



## INTRODUCTIONS AND THE PRESENTATION

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Desperately want better healthcare facilities  
"I am getting older and I do too many dangerous things..."

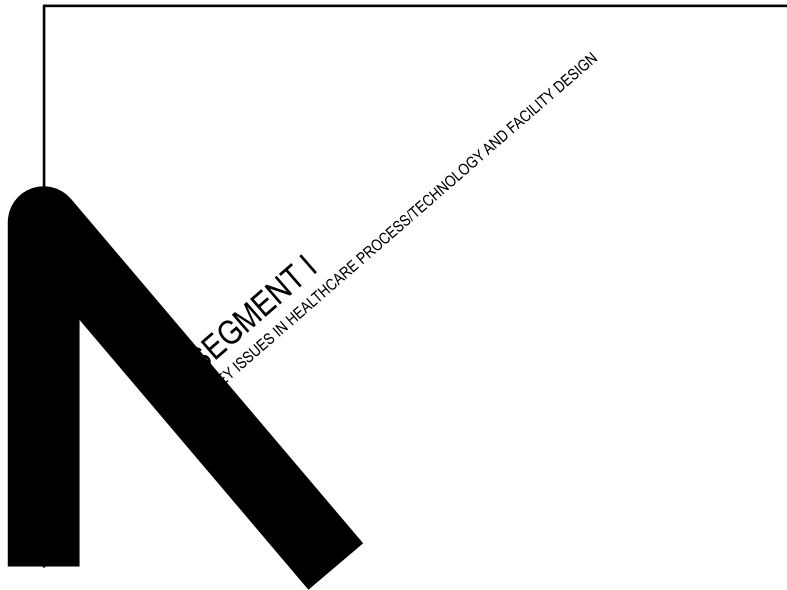
## THE PRESENTATION

Some Practical  
Projects we have done  
Specific ideas / steps to take

Some Theory  
How to get the team to work together better  
Engineering methods

## THE PRESENTATION

Key Issues  
Integrating Process and Technology into the Design Process  
Design - Integrated and Multidisciplinary  
10 Steps



**KEY ISSUES IN HEALTHCARE TECHNOLOGY AND FACILITY DESIGN**

- Recent Projects
- Integration with Process / Workflow
- Medical Device Integration
- Key Departments
- Transforming Care at the Bedside
- Communications

**WHERE ARE THE GREATEST CHALLENGES**

- Surgery
- Imaging
- Pharmacy
- Nursing Units

**WHERE ELSE CAN WE MAKE A DIFFERENCE**

- Transforming Care at the Bedside
- Managing Noise
- Interruptions

# N

SEGMENT II  
INTEGRATING ENGINEERING/TECHNOLOGY IN FACILITY DESIGN

## COMPUTERS AND CLINICIANS

Clinical Systems for Drs and Nurses

- End User Devices, What kind, Where, How Many
- Work space needs are changing
- Current devices are poor at best
- Can the space and device mold the desired behavior



## PATIENT TRANSPORT

6% of ICU transport result in an adverse event

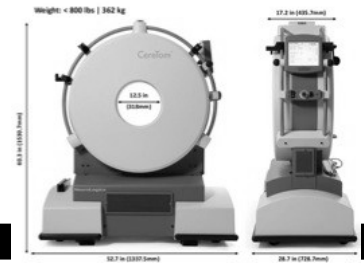
A common adverse incident is jostling the patient in transport and disrupting the attached devices.

Make the journey shorter and less complex  
Or eliminate it altogether



## PORTABLE CT SCANNER

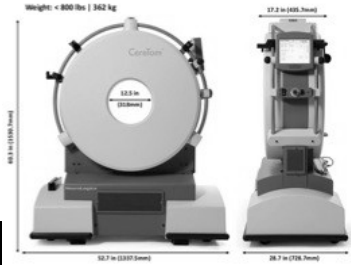
Most transports from the ICU go to the CT Scanner,  
So get a portable CT  
But...



### PORTABLE CT SCANNER

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Is the room big enough  
for the Portable CT?



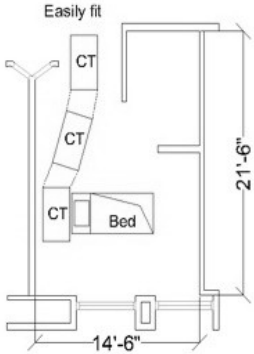
Weights: <math>\lt; 800 \text{ lbs } | \text{ 362 kg}</math>

### PORTABLE CT SCANNER

Most transports from the ICU go to the CT Scanner,

Is the room big enough  
for the Portable CT?

- Follow the path into the room and consider how the staff work



### ALGORITHMS TO GUIDE DESIGN

Transport Path  
Reduce the number of transports, simplify and shorten the path

Patient Lifts  
With limited installable lifts where do they go  
Assessing staff injury risk by admitting pt characteristic

### NAVIGATING HALLWAYS, INTERSECTIONS AND TURNS



### ESTIMATING COMPLEXITY (ADDRESSING THE NEGATIVE IMPACT OF BUMPS, BANGS AND BRIGHT LIGHTS)

$$Complexity = \sum \left[ \begin{matrix} \text{Intersections (2)} \\ + \text{Turns (8)} \\ + \text{Hold Open Door (1)} \\ + \text{Auto Door (2)} \\ + \text{Manual Door (15)} \\ + \text{Elevators (25/trip)} \end{matrix} \right]$$

Path	dist	Elev	turns	inter	doors	Complexity	Cmplx/ft
ER->ICU	761	1	10	16	12	187	0.25
ER->OR	415	1	9	10	9	161	0.39
ER->CT	535	0	9	10	8	134	0.25
ICU->OR	381	0	5	9	4	92	0.24
ICU->Step	381	0	7	12	7	130	0.34

(w) reflects relative complexity (25) is high complexity

### PATIENT LIFTS

#### Patient Lifts

With limited installable lifts where do they go

Assessing staff injury risk by admitting pt characteristic

Bed Assignment to optimize use of lifts

### PATIENT RISK ASSESSMENT

Factor	Score Value				Weight	
	1	2	3	4		
Patient Weight	0-50	50-100	100-150	150-250	35%	1.05
Braden						
Mobility	4	3	2	1	30%	0.9
Friction & Shear	3	X	2	1	15%	0.45
Sensory Perception	4	1	3	2	15%	0.3
Activity	4	3	2	1	5%	0.1
						<b>2.8</b>
	1	Low Risk	3	High Risk		
	2	Moderate Risk	4	Very High Risk		

### PATIENT AND EQUIPMENT TRACKING

Enables significant improvements in Patient Safety, LOS reduction, and capacity management

- RFID
- Wifi
- touchpad

communication



### KNOWING WHERE EVERYTHING (AND EVERYBODY) IS...



### WHERE ELSE CAN WE MAKE A DIFFERENCE

- Transforming Care at the Bedside
- Managing Noise
- Interruptions

Communication Systems are a Key



SEGMENT III  
MULTIDISCIPLINARY THINKING AND DESIGN

### CHALLENGES OF DESIGN

- Integrated
- Multidisciplinary



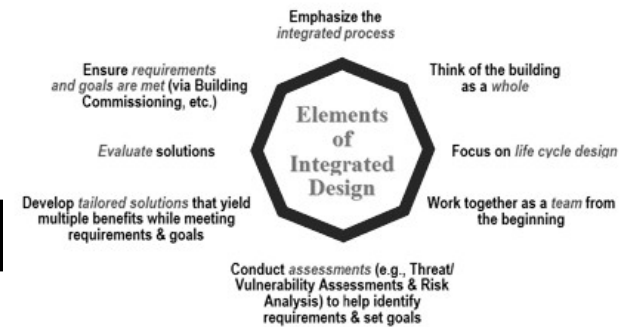
### WHAT IS INTEGRATED DESIGN?

### CONFUSION OF THE CONCEPT

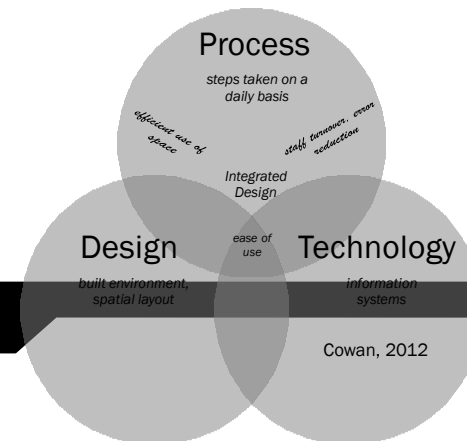
“Integrated design is a collaborative method for designing buildings which emphasizes the development of a holistic design.” –Wikipedia  
But what do others think it is? What do I think it is?

### CONFUSION OF THE CONCEPT

Whole Building Design Guide: More of a process



### THE INTERSECTION



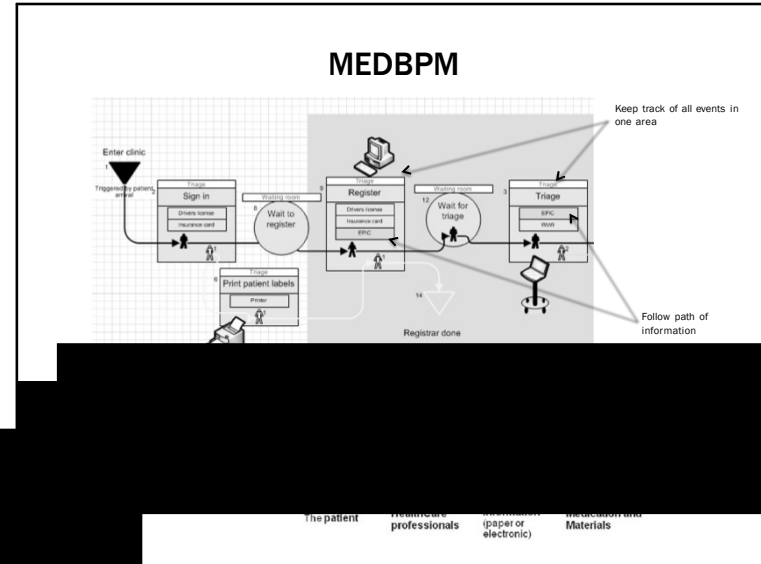
### HOW DO WE MAKE IT HAPPEN?

- Tools
- Approach

### TOOLS FOR INTEGRATED - MULTIDISCIPLINARY DESIGN

- Process Mapping
- VR design tools
- Simulation





### MULTI DISCIPLINARY THINKING

- Get the right folks to the table
- Prepare them
- Understand the problem before you get to the solutions

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### PIVOT THE ROOM

### THE HOPE

Einstein - paraphrase

To solve complex problems we need to address them at a higher level than the one where they were created...

### THE HOPE

Einstein - paraphrase

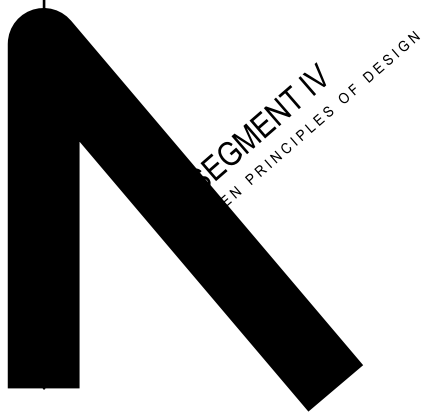
To solve complex problems we need to address them at a higher level than the one where they were created...

### TRANS DISCIPLINARY

### DESIGNING BETTER PERFORMANCE

Acknowledge - Tim Stansfield and David Verner  
published in Industrial Engineer Feb 2010

- Understand the Flows
- Understand Current Performance
- Understand Perceptions of Performance
- Get Clinicians appropriately Involved
- Drive team input via performance measurement



### DESIGNING BETTER PERFORMANCE

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- Timely Team Education
- Keep Design Simple
- Design for Flexibility

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- Design for Flexibility
- 

### 5 METHODS OF FACILITY FLEXIBILITY

**Adaptability:**  
Ability to provide adjustments without actually altering the environment; repositionable partitions or aspects that are changeable per user/occupant.

**Transformability:**  
Ability of an architectural intervention to morph the interior or exterior space without construction in response to external or internal stimuli.

**Convertibility:**  
Ability to alter the physical environment in order to accommodate new uses.

**Responsive:**  
Respond to external stimuli, including energy / environment, interaction, usage or occupation.

**Movable:**  
Structures or buildings capable of being torn down and reassembled in another location.

Crews, Labrador, Zimring, Cowan 2011

### EXAMPLES OF HEALTHCARE FACILITY FLEXIBILITY

Scale	ADAPTABILITY (Temporary)	TRANSFORMABILITY (MOVABLE + RESPONSIVE)	CONVERTIBILITY (Permanent)
SYSTEM			
CAMPUS		Mercy Ship, Tent city	CORE Hospital Prototype, MOB Addition
BUILDING		ER One	ED expansion
DEPARTMENT	Universal Clinic Module		Acuity Convertible Room
ROOM	Acuity Adaptable Room	LDRP	
OBJECT			

Crews, Labrador, Zimring, Cowan 2011

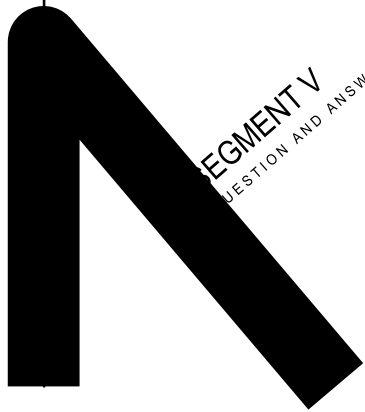
### US NAVY MERCY - HOSPITAL SHIP



### DESIGNING BETTER PERFORMANCE

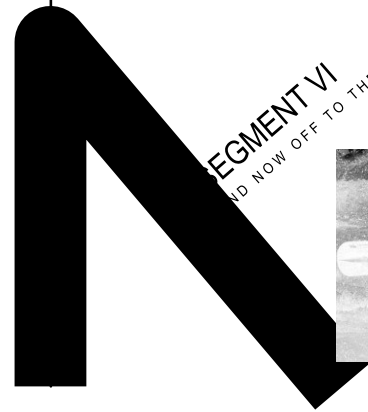
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- Design for Measurement
- Design for the Near Future



SEGMENT V  
QUESTION AND ANSWER TIME

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SEGMENT VI  
AND NOW OFF TO THE RIVER...

