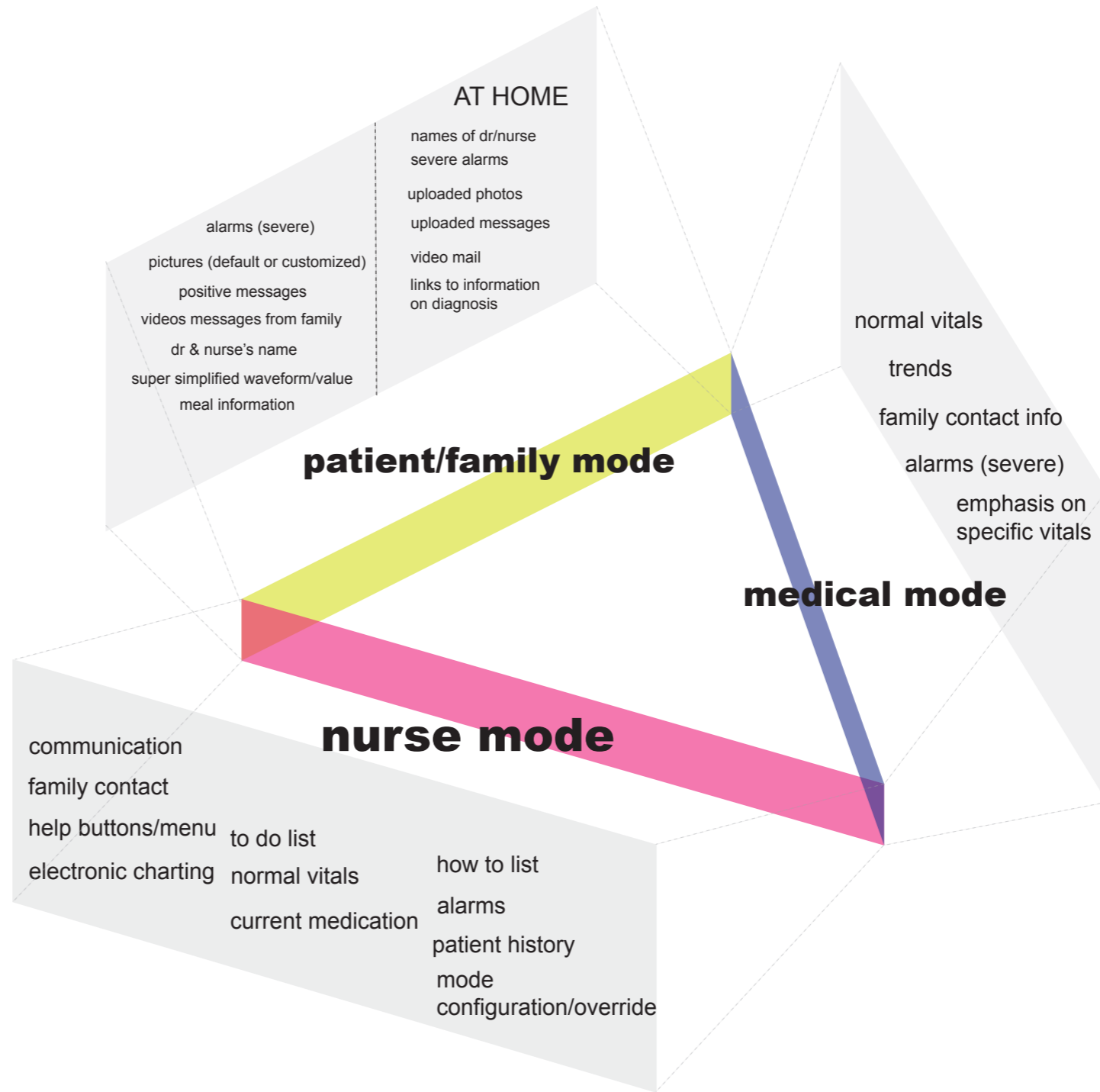
## AFFINITY DIAGRAM





# SYNTHESIS

## BROAD SCOPE



# SYNTHESIS

## NARROW SCOPE

### nurse mode

#### current medication

time left/flow  
more information about med  
protocol  
specific orders  
compatibility  
new medications  
changes  
arrival of med

#### normal vitals

trends  
suctioning/intubated  
specific  
vent check  
lab results  
(recent) w/ time  
see select values in  
other rooms

#### mode configuration

configures own screen  
overrides family mode or  
medical mode

#### to do list

reminders  
organize list  
prioritize  
sort  
check off  
turn optional tasks on/off  
see required tasks only  
remove items w/ or w/o  
reason  
task completed, should I chart  
doctors orders - send response  
other orders  
suctioning/procedures  
leave note for self (audio)  
prepare list for next nurse  
request additional information  
different views (by task, source)

#### communication help

call for help by function  
nurse, RT doctor  
order meds  
send messages  
doctor next shift nurse, RT  
connect to emergency  
contacts  
see others contacting you

#### electronic charting

automatic charting  
vitals, trends  
confirmation of  
auto chart  
similar look/format  
to paper charting  
write on screen  
charts meds  
assessments

#### patient history

medication history  
allergies  
procedures performed  
lab results  
previous assessments  
visual history (wounds)

#### family contact information

names                      pictures  
phone number          email

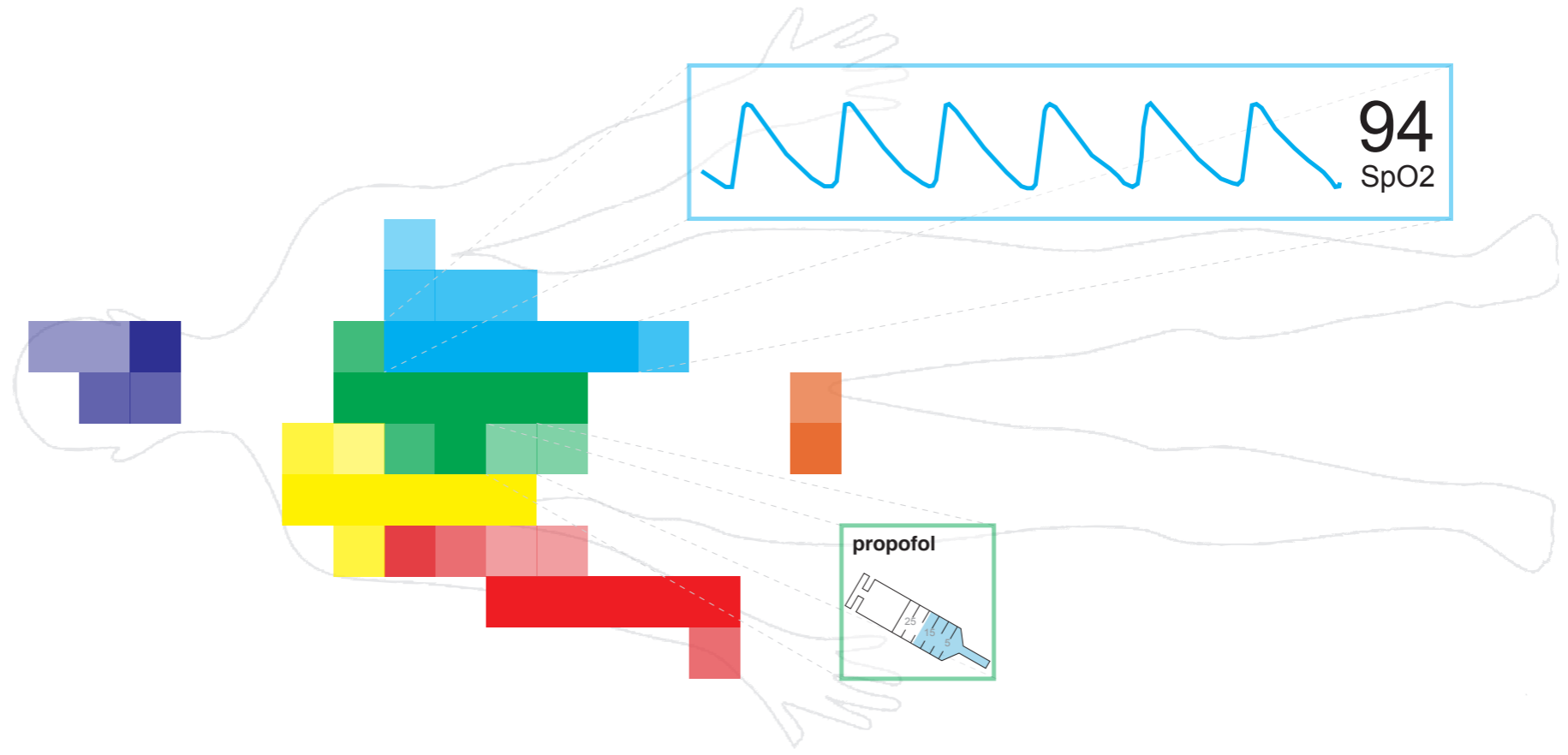
#### how to list

protocol  
procedures

**DESIGN**

**INFORMATION ORGANIZATION**

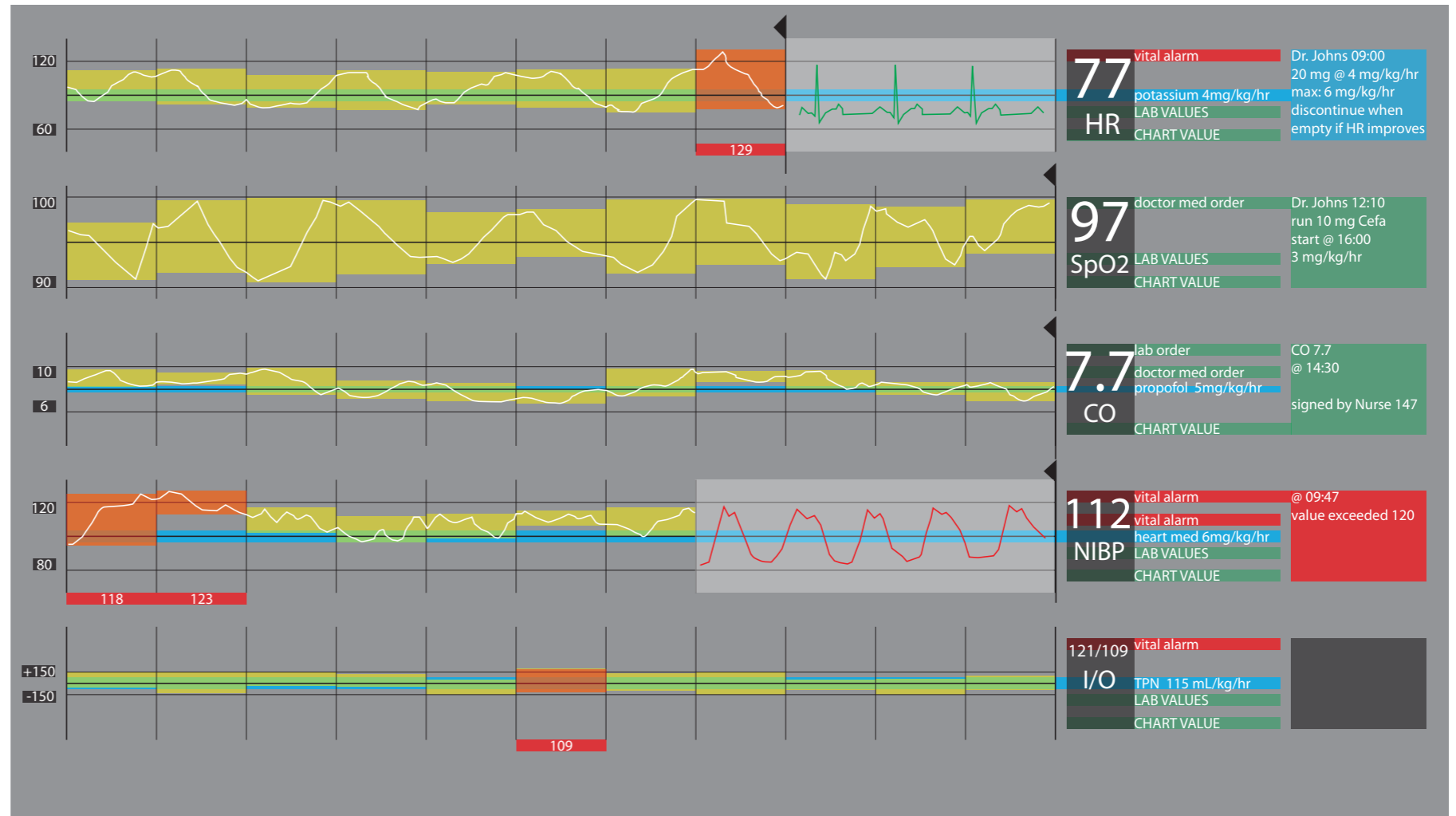
**BODY BASED**



# DESIGN

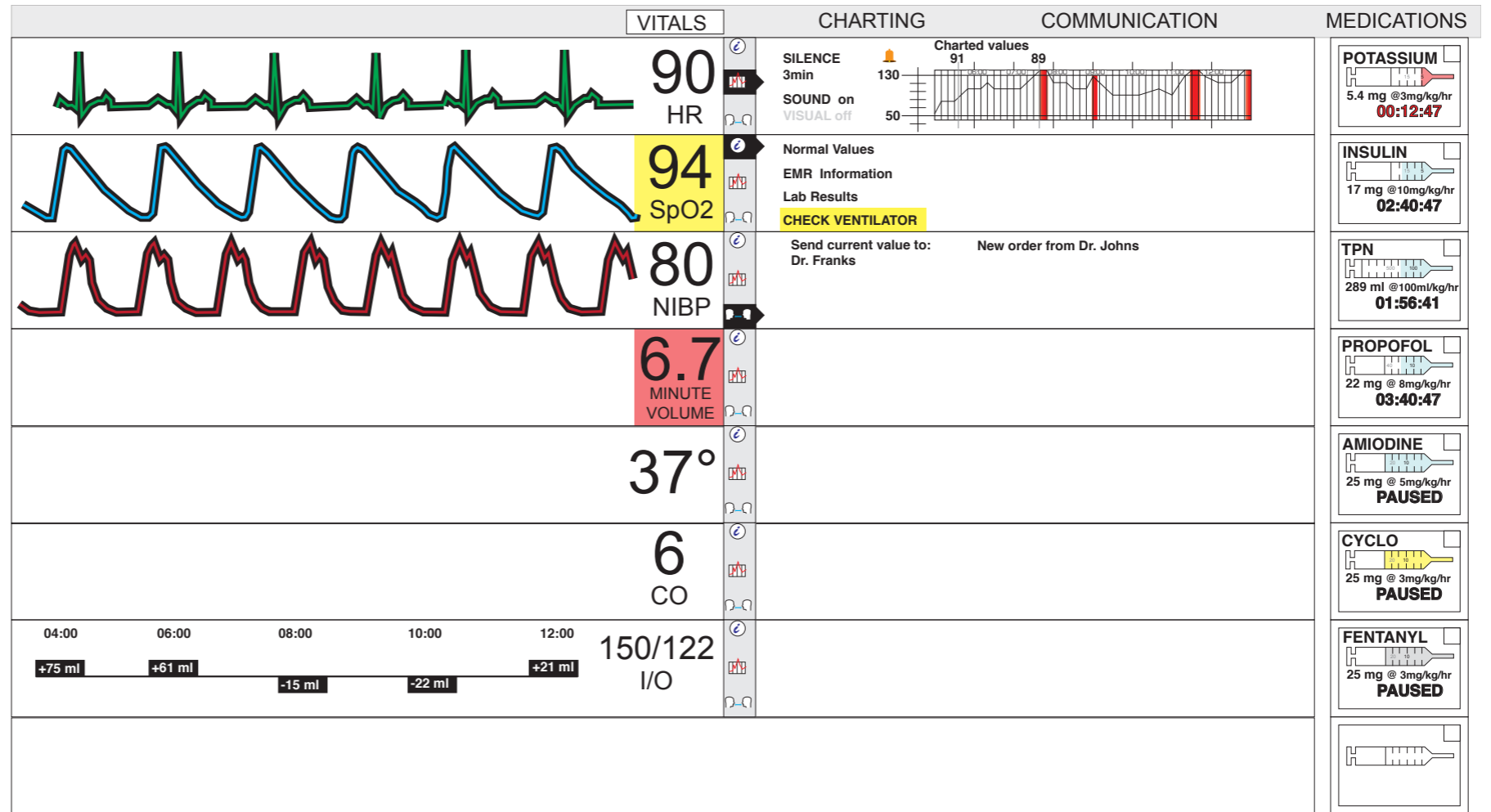
## INFORMATION ORGANIZATION

## TREND CENTERED



# DESIGN

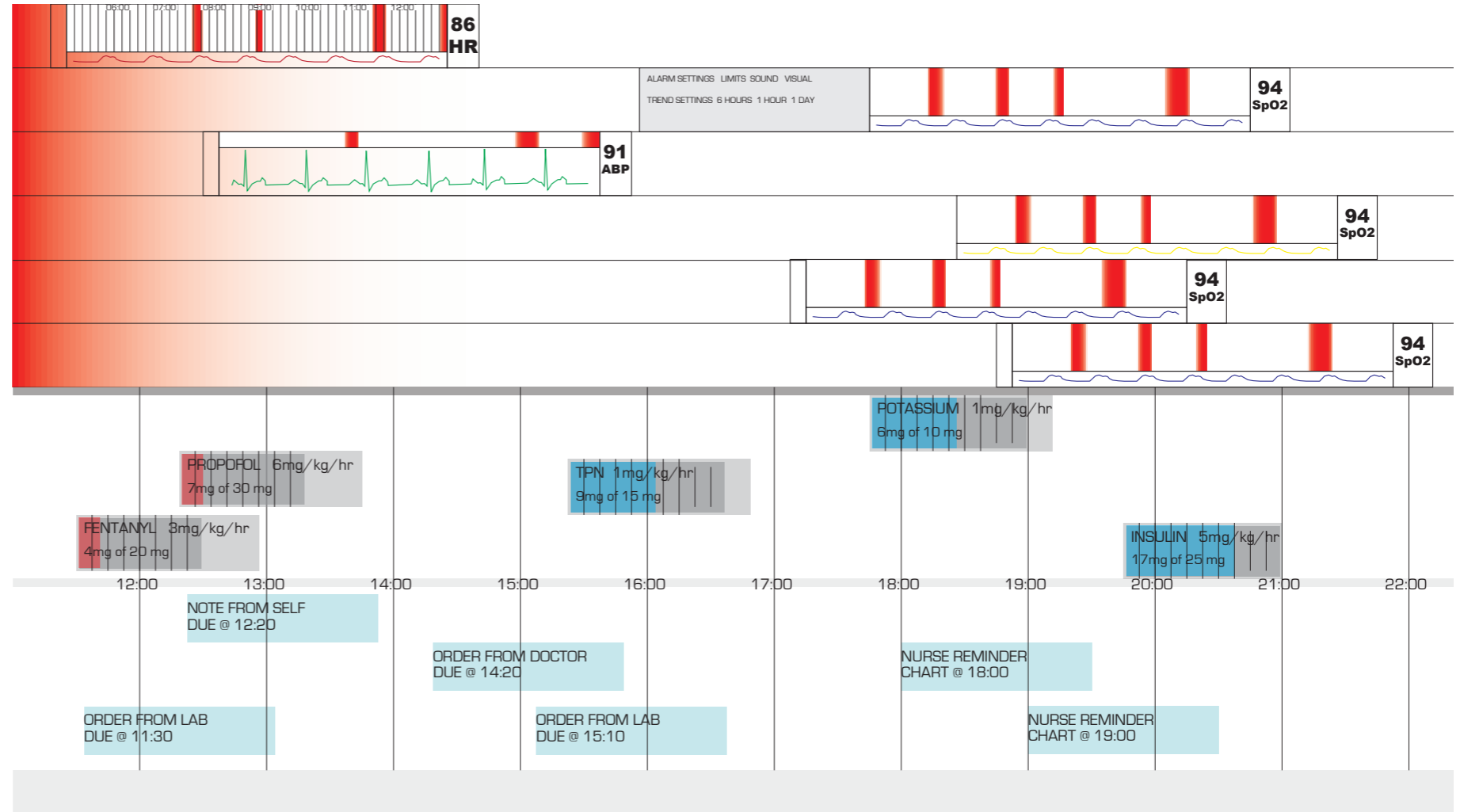
## INFORMATION ORGANIZATION MONITOR PLUS



# DESIGN

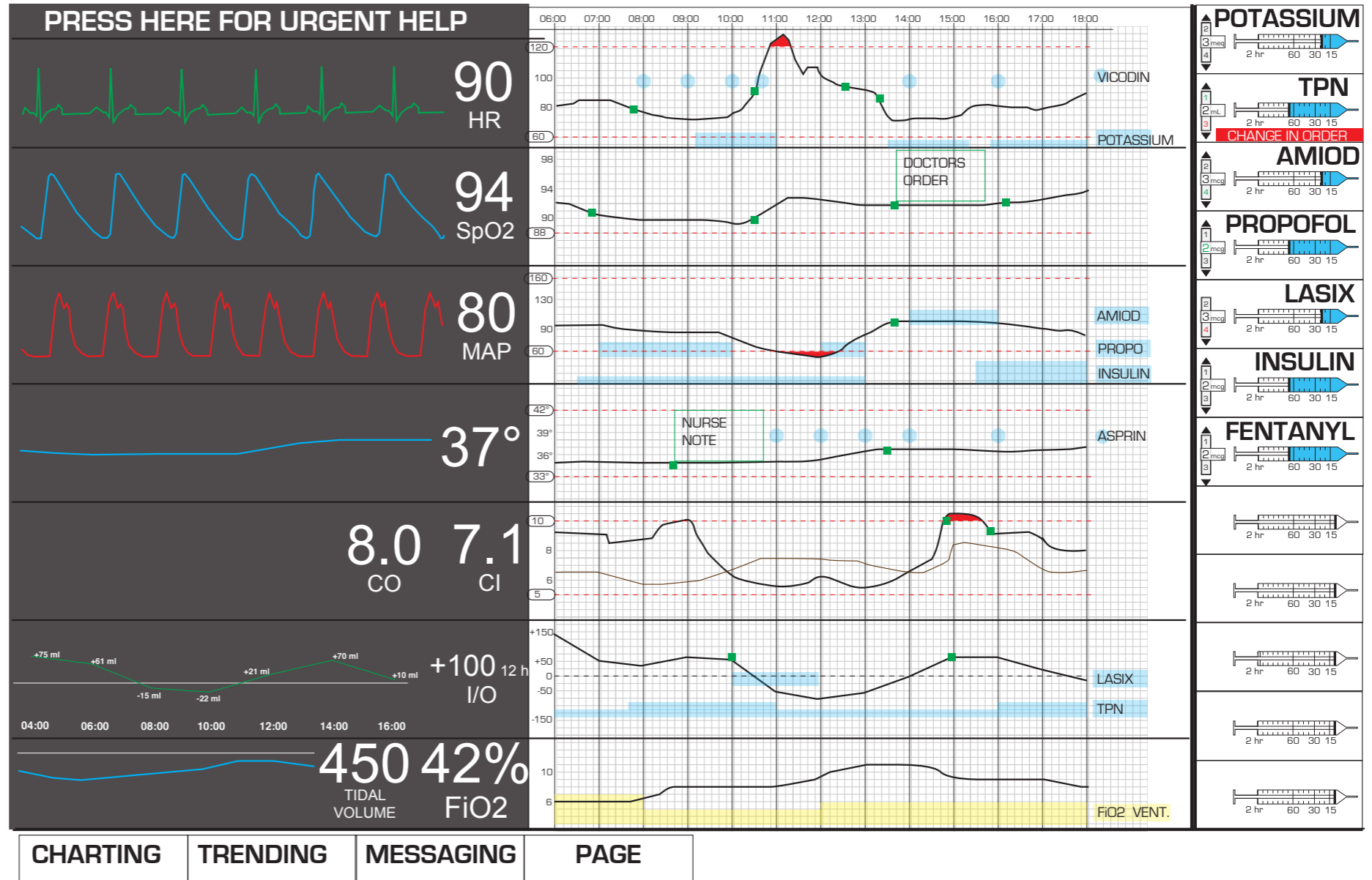
## INFORMATION ORGANIZATION

## TASK CENTERED



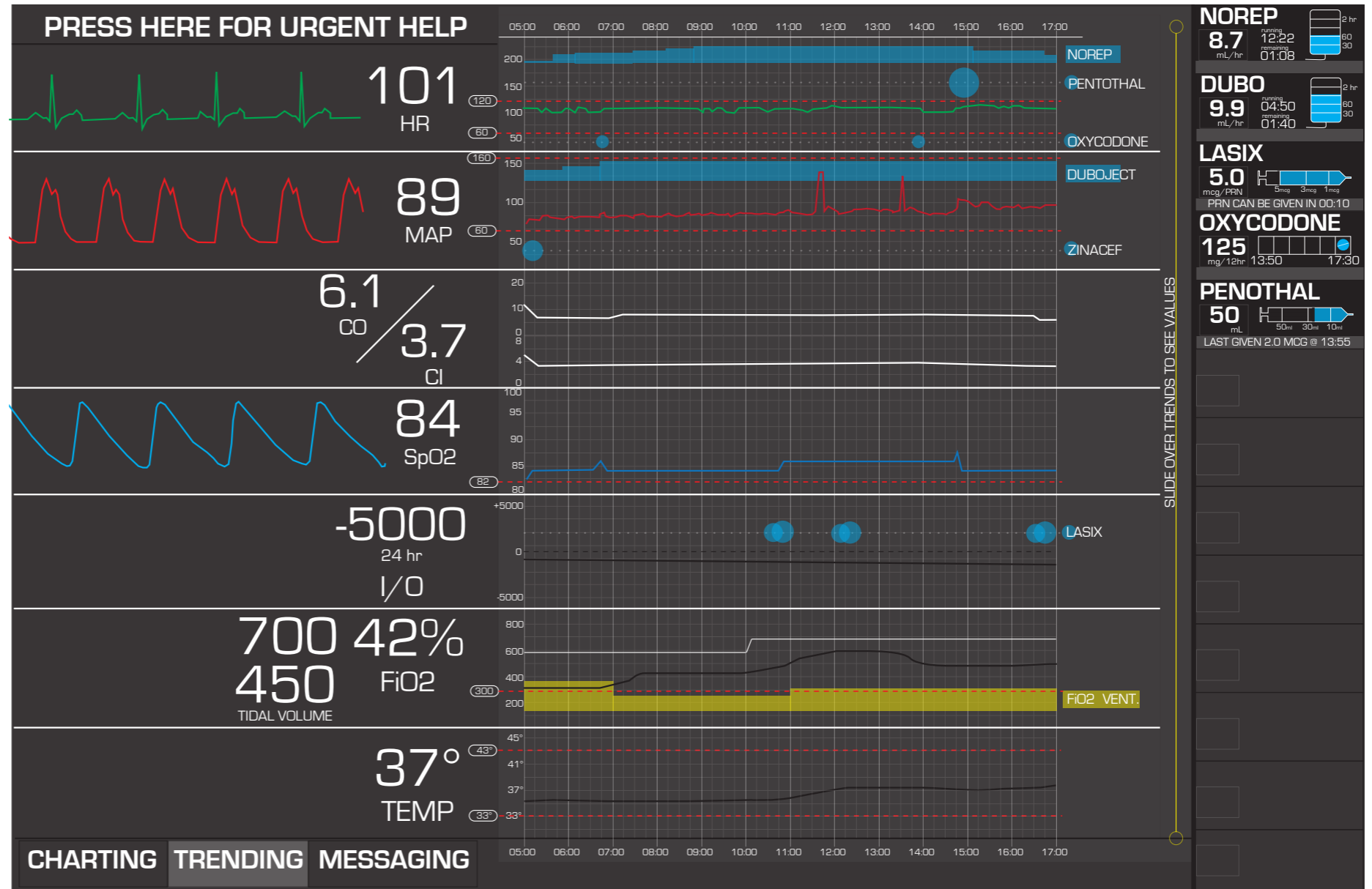
# DESIGN

## EVALUATION & REFINEMENT



# DESIGN

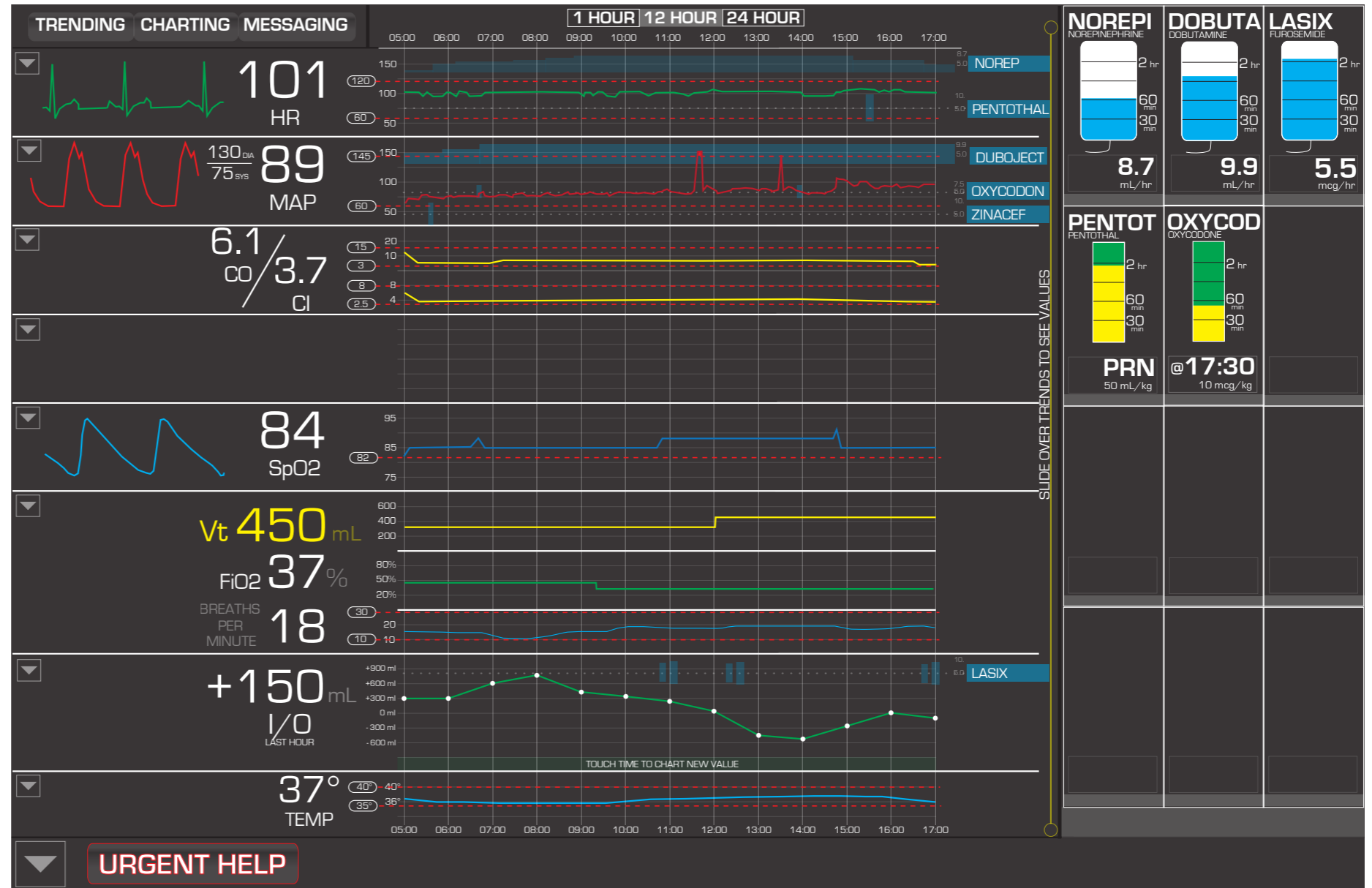
## EVALUATION & REFINEMENT





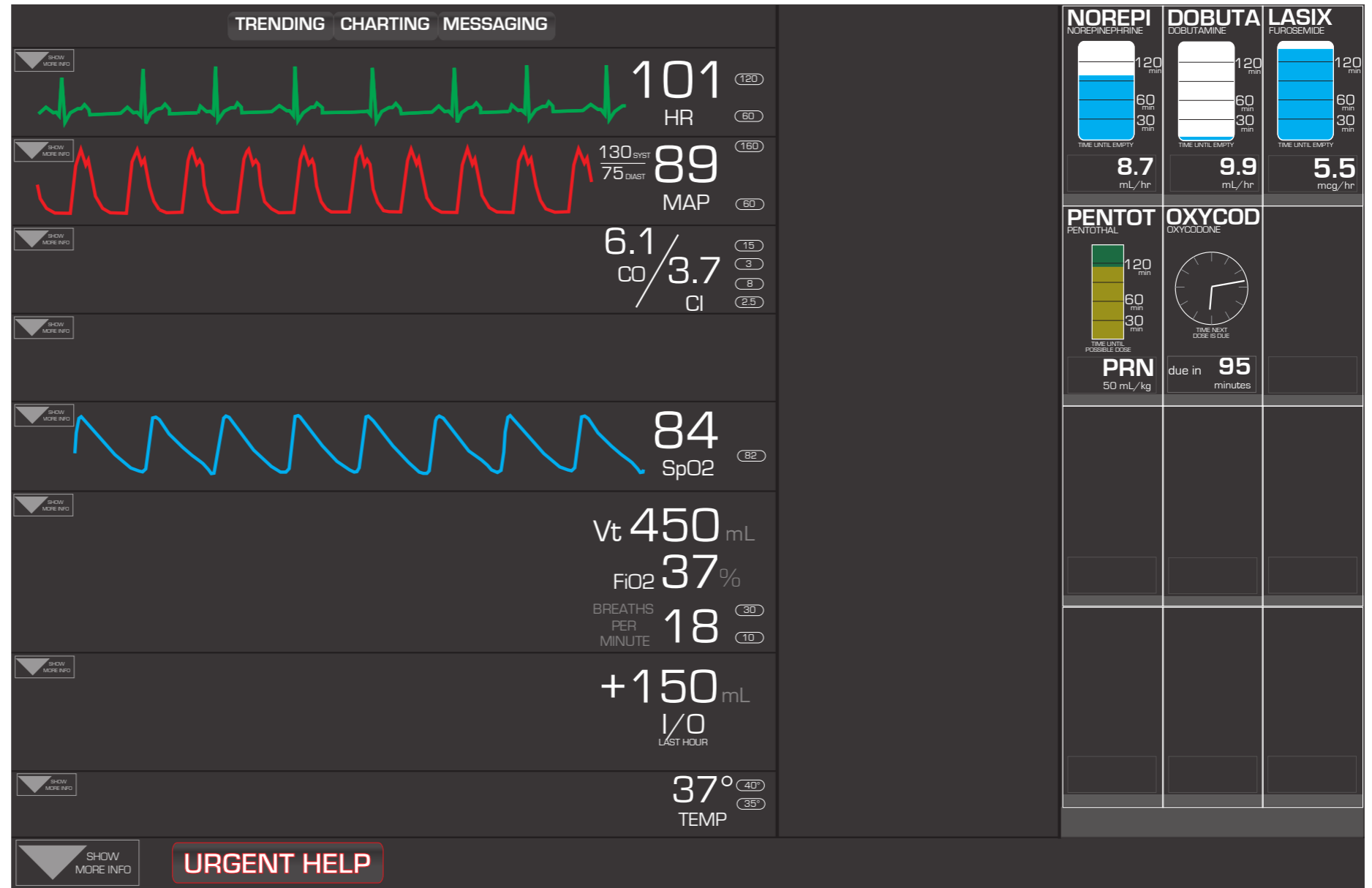
# DESIGN

## EVALUATION & REFINEMENT



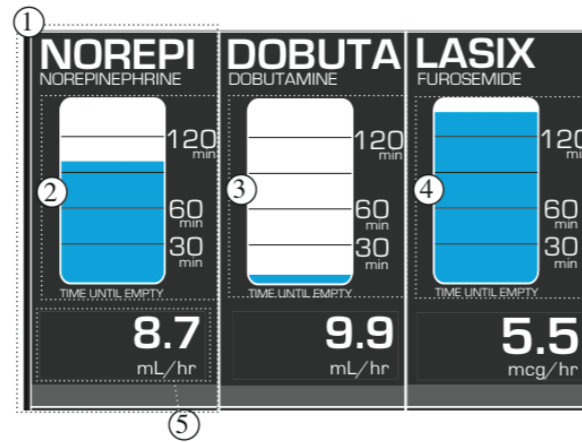
# DESIGN

## EVALUATION & REFINEMENT



# VALIDATION

## USABILITY & ACCURACY



Element 1 is showing:  
 A) current med  
 B) upcoming med  
 C) PRN med  
 D) don't know

Element 2 is showing:  
 A) volume of medication  
 B) time until empty  
 C) time until medication is due  
 D) don't know

Element 2 is showing:  
 A) 30 minutes  
 B) 25 minutes  
 C) 7 minutes  
 D) 30 ml  
 E) 25 ml  
 F) 7 ml  
 G) don't know

Element 3 is showing:  
 A) 100 minutes  
 B) 12 minutes  
 C) 1.6 minutes  
 D) 100 ml  
 E) 12 ml  
 F) 1.6 ml  
 G) don't know

Element 4 is showing:  
 A) 12 minutes  
 B) 2.5 minutes  
 C) 150 minutes  
 D) 12 ml  
 E) 2.5 ml  
 F) 150 ml  
 G) don't know

Element 7 is showing:  
 A) volume left  
 B) current rate  
 C) concentration  
 D) don't know

**What is your opinion of the information presentation?**

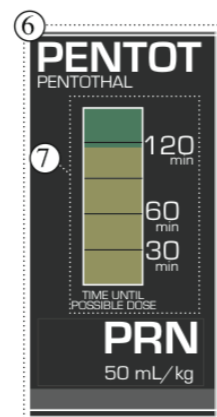
- Strongly dislike
- dislike
- somewhat dislike
- neither like nor dislike
- somewhat like
- like
- strongly like

**This presentation of information would help me do my job:**

- Strongly disagree
- disagree
- somewhat disagree
- neither agree nor disagree
- somewhat agree
- agree
- strongly agree

**I prefer this presentation of information over the presentation I currently use:**

- Strongly disagree
- disagree
- somewhat disagree
- neither agree nor disagree
- somewhat agree
- agree
- strongly agree



Element 6 is showing:  
 A) current med  
 B) upcoming med  
 C) PRN med  
 D) don't know

Element 7 is showing:  
 A) time until medication ends  
 B) volume of medication  
 C) possible time next dose can be given  
 D) don't know

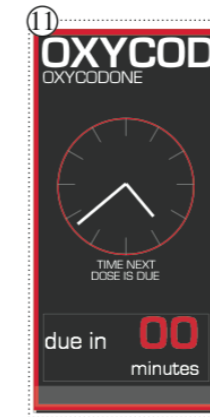
Element 7 is showing:  
 A) 110 minutes  
 B) 60 minutes  
 C) 15 minutes  
 D) 110 ml  
 E) 60 ml  
 F) 15 ml  
 G) don't know



Element 8 is showing:  
 A) current med  
 B) upcoming med  
 C) PRN med  
 D) don't know

Element 9 is showing:  
 A) time until medication ends  
 B) volume of medication  
 C) time next dose is due  
 D) don't know

Element 10 is showing:  
 A) time until medication ends  
 B) volume of medication  
 C) time until next dose is due  
 D) don't know

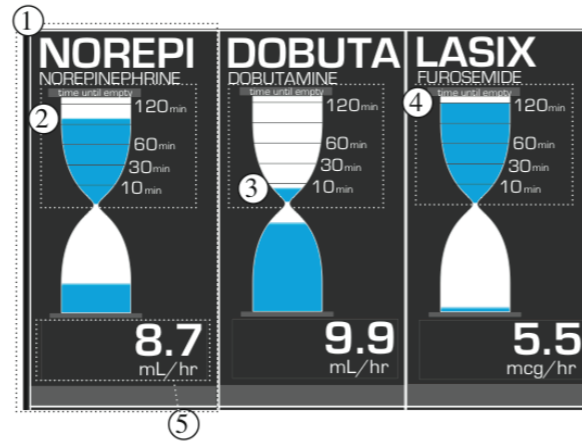


Element 11 is showing:  
 A) med is due now  
 B) recent order  
 C) med is paused  
 D) don't know

How could this be improved to help you do your job better? \_\_\_\_\_

# VALIDATION

## USABILITY & ACCURACY



- Element 1 is showing:
- A) currently running med
  - B) scheduled med
  - C) PRN med
  - D) don't know
- Element 2 is showing:
- A) volume of medication
  - B) time until empty
  - C) time until medication is due
  - D) don't know

- Element 3 is showing:
- A) 7 minutes
  - B) 100 minutes
  - C) 120 minutes
  - D) 7 ml
  - E) 100 ml
  - F) 120 ml
  - G) don't know
- Element 4 is showing:
- A) 7 minutes
  - B) 100 minutes
  - C) 120 minutes
  - D) 7 ml
  - E) 100 ml
  - F) 120 ml
  - G) don't know

- Element 5 is showing:
- A) volume left
  - B) current rate
  - C) concentration
  - D) don't know

What is your opinion of the information presentation?

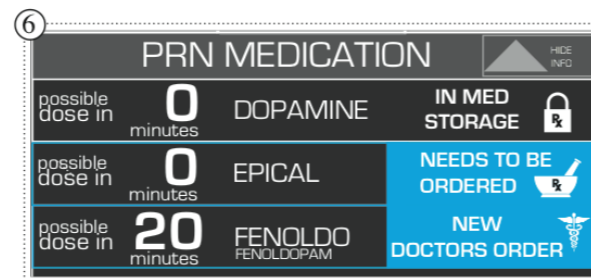
- Strongly dislike
- dislike
- somewhat dislike
- neither like nor dislike
- somewhat like
- like
- strongly like

This presentation of information would help me do my job:

- Strongly disagree
- disagree
- somewhat disagree
- neither agree nor disagree
- somewhat agree
- agree
- strongly agree

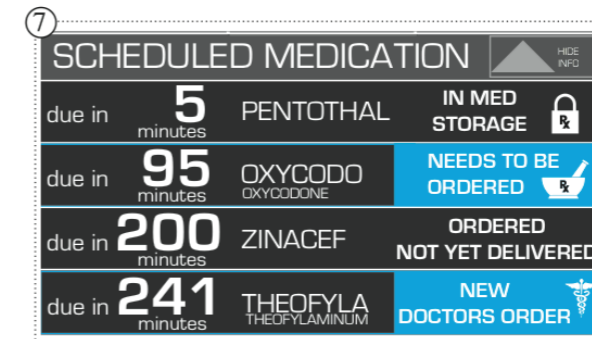
I prefer this presentation of information over the presentation I currently use:

- Strongly disagree
- disagree
- somewhat disagree
- neither agree nor disagree
- somewhat agree
- agree
- strongly agree



- Element 6 is showing:
- A) currently running med
  - B) scheduled med
  - C) PRN med
  - D) don't know
- When can the next dose of Fenolopam be given:
- A) 0 minutes
  - B) 5 minutes
  - C) 20 minutes
  - D) don't know

- What is the status of Epical:
- A) it is in Med Storage room
  - B) it needs to be ordered from pharmacy
  - C) it is a new doctors order
  - D) don't know



- Element 7 is showing:
- A) currently running med
  - B) scheduled med
  - C) PRN med
  - D) don't know
- What is the status of Theofylaminum:
- A) it is in Med Storage room
  - B) it needs to be ordered from pharmacy
  - C) it is a new doctors order
  - D) don't know

- When does Pentothal need to be given:
- A) in 0 minutes
  - B) in 5 minutes
  - C) in 20 minutes
  - D) don't know

How could this be improved to help you do your job better? \_\_\_\_\_

# VALIDATION

## USABILITY & ACCURACY

TOUCH HERE TO ENTER A NOTE

13:30 RATE WAS LOWERED DUE T....  
11:22 RATE WAS RAISED DUE TO....  
11:04 MED WAS STARTED LATE D....  
10:05 ORDER WAS RECEIVED BY....

**ADDITIONAL INFORMATION**  
STANDARD DOSE:  
2-75 mcg/kg/min  
BOLUS:  
5-50 mg  
EFFECTS:  
A sedative hypnotic agent for use in the introduction and maintenance of anesthesia or sedation. Very rapid onset.  
STANDARD MIXTURE:  
10 mg/ml  
SPECIAL CONSIDERATIONS:  
Due to lipid base the vial needs to be wiped with alcohol prior to spiking. Tubing and bottle are changed at least every 12 hours.  
Apnea may occur with administration of drug; should only be given to patients who are intubated or for short term procedures. Hypotension may occur with either a bolus or continuous infusion. Do not give to patients who are allergic to eggs.  
[SEE MED PROTOCOL](#)

**PROPOFOL**

**ORDER FROM DOCTOR:**  
12:15 6/11/08  
15 mg / 2 hours @  
34 mcg/kg/min  
[SET TO DOCTOR'S RATE](#)

**MED RATE**   
[RUN @ NEW RATE](#)  
[PAUSE MEDICATION](#)

**REORDER**   
[SEND TO PHARMACY](#)

**BOLUS**   
POSSIBLE IN 30 MINUTES  
  
[GIVE BOLUS](#)

LOCATION: not yet determined  
LAB VALUES: none taken yet

|   |  |   |
|---|--|---|
| <b>NOREPI</b><br><small>NOREPINEPHRINE</small><br><br><b>8.7</b><br><small>mL/hr</small>  | <b>DOBUTA</b><br><small>DOBUTAMINE</small><br><br><b>9.9</b><br><small>mL/hr</small> | <b>METHY</b><br><small>METHYLPREDNISOLONE</small><br><br><b>1.5</b><br><small>mg/hr</small> |
| <b>PROPO</b><br><small>PROPOFOL</small><br><br><b>PAUSED</b><br><small>TOUCH HERE TO START MEDICATION AT ORDERED RATE OF</small><br><b>34.0</b><br><small>mcg/kg/hr</small> | COMPATIBLE   | INCOMPATIBLE  |

**SCHEDULED MEDICATION**

|                    |           |                           |
|--------------------|-----------|---------------------------|
| due in 5 minutes   | PENTOTHAL | IN STORAGE                |
| due in 95 minutes  | OXYCODO   | NEEDS TO BE ORDERED       |
| due in 200 minutes | ZINACEF   | ORDERED NOT YET DELIVERED |
| due in 241 minutes | THEOPHYLA | NEW DOCTORS ORDER         |

SCHEDULED MEDS    PRN MEDS

To start the new medication, Propofol, you scanned it on the side of the monitor and then appeared on the monitor in yellow.

Which medication below is shown as not compatible with Propofol:  
A) Norepinephrine  
B) Methylprednisolone  
C) none  
D) don't know

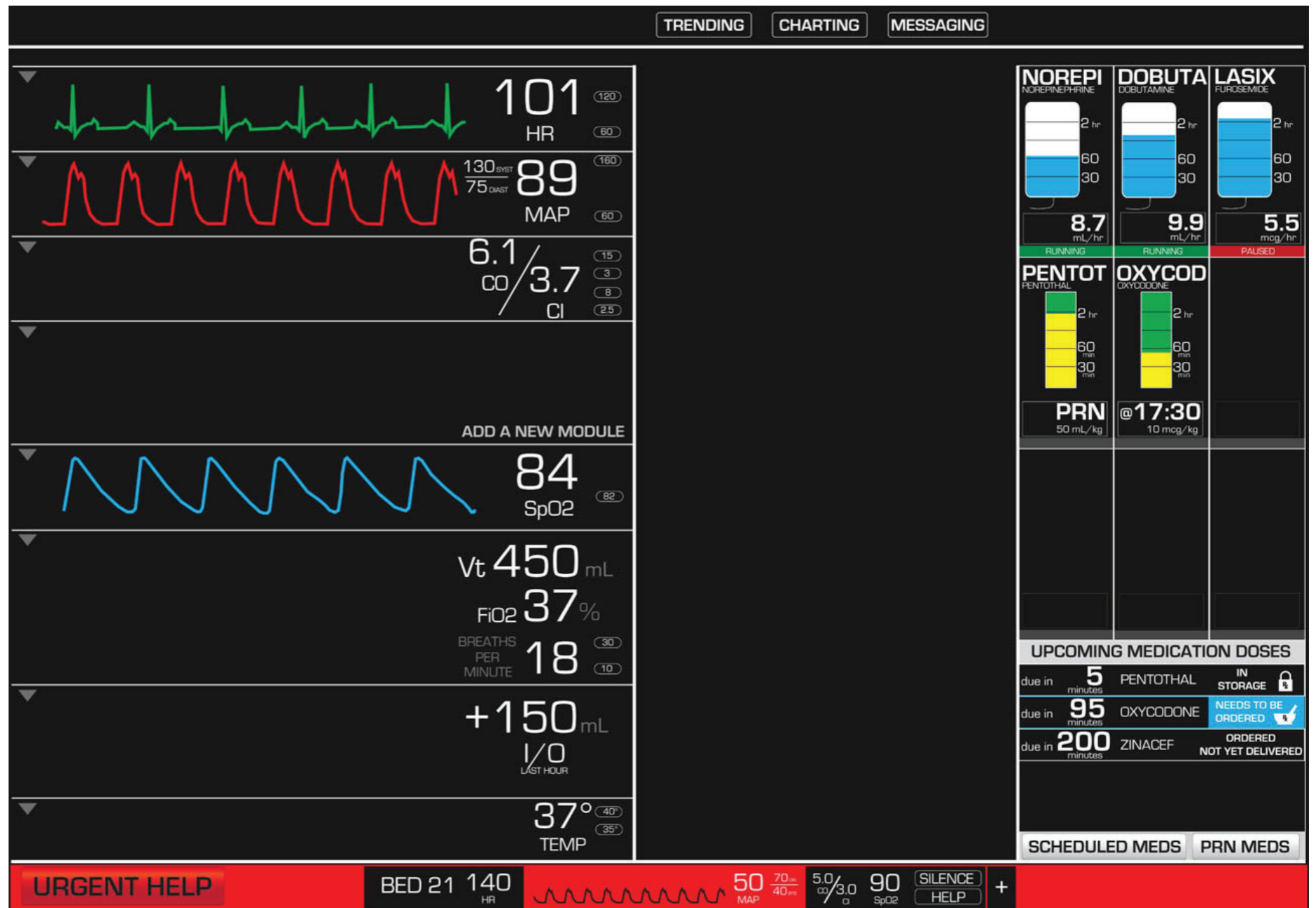
Is Propofol currently being delivered:  
A) Yes  
B) No  
C) don't know

Which medication will run out first:  
A) Norepinephrine  
B) Methylprednisolone  
C) Dobutamine  
D) don't know

- What is your opinion of the information presentation?**
- Strongly dislike
  - dislike
  - somewhat dislike
  - neither like nor dislike
  - somewhat like
  - like
  - strongly like
- This presentation of information would help me do my job:**
- Strongly disagree
  - disagree
  - somewhat disagree
  - neither agree nor disagree
  - somewhat agree
  - agree
  - strongly agree
- I prefer this presentation of information over the presentation I currently use:**
- Strongly disagree
  - disagree
  - somewhat disagree
  - neither agree nor disagree
  - somewhat agree
  - agree
  - strongly agree

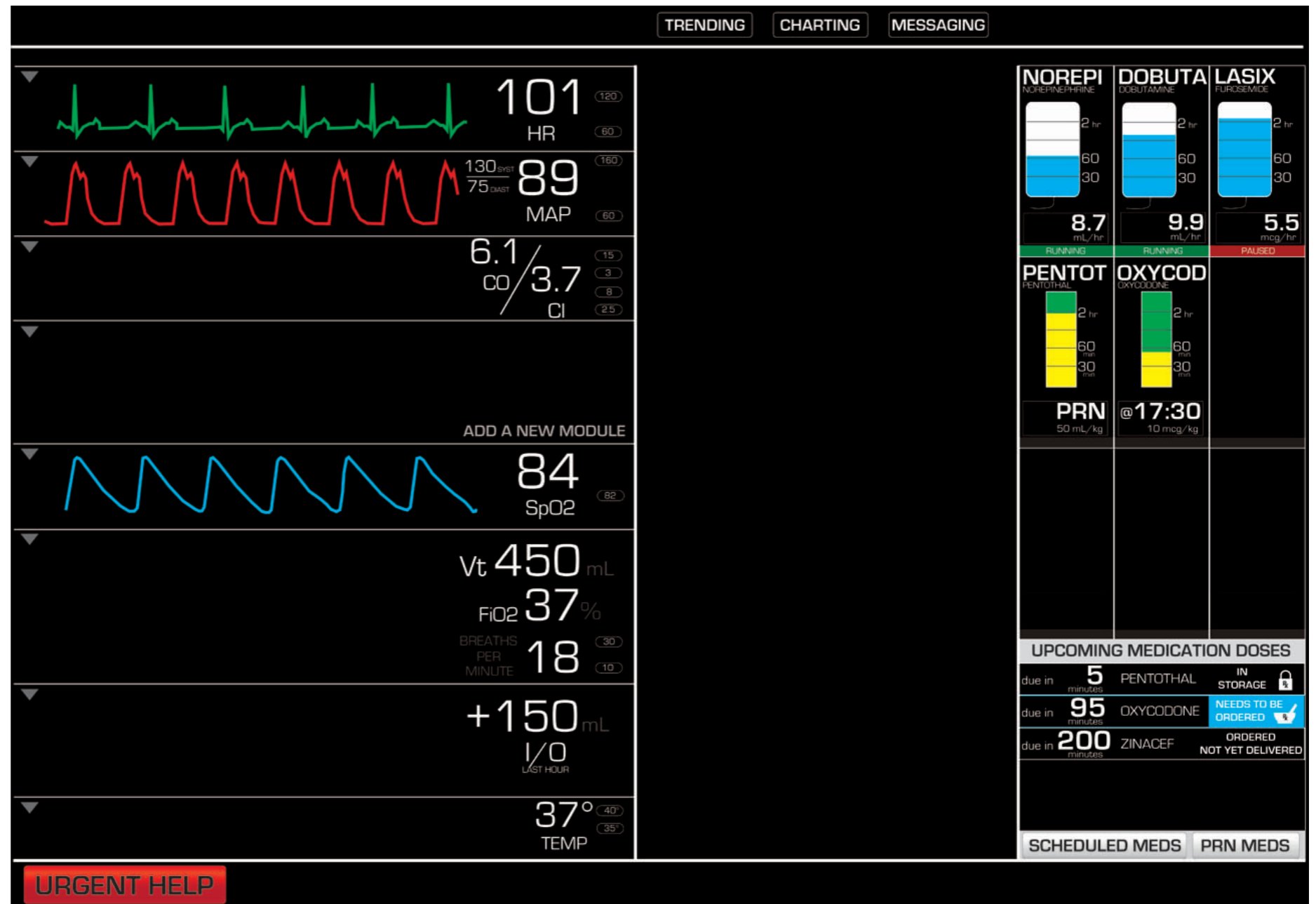
# CONCLUSION

## SCREEN BUILDS



# CONCLUSION


## SCREEN BUILDS

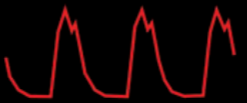


# CONCLUSION

## SCREEN BUILDS

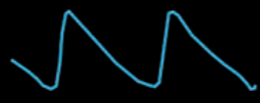
TRENDING
CHARTING
MESSAGING


101 (120)  
HR (60)


89 (160)  
MAP (60)

6.1 (15)  
CO (3) / 3.7 (8)  
CI (25)

ADD A NEW MODULE




84 (82)  
SpO2

Vt 450 mL  
FiO2 37 %  
BREATHS PER MINUTE 18 (30) (10)



+150 mL  
I/O LAST HOUR

37° (40°) (35°)  
TEMP



RESPIRATORY THERAPIST

PAGE  



NURSE AIDE

PAGE  



NURSING STATION

PAGE  



RESIDENT ON CALL

PAGE  


DISTANT MONITORING CLINICIAN


PAGE  

OTHER CONTACTS


PAGE  

**FROM** (2) NEW


RESP. THERAPIST 12:30 

PHARMACY 09:10 


PROPOFOL WILL BE DELI.....


RESIDENT ON CALL 08:10 


NEW MED ORDER VASOPR.....

CHARGE NURSE 23:30 

PATIENT'S FAMILY CALLED.....

RESIDENT ON CALL 20:30 

NURSING STATION 11:10 



RESIDENT ON CALL 08:10

NEW MED ORDER VASOPRESSIN  
40 UNITS IN 10 ml OF NS GIVEN VIA IV/IO/ETT

REPLY ARCHIVE



| NOREPI<br><small>NOREPINEPHRINE</small> | DOBUTA<br><small>DOBUTAMINE</small> | LASIX<br><small>FUROSEMIDE</small> |
|---|-------------------------------------|------------------------------------|
| 8.7                                     | 9.9                                 | 5.5                                |
| mL/hr                                   | mL/hr                               | mcg/hr                             |
| RUNNING                                 | RUNNING                             | PAUSED                             |

| PENTOT<br><small>PENTOTHAL</small> | OXYCOD<br><small>OXYCODONE</small> |
|------------------------------------|------------------------------------|
| PRN                                | @ 17:30                            |
| 50 mL/kg                           | 10 mcg/kg                          |

UPCOMING MEDICATION DOSES

|   |           |   |
|---|-----------|---|
| due in <span style="font-size: 18pt; font-weight: bold;">5</span> minutes   | PENTOTHAL | IN STORAGE           |
| due in <span style="font-size: 18pt; font-weight: bold;">95</span> minutes  | OXYCODONE | NEEDS TO BE ORDERED  |
| due in <span style="font-size: 18pt; font-weight: bold;">200</span> minutes | ZINACEF   | ORDERED NOT YET DELIVERED   |

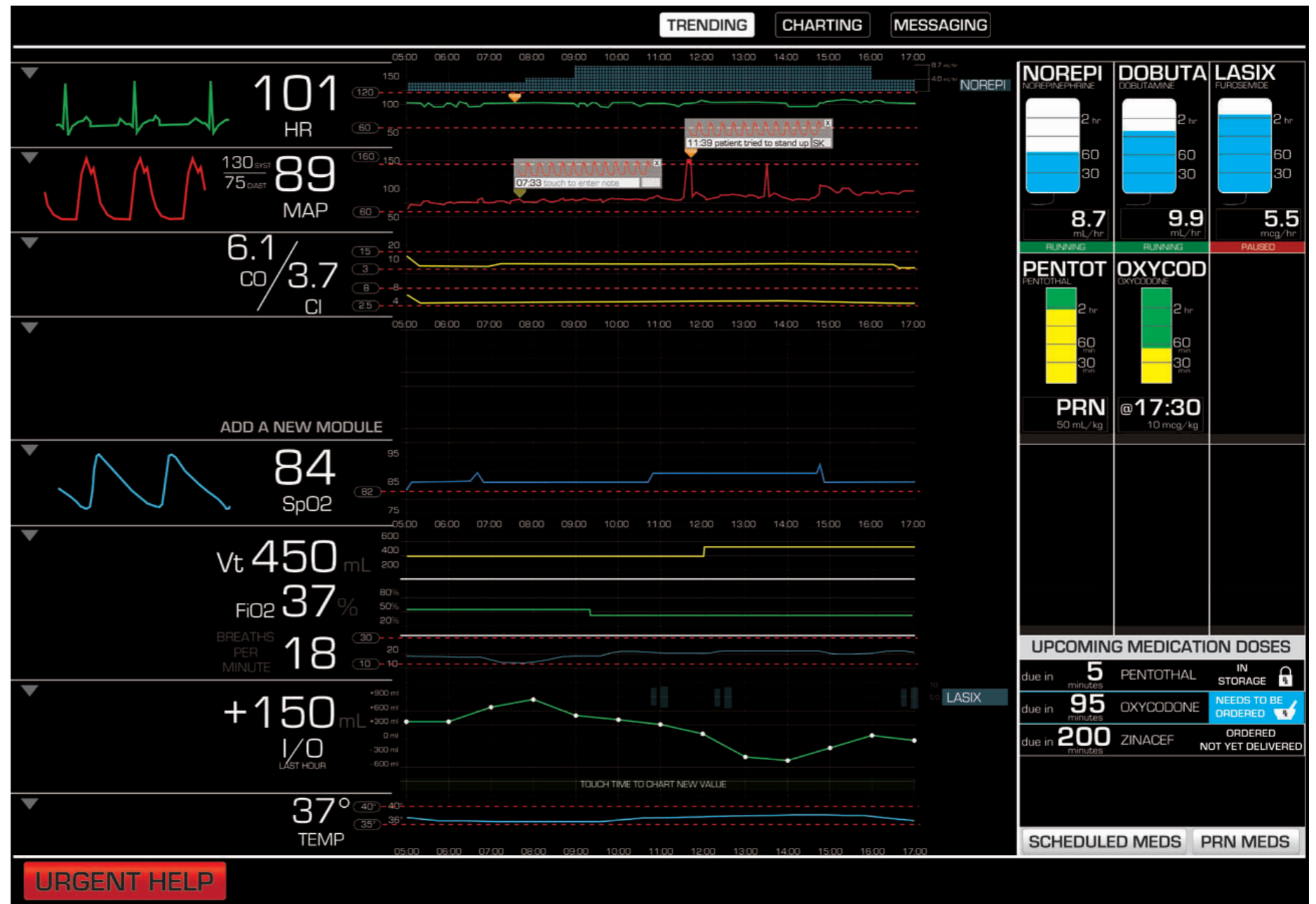
SCHEDULED MEDS PRN MEDS

URGENT HELP



# CONCLUSION

## SCREEN BUILDS

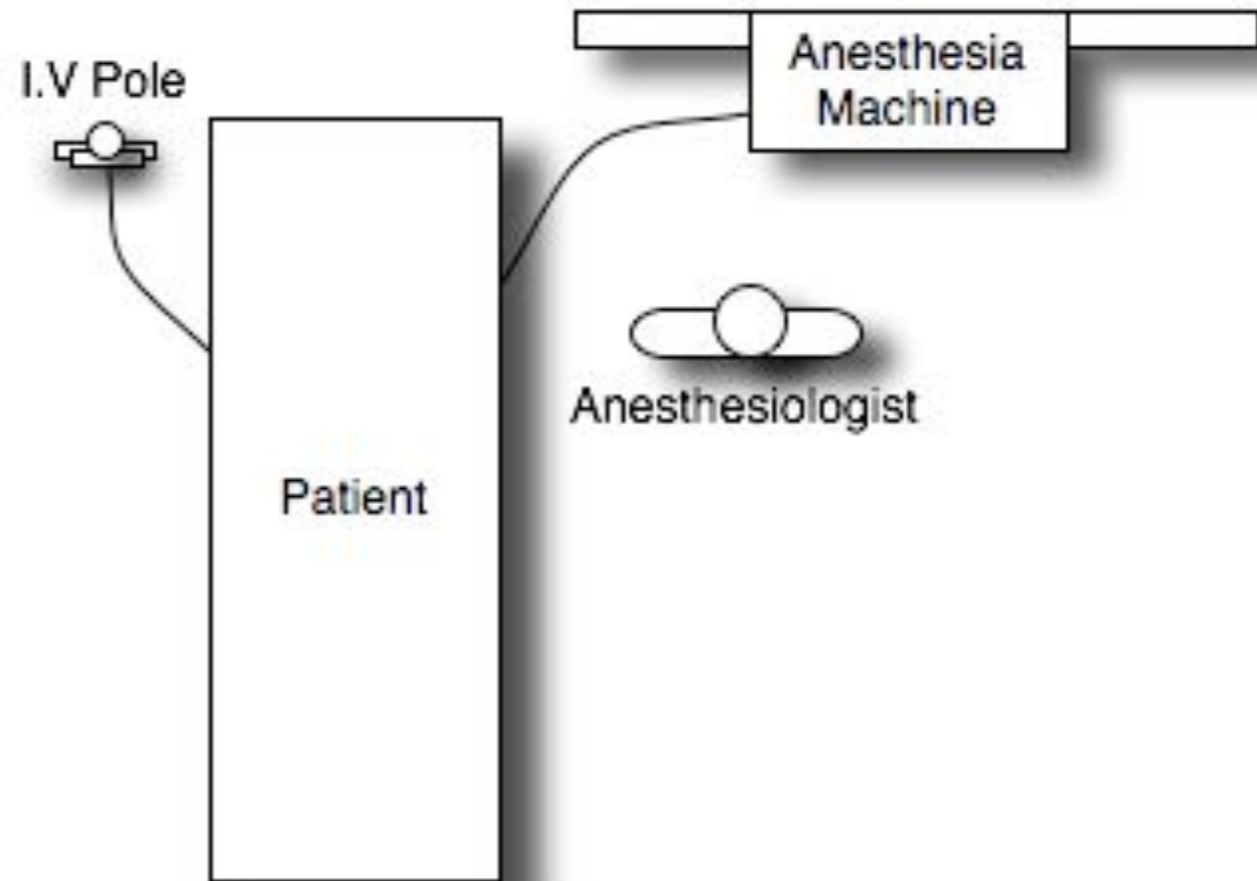


# RESEARCH

Contextual  
Observation



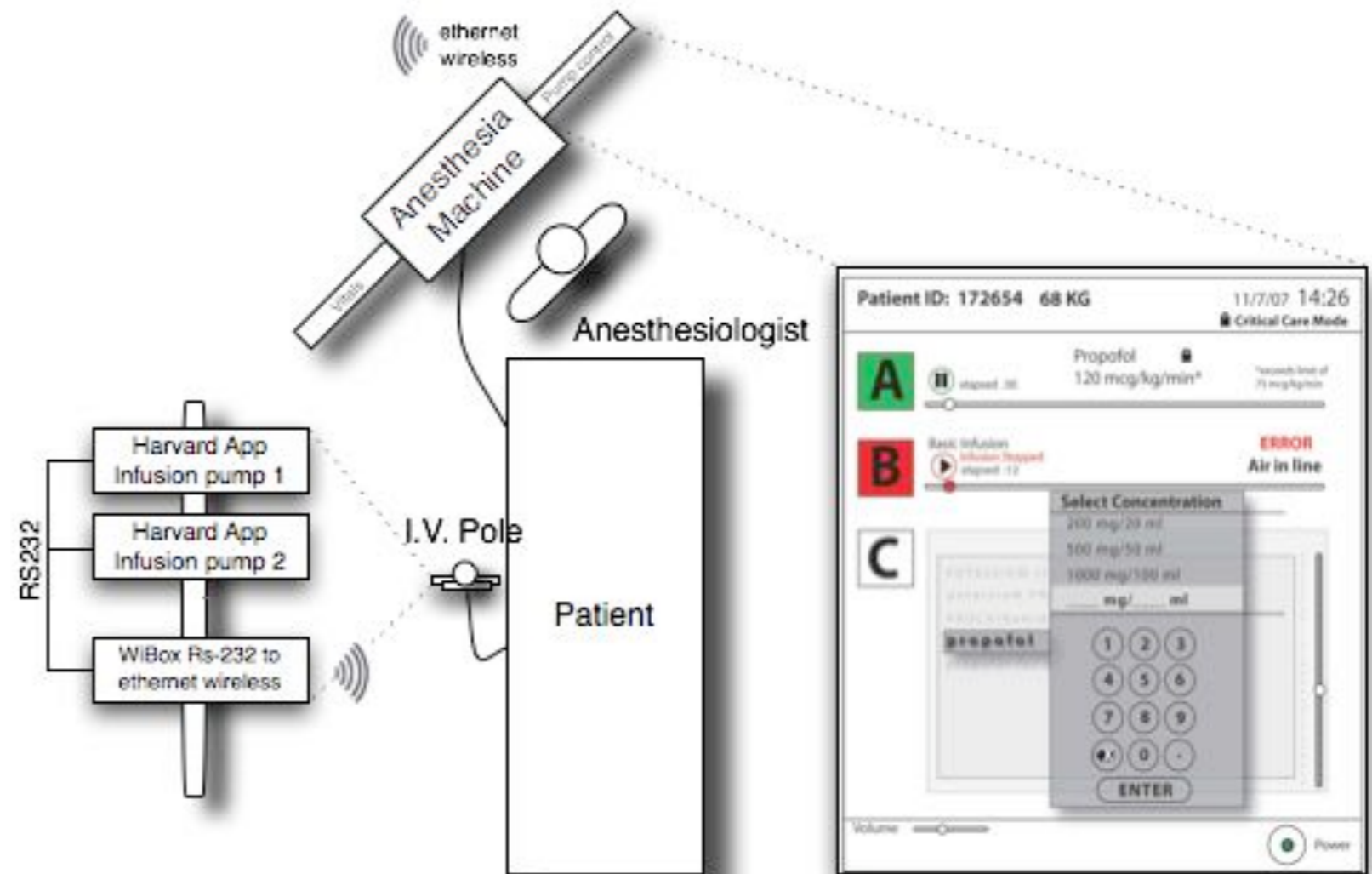
# RESEARCH Environment Mapping



# RESEARCH FMEA

| Step | Type        | Step description  | Failure mode   | Effects of failure                                       | Causes   | Mitigation strategies  | Detailed explanation   | Severity | Probability | Detectability | Priority |
|------|-------------|---|--|--|--|--|--|----------|-------------|---------------|----------|
| 131  | Step        | 3 Press Restart on the module   | User does not know whether a bolus dose will be infused due to pressure build up | Patient receives more/less drugs than expected           | No UI feedback given if either a bolus dose will be inadvertently given once the infusion is restarted | UI provides warning to the user as the occlusion is being cleared about whether a bolus dose will be given | Pump will "back off" after an occlusion alarm (to prevent a bolus dose being given) only if a pressure sensing 5cc has been used | 2        | 2           | 3             | 8        |
| 132  | Task        | Alarm Medley - F - Plug the pump into mains power                     |  |  |  |  |  |          |             |               |          |
| 134  | Step        | 1 Use battery alarm sounds  | Alarm sounds when user is busy with other tasks                                  | Interruption of more important tasks                     | (1) Remaining battery life is rarely displayed on the screen; (2) No advanced warning of low battery.  | Prominent display of battery life remaining (percentage and time) on the screen at all times               | Very Low Battery alarm sounds when there is < 5 mins of battery life remaining   | 1        | 2           | 1             | 8        |
| 135  | Step        | 2 Plug pump into mains power  |  |  |  |  |  |          |             |               |          |
| 137  | Task        | Alarm Medley - G - Replace an empty bag during an infusion            |  |  |  |  |  |          |             |               |          |
| 138  | Step        | 1 Press Pause on the module   |  |  |  |  |  |          |             |               |          |
| 139  | Step        | 2 Change the bag  |  |  |  |  |  |          |             |               |          |
| 140  | Step        | 3 Press Restart on the module   |  |  |  |  |  |          |             |               |          |
| 141  | Task        | Alarm Medley - H - Replace maintenance fluids during an infusion      |  |  |  |  |  |          |             |               |          |
| 142  | Step        | 1 Replace the fluid bag   |  |  |  |  |  |          |             |               |          |
| 143  | Step        | 1.1 Press Pause on the module   |  |  |  |  |  |          |             |               |          |
| 144  | Step        | 1.2 Replace the maintenance fluid bag                                 |  |  |  |  |  |          |             |               |          |
| 145  | Step        | 1.3 Press Restart on the module                                       |  |  |  |  |  |          |             |               |          |
| 146  | Step        | 2 Enter the fluid details into the record keeping system (Centricity) | Transcribing error   | Incorrect or inaccurate details in the electronic record | Pump does not interface with record keeping system   | Pump automatically enters patient information and infusion details into the electronic record              |  | 1        | 1           | 3             | 5        |
| 147  | FailureMode |   | Redundant step   | Time wasted  | Pump does not interface with record keeping system   | Pump automatically enters patient information and infusion details into the electronic record              |  | 1        | 1           | 3             | 5        |
| 148  | Step        | 2.1 Click on Flow Int./sets   |  |  |  |  |  |          |             |               |          |
| 149  | Step        | 2.2 Click on the fluid currently being administered                   |  |  |  |  |  |          |             |               |          |
| 151  | Step        | 2.3 Press Record for the volume that has just been infused            |  |  |  |  |  |          |             |               |          |
| 152  | Step        | 2.4 Press Start Fluids for the current bag                            |  |  |  |  |  |          |             |               |          |
| 153  | Step        | 2.5 Press Record  |  |  |  |  |  |          |             |               |          |
| 154  | Step        | 3 Monitor the patient   |  |  |  |  |  |          |             |               |          |
| 155  | Task        | Alarm Medley - I - Stop an infusion                                   |  |  |  |  |  |          |             |               |          |
| 156  | Step        | 1 Press Channel Off button on the module                              |  |  |  |  |  |          |             |               |          |
| 157  | Step        | 2 Remove the IV line from the module                                  |  |  |  |  |  |          |             |               |          |
| 158  | Step        | 3 Stop the infusion in the record keeping system (Centricity)         | Transcribing error   | Incorrect or inaccurate details in the electronic record | Pump does not interface with record keeping system   | Pump automatically enters patient information and infusion details into the electronic record              |  | 1        | 1           | 3             | 5        |
| 159  | FailureMode |   | Redundant step   | Time wasted  | Pump does not interface with record keeping system   | Pump automatically enters patient information and infusion details into the electronic record              |  | 1        | 1           | 3             | 5        |
| 160  | Step        | 3.1 Select the entry for the drug being infused                       |  |  |  |  |  |          |             |               |          |
| 162  | Step        | 3.2 Stop the infusion   |  |  |  |  |  |          |             |               |          |
| 163  | Step        | 3.3 Enter the time that the infusion was stopped                      |  |  |  |  |  |          |             |               |          |
| 164  | Step        | 3.4 Press Stop  |  |  |  |  |  |          |             |               |          |
| 165  | Task        | Alarm Medley - J - Power off pump                                     | User does not know how to power off pump   | User can't turn off the pump                             | (1) System On button does not turn pump off; (2) There is no indication of how to turn off the pump    | Use on Power button that turns pump on and off   |  | 1        | 1           | 2             | 8        |
| 166  | Step        | 1a Press Channel Off button on "all" modules                          |  |  |  |  |  |          |             |               |          |
| 168  | Step        | 1b Shut down pump using main screen                                   | User can't navigate to the Options menu  | User can't turn off the pump                             | Options menu is available on all screens   | Use on Power button that turns pump both on and off  |  | 1        | 1           | 2             | 8        |
| 169  | Step        | 1b.1 Press Options  |  |  |  |  |  |          |             |               |          |
| 171  | Step        | 1b.2 Press Power Down All Channels                                    |  |  |  |  |  |          |             |               |          |
| 172  | Step        | 1b.3 Press Yes  |  |  |  |  |  |          |             |               |          |
| 173  | Step        | 1c Press back power button at the back of the pump                    | Button doesn't power off pump  | User can't turn off the pump                             | Power button only works in some circumstances  | Use on Power button that turns pump on and off   |  | 1        | 1           | 2             | 8        |

# SYNTHESIS Environment Mapping



# DESIGN

## 20 Iterations

Anesthesiologist: Dr. R. Thomas

Patient Name: Jones, Steven (male) Age: 46

MRN #: 5733298

Height: 183 cm Weight: 90.7 kg LBM: 68.3 kg BMI: 27.1 kg<sup>2</sup>


OR Room: 214 Surgery: Laproscopic Hernia Repair

---

PUMP 1 50% Battery

START STOP

60 min @ 5 mL/hr  
TRIMORPHIC



0 cc  
TOTAL VOLUME IN USE

SYRINGE: B-D 20 mL

BOLUS  
0.4 mL @ 12:00  
LPSI 2005 SMP

---

**STOPPED**

---

MEDICATION: REMIFENTANYL  
5.0 mcg/mL

RATE: 0.6 mcg/kg/min (LBM)

CANCEL CONFIRM

---

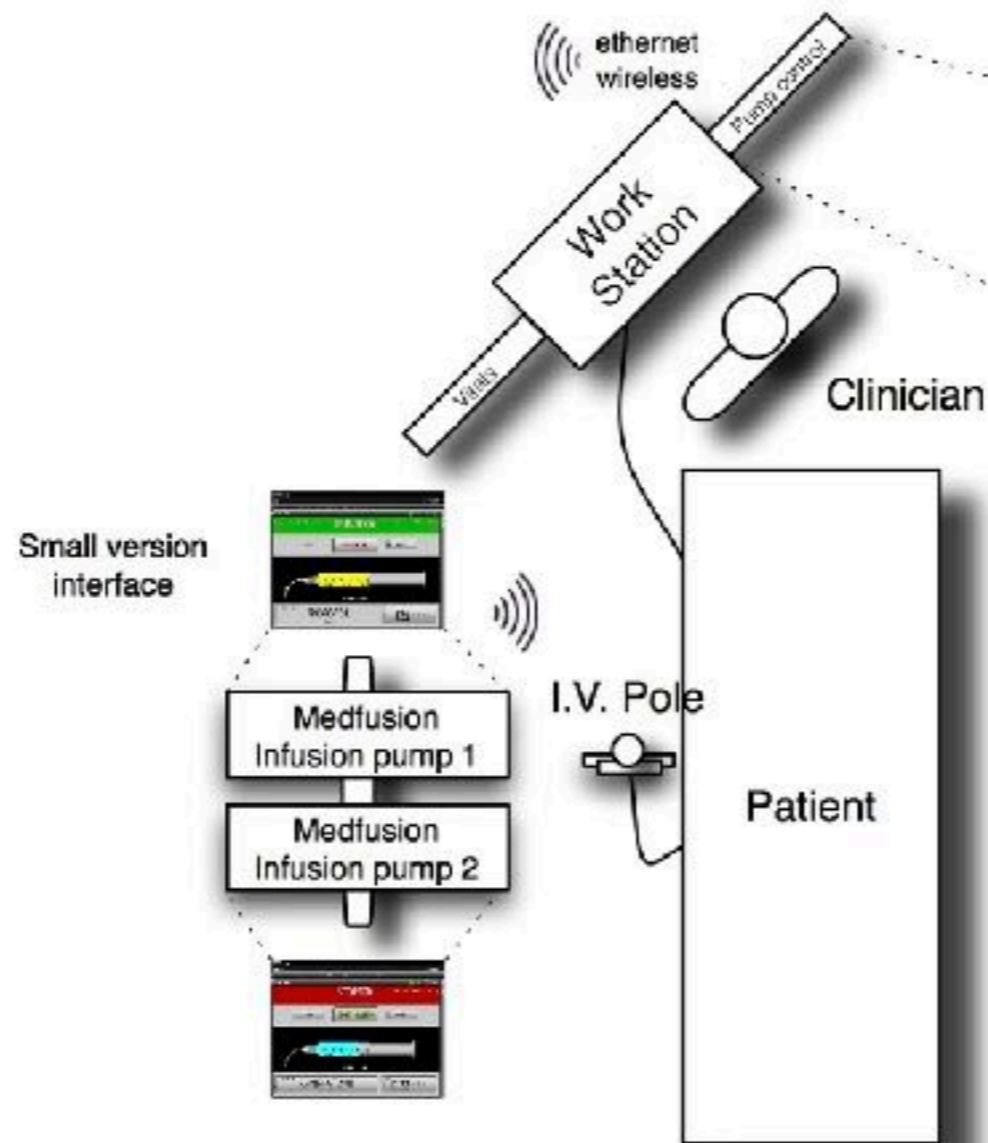
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9

0.6

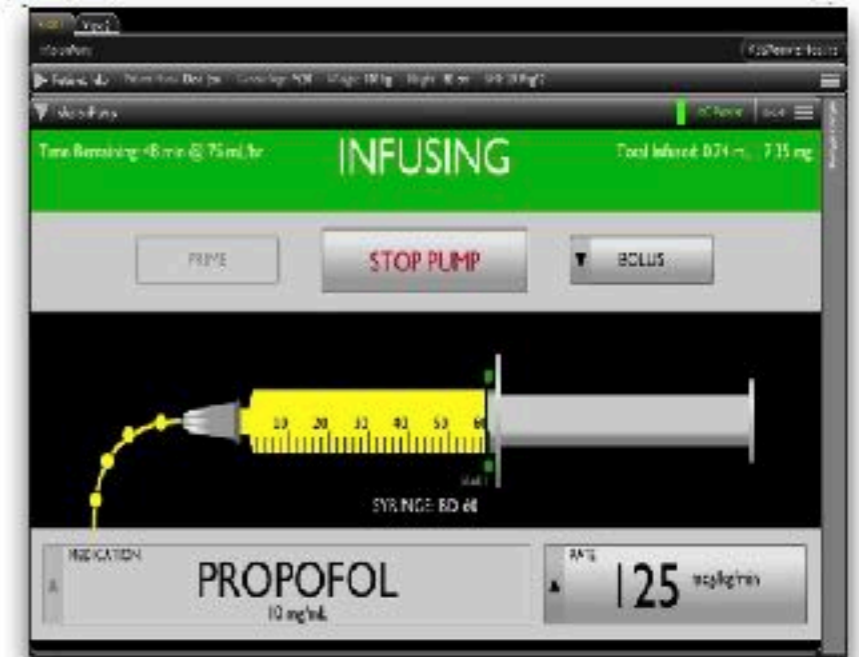
mcg/kg/min mcg/kg/hr mg/min mg/hr mL/min mL/hr

ACTUAL KG 87.2 LBM 42

# DESIGN Overall Strategy

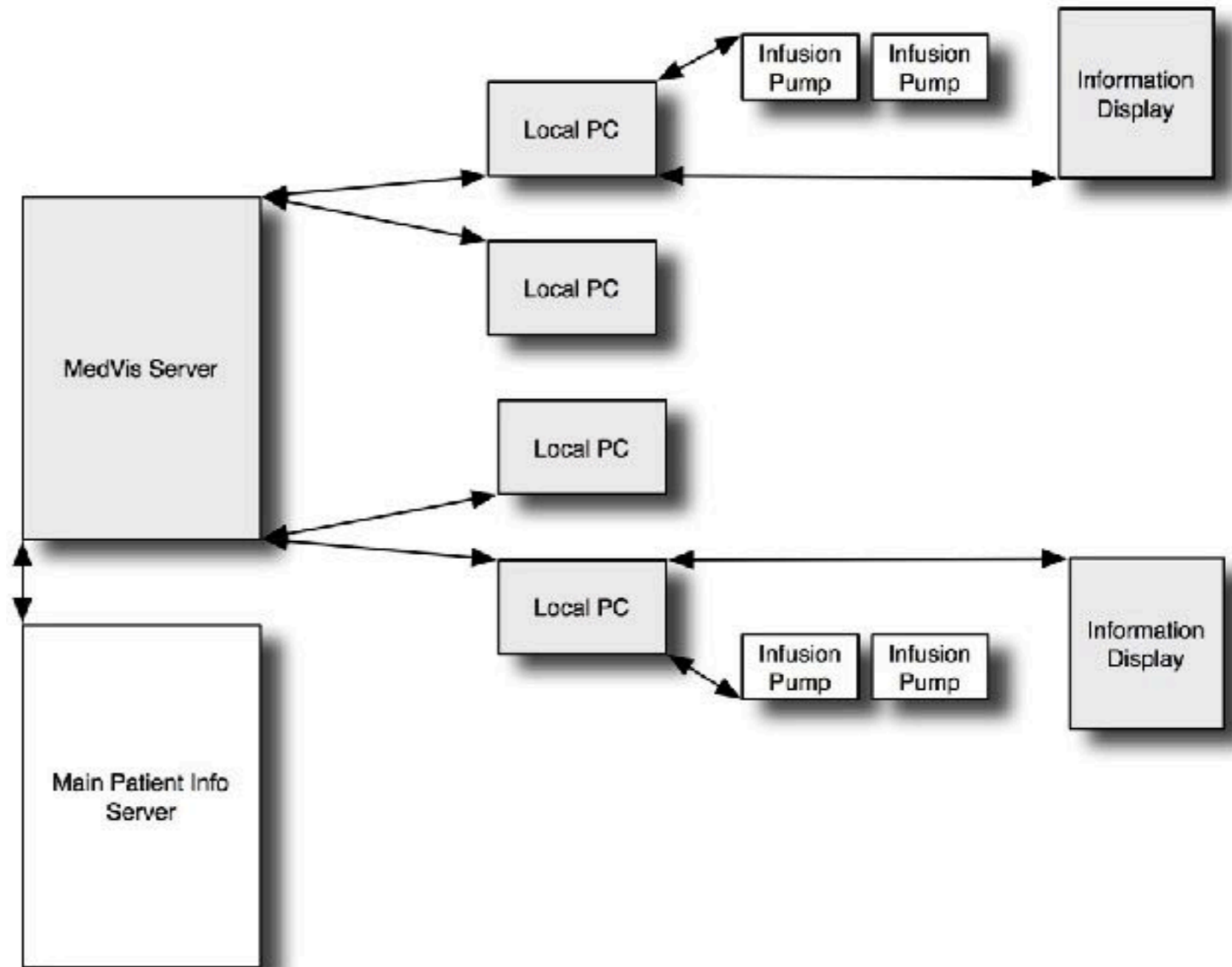


Pump interface for specific OR



Central Station summary view of all pumps in separate rooms

# DESIGN IT Architecture





## Books

Developments in Design Methodology Nigel Cross

Design Research: Methods and Perspectives Brenda Laurel

Universal Methods of Design Bella Martin, Bruce Hanington

101 Design Methods Vijay Kumar

100 Things Every Designer Needs to Know about People  
Susan Weinschenk

Measuring the User Experience Tom Tullis, Bill Albert

Seductive Interaction Design Stephen Anderson

## Journals

The Design Journal, The Journal of Design Research,  
CoDesign, Design Science

Questions?

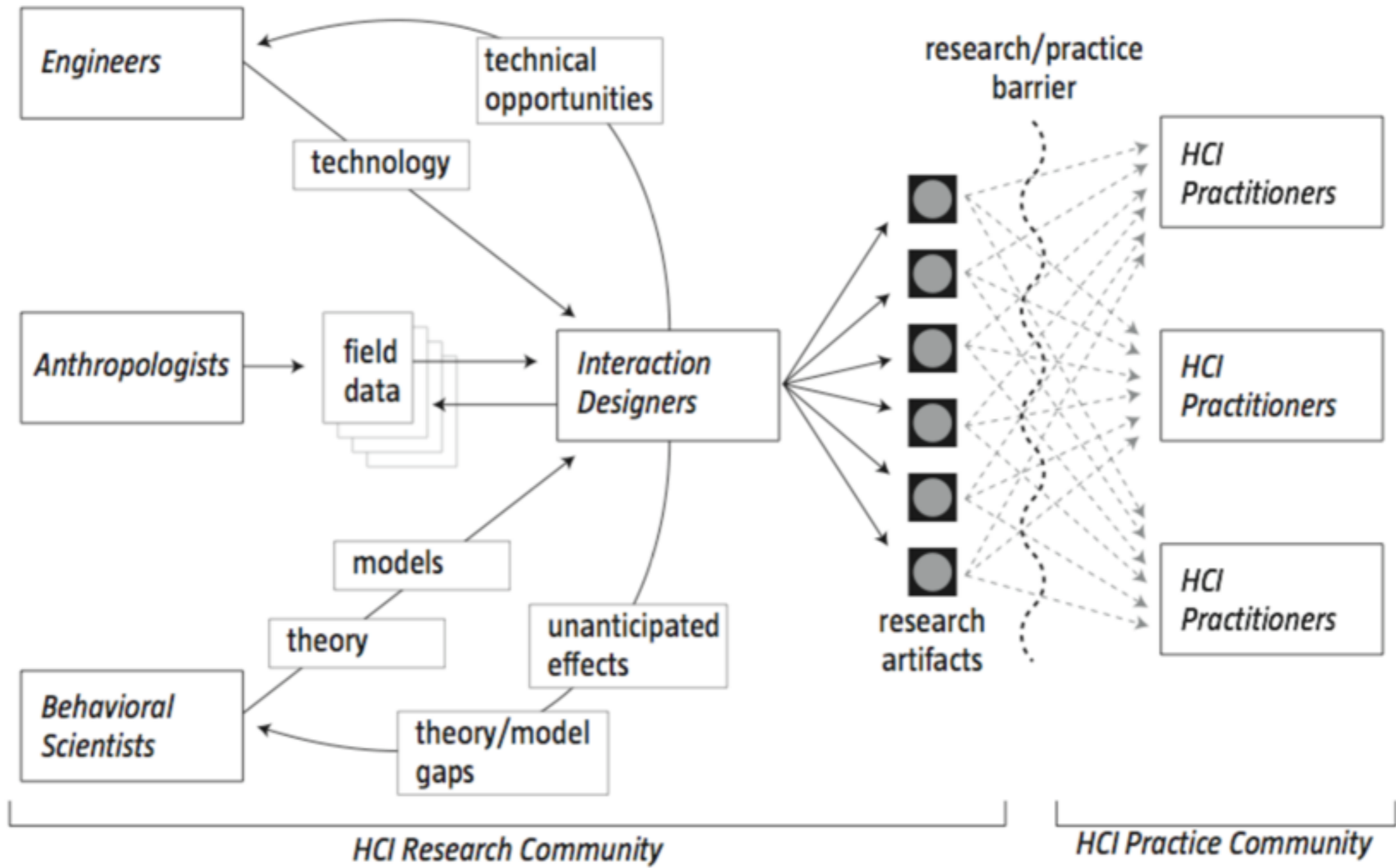
three main themes emerged. First, participants noted that interaction designers brought a process for engaging massively under-constrained problems that were difficult for traditional engineering approaches to address. Second, designers brought a process of integrating ideas from art, design, science, and engineering, in an attempt to make aesthetically functional interfaces. One described this process as similar to composing music or conducting a symphony, where the job is to bring out the richness in a range of voices to make a singular thing. Third, designers brought empathy for users as a part of the process. In addition to considering their needs and desires from an external-observer's perspective, designers worked to also embody the people they made things for.

Using our model, interaction design researchers integrate the *true* knowledge (the models and theories from the behavioral scientist) with the *how* knowledge (the technical opportunities demonstrated by engineers). Design researchers ground their explorations in *real* knowledge produced by anthropologists and by design researchers performing the upfront research for a design project. Through an active process of ideating, iterating, and critiquing potential solutions, design researchers continually reframe the problem as they attempt to make the *right* thing. The final output of this activity is a concrete problem framing and articulation of the preferred state, and a series of artifacts—models, prototypes, products, and documentation of the design process.

**Research Through Design as a Method for Interaction**

**Design Research in HCI**

**John Zimmerman, Jodi Forlizzi, Shelley Evenson**



Research

Understanding

Novel

Practice

Commercial

Refinements