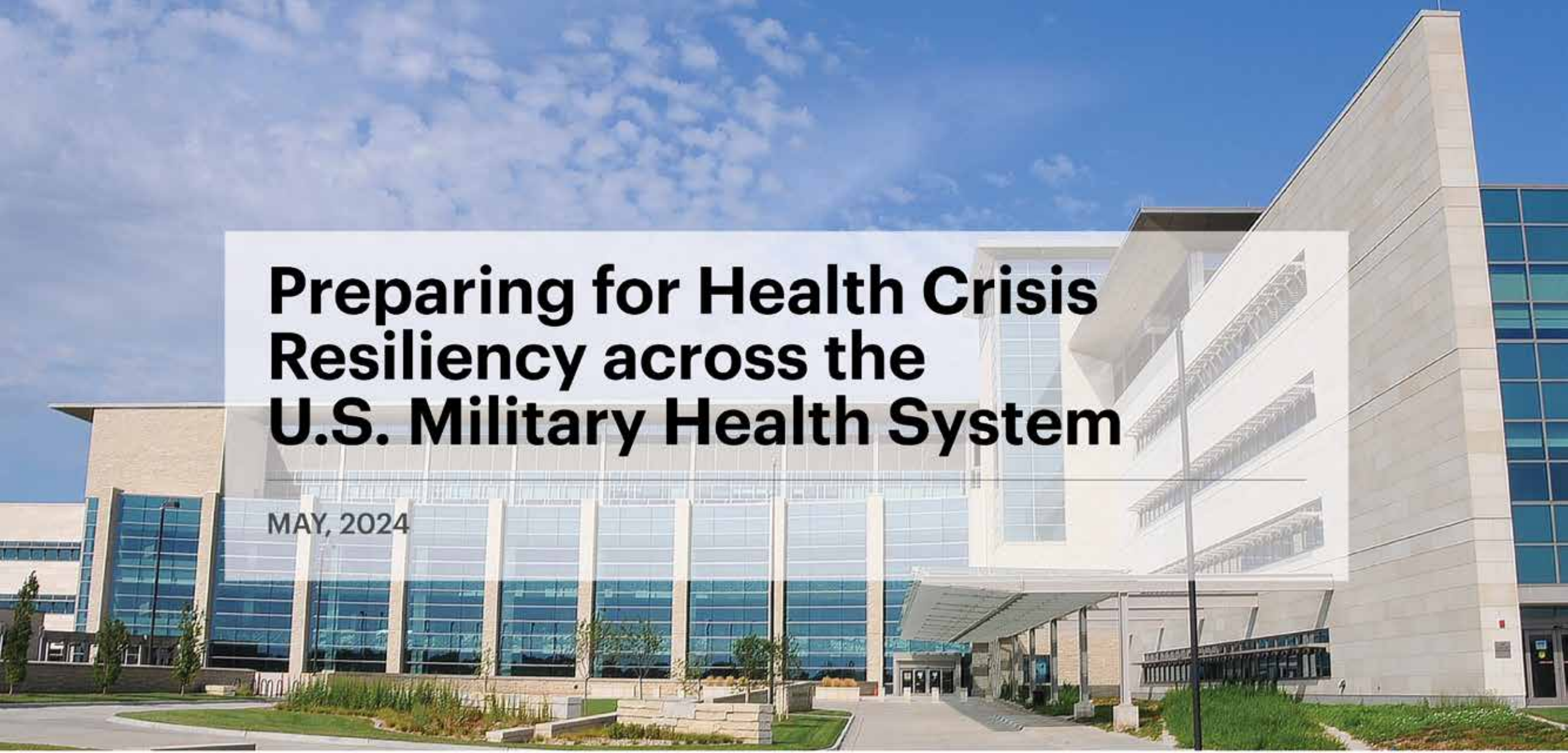

Preparing for Health Crisis Resiliency across the U.S. Military Health System

MAY, 2024

HKS | WSP JOINT VENTURE

Preparing for Health Crisis Resiliency Across the U.S. Military Health System

Speakers:

- **Deborah Wingler, Ph.D., EDAC, LSSYB**

  Global Practice Director, Applied Research, Principal, HKS

- **Brent Willson, AIA, FHFI, DBIA**

  Studio Practice Leader, Federal Health, *Partner*, HKS

May 15, 2024, 4:30 p.m.

HOUSEKEEPING ITEMS

- Take Note of Exits
- Silence Your Mobile Devices
- Presentations and Audio Recordings will be available in the Attendee Service Center until August 30, 2024
- Download your PDH record in the Attendee Service Center before August 30, 2024

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ORLANDO, FL

OPERATION: COLLABORATION

SAME SAMEJETC.ORG

SPEAKER

Deborah Wingler
Ph.D, EDAC, LSSYB

HKS
Global Practice Director,
Applied Research, Principal

Fun Facts

- Did you Know I used to work in the crime lab
- Hobbies- Mixology, Hot Yoga

Joint Engineer Training
JETC
Conference & Expo

MAY 14-16, 2024
ORLANDO, FL

OPERATION: COLLABORATION

SAME SAMEJETC.ORG

SPEAKER

Brent Willson
AIA, FHFI, DBIA

HKS
Studio Practice Leader,
Federal Health, Partner

Fun Facts

- Vacation Spots- Barcelona, Disney World, anywhere there is a bike trail
- Did you Know I rode my bike from Pittsburg to Washington D.C.

Content

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THE CHALLENGE

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Impact to Date

on the US healthcare system

94,413,388
Confirmed cases

36%
Increase in hospital negative margins from 2021

500%
Increase in contract labor expense in 2022 than pre-pandemic levels

1,042,582
Deaths

$135 billion
Projected increase in hospital expenses from 2021

20% to 25%
Higher expenses for supplies and drugs than pre-pandemic levels

Almost two years later

OUR HEALTHCARE SYSTEMS HAVE NOT BEEN ABLE TO BOUNCE BACK FROM THE SHOCK...

...continued staff shortage

...financial challenges

...lack of flexibility in care delivery and facility design

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Sources:
Kaufman Hall/American Hospital Association, "The Current State of Hospital Finances: Fall 2022 Update"
https://www.advisory.com/daily-briefing/2022/09/20/hospital-margins

What contributes to RESILIENCY in our health systems ?

// Resilient systems can **recover** to acceptable levels after experiencing performance degradation

// Resiliency is the ability to **rebound** from unexpected, stressful, adverse situations and to **pick up** where they left off

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PROJECT OVERVIEW

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Our Team

Leadership

Brent Willson
Director of Federal Health, Principal
HKS, USA

Deborah Wingler, PhD
Research Practice Director, Health & Experience, Principal
HKS, USA

Nolan Rome
US Healthcare Director
Senior Vice President
WSP, USA

Field Team

Shane Mommers
Project Manager
HKS, USA

Gary Hartfield
Sr. Medical Planner
HKS, USA

Jeff Bush
Sr. Architect
HKS, USA

Ryan Sekreta
MEP Engineer
WSP, USA

Jonathan Policke
Senior MEP Engineer
WSP, USA

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Project Overview

15 Army Medical Treatment Facilities
(Medical Centers, Community Hospitals and Ambulatory Care Clinics)

WHAT?

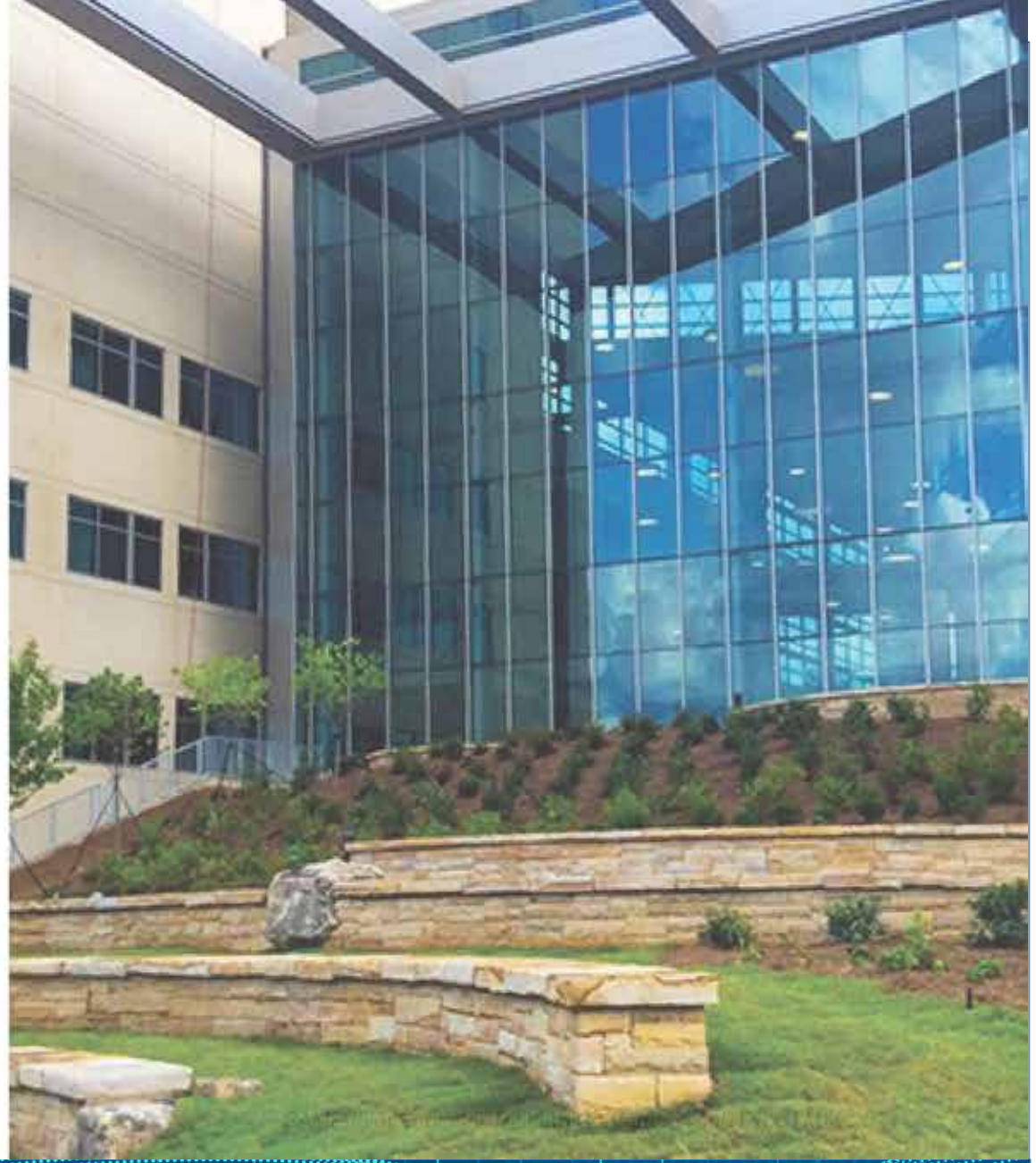
Understand the characteristics of a healthcare facility that contribute to effective facility response during a pandemic

HOW?

- On-site assessments
  - To evaluate existing and planned facility improvements
  - To recommend potential facility improvements

WHY?

- To mitigate the spread of COVID-19 infection
- To reduce the costs to implement recommendations



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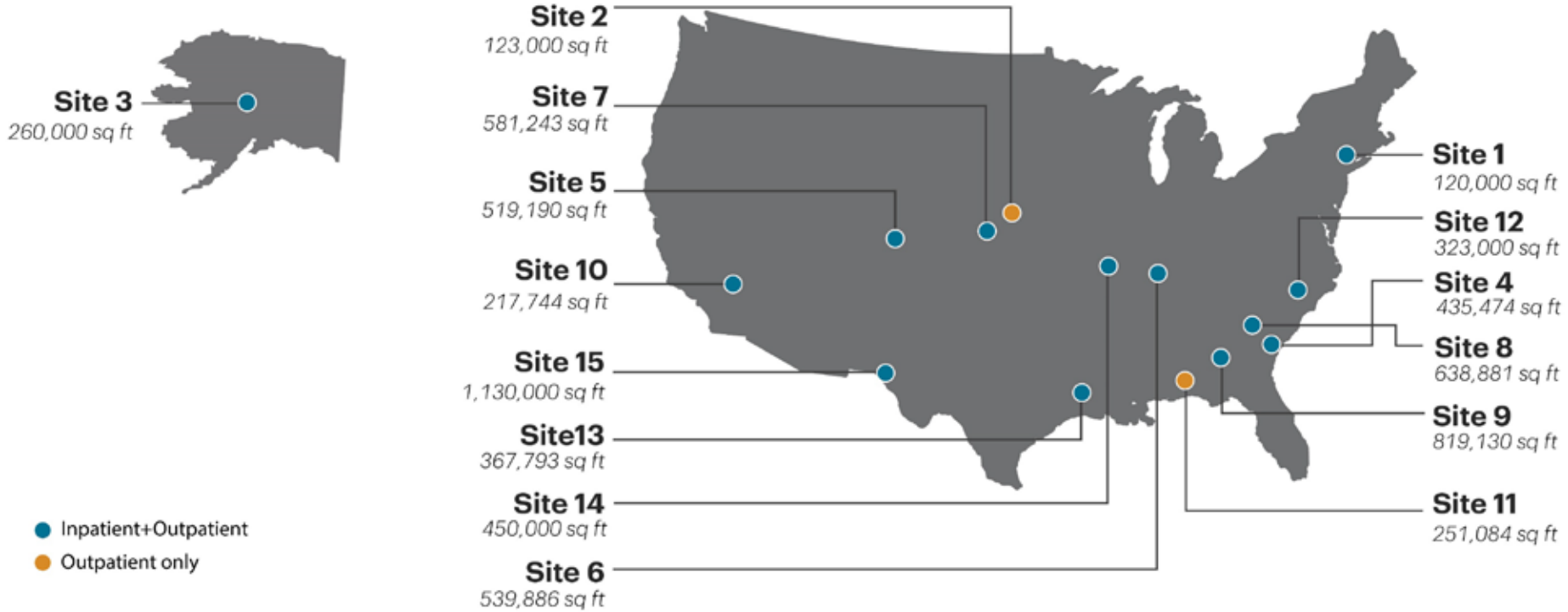
Assessment Sites



Tool Development		Data Collection					Comparative Analysis						Current Dissemination
Nov	Dec	Jan	June	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Apr	May	June
2020	2020	2021	2022	2022	2022	2022	2022	2022	2022	2023	2023	2023	2023

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Journey into the Unknown

THE CHALLENGE

The pandemic revealed much about the capacity constraint, lack of resources and spaces, as well as the challenges of aging healthcare facilities. Amid the scramble of increased surge, hospital administrators and planners had to assess unique challenges at each facility and quickly modify operations and physical spaces based on necessity. Health systems had to adopt new regulations and habits within the bounds of stringent military standards and COVID protocols.

We went into this project with a lot of uncertainty and fear!

The project was initiated during the second wave of COVID 19. It required the evaluation team to adhere to strict COVID 19 testing and travel policies throughout the duration of the project, making the team's commitment to the effort notable. Joined together with 15 army medical treatment facilities all across the US and our MEP partners, we became one big team dedicated to tackling this ominous challenge.

On-site team during field audits

METHODOLOGY

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Project Breakdown

Study Set Up

Site Identification

Framework Development

Tool Development and Training

Data Collection

[December 2020 - June 2022]

Web-Based Surveys

Semi-Structured Interviews

Field Audits

Analysis

Facility Level Analysis

Comparative Analysis

Dissemination

Awards

Conference Presentations

Peer-Reviewed Publications

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Framework

Surge Capacity | 36 items

The capability of a facility to handle an influx in patients by increasing:

CLINICAL CARE CAPABILITIES
- screening • testing • triage
- patient cohorting • isolation

TREATMENT AREAS
- emergency and critical care

SUPPORT SERVICES
- materials management • PPE waste
- ambulance parking • communication
- general and emergency supply storage
- environmental services • monitoring
- virtual care technologies

MEP
- mechanical • electrical
- plumbing infrastructure

Flexibility | 4 items

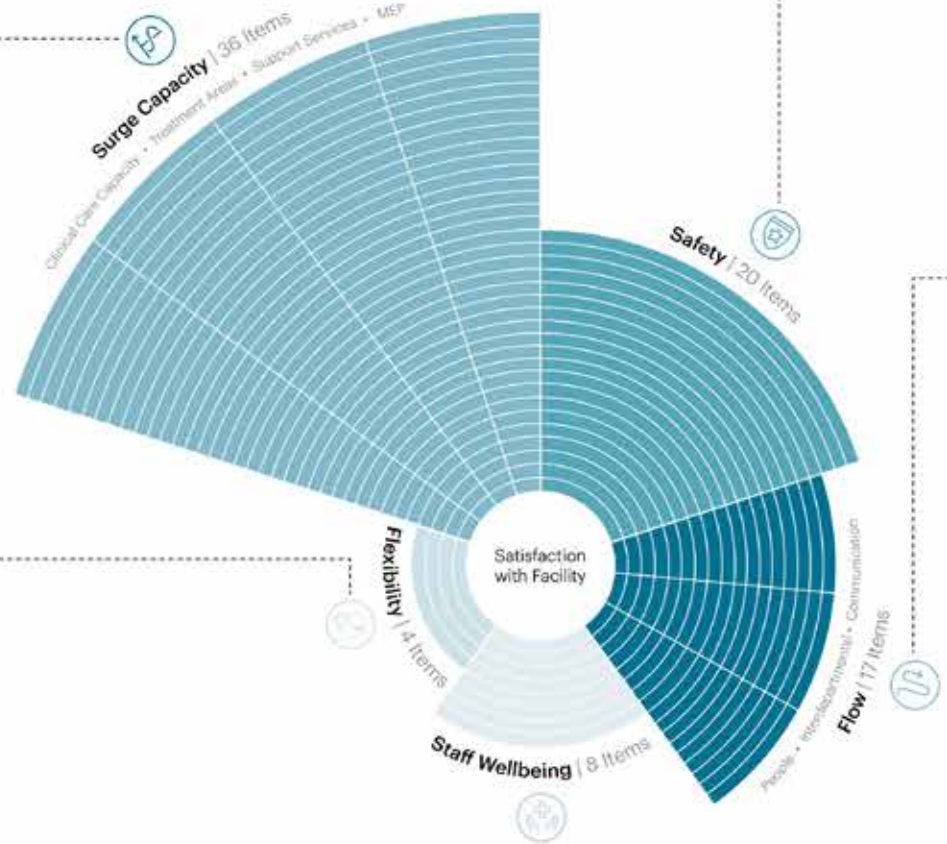
The ability for a facility to respond to rapidly changing demands by being:

Versatile
- (immediate multifunctional use)

Modifiable
- (quickly reconfigurable for different uses)

Convertible
- (make minor renovations)

Scalable
- (expand or contract according through new or temporary construction)



Safety | 20 items

The ability to implement and maintain infection control strategies through:

- separation of flow between people (COVID-19 and non-COVID patients and staff)
- provision of security and access control measures
- space condition monitoring
- dedicated areas for doning and doffing
- access to PPE
- physical distancing between patients and staff

Flow | 17 items

The ability of a facility to support an increase and separation of movement for:

PEOPLE
- inpatients • outpatients • family
- clinical • support staff

INTERDEPARTMENTAL
- equipment • supplies • medication • PPE
- waste • food to support patient care

COMMUNICATION
- patients • families • staff • community
- the greater emergency management network

Staff Wellbeing | 8 items

The provision of areas and amenities that support staff:

- mental • physical • emotional
- spiritual health • happiness • welfare

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QUESTION 01

Which factors impacted overall experience with the facility during the pandemic?

QUESTION 02

What are some facility, operations and MEP considerations associated with these factors?

QUESTION 03

Was there a difference in factors that impacted overall experience between facility types?

QUESTION 04

In what ways did the facilities respond well to the COVID-19 pandemic?

QUESTION 05

In what ways did the facilities respond poorly to the COVID-19 pandemic?

QUESTION 06

Which sites and departments contributed to overall satisfaction or dissatisfaction of the experience during COVID-19 pandemic?

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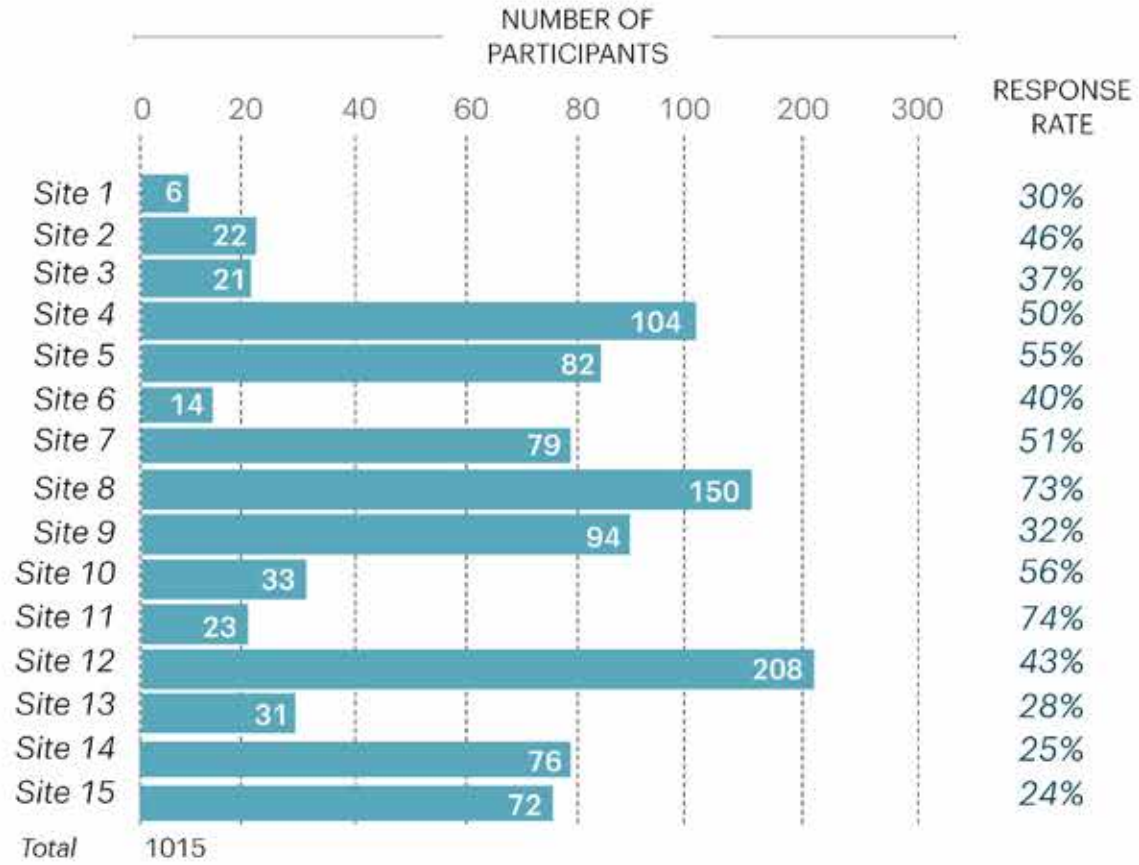
Approach

STAFF SURVEYS

Measure staff perception regarding their experience with the facility and the effectiveness of facility response during COVID-19.

- Web-based
- 105 closed questions
  (rated on a 5-point Likert scale)
- 10 open-ended questions
- 2 phase analysis process
  - Descriptive analysis
  - Logistical Modelling



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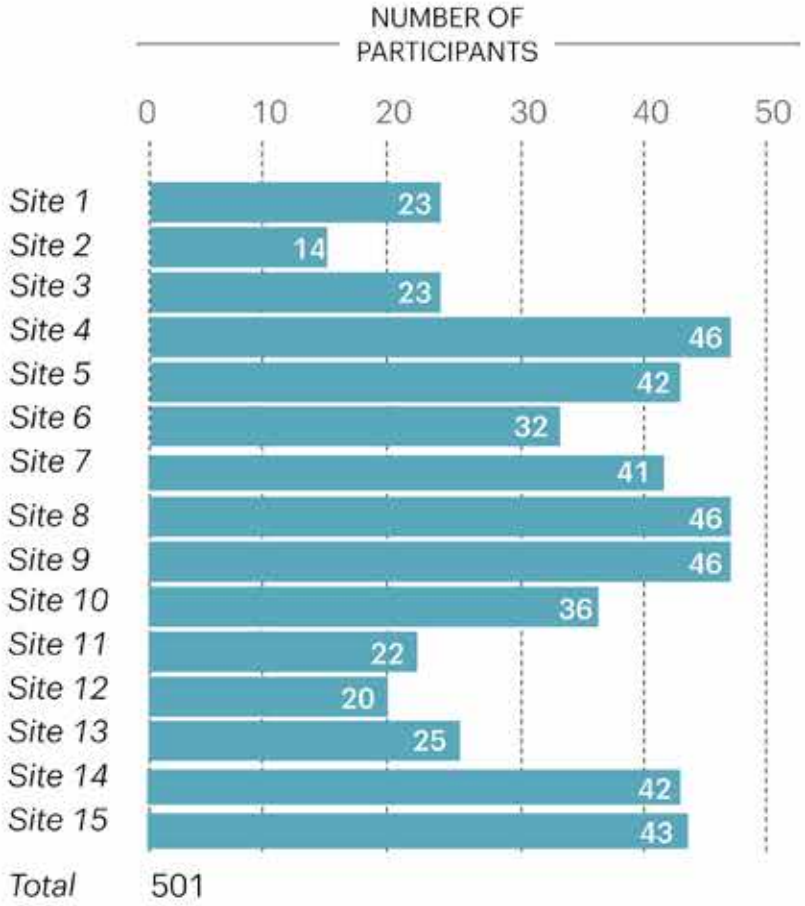
Approach

STAFF INTERVIEWS

Garner staff feedback regarding their experience with the MTF during COVID-19 and identify potential environmental and operational facilitators and barriers.

- Semi-structured
- 15-20 mins each
- Field note data capture
- Thematic content analysis



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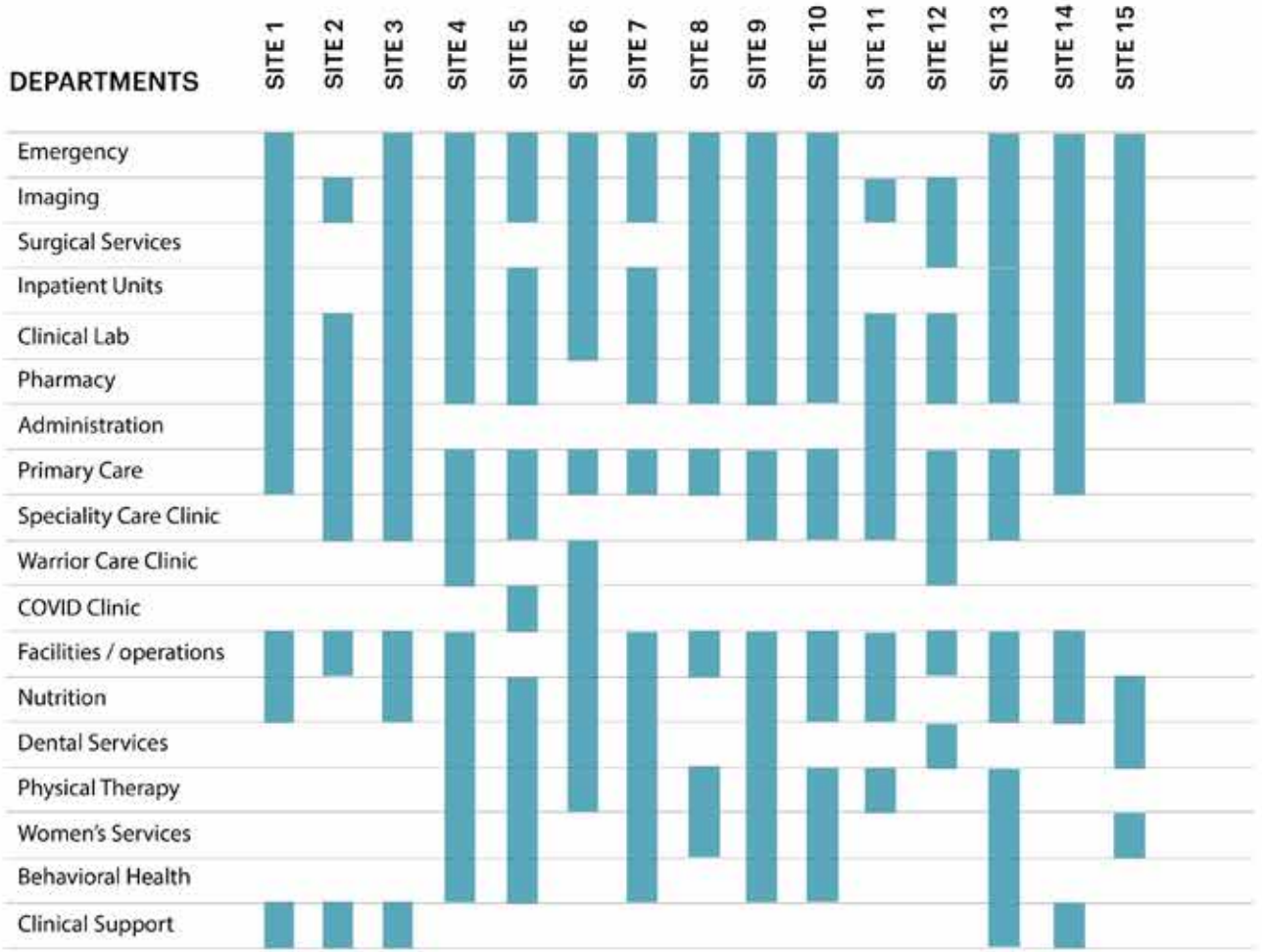
Approach

FIELD AUDITS

Capture and document significant spaces, inefficiencies, and positive design features through written text, imagery, and annotations.

- Architectural stream
- MEP stream



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Approach

DATA ANALYSIS

PHASE 1

DESCRIPTIVE ANALYSIS

Staff Surveys

Statistical means
summarize the data points by construct for each site

ECONOMETRIC MODELING

Staff Surveys

Ordinal Logit Model
assess the impact of constructs and sub-constructs on overall experience

Structured Equation Model
address the multicollinearity issues between the potential independent variables in the models

TIME-SERIES ANALYSIS

Staff Surveys

Time-series Regression Model
analyze a sequence of data points collected over an interval of time and include time as a variable in the regression model

PHASE 2

NATURAL LANGUAGE PROCESSING

Open-ended survey items, interviews data

Polarity and Subjectivity Score Rating
conduct a rule-based sentiment analysis to quantify affective states and subjective information
(VADER apporach, TextBlob Approach and Customized Lexicon Approach)

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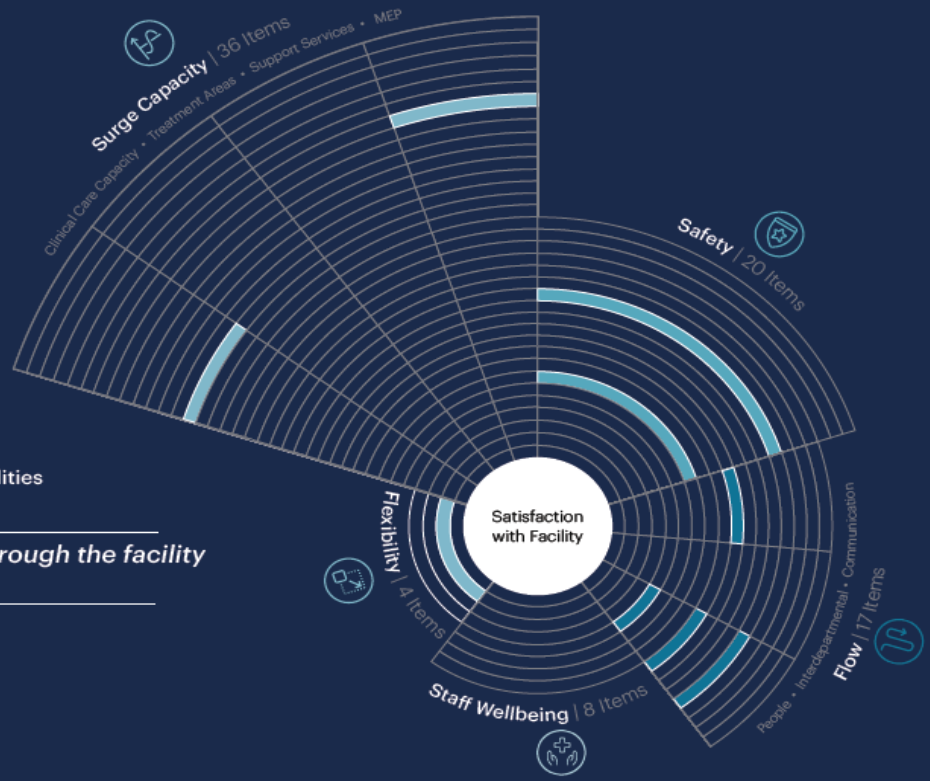
Results

KEY FINDINGS | THE BIG NINE

Among all 105 factors that we analyzed, there were 9 that significantly impacted the overall experience with facilities during the pandemic.



Staff experience **IMPROVED** significantly when facilities implemented design or operational measures to:

FLOW	*optimize flow of outpatients*	**VALUE:** 0.353 **STD. ERROR:** 0.174 **t-value:** 2.034
FLOW	*optimize flow of support staff*	**VALUE:** 0.465 **STD. ERROR:** 0.148 **t-value:** 3.135
FLOW	*improve communication flow*	**VALUE:** 0.222 **STD. ERROR:** 0.124 **t-value:** 1.813
SAFETY	*mandate social distancing in dining areas*	**VALUE:** 0.172 **STD. ERROR:** 0.111 **t-value:** 1.542
SAFETY	*prevent spread of infection*	**VALUE:** 0.309 **STD. ERROR:** 0.129 **t-value:** 2.405
SURGE CAPACITY	*expand critical care capacity*	**VALUE:** 0.210 **STD. ERROR:** 0.111 **t-value:** 1.903
SURGE CAPACITY	*access control*	**VALUE:** 0.254 **STD. ERROR:** 0.124 **t-value:** 2.043
FLEXIBILITY	*easily redefine or adapt spaces*	**VALUE:** 0.233 **STD. ERROR:** 0.089 **t-value:** 2.620

Staff experience **DIMINISHED** significantly when facilities implemented design or operational measures to:

FLOW	*encourage the flow of family through the facility*	**VALUE:** -0.504 **STD. ERROR:** 0.190 **t-value:** -2.661

NOTE:

Several planning, MEP, and facility considerations emerged from interviews, surveys, and field audits. The following slides highlight considerations pertaining to factors that were found to have a statistically significant impact on staff experience with their facilities during the pandemic. Only a select few planning, MEP, and facility considerations are demonstrated through vignettes.

Results

What **SAFETY** factors impact overall experience with the facility during the pandemic?

- Likelihood of **satisfaction** with overall experience with the facility during the pandemic **increased** when survey respondents strongly agreed that facility had adequate/ enhanced capabilities for effectively supporting patients and family distancing in dining areas

The design effectively supports:

Increased capacity of hand washing

Increased capacity of hand sanitization

Increased capacity of incident command

Increased capacity of security

Increased capacity of access control

Increased capacity of space condition monitoring

Team distancing in work areas

Team distancing in respite areas

Team distancing in public areas

Patient and family distancing in public areas

Patient and family distancing in waiting areas

Patient and family distancing in dining areas

Donning PPE

Doffing PPE

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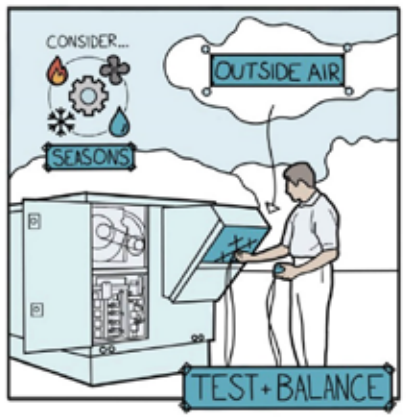
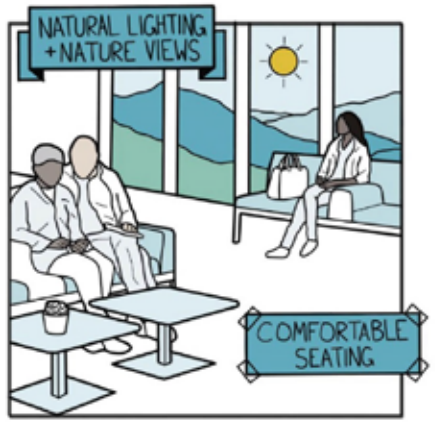
Results

SAFETY





	PLANNING CONSIDERATIONS	MEP CONSIDERATIONS	FACILITY CONSIDERATIONS
Patient and family distancing in dining areas	• Provide *adequate number* of and adequately *sized* dining areas throughout the facility that meet social distancing requirements for personal/physical safety	• *Outside air* in dining areas is typically high but test and balance should confirm outside air for proper dilution rates • *Seasonal exhaust* arrangement should be considered for long term or planned annual use	• Incorporate natural *lighting*, views to *nature*, comfortable *furniture*

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Results

What **FLOW** factors impact overall experience with the facility during the pandemic?

- Likelihood of **satisfaction** with overall experience with the facility during the pandemic **increased** when survey responders leaned towards strongly agreeing that facility effectively supports the flow of outpatients
- Likelihood of **satisfaction** with overall experience **decreased** when survey responders leaned towards strongly agreeing that facility effectively supports the flow of family.
- Likelihood of **satisfaction** with overall experience with the facility during the pandemic **increased** when survey responders leaned towards strongly agreeing that facility effectively supports the flow of support staff

The design effectively supports flow of:

PEOPLE
Inpatients
Outpatients
Family
Clinical Staff
Support Staff

INTERDEPARTMENTAL
Medication
Supplies (general)
PPE
Equipment
Food
Waste
Ventilation

COMMUNICATION
Patients
Families
Staff
Community
Emergency management work

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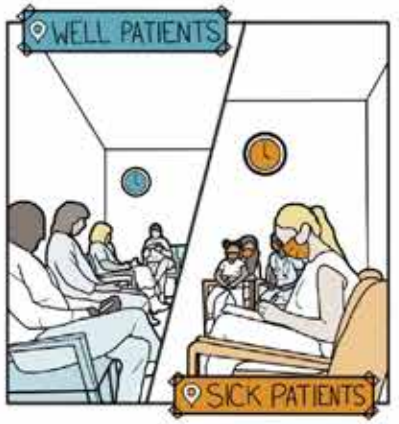
Results
FLOW



	PLANNING CONSIDERATIONS	MEP CONSIDERATIONS	FACILITY CONSIDERATIONS
People flow- Outpatients	• Distinct *separation and control* of outpatient entry and travel to ED and other patient care areas	• Enable building systems that promote clear *wayfinding* and flexibility for alternative pathways in emergency response protocols	• Identify department/unit entry *thresholds* • Separate *entry* for patients who are symptomatic • Provide space to *separate well and sick* patients in the waiting areas
People flow- Support Staff	• Ancillary and EVS support staff requires *"back of house" access* to patient care areas via designated horizontal and vertical routes • For *temporary structures* on the facility site, or when utilizing buildings of opportunity near the facility, *storage, and distribution* of essential *supplies/ medications* must support increase in vehicle traffic, line "queuing," parking for add'l delivery vehicles, protection of staff from outside elements	• Support *temporary walls/barriers* and *mechanical ventilation strategies* that support clear path of travel for staff ensuring pressurization from clean to less clean	• *Separate* facility *entry/exit* points for patients and staff

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Results

What **SURGE CAPACITY** factors impact overall experience with the facility during the pandemic?

- Likelihood of **satisfaction** with overall experience with the facility during the pandemic **increased** when survey responders leaned towards strongly agreeing that facility effectively supports the increased capacity for critical care

The design effectively supports:

Increased Capacity | Clinical
Screening
Testing
Triage
Patient cohort by diagnosis
Airborne infection isolation
Contact infection isolation
Critical Care
Emergency Care
Staffing

Increased Capacity | MEP
Normal power
Emergency power
Oxygen
Medical Air
Vacuum Suction
Air changes

Increased Capacity | Support Services
Morgue
Materials management
General supply storage
Emergency supply storage
Environmental Services

Increased Capacity
Physiological Monitoring
Communication Technology (e.g., Vocera)
Telehealth
Data

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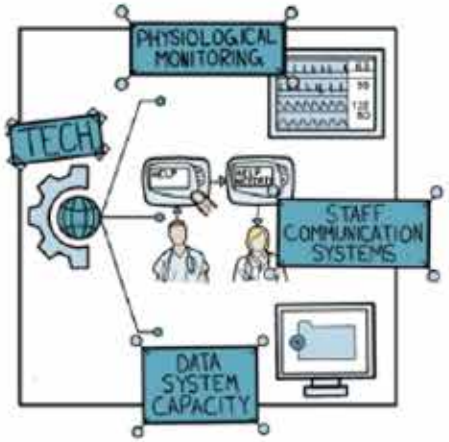
Results

SURGE CAPACITY



Increased capacity of critical care

PLANNING CONSIDERATIONS

- Inclusion of *acuity adaptable patient rooms* for critical patients; conversion of pre and post op care to critical care beds; single patient bedroom headwalls support two patients
- Provide multiple *negative pressure treatment rooms* and waiting areas in the ED
- Medical Force trained for "*deployable medicine*" to facilitate predictable "seasonal" and unpredictable "surge" requirements

MEP CONSIDERATIONS

- Increased capacity for *Isolation Rooms* for treatment areas
  - ED exam capacity
  - Triage capacity
  - Operating Rooms
  - Patient Floor compartmentalization
- *Electrical distribution* system load capacity and *head wall outlet* counts in existing facilities at targeted flexible beds or expansion areas
- *Oxygen, medical air & vacuum system distribution* capacity and *outlet counts* at targeted flexible beds or expansion areas
- *Seasonal/Emergency Preparedness Exhaust* arrangements for flexibility in expansion areas, Emergency Department and Patient Floors
- *Technology* impacts on physiological monitoring, staff communication systems, and capacity of data systems

FACILITY CONSIDERATIONS

- Based on geographical location, utilize *temporary structures* (tents /trailers) or *non-healthcare buildings* of opportunity to provide COVID testing, screening, and ED triage to facilitate surge capacity
- Consider increased volume of *vehicle traffic and flow patterns* when selecting a location for temporary structures on the facility site, or when utilizing buildings of opportunity near the facility

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Results

What **FLEXIBILITY** factors impact overall experience with the facility during the pandemic?

- Likelihood of **satisfaction** with overall experience with the facility during the pandemic **increased** when survey responders leaned towards ranking convertibility as the most important factor for buildings ability to respond during pandemic.

The design of the facility effectively supports the ability to provide pandemic response through

Versatility
(allow for immediate multifunctional use)

Modifiability
(be quickly reconfigured for different uses)

Convertibility (make minor renovations)

Scalability
(expand or contract according through new or temporary construction)

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Results

FLEXIBILITY

	PLANNING CONSIDERATIONS	MEP CONSIDERATIONS	FACILITY CONSIDERATIONS
Convertibility *(make minor renovations)*	• Flexibility and convertibility includes *resources*, *time*, a clear understanding of *roles*, *functions*, and *processes* • Foster a culture of *innovation* and *interpersonal collaboration* with facility leadership and facility management to *educate* the staff about the convertible features of the facility to promote a resilient health care organization	• Capital replacement projects over time that provide AHU flexibility and redundancy for emergency preparedness - Coil sizing for additional outside air - Fan redundancy - Filter bank flexibility • Utilizing *communications systems and protocols* to fullest extent to inform staff and patients • *Continued investment* of facilities engineering operations and maintenance program	• Provide *open spaces* that can be easily converted into patient care areas (such as gyms, administrative areas) • Consider *large waiting areas* that can be reconfigured during a pandemic • Provide more *ante rooms* for All and negative pressure patient care spaces • Provide dedicated areas to accommodate *PPE donning/doffing*

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Results

Was there a difference in factors that impacted overall experience between **FACILITY TYPES**?

Ordinal Logit Model

There were significant differences in factors that impacted the overall satisfaction with experience of facilities with inpatient and outpatient accommodation and those with only outpatient accommodation

Of all the significant factors, the likelihood of satisfaction decreased when survey responders leaned towards strongly agreeing that facility effectively supports the flow of family.

The likelihood of satisfaction increased when survey responders leaned towards strongly agreeing that facility effectively supported rest of the factors.

Factors	SATISFACTION MODEL 1: All Facility Types	SATISFACTION MODEL 2: Inpatient & Outpatient Facilities	SATISFACTION MODEL 3: Outpatient Facilities	Impact Description
People flow-outpatients	✓	✓		Satisfaction Increases
People flow-family	✓	✓	✓	Satisfaction Decreases
People flow-support staff	✓	✓	✓	Satisfaction Increases
Communication flow-staff	✓	✓		Satisfaction Increases
Increased capacity-access control	✓	✓		Satisfaction Increases
Enhanced capacity - Social distancing in dining areas	✓			Satisfaction Increases
Infection Prevention	✓		✓	Satisfaction Increases
Increased Capacity - Critical Care	✓	✓		Satisfaction Increases
Convertibility	✓			Satisfaction Increases

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Results | Interview Responses

How did facilities respond **WELL** to the COVID-19 Pandemic?

How did facilities respond **POORLY** to the COVID-19 Pandemic?

SITE 06

"Staff has been proactive and willing to adjust. We saw surges and the team was always willing to help each other and fill in/work extra hours, etc."

SITE 01

"Utilized empty clinic buildings by turning them into a drive-thru testing site. Increased bed capacity from single room to double in Medical Surgical floor for non-covid. Increased lab capability for faster processing covid swabs. Increased capacity of waiting room for covid patients."

SITE 03

"It was never clear as to who can telework or who can't and we didn't have enough laptops for everyone."

SITE 12

"There was a complete lack of testing supplies & reagents, lack of space for the placement of additional instrumentation and storage. We had insufficient overhead stored for the hospital for a pandemic emergency."

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Results | Interview Responses

Which departments were associated with a **NEGATIVE** sentiment?

BEHAVIORAL HEALTH UNIT

SITE 07

"There are no airborne infection isolation rooms in the inpatient Behavioral Health Unit requiring COVID positive patients to be in the COVID Ward without a safe room environment appropriate for behavioral health patients."

EMERGENCY DEPARTMENT

SITE 14

"Limited number of negative pressure exam rooms has placed some COVID patients in standard exam rooms increasing the potential for exposure to patients and staff."

INPATIENT SERVICES

SITE 14

"Utilized the patient room or corridors for donning and doffing since there were was lack of dedicated areas for that function."

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Implications

CURRENT AND FUTURE IMPLICATIONS

Access control, people and communication flow, as well as convertibility are important factors that contribute significantly to the overall experience with the facility during the pandemic for staff.

- To achieve true resiliency it is essential to consider not only a facilities ability to respond to unforeseen circumstances, but also the resiliency of the overall system including those that deliver care.

- Lessons learned from this project will help to inform how to make existing military facilities more resilient, as well as to inform the planning criteria for future capital investments.

- Emphasize to your leadership the move from strategic planning to strategic timely implementation and continuous evaluation.

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Key Takeaways

Communication is key to building trust.

Communication from leadership that is both informative and comforting is essential to bridging the disconnect between front-line workers, administrators, and policy makers.

Safety and hygiene will remain top of mind.

Promoting and improving infection prevention strategies through facility design, MEP systems, and operations is essential to pandemic preparedness and recovery.

Optimized flows are vital for agile care delivery.

Implementing agile solutions to avoid bottlenecks are essential to the success of efficient and effective care delivery process that can quickly pivot based on rapidly changing census and care needs.

Digital first solutions are challenging the status quo.

Considering which service can be effectively delivered virtually and which cannot helps to support nimble and resilient care delivery during a health crisis, while making care personalized and responsive.

Staff well-being has become table stakes.

Environments and amenities that prioritize holistic well-being by addressing the emotional, cognitive, physical, and social needs of staff can help to attract and retain top talent.

Convertibility is the key attribute for designing flexible infrastructure.

Flexibility beyond physical space in the form of time (scheduling and hours of operation), roles (staffing responsibilities), and resources (equipment, furniture, supplies, and amenities) will help with quick decision-making in times of emergency.

Better indoor air quality is crucial to promoting safety and comfort.

Designing natural and mechanical ventilation, as well as continuously assessing ventilation performance are essential steps toward reducing transmission of infection and providing comfortable working conditions for staff.

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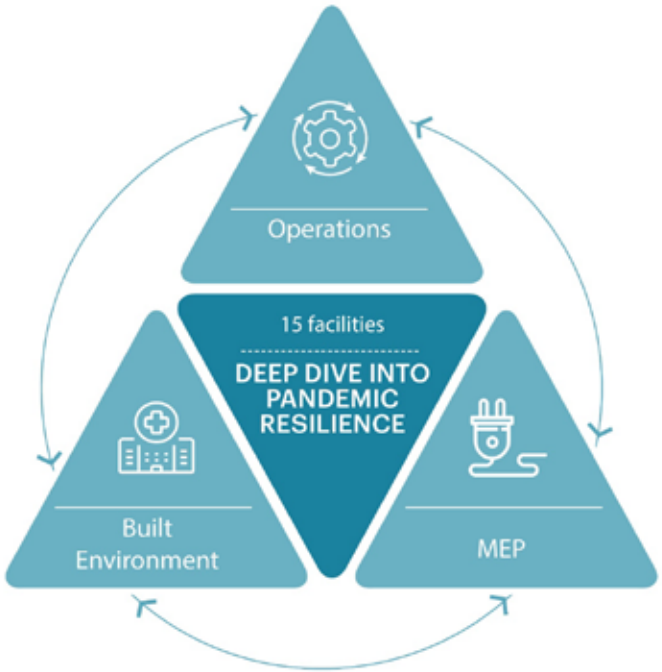
Strengths and Limitations



- provides an in-depth view into 15 facilities of one health system
- understand the complex relationships between several variables
- examines operations, MEP, and environment to get a holistic understanding of pandemic resiliency

SAMPLE SIZES

It is important to take into account the unequal sample sizes when interpreting the results.

TIMELINE

The variation in COVID-19 surge over time and geographies may have impacted the data gathered during site audits and surveys.

SURGE

The military health system did not receive the degree of surge that other health systems within the same geographic region due to the nature of their patient population.

HKS | WSP
JOINT VENTURE

STAY RESILIENT!!

HKS | WSP
JOINT VENTURE

Session Name

THANK YOU

Please take a few minutes to complete a short survey about this session. Your feedback will help us improve future programming for JETC.

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Preparing for Health Crisis Resiliency across the Military Health System

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