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# EXPLORING THE NEXT GENERATION INTENSIVE CARE UNIT OF THE FUTURE

A Collaboration between the Department of Design and the Department of Surgery



THE OHIO STATE UNIVERSITY

# OBJECTIVE

An interdisciplinary, co-design-led exploration of future scenarios of use for the James Cancer Hospital and University Hospital surgical intensive care units at The Ohio State University Wexner Medical Center.

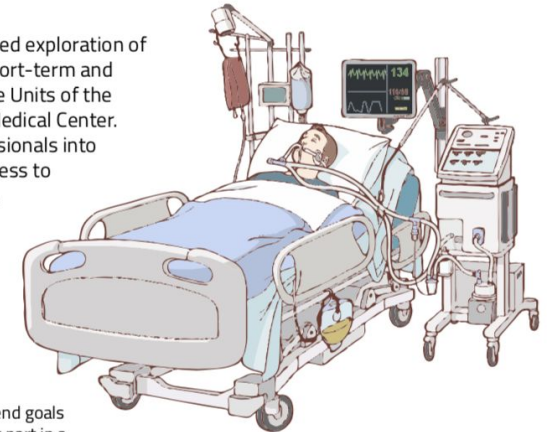
This is an initial experiment, the first step in what will be a long-term collaborative and participatory innovation process.

Design 6400 Class number: DESIGN 6400-0010 (13598) Spring Semester 2018  
Mondays from 3:00 until 7:00 • 105 Hayes Hall and the OSU Medical Center

## A Co-Design Studio for Graduate Students:

EXPLORING THE NEXT GENERATION INTENSIVE CARE UNIT OF THE FUTURE

An interdisciplinary, co-design-led exploration of future scenarios of use (both short-term and longer-term) for the Critical Care Units of the Ohio State University Wexner Medical Center. We will invite healthcare professionals into the front end of the design process to explore future ways of working.



A collaboration between the Department of Design and the Department of Surgery in the Critical Care Units of The OSUWMC. This unique setup will allow the students to work directly with healthcare professionals and immerse themselves in the working environment they are studying. The end goals for the students would include taking part in a hands-on experience on a real-world challenge in an interdisciplinary setting. We will focus on the James Cancer Hospital and University Hospital surgical intensive care units.

### Format

- Immersive observations
- Facilitating a series of co-design workshops with healthcare professionals

### Participants

- Graduate students from all disciplines are welcome.
- Application paperwork and immunization record are required.
- No other prerequisites.
- Class size is limited to 16, so please enroll early.

We are particularly interested in hearing from graduate students in:

- Nursing
- Public Health
- Communication
- Psychology
- Biomedical Sciences
- The Fisher College of Business
- Architecture
- Computer Science
- Integrated Systems Engineering

Facilitator/Instructor: Elizabeth Sanders, PhD, Department of Design, <http://u.osu.edu/sanders.82/>  
Collaborator: Daniel Vazquez, MD, MSc, FACS, Surgical Intensive Care Unit, OSUMC

**Questions?** Send me an email to Liz Sanders at [Sanders.82@osu.edu](mailto:Sanders.82@osu.edu) • Open to all disciplines. Seeded by Design.

# WHAT IS CO-DESIGN?

Co-design is an approach to design that actively involves all stakeholders in the design process to help ensure that what is designed is useful, usable and desirable.

In the Co-design Studio an interdisciplinary team of graduate students collaborated with healthcare professionals, ICU patients and family members in the front end of the design process to explore future ways of working and healing.

# WHO WERE THE CO-DESIGNERS? HEALTHCARE PROVIDERS

## Physicians

Dr. Daniel Vazquez

Dr. Andrew Loudon

## SICU Advanced Practice Providers

Nikki Allen-Payne

Cindy Byrd

Amanda Finnicum

Mandy Haney

Nicole Kover

Harry Rees

Michael Young

## Nurses

Stephanie Burrows

Devin Flood

Jenna Tope

Suzy Linville

Kay Ashworth (UH SICU Manager)

Stephanie Vaupel-Juart (UH Assistant Manager)

Dan Thorward (JSICU Manager)

Shawna Cornell (JSICU Assistant Manager)

## Physical Therapists

Lindsay Riggs

Ashley Hennen

# WHO WERE THE CO-DESIGNERS? HEALTHCARE PROVIDERS

## **Occupational Therapists**

Debi Staab

Sarah Shatto

## **Pharmacist**

Tony Gerlach

## **Social Worker**

Crystal Augsburg

## **Echo Team**

Loretta Damron

Mary Ellen Orsinelli

## **Respiratory Therapist**

Tim Dunlea

## **Radiographer**

Kay Peters

## **James Volunteer Services**

Sharon Cross

# WHO WERE THE CO-DESIGNERS? PATIENTS AND FAMILY

## **ICU patients**

Derek Gordon

Jennifer Ludwin

## **Family members of ICU patient**

Carla Stewart

Suzanne Hoholik

Kristin Schoeff

# WHO WERE THE CO-DESIGNERS? GRADUATE STUDENTS

## **ISE, Human Factors and Ergonomics**

Steven Bigelow                      Xueke Wang

Kelly Seagren                      Yilun Xu

Vivek Ramachandran

## **ISE, Cognitive and Systems Engineering**

Gina Torelli

Laura Maguire

## **ISE, Human Factors & Ergonomics and Cognitive & Systems Engineering**

Michael Picchiotti

## **Health & Rehabilitation Sciences, Allied Medicine, Occupational Therapy**

Karen Guo

## **Health & Rehabilitation Sciences, Biomedical Informatics**

James Hendrickson

## **Health and Rehabilitation Sciences, Allied Medicine, Imaging Personnel**

Allison Stokes

Nicole Stigall

## **Design Research and Development**

Hemalatha Venkataraman

Jason Duffield

## **Design Strategist and Interior Designer**

Rose Phillips

# WHO WERE THE CO-DESIGNERS? FACULTY MEMBERS

**Associate Professor, ISE, Human Factors and Ergonomics**

Carolyn Sommerich

**Health and Rehabilitation Sciences, Occupational Therapist**

Monica Robinson



# THE CO-DESIGN PROCESS: OVERVIEW

1. Introduction to the ICUs, including tours
2. Shadowing an NP at work (optional)
3. **Workshop 1: Understanding current experience**  
*What is working and what are the opportunities for improvement?*
4. **Workshop 2: Prioritization of the opportunities**
5. **Workshop 3: Exploring future scenarios of use**
6. **Analysis and presentation**

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Improving People's Lives Through Innovations in Personalized Health Care

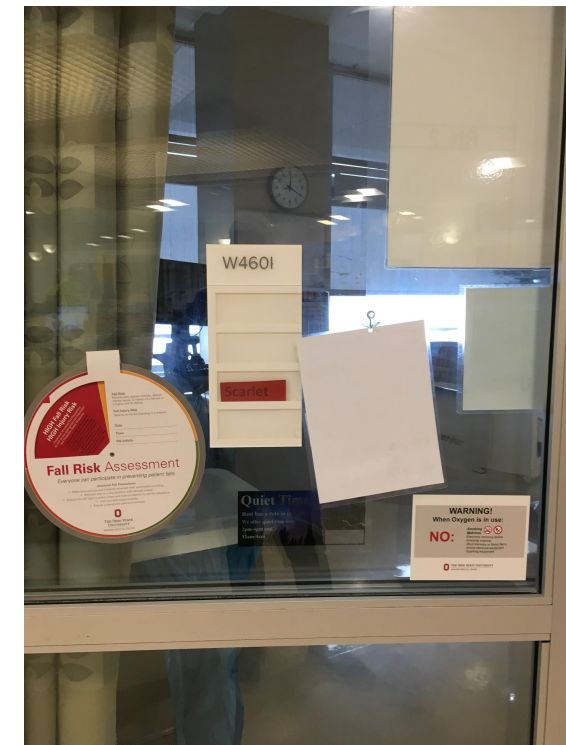
## The Next Generation, Intensive Care Unit of the Future

Daniel E. Vázquez, MD, MSc, FACS  
Assistant Professor of Surgery  
Jan 2018

 THE OHIO STATE UNIVERSITY  
WEXNER MEDICAL CENTER

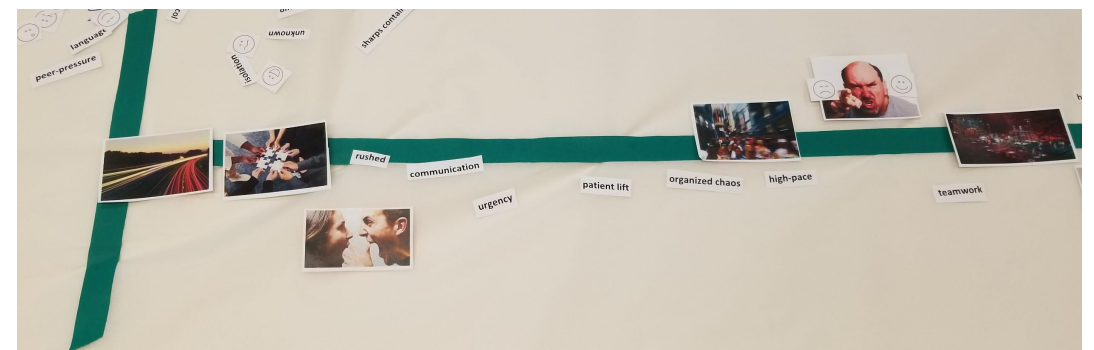
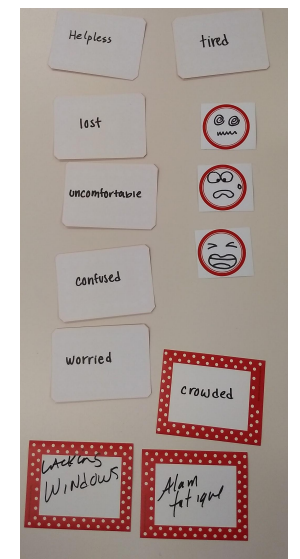
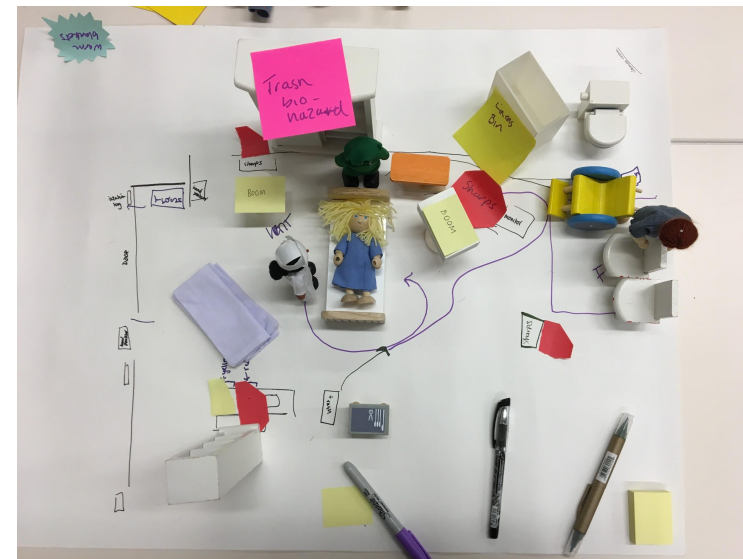
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# OBSERVATIONS FROM THE CO-DESIGN PROCESS

- We documented 255 observations during the touring, shadowing and first workshop.
- In Workshop 1 our co-designers identified 31 things that are working and 47 opportunities for improvement.
- Based on the priorities of the co-designers, we narrowed the 47 opportunities down to the top 8.
- We also generated a large number of preliminary ideas for the future (2030 and interim).



# OBSERVATIONS FROM THE CO-DESIGN PROCESS

## UNIT

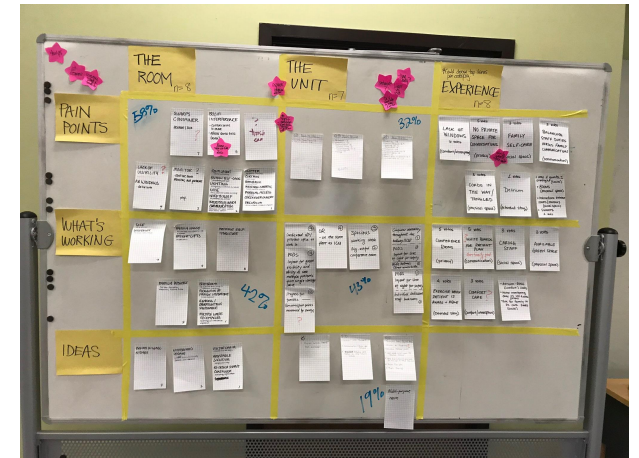
- Linear vs pod design
- Dedicated spaces to meet the needs of the SICU staff

## ROOM

- The sharps containers
- The booms
- Lighting: natural and artificial lighting from the perspectives of staff, family, patients
- Visibility vs privacy of the patient/family from outside the room door

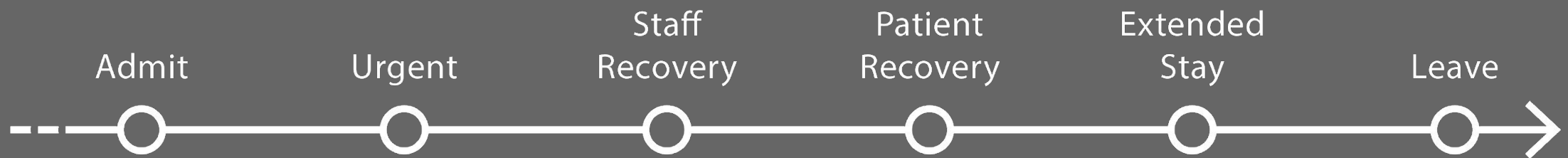
## EXPERIENCE

- Communication between staff members as well as between staff and family
- The patient/family SICU experience

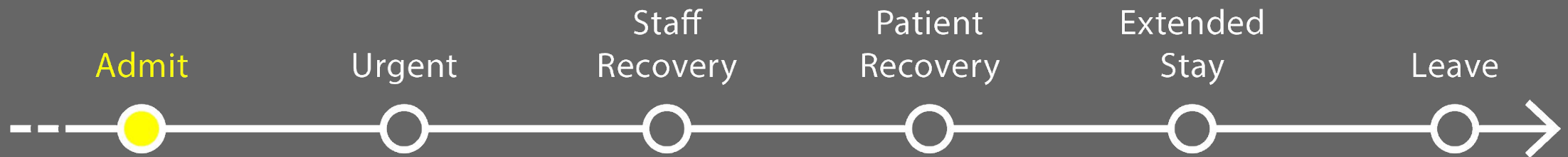
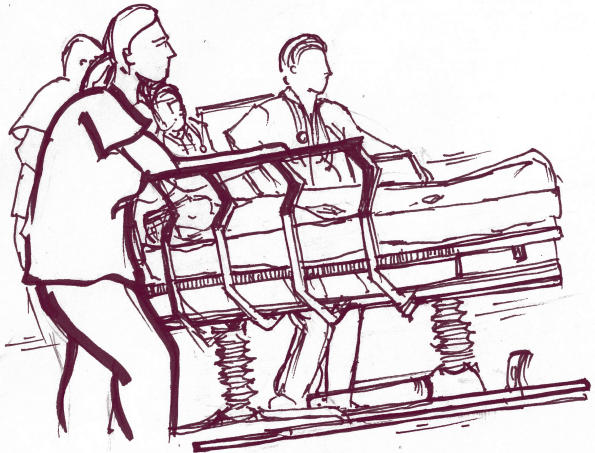


# THE STORY

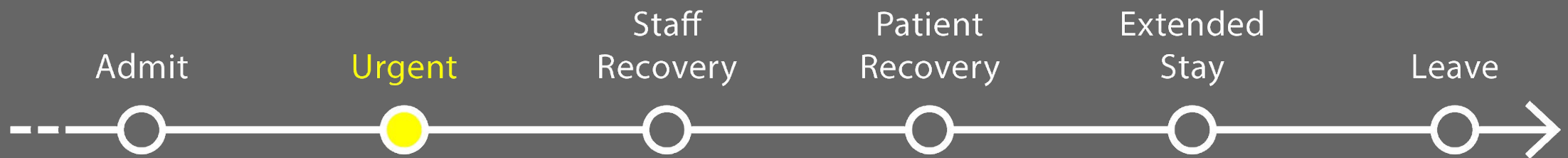
Meet Josh.



# THE STORY



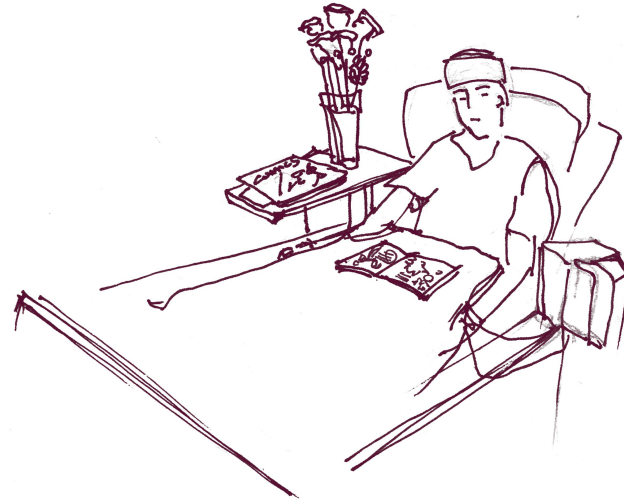
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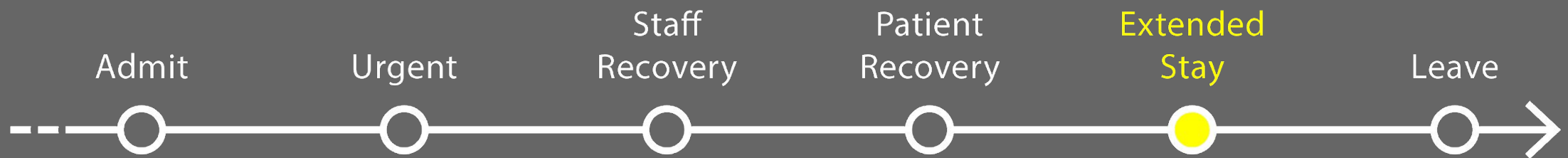
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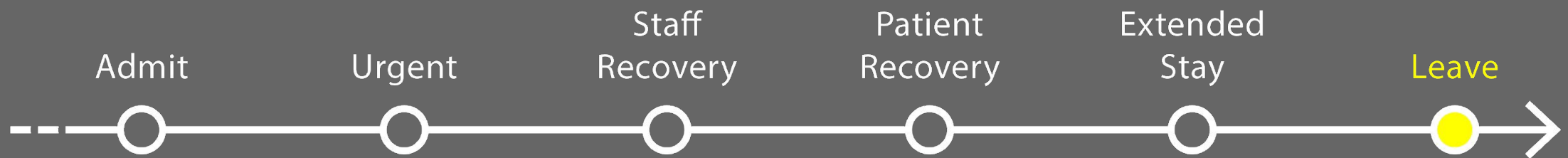
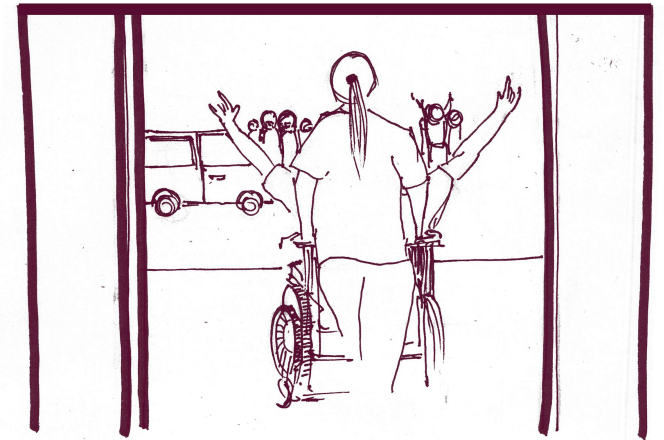
# THE STORY



# THE STORY



# THE STORY





# THE STORY

Using Josh's story, we'll describe the eight opportunities for improvement.

- **NOW:** We will first describe the current situation.
- **2030:** Then we will share ideas for the future
- *interim* ideas will also be shared when relevant.

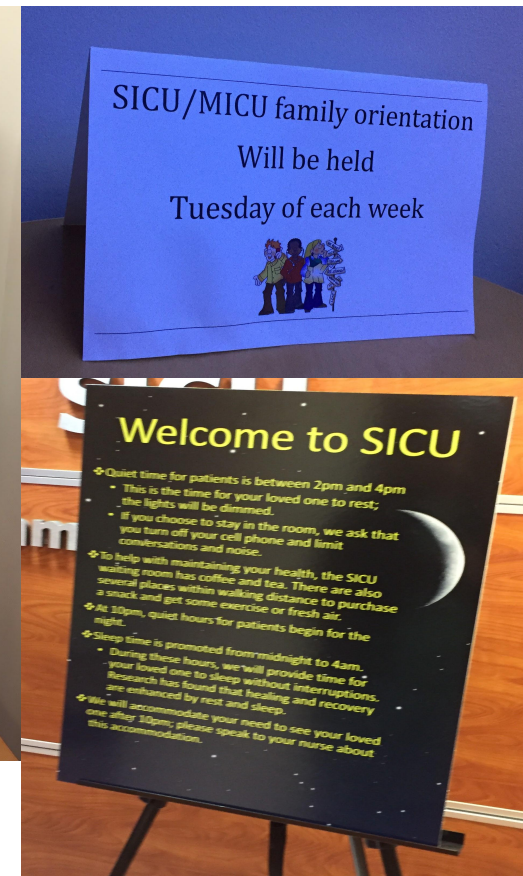
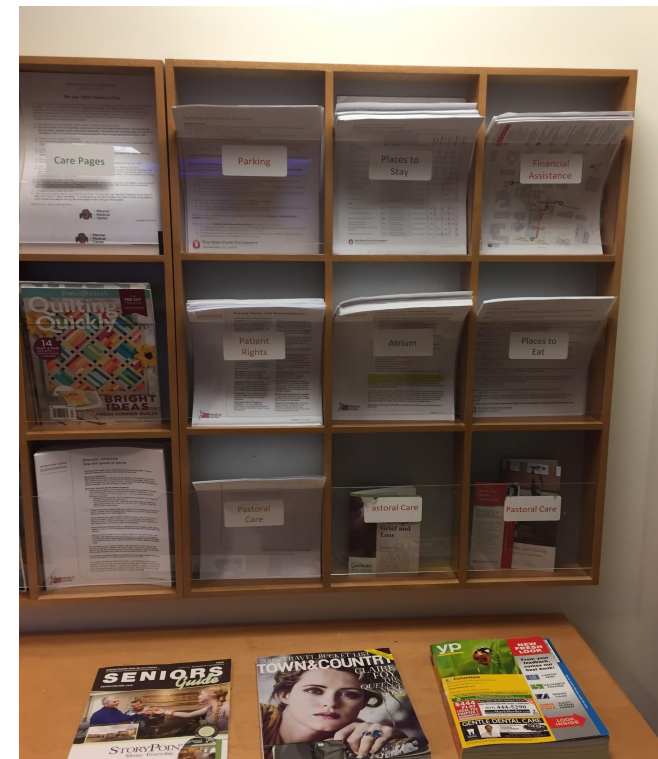
# NOW FAMILY ORIENTATION



Families recognized as vital to patient healing processes  
(Hupcey, 2001; Williams, 2005; Rippin, 2016)

Support for families is available but inconsistently communicated or may not be clear

- Low health literacy = higher workload for practitioners.
- OSUMC has excellent programs & services available that may not be communicated to families consistently.
- Resources available in waiting room or family resource center but require families to seek them out or have them provided by staff.
- Signage lacks some relevant details and consistency.

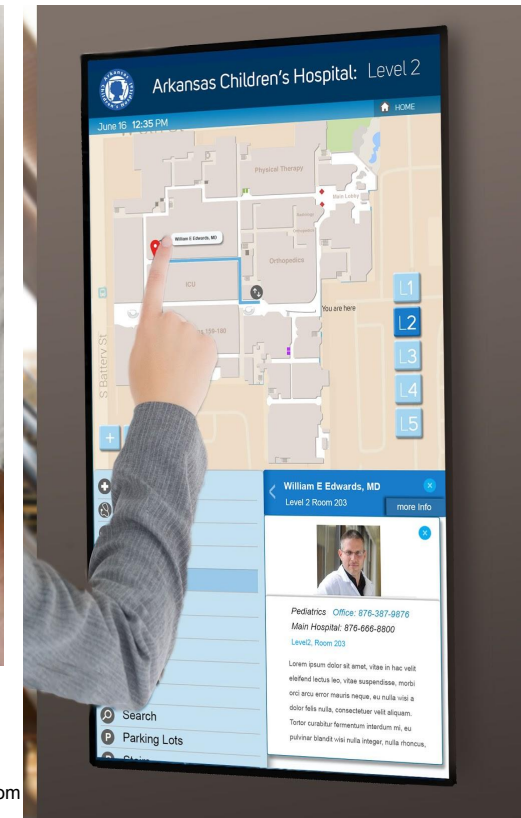


# 2030 FAMILY ORIENTATION



## Family Orientation Resources

- Expand availability of comprehensive electronic resources on a tablet or iPad given to families upon arrival or accessible via an In Room white board providing real time updates.
- *Interim:*
  - Promote awareness amongst support resources (social worker, chaplain, family resource center) of the existing programs and resources
  - Enhance & compile existing orientation materials into a coherent package in multiple languages



credit lbgdesign.com

# NOW PHYSICAL ENVIRONMENT



## Travel Time

- Linear hallways increase time for staff to reach patients, supplies

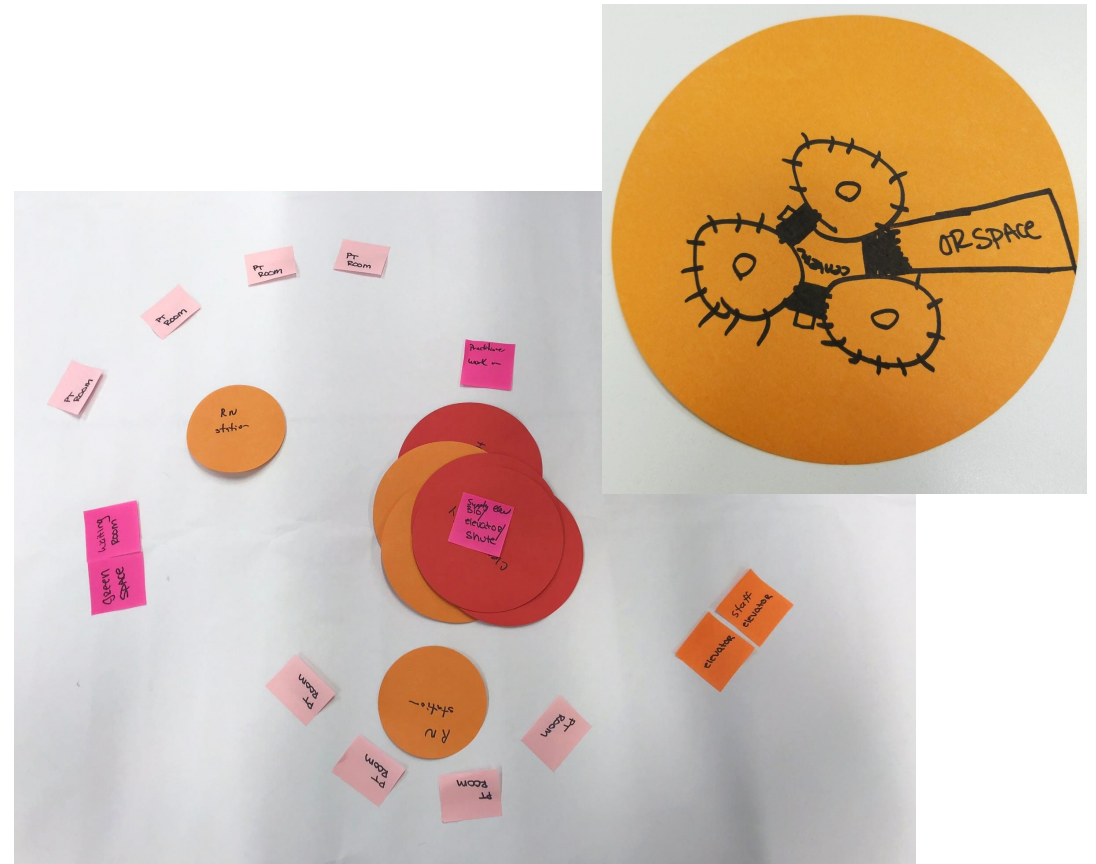


# 2030 PHYSICAL ENVIRONMENT

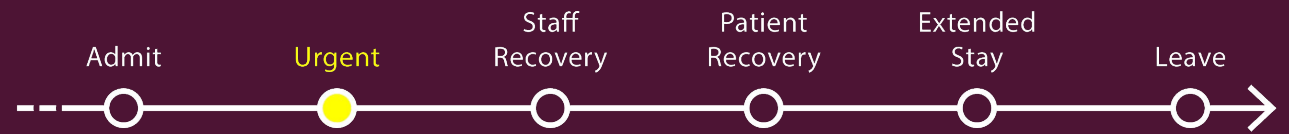


## Travel Time

- Pod-based layout decreases travel distance to patient rooms
- *Interim:* Consider testing Vocera or developing a secure mobile app for staff communication



# NOW PHYSICAL ENVIRONMENT



## Task Lighting

- Lack of surgical lighting makes it difficult to see patients during procedures



# 2030 PHYSICAL ENVIRONMENT



## Task Lighting

- A moveable, adjustable surgical light installed in the room above the patient bed for procedures
- *Interim:* Utilize mobile task lighting similar to those used in other areas of the hospital such as Labor and Delivery



Credit Midmark, Welch-Allyn

# NOW PHYSICAL ENVIRONMENT

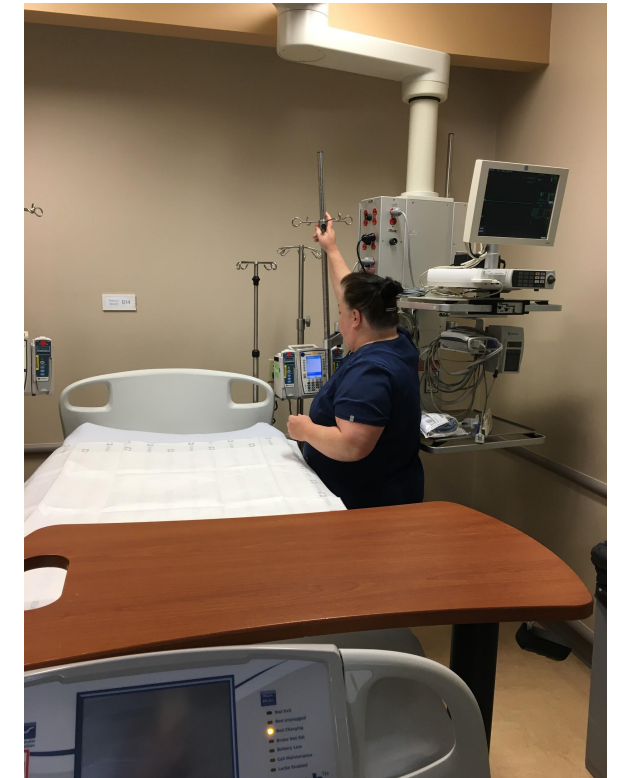


## Sharps

- Sharps containers are poorly located in the room
- Small size of sharps container leads to overflow, ICU units in general utilize a larger proportion of sharps filling smaller containers quickly
- Time consuming 'one-by-one' disposal requires additional handling of used sharps

## Boom

- Boom is difficult to navigate around and hard to move to reach patient
- Makes it hard to maintain sterile field





# 2030 PHYSICAL ENVIRONMENT



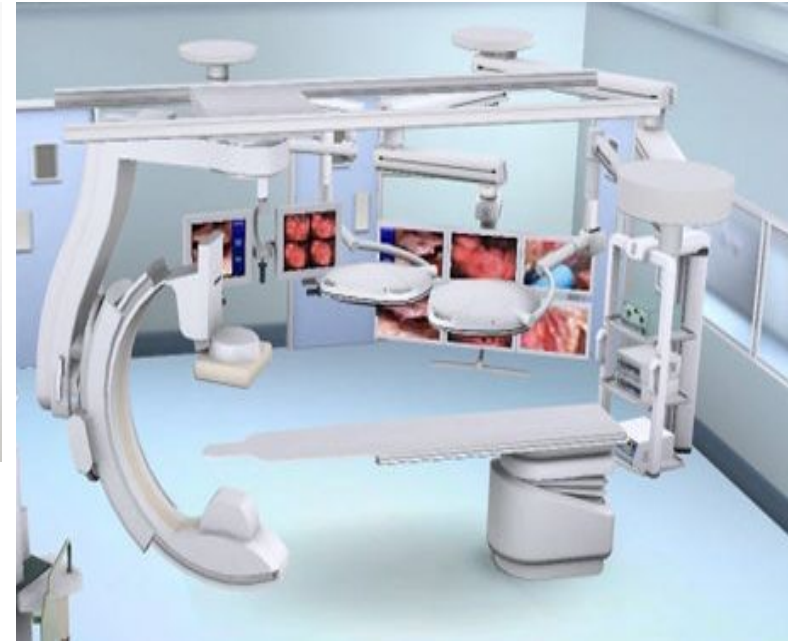
## Sharps

- ICU rooms have large, wheeled sharps bins with hands-free opening tied to digital layer (RFID)
- Stored in designated docking area within room
- *Interim:* Purchase large, wheeled sharps bins with foot-pedal activated opening for use in all SICU rooms



## Boom

- Boom pneumatically controlled with minimal effort
- Can be lifted to ceiling height so no procedure interference or breakage of sterile field



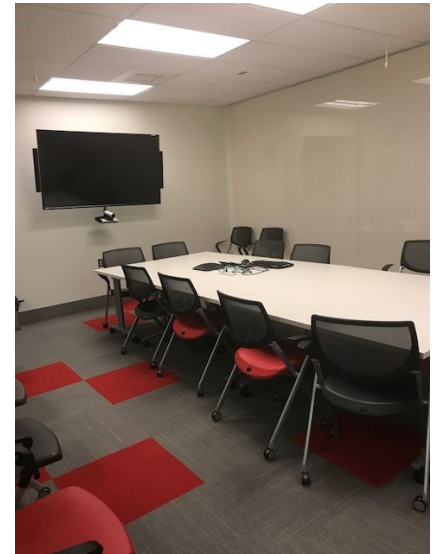
Credit:<http://hybridoperatingroom.com/hybrid-operating-room-layouts-3d-design-mockups/>

# NOW STAFF DEDICATED SPACES



## Workplace stress can impact health care professionals' physical and emotional well-being

- Limited or lack of dedicated workspace for all practitioners/PT/OT/RT/etc.
- Inadequate break room - small for number of staff that utilize them, uncomfortable, limited amenities
- Staff conference rooms - double as family conference space
- Restroom shuffle - current location of restrooms are in public areas and often used by others (non-staff)
- Poor visibility of patient rooms in linear-style unit while working at dedicated staff areas



# 2030 STAFF DEDICATED SPACES



## Workplace stress can impact health care professionals' physical and emotional well-being

- Separate dedicated work space in unit for practitioners and physicians to document in IHIS
- Dedicated staff “respite” space to recover from traumatic events
- Adequate number of staff-specific conference rooms and restrooms
- Workstations have a clear visual line to patients' rooms allowing nursing staff to see critically ill patients at all time while able to complete daily charting requirements



Credit:  
<https://www.greshamsmith.com/showcase/projects/showcase-8/20-20-research-new-headquarters-renovation>  
<http://barcelonanavigator.com/barcelona-co-working-spaces/>  
<https://www.abcn.com/meeting-rooms.php>

# 2030 STAFF DEDICATED SPACES



Improving staff dedicated space for staff physical and emotional well-being

*Interim:*

- Improve aesthetics of current locations: paint, new furniture, general atmosphere
  - Small improvement in this area could have a larger impact on staff satisfaction
- Convert existing workstations, where available, into ergonomically usable workstations using a sit-to-stand desk



Credit: <https://nerdycomputers.com>



Credit: <https://www.pinterest.com/pin/458100593332277034>

# NOW PATIENT RECOVERY



## Signage and Doors

- Signage outside of room is not easily recognized due to size or placement and can be overlooked
- Doors are cumbersome to open wide and may come off tracks if a patient needs to be moved
- Inconsistent isolation room signage makes it possible for an accidental un-gowned entry

*“People don’t realize it’s an isolation unit and walk right in. It’s not as noticeable when you’re entering the room.”*



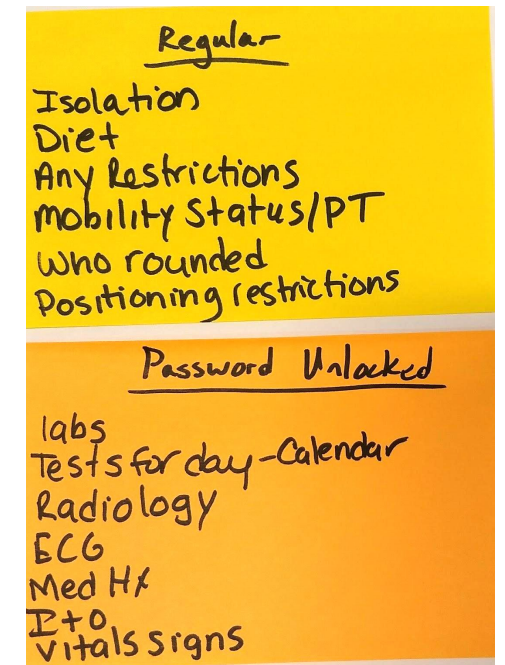
# 2030 PATIENT RECOVERY



## Signage and Doors

- RFID-activated signs outside patient rooms allows certain staff to access HIPAA-protected information while displaying general information like isolation status to medical personnel and visitors.

*“I like having the technology piece on the outside of the door to decrease interruptions of sleep, but with security features to prevent HIPAA violations.”*



Credit: [www.infotronik.at/en/referenzen/digital-door-signs-university-klagenfurt](http://www.infotronik.at/en/referenzen/digital-door-signs-university-klagenfurt)

# 2030 PATIENT RECOVERY



## Signage and Doors

- Eye-catching lighting around sliding doors can be turned on outside of isolation rooms that cues staff and visitors to sanitize their hands.

*“Could you make the room number lighted and have a sign beneath it to indicate what the color means? Eyes go to room number first, because you have their attention.”*

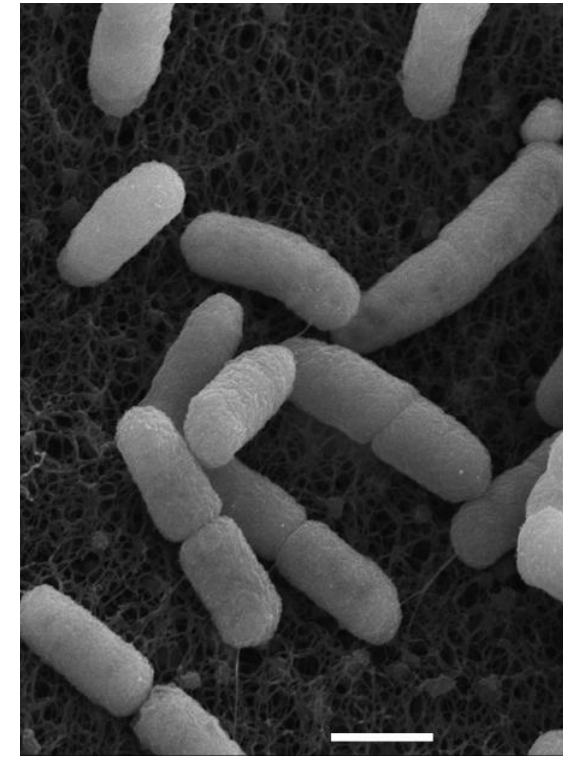


# NOW PATIENT RECOVERY



## Privacy and Visibility

- Curtains harbor bacteria, but are necessary for privacy during procedures



Credit: [penpals.web.unc.edu/2013/04/14/what-microscopes-do-you-use-to-see-microbes/](http://penpals.web.unc.edu/2013/04/14/what-microscopes-do-you-use-to-see-microbes/)



# 2030 PATIENT RECOVERY

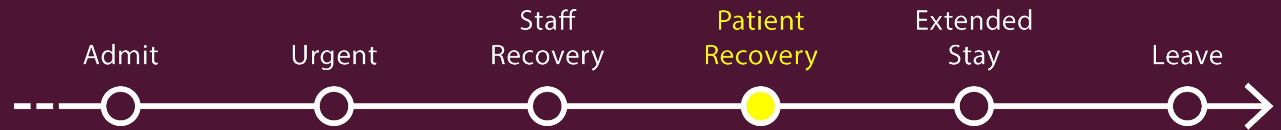


## Privacy and Visibility

- Customizable electronic frosted glass reduces need for curtains in patient and private conference rooms.
- Patient rooms
  - Electrical glass or glass film can be made transparent or opaque with the flick of a switch, patient or family can pick scenery. Staff can login and use like a smart screen.
- Conference rooms
  - Staff can dim glass when having private conversations with patient family
- *Interim:* Frost conference rooms windows, apply smart film to patient room windows



# NOW PATIENT RECOVERY



## Room Lighting

- Bright, overhead lights are not dimmable, and disturb patient circadian rhythms when off during the day and on at night.

*“Hallucinations and delusions are caused when you have no perception of time.”*

*“I want better lighting. Our lights are all or nothing, which is awful for ICU delirium. We need dimmers and special lighting for procedures.”*

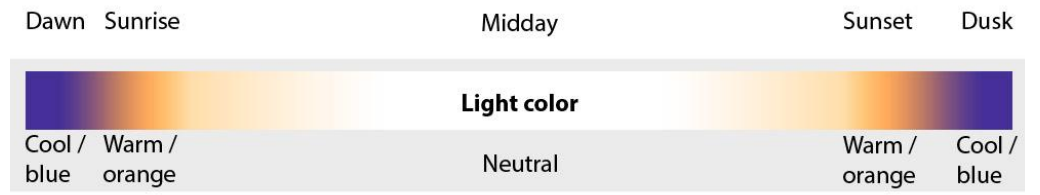


# 2030 PATIENT RECOVERY



## Room Lighting

- *Interim:* Networked, dimmable lights give off warm to cool temperature lighting that changes throughout the day, helping to maintain natural sleep cycles.
- *Interim:* Lights are controlled by computer, but can be customized by patients and staff.



# NOW FAMILY AMENITIES

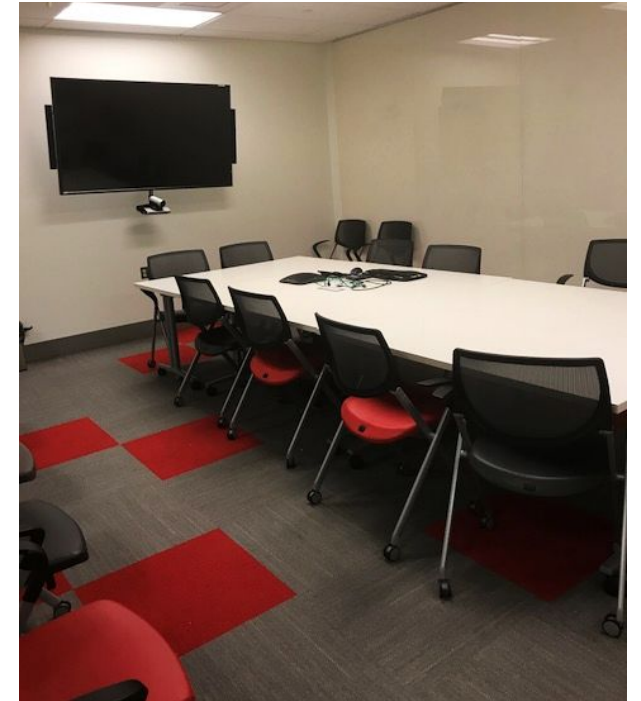


## Family Designated Conference Space

- The same rooms are used for both staff meetings and meetings with family
- Families desire a more comforting and private atmosphere for receiving news about their loved ones

## Family Self-Care

- Family members tend to spend little time away from the patient which can result in lack of sleep or poor nutrition habits while visiting.



# 2030 FAMILY AMENITIES



## Family Designated Conference Space

- Spaces in low traffic areas to increase privacy
- Calming atmosphere (colors, pillows, etc.)
- Comfortable chairs, no boardroom feel
- *Interim:* Designate space for private conversations

## Family Self-Care

- In-unit snack/break room
- Pull-out bed for visitors
- *Interim:* snacks in the waiting room



# NOW PATIENT EXPERIENCE



## Patient Delirium

- Delirium is a frequent and serious problem in the ICU, causing confusion and hallucinations
- Lack of windows prevent patients from knowing time of day

## Patient Communication

- Patients may have difficulty expressing their needs while intubated



# 2030 PATIENT EXPERIENCE



## Prevent Patient Delirium

- Windows in each room
- If windows are not possible, install screens with images that simulate times of day
- Circadian lighting
- *Interim: Install light dimmers*

## Enhance Patient Communication

- Alternative and Augmentative Communication (AAC) iPad apps
- *Interim:* Include printouts or card sets of common images/words/symbols for patients to point to.



simonlakey.com



usailighting.com



skyfactory.com

# NOW COMMUNICATION



## Interdisciplinary Communication

- Family can receive delayed or conflicting information from different teams in Open Units.
- Consultation as a complex interaction in the ICU is well documented (Goldman et al, 1983; Salerno et al, 2007)

## Communication with the Family

- Family may not be present when the team is rounding & can miss out on important updates.
- Extensive literature shows the importance of communication with family in ICU & critical care settings (Jamerson, 1996; Azoulay et al, 2000; Gaeni et al, 2015)





# 2030 COMMUNICATION



## Interdisciplinary Communication

- Integrated technology to support rapid, high fidelity communication
- Develop & deploy integrated software
- *Interim:* Develop a secure mobile app to enable texting across smartphones.



## Communication with the Family

- Digital in-room Whiteboards
- iPad with resources/information
- *Interim:* Maintain current system of follow-up phone calls.



# NOW LEAVE



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## Patient Stories

Behind every one of our statistics and anecdotes are compelling real-life stories of patients and those who cared for them and about them.

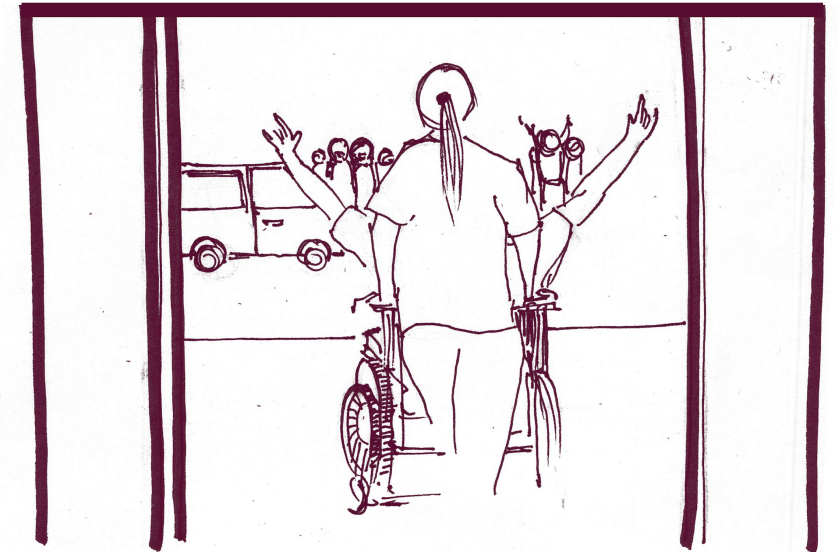
Here, a few of our patients share the stories behind—and beyond—their medical diagnoses.

# 2030 LEAVE



## Continuous Improvement Through Patient Participation

- Enhanced technology to support patient participation across the world
- Allow patients and family members the opportunity to evaluate their ICU experience
- Utilize a co-design group for hospital improvement
- *Interim:* Consider providing patient incentives for giving feedback or participating in research



## KEY FINDINGS OF THE CO-DESIGN PROCESS

Substantial improvements can be seen in the patient and family experience with the implementation of initiatives aimed at improving the physical atmosphere and support services. Families are more engaged in the decision making process and are ever present in the ICU setting.

Healthcare staff experience has shown some positive improvements with environmental changes however some opportunities are still available to improve the workers experience.

The next generation of SICU design should include all aspects of the healthcare delivery team. With the aim to improve the experience not only for the healthcare consumer but also the healthcare provider.

This can be accomplished through the use of a co-design process.

# BENEFITS OF THE CO-DESIGN PROCESS

The co-design process offers benefits at many levels:

- Identification of relevant opportunities for improvement
- Prioritization of those opportunities
- Generation of ideas to solve the problems and address the opportunities
- Shared ownership and responsibility for the healthcare journeys
- Empowerment of healthcare providers, patients and family members

# FUTURE OPPORTUNITIES FOR THE CO-DESIGN PROCESS

There were many opportunities for improvement that we were not able to pursue:

- Dispatch services for room availability, etc.
- Isolation room waste management
- Resource optimization
- Sterile field management
- Improvement of the family space within the SICU patient room
- Access to current SICU patients and family members to engage as co-designers in ongoing design processes



# THANKS!

Dr. Daniel Vazquez

Cindy Byrd

Mandy Haney

Sharon Cross

Adam Fromme