



WELCOME TO OUR PRESENTATION

When Murphy is Your Customer: Designing Flexible and Resilient Facilities for the Unplannable

1 hour AIA CEU credit
1 hour EDAC CHD credit





About My Background

My Name is Gary Schindele



- **Current Executive Board Member, Past Board Chair and a Fellow of the Health Facility Institute (HFI)**
- **Served on two Facility Guideline Institute (FGI) subcommittees developing new standards for Emergency Conditions and Surge**
- **Have been involved in hundreds of healthcare facility projects around the world for 40 years**
- **47 years as a certified EMT Firefighter and former Paramedic (trained right here at Methodist Hospital))**
- **Active member in the Central Florida Disaster Medical Coalition Team**



“By failing to prepare,
you are preparing to
fail”
-Benjamin Franklin





Learning Objectives:

- **You will learn the importance of Emergency Management and how the Healthcare Engineering community can play a major role in supporting the response by emergency personnel**
- **What Emergency Preparedness has to do with the Physical Infrastructure**
- **Discuss some basic design options and new technology which will support effective surge response and post admission infection control**
- **Discuss what we have learned so far from the COVID-19 and recent Hurricane Response**
- **What we can do now and in the future to prepare for another event**





MASS CASUALTY INCIDENT (MCI) is defined as:

“Any situation where the number of injured needing care exceeds the resources available to perform care”



Emergency Conditions and MCI incidents.....

.....are unforeseen situations which threaten your employees, customers, or the public. One which disrupts or shuts down your operations or causes physical or environmental damage.





We generally view
these as BIG
national events



THE REALITY.....

BY PAUL COMBS

@paulcombsart www.ArtStudioSeven.com

THIS IS
A SMALL
COMMUNITY -
A MASS
CASUALTY
INCIDENT
COULD NEVER
HAPPEN HERE!

OOOFF!

COMBS
©2017
DRAWN BY FIRE
JEMS





.....it can be any hospital in the U.S.
on any afternoon on any given day



Or it can be a new global virus blowing all previous conventional thinking out of the water.



The health care delivery system is defined as the network of healthcare facilities and persons who carry out the tasks of providing healthcare services to the public.....like an onion, it has layers.

They include:

1. Hospitals and health systems, (EM Category 1)
2. Public health,
3. EMS providers,
4. Long-term care providers,
5. Behavioral and mental health providers,
6. Specialty service providers (dialysis, pediatrics, urgent care, district Medical Examiners, funeral directors, etc.),
7. Support service providers (laboratories, pharmacies, blood banks, poison control, etc.),
8. Primary care providers,
9. Community health providers, and other healthcare and response stakeholders.





The 4 Phases of a Mass Casualty Incident





Common Misconceptions:

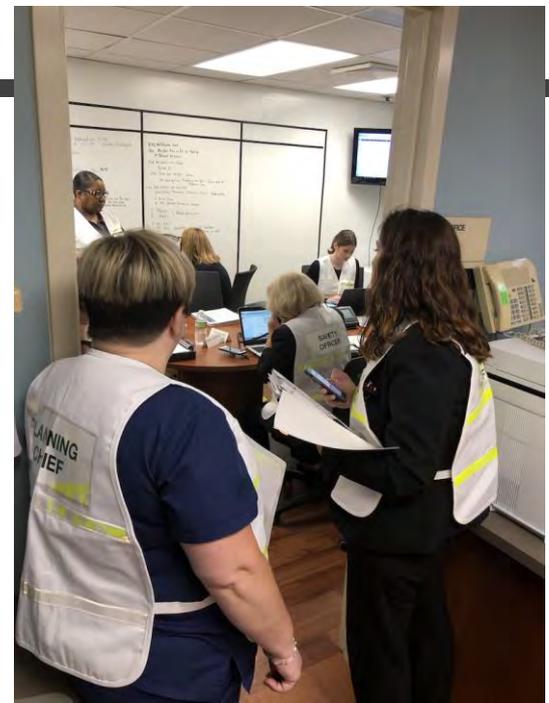
- Most emergencies are short-lived.
- I won't ever have to deal with an emergency where I live.
- There are a lot of emergencies I just can't prepare for.
- What I want to do does not meet code.
- Preparing takes too much time.



Emergency Preparedness is the managerial function charged with creating the framework within which facilities and communities reduce vulnerability to hazards and cope with disasters. We would call it a “business continuity” plan.

Emergency Preparedness seeks to promote safer, less vulnerable communities and facilities with the capacity to cope with hazards and disasters.





WHY Emergency Preparedness? The new NFPA 99 2021 Code has added language in section 12.5.3.3.7.1 under the heading staff education: “includes training, drills and exercises”.

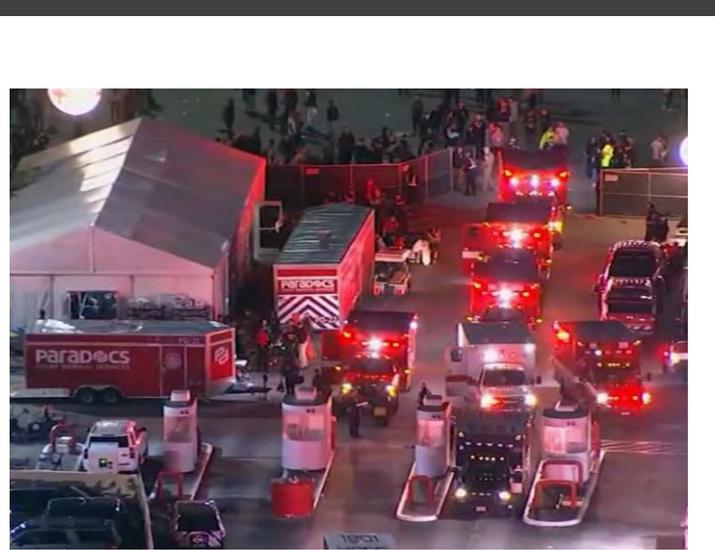
Central Florida held a mass casualty drill in early 2019 involving 40 healthcare facilities, 60 municipal, county, state and federal agencies, and 1,500 “victims” throughout 5 counties. The premise was a coordinated bombing and active shooter assault throughout the Central Florida region. In addition, there was a Ricin chemical attack with a potential Ricin release in to the public water supply.

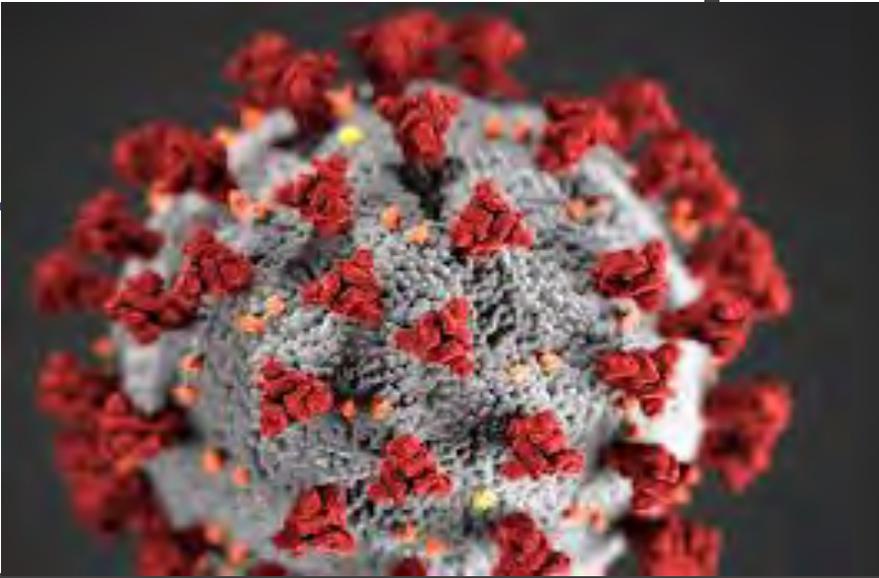


WHY Emergency Preparedness:

Fast forward to Easter 2019 in Sri Lanka....the only thing missing there was the Ricin. Over 100 bombs were detonated throughout the region, including 87 alone at the bus station.

In Nov 2021, we had the Astroworld crowd rush MCI in Texas and the Wisconsin SUV driver through a Christmas Parade.....and many many more.





COVID-19

RESPONSE

WHY Emergency Preparedness?
.....and here we are in 2022,
recovering from one of the most
reactive worldwide healthcare
events we have seen in our
lifetime.



The spread of COVID-19



Preparedness: NFPA99 Section 12.5.3.3

When responding to an MCI, the goal is always to proactively MANAGE the compromise rather than reactively DEAL with it.

The goal of preparing for and training for the “worst case scenario” is not to eliminate compromise but reduce and manage as much of the risk to the caregiver and patient alike.

If a caregiver is compromised, it will only further reduce the ability to adequately manage patients.





Why is this important for the Engineering and Architectural communities?

Know the Risks, Know Your Region, Know the population you serve. Not every architect's project is in their home town.

- The consequences of emergencies can be similar, but knowing the risks in the region you serve will help everyone be better prepared.

Talk to your client groups about this! WHAT KEEPS THEM UP AT NIGHT??

- [What is a Hazard Vulnerability Assessment?](#)

Per NFPA 99 Section 12.5.3.1 Hazard Vulnerability Analysis (HVA) and Risk Assessment are systematic approaches to identifying **hazards** or risks that are most likely to have an impact on a healthcare facility and the surrounding community.

- [What is a Hazard Risk Assessment?](#)

Risk assessment is a term used to describe the overall process or method where you:

- Identify **hazards** and **risk** factors that have the potential to cause harm (**hazard** identification),
- Determine appropriate ways to eliminate the **hazard**, or then control the **risk** when the **hazard** cannot be eliminated (**risk** control).



CONTINUITY OF HEALTHCARE SERVICE DELIVERY



Purpose: Continuity Of Operations Planning (COOP) ensures the ability to continue essential business operations, patient care services, and ancillary support functions across a wide range of potential emergencies. The COOP plan may be an annex to the organization's Emergency Operations Plan (EOP) and during a response should be addressed under the incident command system (ICS). The COOP plan should include the following elements based on the HVA:

- Continuity of Operations
- Care of New and Existing Patients/residents/clients
- Health Safety and Security of persons in the effected area
- Support of staff
- Property, facilities and infrastructure
- Environmental Impact
- Economic and financial considerations
- Regulatory and contractual obligations
- Reputation of, or confidence in the facility



High Consequence Infectious Disease (HCID) Disease Response Plan

Revised 04 MAY 2020



The Office of the Assistant Secretary for Preparedness and Response
(ASPR) Health Care Preparedness and Response Capabilities

THIS IS NOT THE COVID PANDEMIC PLAN

The World Health Organization warns that infectious diseases are emerging at a rate that has never been seen before. Emerging infectious diseases (HCIDs) include hemorrhagic fever viruses (Ebola, Marburg, etc.) and other highly contagious diseases such as MERS-CoV, SARS, and pandemic strains of the influenza virus. Additionally, the potential exists for highly infectious diseases to emerge as a result of deliberate introduction into human, animal, or plant populations for terrorist purposes, such as anthrax, smallpox, and tularemia. The circumstances of infectious disease emergencies may vary by multiple factors, including type of biological agent, scale of exposure, mode of transmission and intentionality (bioterrorism), and many others

HEALTH CARE AT THE CROSSROADS:
Guiding Principles for the
Development of the Hospital
of the Future



With support from Aramark



Even The Joint Commission speaks to disaster preparedness.....published in 2013.

The need for preparedness has always been out there but we have not necessarily been listening.

“The transformation of the physical environment of care must also take into consideration future needs such as achieving surge capacity in response to disaster.”



Guidance for Designing Health and Residential Care Facilities that Respond and Adapt to Emergency Conditions

FGI Emergency Conditions Committee



March 2021



New FGI Guidelines will address
Alternate Care sites both in-hospital and
external to healthcare facilities, as well as
guidelines for managing surge populations





Some events just can
not be eliminated



Hurricane Ian was a state-wide regional event









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AMERIS BANK

ART & FRAME

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DESIGN PICKUP
WE DELIVER (321) 212-1111

Silver Springs Blvd

DO NOT CROSS



How do we improve what we do best?

We do the “Gemba Walk”.

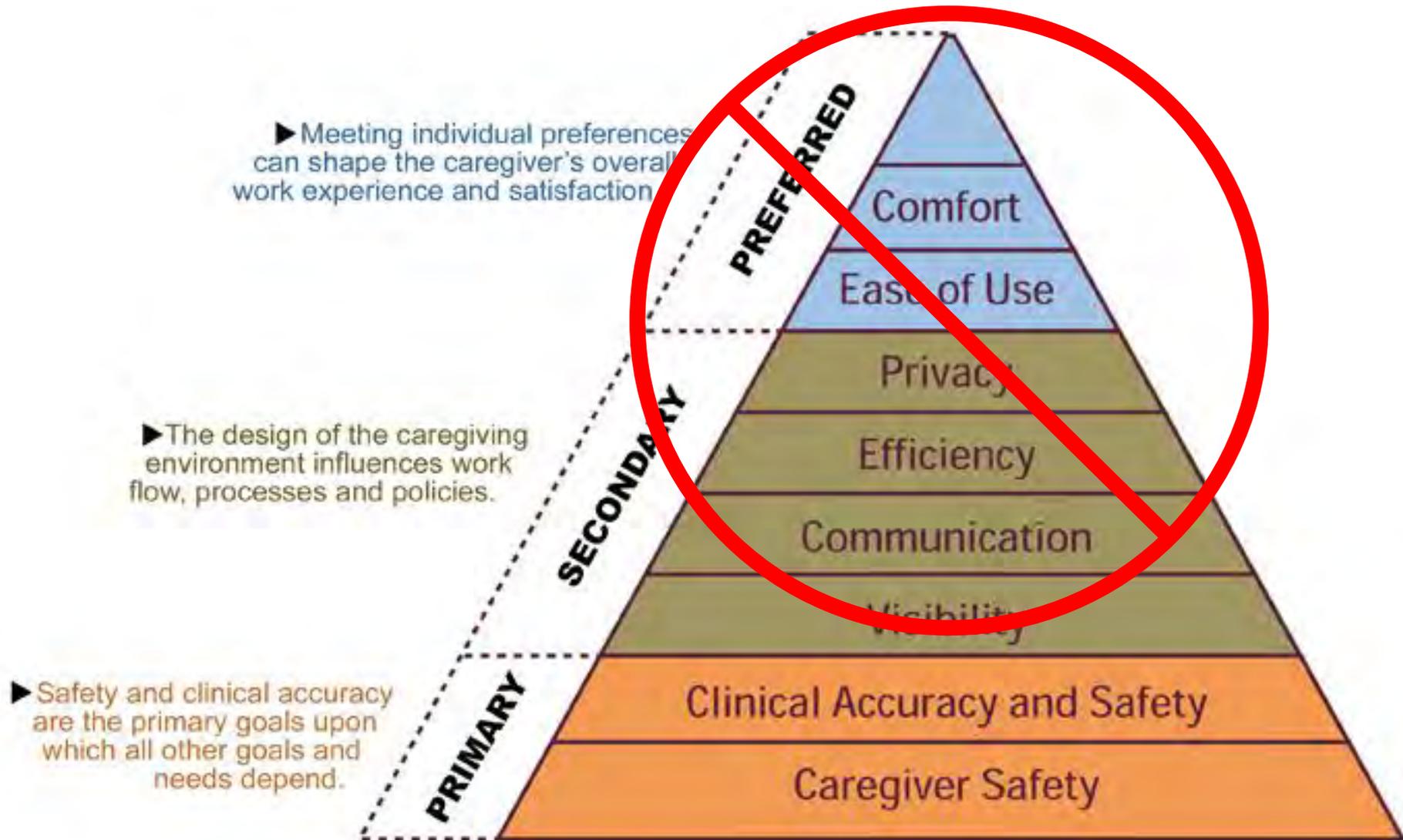
Genba (現場, also Romanized as **gemba**) is a Japanese term meaning "the actual place". Japanese detectives call the crime scene genba, and **Japanese TV reporters may refer to themselves as reporting from genba.**

Gemba Kaizen is a Japanese concept of continuous improvement designed for enhancing processes and reducing waste. Within a lean context, **Gemba simply refers to the location where value is created,** while **Kaizen** relates to improvements.

- Where work is done
- Where the Value is Created
- Where the **problems are owned and solved**
- Where the operators (**or in our case clinicians**) work



In Healthcare, work takes place at **THE POINT OF CARE** wherever the patient is. These are our priorities.....



SO WHERE DO WE
START?



HICS Code D Activation Levels

A = Assessment Level
 L1 = HICS Level 1 (Includes the A)
 L2 = HICS Level 2 (Includes A and L1)
 BC = Bridgeport Hospital Main Campus
 MC = Milford Campus

Incident Advisors (A)
 Anne Diamond CEO (BC & MC)
 Pam Scagliarini, COO (BC & MC)

Incident Commander (A)
 Victor Morris
 Alt: Dan Walsh

Dep. Incident Commander (A)
 Dan Walsh
 Alt M. Kosturko

Safety Officer (A)
 Paul Possenti

Public Information Officer (L1)
 John Cappiello
 Dana Marnane

Security Officer (L1)
 Ivan Miranda
 Alt D'andra Brown

Liaison Officer (A)
 Paul Possenti
 Alt. John Pelazza

OEP / SIM Liaison (A)
 J. Pelazza, J. Paturas

Medical Staff Director (A)
 Rock Ferrigno (BC)
 Alt G Buller (MC)

Operations Chief (A)
 M. Kosturko (BC)
 Alt: Mary Christoffersen

Planning Chief (L1)
 Gini Neglia
 Alt: Peg Parniawski

Logistics Chief (L1)
 Gina Calder
 Alt: Steve Jakab

Finance Chief (L1)
 Gene Colucci
 Alt: J Del Mastro (BC) & (MC)

Medical Care Director (A)
 Greg Buller (BC)
 Alt M Misra (MC)

In Patient Area Supervisor (A)
 M. Christoffersen (BC)
 Alt P Parniawski

Treatment Area Supervisor (L1)
 Justin Cahill
 Alt Rich Greiner

Ancillary Services Director (L1)
 Mahfuz Hoq
 Alt. Vicki Winks
 Tert. Post Doc Fellow

Sit-Sat Leader (L1)
 John Palumbo

Facility Unit Leader (L1)
 Peter Romano (BC)
 Zbig Lukpmski (MC)

Time Unit Leader (L2)
 Vernetta Gray (BC) & (MC)

Medical Staff Office Unit Leader (L2)
 Laura Nasufi (BC)
 Karen Fernandez (MC)

Surgical Services Unit Leader (L1)
 Diane Youd (BC)
 Janet Serra (MC)

Triage Unit Leader (L1)
 Keri Bill

Lab Unit Leader (L1)
 Teodorico Lee (BC)
 Will Jones (MC)

Labor Pool Leader (L1)
 Barbara Spodnick (BC)
 Alt. Lisa Czaplinski
 Alt. OSAM

Damage Assessment & Control Officer (L1)
 Jack Thomson (BC)
 Zbig Lukpmski (MC)

Claims Unit Leader (L2)
 Carlos Cuevas (BC) & (MC)

Physician Leads (L2)
Surgery
 Atweh/Greg (BC)

Psychiatric Services Leader (L2)
 Kathy Pontes

ED Treatment Leader
 As assigned

Radiology Leader (L1)
 Mike D'Angelico (BC)
 Alt Marie Mueller

Patient Information Unit Leader (L1)
 Shannon Kemp (BC) & (MC)

Communications Unit Leader (L2)
 Jodi Kszywanos (BC)
 Alt Lorri Koepke

Cost Unit Leader (L2)
 Debbie Miller (BC) & (MC)

Medicine
 Augustyn Andoh-Duku

Maternal-Child Unit Leader (L2)
 Kelly Reddington

Urgent Treatment Leader
 As Assigned

Pharmacy Leader (L1)
 Theresa Papstein (BC)
 Chris Flores (MC)

Patient Tracking Leader (L2)
 Tina Ferreira
 Alt Nestor Kaplan

Materials Supply Unit
 N. Cioffi (L1)
 Procurement Leader (L2)
 M Jovovich (BC)
 Karen Santos (MC)

Business Continuity Leader (A)
 John Pelazza (BC & MC)
 Bill Halstead (BC & MC)

ED
 Rich Greiner

Pediatrics / NICU Unit Leader (L2)
 Julie Brown

Non-Urgent Treatment Leader
 As Assigned

Respiratory Therapy Leader (L1)
 Jose Jimenez (BC)
 Chris Yarson (MC)

Human Services Leader (L1)
 Jodi Boldrighini
 Alt. Ron Johnson

Information Tech. Unit Leader (L1)
 Diane Forni (BC)
 David Cegan (MC)

Nutritional Supply Unit Leader (L2)
 Nicole Guillory (BC)
 John Cukale (MC)

Radiology
 Paul Himelfarb / I Karol

Gen. Nursing Care Unit Leader (L1)
 Peg Parniawski
 Alt. Andy Quito

Discharge Unit Leader
 As Assigned

Ambulatory Sites Unit Leader (L2)
 Kathy Oraziotti (BC)
 Alt Michael Schaffer

Staff Support Unit Leader (L2)
 Ron Johnson
 Alt Jeff Komornick

Transportation Unit Leader (L1)
 Vesel Haxhillary (BC) & (MC)

Sanitation Systems & Control Officer (L2)
 Vesel Haxhillary (BC)
 Margaret Gamache (MC)

Hospitalist
 Monique Misra
 Mike Rudolph

Critical Care Unit Leader (L1)
 Anne Aquila
 Alt. Jackie Laird

Morgue Unit Leader (L2)
 Jeff Bluege (BC)
 Nestor Kaplan (MC)

Psychological Care Unit Leader (L2)
 Adrian Budica

Dependent Care Unit Leader (L2)
 Karen Kipfer
 Alt Andrea Iacomacci

Biomed Engineering Leader (L2)
 Dan Tichon (BC)
 Frank Rose (MC)

Not on HICS but on notification list
 Peggy Beley (A) & (L1) & (L2)
 OSAM (A) & (L1) & (L2)
 AOC (A) & (L1) & (L2)
 ED Charge (A) & (L1) & (L2)
 IT VPs (A) & (L1) & (L2)
 Steve Tortora (A) & (L1) & (L2)
 Nursing Supv. (L1 & (L2)
 Stacy Vaeth (L1 & (L2)
 Wes Young (L1 & (L2)
 Karl Schmidt (L1 & L2)
 Jack Merionyak L2
 Magna Dias (Ped) L2
 T Vander/Vennet L2
 Stuart Zarich L2
 Karen Hutchinson L2
 C Arizmendi L2
 C Bonacci L2
 G Mejias L2
 K Pallant L2
 H Ruff L2
 D Goffman L2
 Robert Nelson L2

Laboratory
 Paul Cohen (BC)

Outpatient Services Unit Leader (L2)
 Gary Smart
 Alt. Lisa Silk

Volunteer Unit Leader (L2)
 Elizabeth Locke (BC)
 Christine Brown (MC)

Biomedical Engineering Leader (L2)
 Dan Tichon (BC)
 Frank Rose (MC)

Psychological Care Unit Leader (L2)
 Adrian Budica

Sanitation Systems & Control Officer (L2)
 Vesel Haxhillary (BC)
 Margaret Gamache (MC)

Biomed Engineering Leader (L2)
 Dan Tichon (BC)
 Frank Rose (MC)

Anesthesia
 K Stone

OB
 Harold Sauer

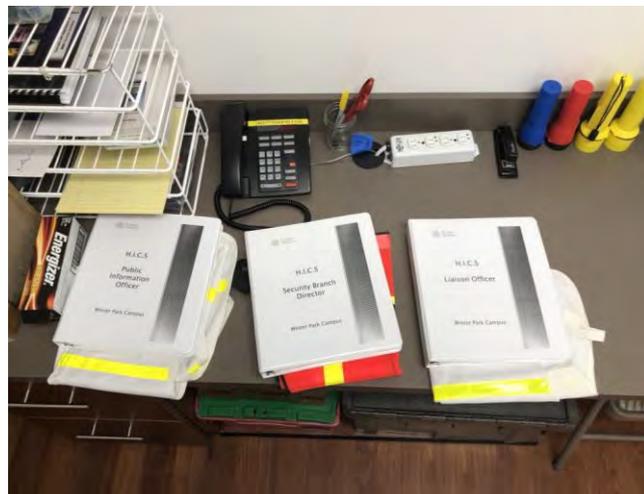


Emergency Operations Center (EOC)

- Outfitting with phones, computers, additional electrical outlets tied to a dedicated UPS electrical circuit.
- Separate Division chief areas of work
- Multiple doors for optimizing workflow in and out of the room.
- EOC must meet the National Incident Management System (NIMS) and Hospital Incident Command System (HICS) compliant.



This.....



Is Better Than This



Emergency Operations Center (EOC) at Bridgeport Hospital in Connecticut.

- Food and water considerations for long duration events.
- Each division should have it's own table and comms set up.
- Consider minimal bunking arrangements in the space as well.





....or lots of screens.





Emergency Notification



Requirements should include:

- Mass Notification of all Employees/Community Partners.
- Ability reach, by radio, all areas of the hospital, what effect does lead shielding have, do you need to install an in-house repeater system?
- Redundant call-in feature if Internet is down.
- Pre-plan with cellular service to have portable cell towers brought in.
- Ensure that overhead paging reaches all areas of the facility.
Can the EOC reliably connect to the Operator for paging?



DECONTAMINATION

An area MUCH LARGER than most decontamination rooms inside the facility must be accounted for at a moment's notice. Most of our current standards speak to the decontamination of one or two patients at a time, not 40 victims of an RBC (Radiological, Bio-Hazard or Chemical) event. Water flow/run-off must also be considered. Plans must be re-assessed every year and before the start of any onsite construction.





Question: What has been the most positive unintended consequence on nurses from this event?

- **ED Nursing Perspective** -Paula A. Fessler RN, BSN, MSN, MS, FNP-B-C, Chief Nurse Executive, Senior Vice President, Patient Care Services; Westchester Medical Center, NY.
- Success depends on decompressing ED. Did pre-screening outside ED. Posted phone numbers for calling ahead. Put up triage tent. Also rearranged ED to separate patients. Volume dropped for non-COVID, biggest was pediatrics and moved that to a small section apart.
- Infection control was very important. Two-hour test has helped conserve PPE. Had donning/doffing coaches. Team nursing and cross-training.
- **Through-put was the most important in ED. Opening new beds for ICU patients upstairs to make sure ED was ready to take the next patients**



We have learned that Through-put is better than park

Patients who are not critical and can be ADEQUETLY managed in a non-critical/non traditional setting should be quickly moved through to create room for more critical patients. This is a key element of a successful MCI event.

This is where the design aspect and equipment planning at the concept of staging comes in. Talk about alternate locations in the design process. Also think reunification with family members.





- **Re-Purposing Emergency Department Space**
- Another aspect of the training that was of paramount importance after the Pulse nightclub shooting was the shift of the physical emergency department from a treatment area to a triage area. At [Orlando Regional Medical Center](#), the ICU/PACU became the treatment area because they expected another patient surge.
- Mass casualty incident training taught us what our emergency management policies needed to contain, including:
 - **Available carts**
 - **Surge locations**
 - **Establishing a corporate command and/or site command center**
 - Calling for back-up/mutual aid from area hospitals

Rapid deployment of additional Medical Gas Services

- The need to surge patients into a critical care space has never been seen on this scale.
- Managing the expansion of medical gas services without compromise and in a rapid fashion is critical to a successful adaptation to real-world needs.



- There may not be gas services available where care needs to be provided.

- Multiplexing outlets and dragging hoses to remote locations sets up the facility for damaged outlets and trip hazards. We will revisit a better option later in the program.





The new FGI guidelines for Emergency Conditions also makes a reference to incorporating means to rapidly deploy medical gas delivery systems.

Figure 2-11: Medical Gas Expansion Rail



 **FGI** The Facility Guidelines Institute

Guidance for
Designing Health and
Residential Care Facilities
that Respond and Adapt to
Emergency Conditions

FGI Emergency Conditions Committee

Integration by design of an equipment management rail allows for safe and clinically appropriate on-demand gas expansion.



Some hospitals faced an oxygen shortage amid COVID-19 crisis:

"We burn through oxygen every day," a New York doctor said.

Hospitals across the U.S. battling [the coronavirus](#) have been consistently reporting shortages of personal protective gear, ventilators and drugs used to help patients with pain management. But medical professionals in the state that's become the front line in America's fight against [COVID-19](#) say **they're concerned about the flow of oxygen itself to patients.**

"The hospital was close to running out of oxygen," said an emergency room doctor at Elmhurst Hospital in Queens, New York, which has become known as the epicenter of the outbreak in the state. **"With the number of patients we have, we are using up resources at an unusual rate."**



Access to med gas in other areas:

For non-traditional point of care locations, there are now portable high-volume gas delivery systems on the market which can bring enough oxygen to support a ventilated patient.





What If.....you could bring high-capacity Oxygen delivery systems to any location on demand?

- Lightweight carbon fiber bottles are the equivalent of a standard “M” cylinder, which normally alone weighs 50 pounds full.
- Each of these bottles weigh 13 pounds full and the entire unit weighs less than 50 pounds and is entirely portable.

3. Recent advances in oxygen delivery technology include a lightweight carbon fiber tank integrated with a portable manifold system, which delivers high-capacity oxygen in a portable package. The device may be wall-hung on a rail system or integrated into a mobile cart.

4. Another solution, noted from an interview during the COVID-19 pandemic, is to add permanent headwalls into non-traditional care areas such as waiting rooms. This, along with option 1 described above, would require increased capacity to the overall gas delivery system, including storage capacity, evaporators, and piping systems.

Figure 2-12: Carbon Fiber Medical Gas Tank



Portable and lightweight tanks can provide on-demand high-capacity oxygen where patient care is provided (e.g., hotels, gymnasiums, surge areas in hospitals).

Source: Paladin Healthcare, LLC



Guidance for Designing Health and Residential Care Facilities that Respond and Adapt to Emergency Conditions

FGI Emergency Conditions Committee

Cross contamination

- Patient care providers (people) and their safety are the first and most important aspect to managing any MCI event. (Refer back to the chart).



This.....



Is better than this



An erector set concept allows for any level of technology to be managed in mobile tent applications.



Flexibility with space is key in planning the response to a surge event..... So What If?

What if the hospital main lobby was designed to become the ER overflow space?

What if the cafeteria was designed as a “walking wounded” gathering space where patients could re-connect with worried loved ones?

All of this is possible with situational understanding and application of the proper mindset on the front end of the design process....in other words, **Master Planning.**



The Regulatory and A & D components of our industry **must, at some point,** realize that in a crisis situation aesthetics do not matter!



When hallway patients are a given, staff and patients deserve at least the basics.

Access to PPE, basic equipment, supplies, and disposal of hazardous sharps and waste are at the most critical of needs.



This.....



Is Better Than This



What If... you could bring a self-contained system of clinically appropriate technology and PPE to any point of care location immediately and without long delays or set up times?







What If... gas outlets were pre-positioned behind artwork in a lobby. Now envision the deployment of mobile equipment stations to these areas, where, in a matter of minutes, an entire triage and patient care environment can be created.





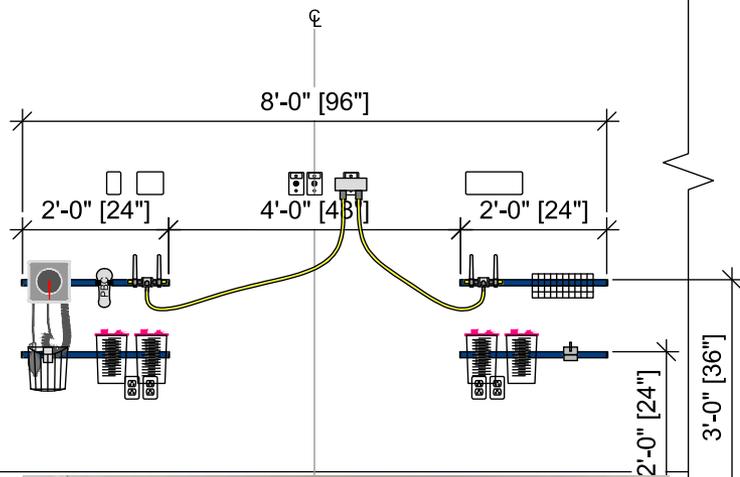
Think about how easy it would be to deploy gas services like this without bringing in a large tank!





What does the future of medical gas delivery look like?

We need to start thinking about future-proofing our designs and giving our users teams the ability to RAPIDLY adapt to conditions on demand.





Wayfinding, especially for triage during surge

This is a common current method of wayfinding in a mass casualty scenario.



...works great, if the person, who knows where these are stored, is in house

...what happens at 3AM on a weekend shift?





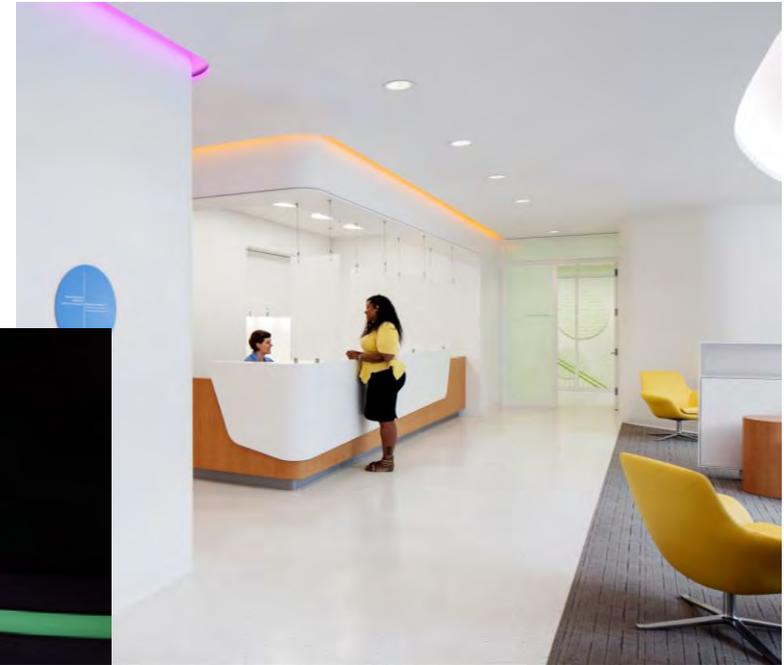
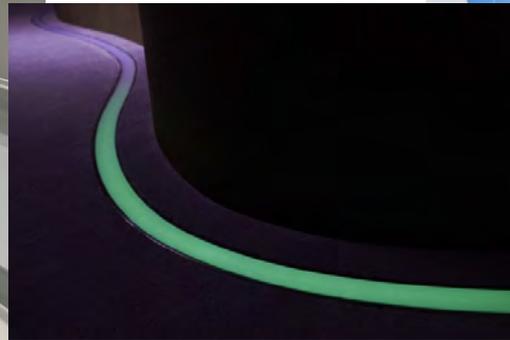
During a Mass Casualty Incident, mutual aid EMS units unfamiliar with the local hospitals pour in from around the region?



Transport units from many different agencies will stage at a common location and transport patients to whatever facility can manage the next wave.



Let's talk about lighting as an aid in directing traffic.



What If... we would integrate LED lighting into our designs dedicated to an emergency incident to intuitively show the way to various designated triage areas.

**Green lighting for low acuity.....Yellow for moderate severe.....
.....and Red for Critical**



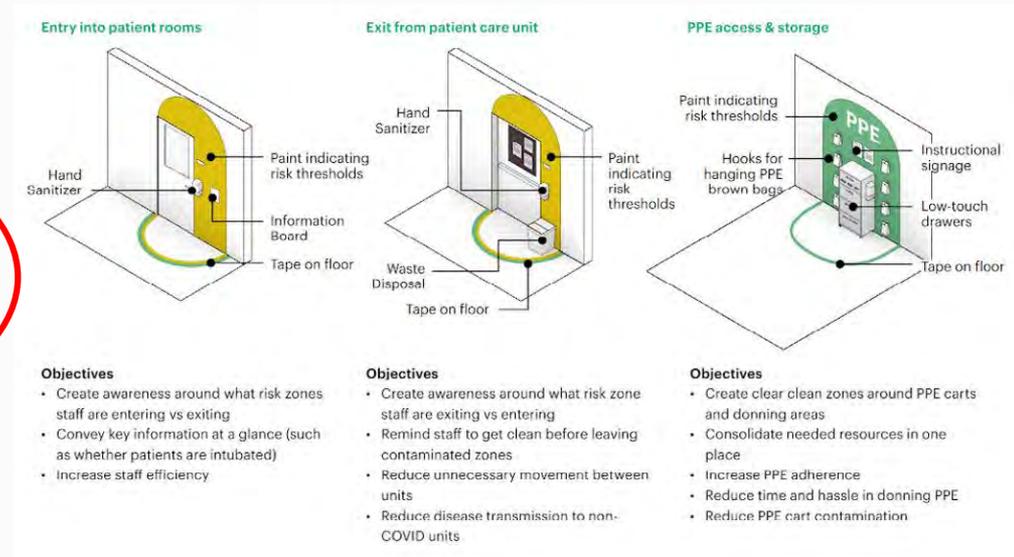
Lighting Systems and Wayfinding

When patients surge into new areas of a health care facility, support staff will be required to quickly assess the risks from entering these locations. To alert staff to these changes in use, clear visual cues should be provided for those entering and exiting areas that pose a high risk of exposure to infection or contamination (the heat map in Table 1-1 can be a useful tool for identifying risk levels). Organizations should develop interior and exterior signage and other visual cues (e.g., signs for “contaminated” and “clean” areas) that have consistent colors and symbols, regardless of location; this practice will make the signs more effective.

New light-emitting diode (LED) lighting products provide opportunities for patient wayfinding support during an emergency event. For example, color-changing LED lighting that corresponds to the standard colors of patient triage (i.e., green for walking wounded, yellow for those who are currently stable but need care, and red for those who need immediate care) can be incorporated into the ceiling or floor. These lights can then be activated when an emergency condition arises to immediately define pathways for staff, patients, and visitors.

In existing facilities where LED lighting for directional purposes cannot easily be added, graphics may be used to communicate risk to caregivers and staff throughout the hospital. An example of this approach is described in “The Role of Architecture in Fighting COVID-19: Redesigning Hospital Spaces on the Fly to Protect Healthcare Workers,”²⁰ which documented the work of a team of designers, researchers, and clinicians from Mount Sinai Hospital in New York City as they prepared to address infrastructure modifications during the COVID-19 pandemic.

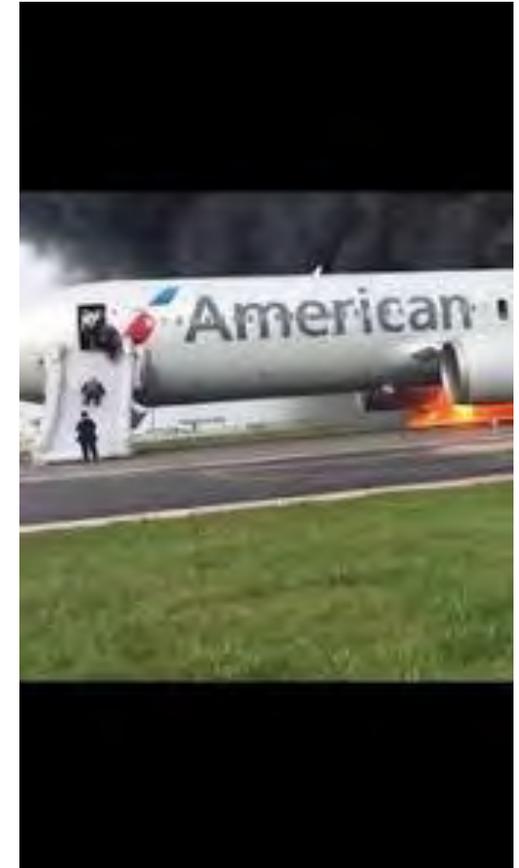
Figure 2-9: Sample Risk-Based Signage and Visual Cues



Source: Ariadne Labs + MASS Design Group



After all...we have used this lighting as a concept to guide people during emergencies for decades



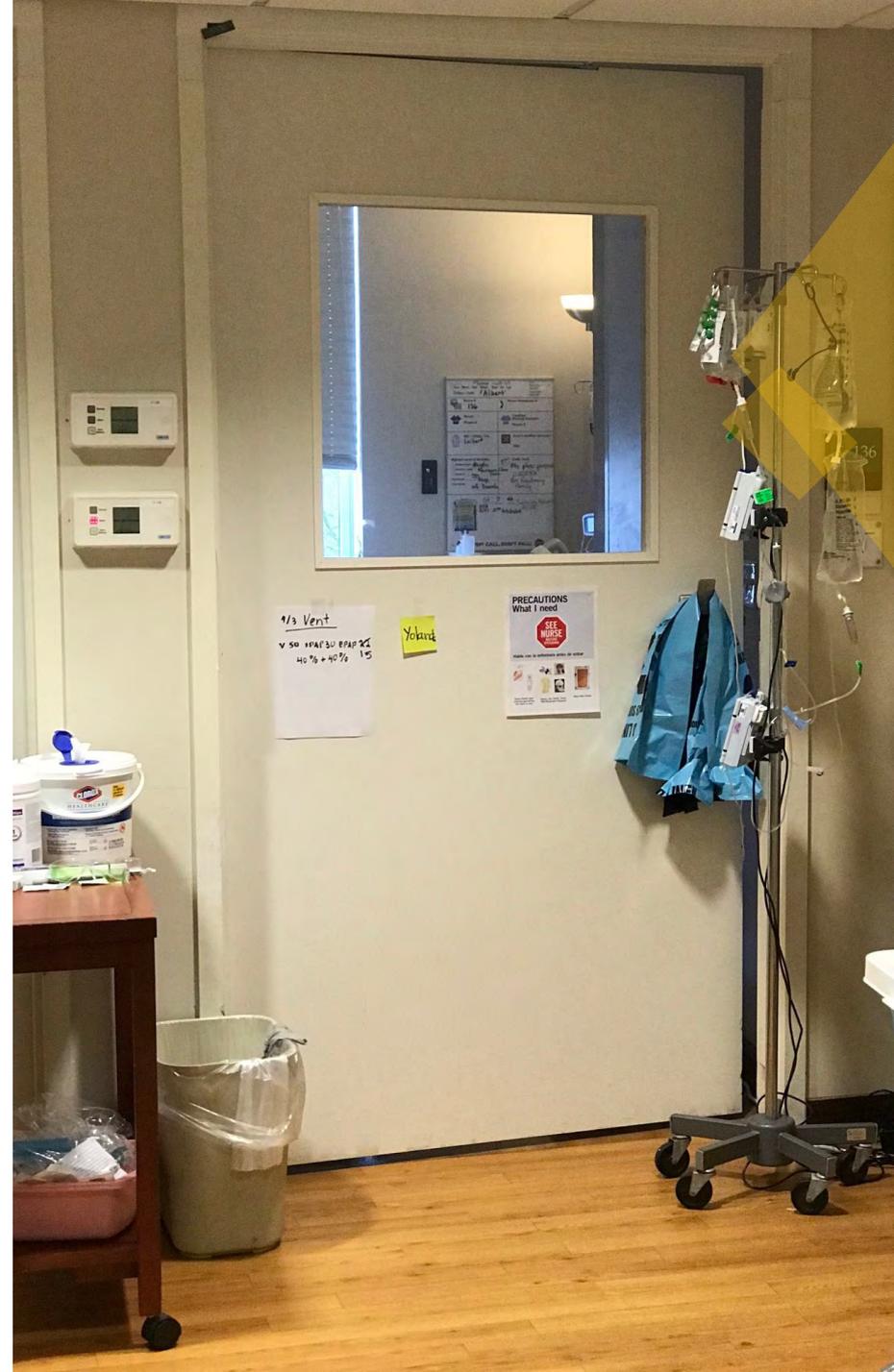


WHAT HAVE WE LEARNED SO FAR FROM COVID-19
AND
WHAT DO WE STILL HAVE TO LEARN?

We have learned that not all rooms are equal:

At the beginning of the COVID crisis, this Med-Surg patient room door had no window

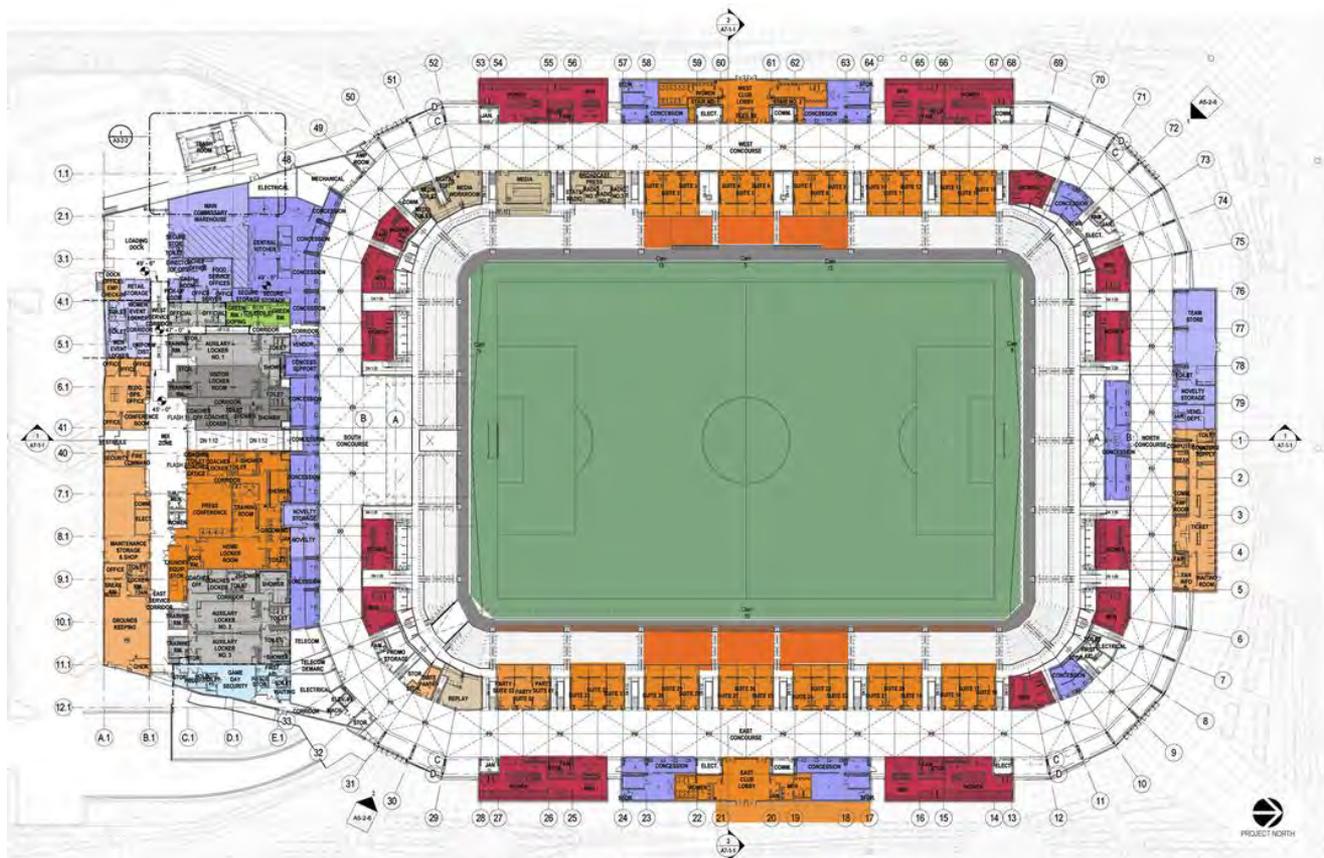
- Critical Care rooms should have patient viewing capability.
- In this case, the facility utilized in-house resources to create window openings and add plexiglass so nursing staff could view the patient without opening the door.
- This facility is now considering windows in all new patient room doors, regardless of acuity as a default design, and adding blinds if privacy is needed.





WE HAVE LEARNED:

That public venue projects and public/government facilities should be identified and designed with the deliberate intent to support a public safety role in time of a crisis.







WE HAVE LEARNED:

.....that every public arena such as sports stadiums, convention centers and so on, can be “pre-planned” to stage emergency medical supplies.

.....that if all these venues had a medical pre-plan so that patients could be collected, triaged and MANAGED on site we would be better prepared for the next event.

COVID-19 is not the first time these facilities would have come in handy....

Think back to the terrorist incidents such as Ariane Grande’s Manchester UK concert bombing, or the Las Vegas Shooting incident, but also in the case of natural disasters. After Hurricane Katrina they used the Super Dome in New Orleans, and after Hurricane Harvey, the Convention Center in Houston.



Rethinking the Hospital for the Next Pandemic

The coronavirus caught hospitals flat-footed. Now, worried about a resurgence and future infectious diseases, they want to make sure that doesn't happen again.

Preparing for a surge

But preparing for a crisis doesn't mean just making the traditional emergency room safer. When a crisis hits, hospitals are often hugely overcrowded, so patients are often stuck waiting for attention from overworked staffers. And that can mean catching an infectious disease like Covid-19 or worsening your condition due to other hazards and infections if you are already afflicted.

COLISEO JUAN AUBIN CRUZ ABREU "BINCTO"



It's been done before!



Appendix 3-4: Case Study—Coliseo Juan Aubin Cruz Abreu, Manati, Puerto Rico

Hurricane Maria struck Puerto Rico as a Category 5 storm in September 2017. Winds topped out at 175 miles per hour, devastating the island and causing nearly 3,000 fatalities. This took place only two weeks after Hurricane Irma had struck the island, which meant that more than 80,000 residents were still without power when Maria arrived. The second hurricane completely destroyed the island's power grid, left 44 percent of the population without water, and eliminated 95 percent of the island's network connections. One week after Maria, only 11 of 69 hospitals were receiving electricity from generators.

The immediate medical response came from the Federal Emergency Management Agency Disaster Medical Assistance Teams based in Florida, which were on the ground in Puerto Rico within 48 hours. They began

Figure A3-9: Arena Used to Provide Health Care



Source: Battalion Chief Juan Atan, Firefighter/Paramedic, Orange County Fire Rescue

by identifying alternate care sites that could serve local communities throughout the island. Roads were impassable, so most patients traveled by foot. Within 72 hours, the Coliseo Juan Aubin Cruz Abreu basketball arena in Manati, a community about an hour and a half outside of San Juan, was taking in patients while operating at a basic level of efficiency.

Short-Term (Immediate) Actions

Upon arrival, medical teams found no electrical service to the facility, no backup generators, and no water service. Note that the immediate need for caregiver safety necessitates prompt deployment of very rudimentary care stations equipped with small portable generators. Larger generators were found within 48 hours,

Figure A3-10: Patient Care Areas Inside the Arena



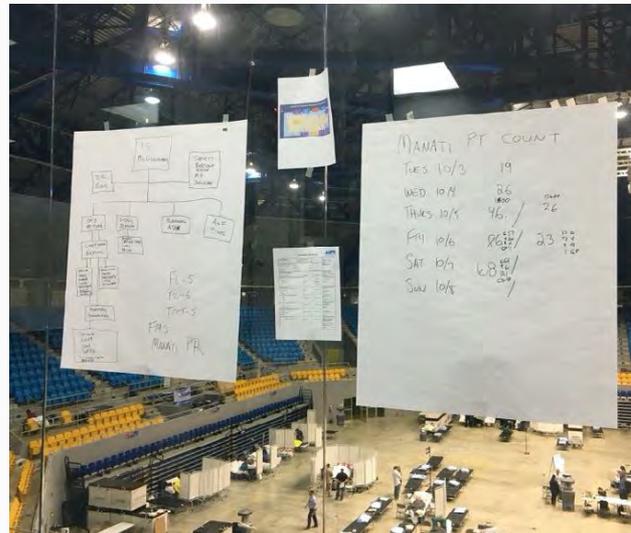
Source: Battalion Chief Juan Atan, Firefighter/Paramedic, Orange County Fire Rescue

and a local fire department tanker truck was commandeered to provide some basic water supply, but it was not possible to provide functioning toilets. Tents were set up inside the arena for provision of immediate emergency patient care. Tent roofs were left uncovered because the arena's overhead lights were able to support patient care processes once generators were activated. Fire safety sprinklers were not a consideration due to the absence of the water and electrical services required to operate the system's pumps.

Temporary Actions

Primary public access was routed through the front door of the arena, while the ambulance entrance was in the rear. No loading docks or refrigeration spaces were available. There also were no on-site mortuary accommodations, but fortunately this care site did

Figure A3-11: Managing the Alternate Care Site



Source: Battalion Chief Juan Atan, Firefighter/Paramedic, Orange County Fire Rescue



They just did not need to put the roof on the tents they set up



U.S. ARMY CORPS OF ENGINEERS (AS OF: 12-JUN 0700)

COVID-19

CORONAVIRUS

COVID-19
RESPONSE DAY



USACE
ENGAGEMENT 50/5
States / Territories

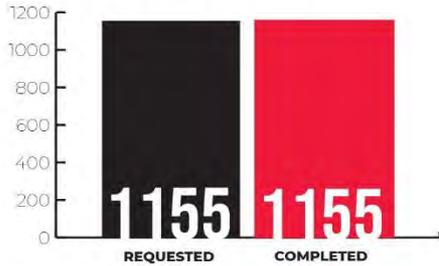
ADMINISTRATIVE

MISSION ASSIGNMENTS **64** OPEN: 3
CLOSED: 61

CUMULATIVE FUNDING **\$1.8B** MA: \$1.8B
NEPP FUNDING: \$21.6M

ENGAGED PERSONNEL / DEPLOYED: 75
SUPPORTING: 253

ASSESSMENTS



ALTERNATE CARE FACILITY TOTAL BED COUNT

15,074



U.S. Army Corps of Engineers®

BUILDING STRONG®

SIMPLE SOLUTIONS FOR A COMPLEX PROBLEM

For more information about what the Corps is doing in response to COVID-19 visit: <https://www.usace.army.mil/coronavirus/>

USACE works in conjunction with the entire federal eco-system during responses like COVID-19 through FEMA learn more about their mission here: <https://www.fema.gov/coronavirus>

ALTERNATE CARE FACILITY CONSTRUCTION



ARENA TO HEALTHCARE (A2HC)
603 Assess Complete 21 Sites Selected 12,184 Beds 0 Pending Contracts **21 Contracts Awarded**



HOTEL/DORMS TO HEALTHCARE (H2HC)
552 Assess Complete 17 Sites Selected 2,890 Beds 0 Pending Contracts **17 Contracts Awarded**

ARENA TO HEALTHCARE (A2HC)

603/603
Assessments Complete



12,184 Potential Beds

HOTELS/DORMS TO HEALTHCARE (H2HC)

552/552
Assessments Complete



2,890 Potential Beds



ENGINEERED SOLUTION PLANS
Approved site adaptations must be accomplished in as little as 5 days and at most 2 weeks to align with state projected virus infection peaks.

4 STANDARD DESIGNS



College Dorm



Hotel



Sports Arena



Convention Center

All 4 designs can be adapted to serve COVID and NON-COVID patients.

PROJECT COMPLETION



38 OF 38
COMPLETE





The briefing in summary

AIA COVID-19 Task Force 1: Health Impact
Briefing #1 April 6, 2020

COVID-19 alternative care sites: Addressing capacity, safety, & risk challenges for our nation's hospitals during a public health pandemic response

Coronavirus Disease 2019 (COVID-19)
Alternative Care Sites (ACS)
Preparedness Assessment
Tool V1.0

1.3.5.1 Medical gas

- Provide accommodations for oxygen, medical air, and vacuum to support intubation and ventilator operations.
- Ensure availability of a rated storage container or room for bottled oxygen.
- Confirm availability of storage for empty oxygen tanks.

Experience from clinicians at the front line

Health care workers at the front line of the COVID-19 pandemic can provide architects and designers with critical perspectives on how hospital design is currently working (and what is sorely lacking) in this crisis. Although all hospitals have disaster plans in place, the deployment of these plans within a rapid response pandemic has never been tested. **The unprecedented scale and spread of COVID-19 has put the US health care system and its health care workers at tremendous risk. Thus, clinicians are essential partners for design teams seeking to circumvent the overwhelming burden of disease stressing the health system capacity and its workforce.**



Queens Stadium to Be Converted Into Temporary Hospital in Coronavirus Fight

Training facility at Billie Jean King Tennis Center will have 350 beds as Covid-19 cases surge in New York



How do you do this in 5 days or even in 2 weeks?





Mobile tents work great when the weather cooperates.....
December in NY and this would not be an option.



Moving Surge tents into a public venue first takes availability, then time and manpower, not to mention access to the venue. Think broken infrastructure after a Hurricane or Earthquake, or limited manpower when first responders are ill during a pandemic.



■
This is the Orlando Citrus Bowl/Camping World Stadium...54 bed field hospital being set up for the Electric Daisy Carnival... took DAYS to move in and set up, under IDEAL conditions.

What if power generation, A/C units had capability to “plug in” to the building or if specific areas inside the building were pre-planned and staged in every such venue?



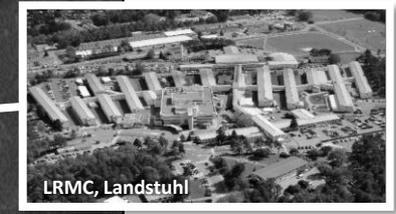
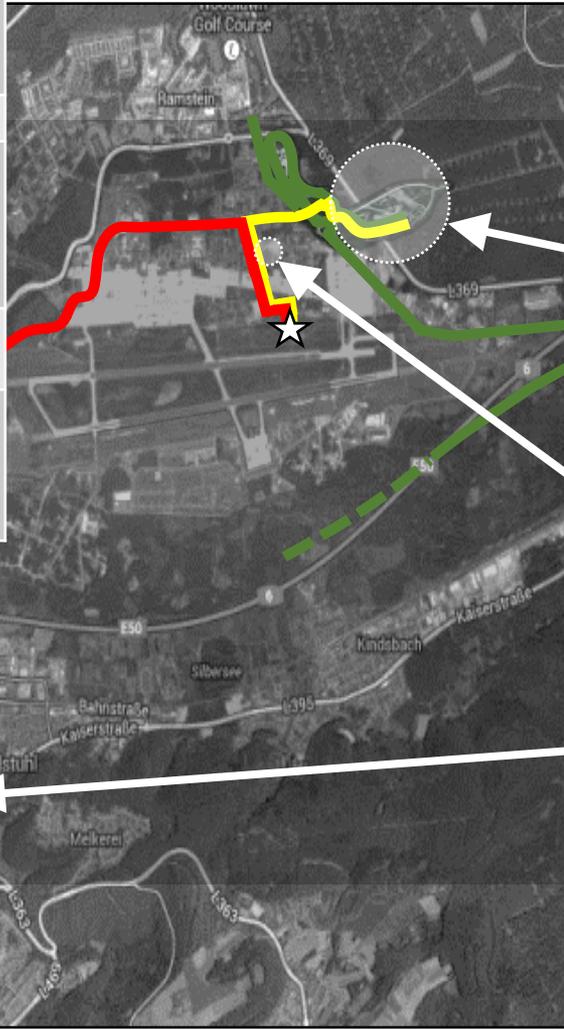


What if we would pre-plan parking lots or green space for power and water to reduce set up time for surge tents?

PROJECT OVERVIEW

Scope	985,422 square foot recapitalization and collocation of LRMC and 86MDG Health Clinic Provides: Medical Center and supporting infrastructure (roads, parking, utility plants and network) Capabilities: 9 operating rooms, 68 beds (expandable to 93) and 120 exam rooms
Cost	\$1.59 billion, incrementally funded
Status	Construction contract awarded Dec 2021 Site development and infrastructure underway Utilities to site, Access Control Point and bridge complete
Schedule	Construction Completion 2027 First Patient 2028
Expectations	World Class quality for patient-focused care Peacetime and contingency mission support DHA/Army/Air Force clinical interoperability

Rhine Ordnance Barracks Medical Center (ROBMC)



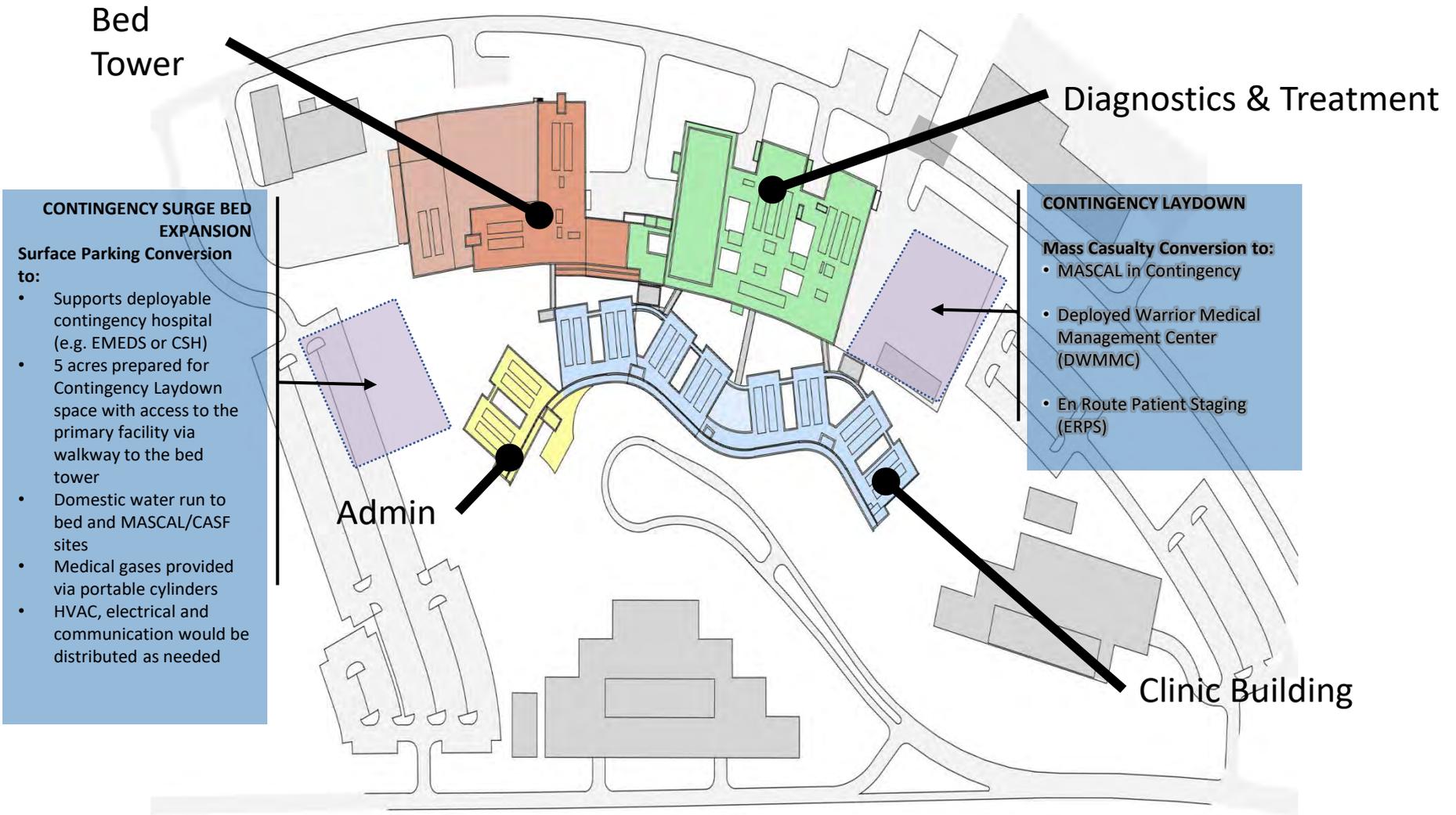
PATIENT TRANSPORT FROM FLIGHTLINE
 Unsecured travel to LRMC
 13KM
 Secured travel to ROBMC
 3KM
 Access from A6



Design Rendering – North-facing Medical Center Patient Access

Optimized Location for Medical Hub

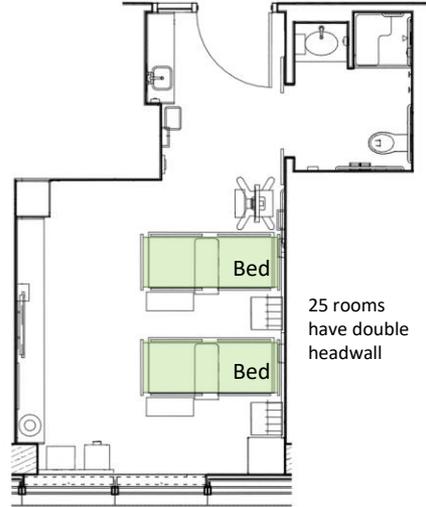
Exterior Contingency/Surge Capabilities



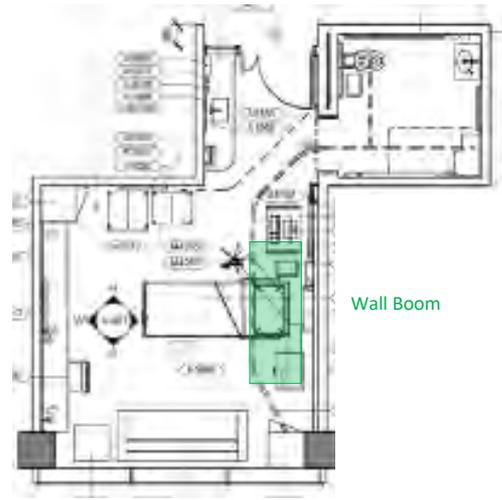
Versatile Patient Rooms



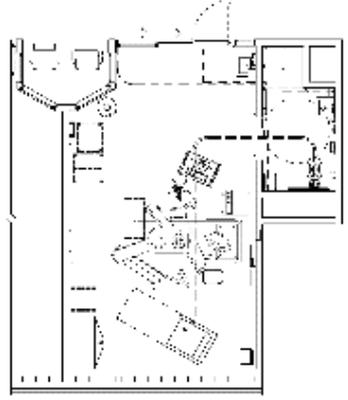
Standard



Contingency



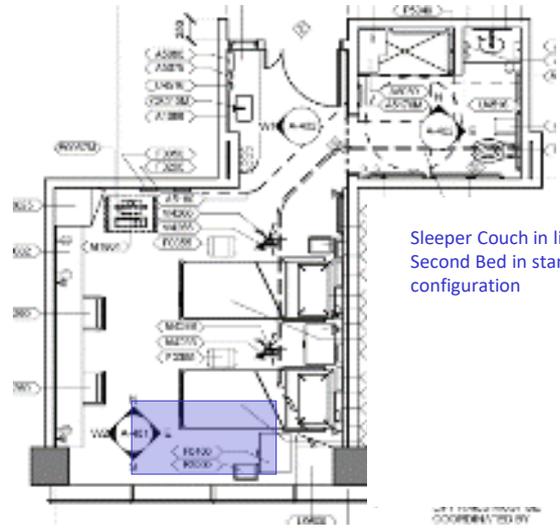
Acuity Adaptable/Step-up ICU



ICU



LDR(P)



Med/Surg/Peds/OB
(shown in double headwall configuration)

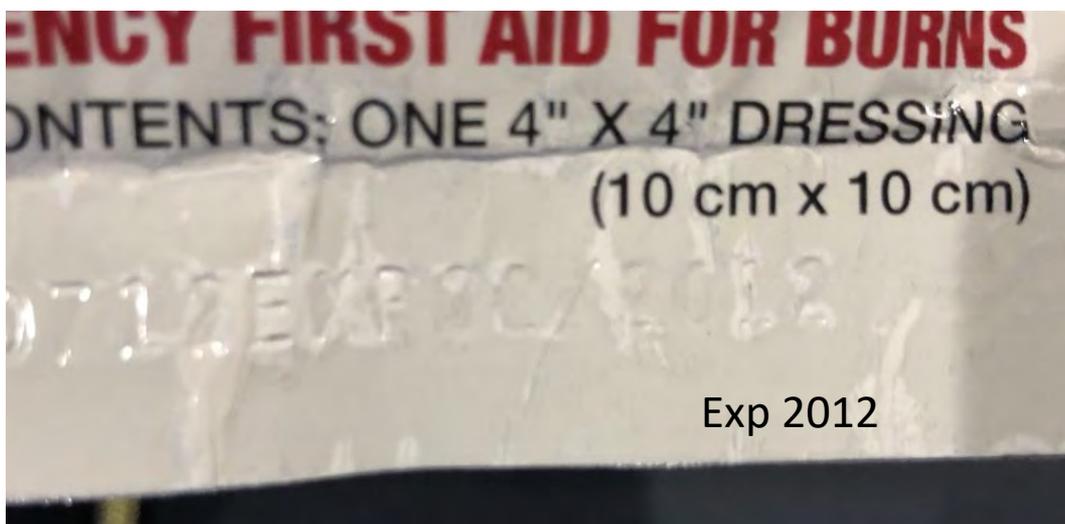


What if that shelter was solar powered and could be flat packed along with all needed supplies in a self-contained trailer?





WHAT IF hospitals took their expired goods and re-purposed them for a mass casualty response. The patient / victim of an MCI will not care if the gauze pad or IV tubing was expired by a year or two or three.





Bulk storage of medical supplies in the pre-hospital setting are rarely checked for expiration dates... hospital supplies should fall under the same category.



Every time Joint Commission comes around, we scour our closets for anything expired, and send millions of dollars worth of these consumables to underdeveloped countries who use them for years to come.

WHAT IF expired inventory were stockpiled for 5 years in an easily deployable manner at every point of care location for a time such as our current situation.

Sadly, this will not be the last large-scale event we will need to manage.



TERMINAL CLEANING

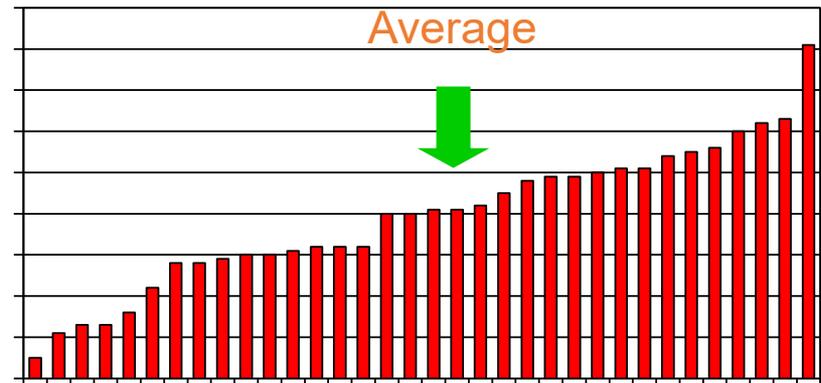
HOW DO WE DEFINE
TERMINAL CLEANING IN A
POST COVID-19 WORLD?



What is the Track Record on Handwashing in Healthcare Facilities?

- A review of 34 published studies of handwashing adherence among healthcare workers found that adherence rates varied from 5% to 81%
- The average adherence rate was only 40%

Average Handwashing Adherence of Personnel in 34 Studies



Published in the University of North Carolina Hand Hygiene Compliance Program Overview



FACTS & FIGURES

Source MCD Medical Construction & Design, Volume 15, Issue 6, November/December 2019

100K

In the U.S., HAIs account for more than **100,000 deaths per year**. — nist.gov

\$161K

Average estimated annual **cost for an infection prevention program per hospital**. — ncbi.nlm.nih.gov

30%

Effective infection prevention and control reduces healthcare-associated infections by at least **30%**. — World Health Organization

\$96-147B

Nationwide, HAIs increase medical **costs annually by around \$96-147 billion**. — nist.gov

50%

50% of surgical site infections can be antibiotic-resistant. — World Health Organization

19.2

An HAI adds **19.2 hospital days and \$43,000 in treatment costs** for an average patient who develops an infection. — cdc.gov

1 in 10

1 in 10 patients, globally, will get an infection while receiving care. — World Health Organization

15-20

15-20 seconds of vigorous hand-washing with soap and water is recommended to effectively kill germs. — cdc.gov

1 in 25

1 in 25 of U.S. hospital patients, are infected with HAI's per year. — nist.gov

35% +

Ultraviolet-C antimicrobial devices reduce the incidence of many HAIs by **35% or more**. — nist.gov



Center for Transforming Healthcare launches new Reducing Sepsis Mortality TST®

The Joint Commission Center for Transforming Healthcare has unveiled a Reducing Sepsis Mortality Targeted Solutions Tool® (TST®), a web-based application to help providers reduce sepsis mortality and increase sepsis protocol compliance in pursuit of zero harm.

Sepsis — a severe reaction in response to an infection — is a top cause of death in hospitalized patients that costs the health care system at least **\$41 billion each year**. It typically affects 1.7 million U.S. patients yearly, with about **270,000 of those cases resulting in death**.

Early recognition and effective treatment of sepsis not only saves lives but also frees up scarce resources and dollars that hospitals need for staff or to rebuild services and infrastructure.



alerts increased by 43%, even though hospitals had cancelled elective surgeries and reduced their census by 35% to prepare for the [COVID] surge,” Singh said. One reason for the higher number of alerts despite a lower patient census is that the patients who filled hospitals during COVID’s first wave were, in general, in more critical condition than elective surgery patients and therefore more likely to generate alerts.

Another reason for the jump in alerts could be a result of “dataset shift,” where a model’s performance will deteriorate when there are sudden, unexpected changes in a hospital’s case mix (e.g., a COVID surge). Singh previously described the phenomenon of dataset shift in a July 2021 *New England Journal of Medicine* paper.

“COVID-19 was a ‘black swan’ event that likely affected many existing models in ways we don’t yet fully understand,” said Singh. “Future studies that use post-pandemic data to evaluate AI models should be careful to interpret their findings within the context of the pandemic.”

And aside from what caused it, “the increase in total alerts is illuminating because it provides a sense of just how busy front-line clinicians were during the first wave [of COVID], despite the lower hospital census,” he said.

The study points to the importance of monitoring sudden increases in alert volume, both to prevent alert fatigue for overworked healthcare workers, and to look into whether some form of dataset shift is affecting a model’s accuracy.

“We need to have a way to anticipate and deal with situations where the alert volume is high,” said Singh. “Even among well-resourced hospitals, there is a limit to the capacity to respond to model-driven alerts. Clinical AI governance is a first step toward providing real-time guidance to health systems when situations like this arise, and for setting standards based on local constraints.”

[University of Michigan Medicine report](#)

[More on COVID](#)

Released
10 December 2021

HEALTHCARE PURCHASING NEWS

CLINICAL INTELLIGENCE FOR SUPPLY CHAIN LEADERSHIP

SURGICAL CRITICAL CARE

Study of 24 U.S. hospitals shows onset of COVID-19 led to spike in sepsis alerts

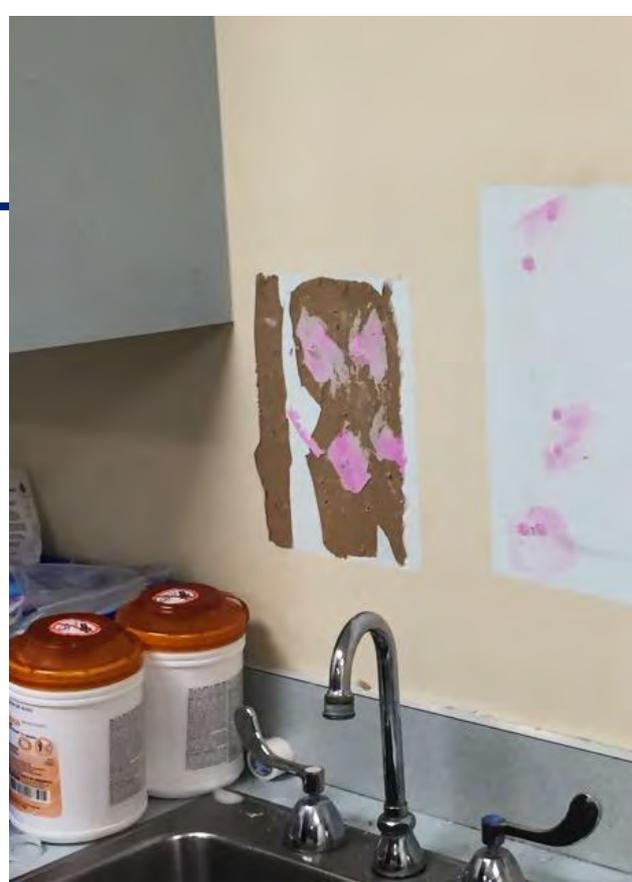
A descriptive study in *JAMA Network Open*—involving 24 hospitals across four geographically diverse health systems looked at the number of sepsis alerts in the months before and during COVID-19 — and found a significant jump in alerts after the start of the pandemic, despite lower patient numbers from canceled elective surgeries.

The hospitals involved were associated with the University of Michigan, New York University Langone Health, Mass General Brigham, and BJC Healthcare.

The Epic Sepsis Model, also known as ESM, is a widely implemented system based on artificial intelligence that will generate an alert if a patient displays a sufficient number of variables indicating a risk of sepsis.

“The ESM calculates a score from 0-100, which reflects the probability (or percent chance) of a patient developing sepsis in the next 6 hours,” explained author Karandeep Singh, MD, MMSc, Assistant Professor in the Departments of Learning Health Sciences, Internal Medicine, Urology, and Information at U-M. Singh also heads U-M Health’s Clinical Intelligence Committee.

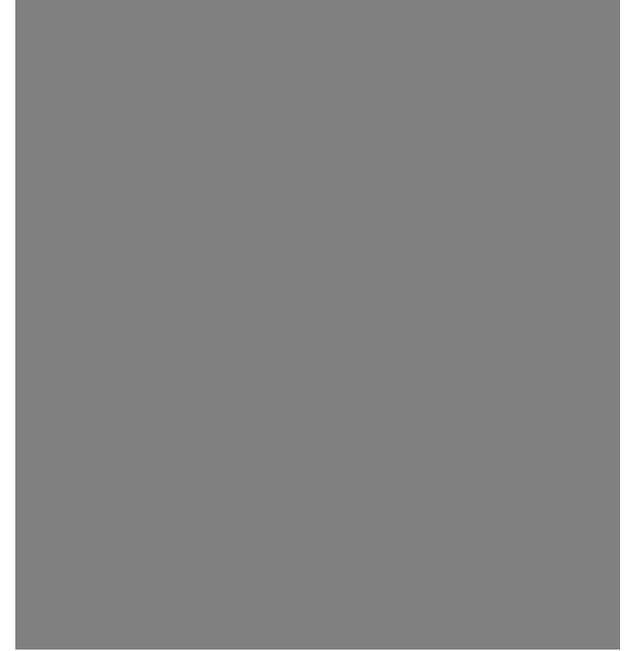
With an alerting threshold of 6, “our study found that the total volume of daily sepsis



If you can't paint behind it,
you can't clean behind it.

Healthcare facilities must be prepared to terminally clean any patient room after discharge of an infectious patient.





What If.... you could strip
and an entire room of all
devices in minutes after
a patient is discharged to
do a TRUE terminal
clean?





CAREGIVERS MUST DEFEND THEIR CASE!

Technology exists to create these spaces and manage these clinical expectations. **We need to STOP “saying”** Flexibility, Adaptability and Expandability and start applying tools which will deliver the goods. We have been throwing the terms around much too long.....e.g. below, it is not a new discussion.

Inpatient Unit Flexibility: Design Characteristics of a Successful Flexible Unit

Debajyoti Pati, Tom Harvey, Carolyn Cason

First Published March 1, 2008 Research Article

Abstract

*Flexibility in health care design is typically addressed from an architectural perspective **without a systematic understanding of its meaning from the end-user's viewpoint**.* Moreover, the architectural perspectives have been generally focused on expandability and convertibility. This study explored flexibility needs in adult medical-surgical inpatient care with the objective to understand its meaning from an end-user perspective and identify characteristics of the physical environment that promote or impede stakeholders' requirements.



The Architectural And Design Community Can Help.

We need to rally together to implement change in our regulatory agencies, government agencies, equipment planners and architectural firms.

We **must** at some point address the reality of “non-traditional” or Alternate Care locations for both in-hospital and pre-hospital areas of patient care in a mass casualty and surge scenario.

These events are NOT going away.



SMART INVESTING MITIGATION SAVES





Emergency Preparedness Teams and the A & D Community,
are essential elements of emergency preparedness planning:

- **Collaborate with your Clinical and Design Teams on future projects**
- **Raise the HVA issue and identify hazards and assess risk.**
- **Assess capabilities and resources.**
- **Learn their emergency plan and procedures.**
- **Integrate the facility plan with the community plan.**
- **Conduct training, attend drills with them.**
- **Public relations, the news is always good when you plan ahead.**
- **Conduct Drills and Exercises in your facilities.**
- **THINK OUTSIDE THE BOX!**

And ask.....
WHAT IF ?





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This concludes our Presentation. We are pleased to be your partner in advancing the state of the art of healthcare design and delivery.

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