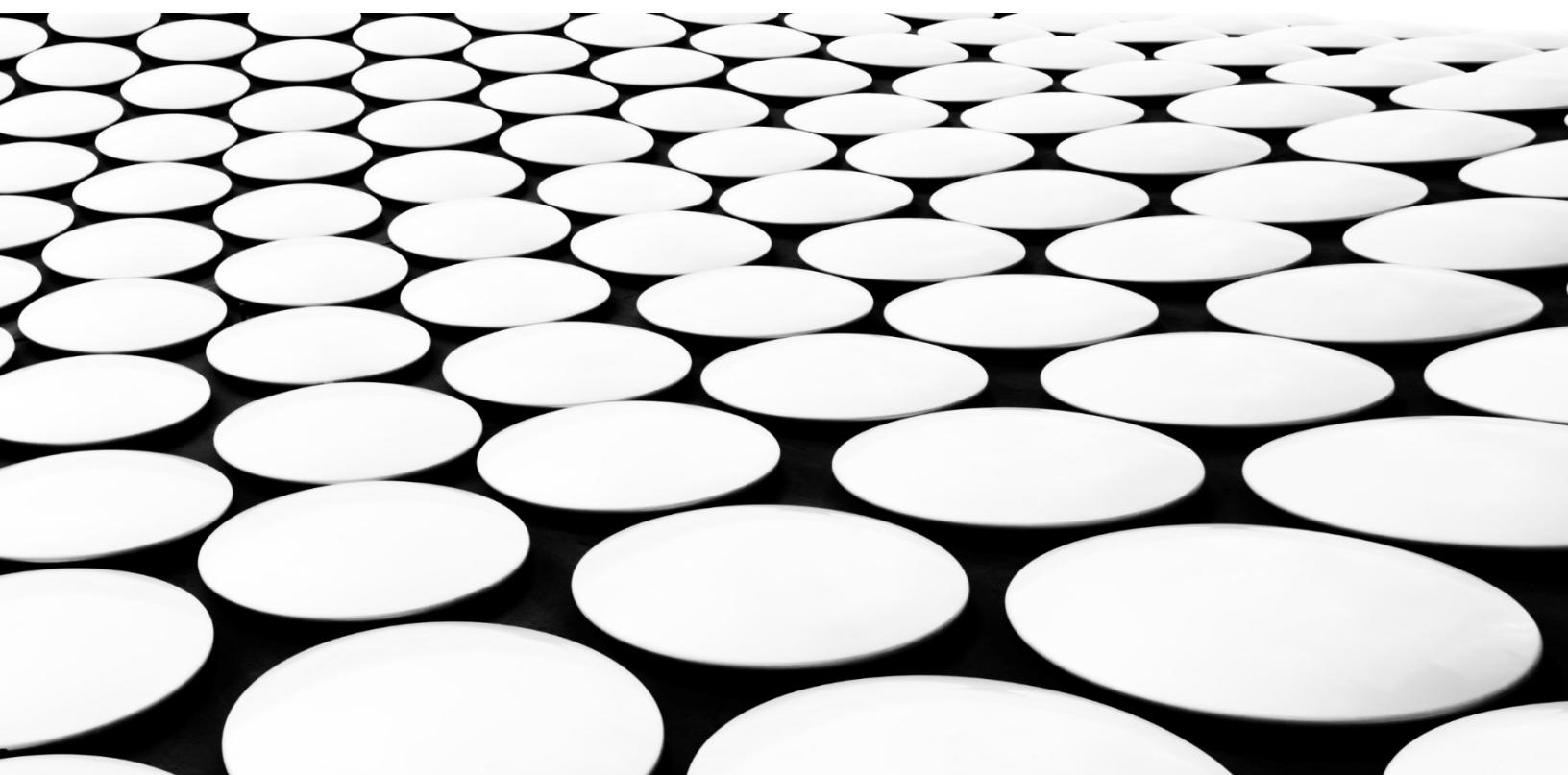




FUTURE OF HEALTHCARE TASK FORCE REPORT

JULY 31, 2021



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INTRODUCTION

The Board of Regents of the American College of Healthcare Architects (ACHA) formed a Task Force to study and recommend ways to improve access to healthcare. In particular, the Board wanted to look proactively at healthcare industry paradigm shifts and the role that the built environment will play. The Task Force was comprised of ACHA Certificants and members of allied organizations. Specific questions posed to the task force were:

- How will Healthcare be delivered in the future?
- How can we create an equitable system?
- What kinds of spaces are needed to accommodate this?

The task force met monthly for 6 months. Two deep dive workshop sessions were also scheduled with an expanded group of ACHA certificants and allied organizations around the following topics:

WORKSHOP 1 Enhancing adaptability/flexibility/portability of healthcare environments/speed to market

WORKSHOP 2 Technology and Artificial Intelligence (AI)'s role in introducing other disruptors/providers

CHARTER:

Recommend new health paradigms to improve access to care

How will healthcare be delivered in the future?

How can we create an equitable system?

What kinds of spaces are needed to accommodate this?

WORKSHOP 1
Enhancing adaptability/flexibility/portability of healthcare environments/speed to market

WORKSHOP 2
Technology and AI and how it will introduce other disruptors/providers

EXECUTIVE SUMMARY

DEFINING THE FUTURE OF HEALTHCARE

This Task Force looked at what is on the horizon for healthcare, including adaptations and adoptions of models of care in a post-pandemic world. They considered ways the industry must realign thinking to consider the future of medicine and the future of care that will include unconventional ambulatory models as well as highly sophisticated facilities to meet healthcare needs in the future. The Task Force viewed healthcare as being acted upon by three spheres of influence that will address the needs for a more holistic approach to care. As the pace of change accelerates, the built environment needs to be able to embrace this change, including accommodating technologies and revising codes and standards.

WHOSE FUTURE IS IT?

The focus of the panel was related to the healthcare landscape in the United States. The definition of healthcare traditionally implies a specialty space dedicated to the care of individuals for a defined medical need (care plan). The Task Force chose to broaden its look to focus on population health in a wider number of building types to focus on disease prevention and health promotion.

KEY FINDINGS

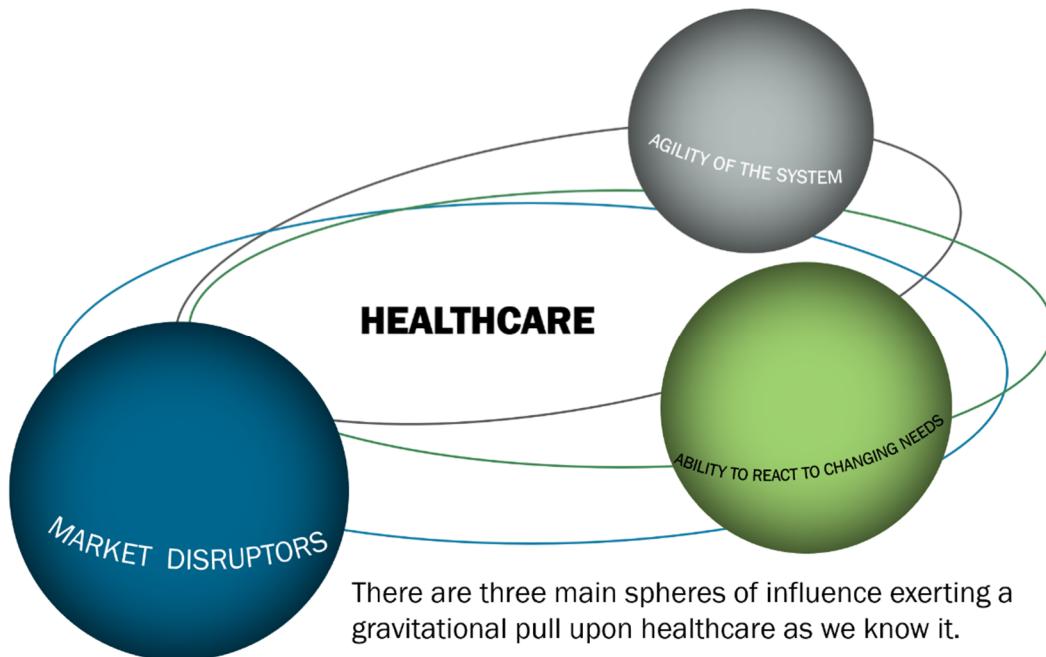
- Change the name of ACHA to American College of “Health” Architects. This shift from the word “healthcare” to “health” represents the broader charge of our organization as we move into an era focused on promoting well-being not merely treating illness.
- Begin to envision hospital campuses as community centers that promote well-being. This includes providing services and access to the well, not just the sick, building a support network and gathering place. We imagine these campuses being reborn as “Living centers.”
- Reevaluate space requirements within healthcare facilities as we leverage technology impacts for diagnostics and treatment outside of the hospital setting. Factor how this impacts earlier discharges, smaller waiting rooms, fewer exam rooms, smaller emergency departments to create a nimbler facility that is more able to accommodate changing needs on a daily, annual or event basis.
- Architects must be included in health policy and code development processes in third party payors, FEMA, CMS, Joint Commission, Departments of Public Health, etc.
- Architects must be more familiar with policy and business disruptors including global supply chain, transportation, and delivery methods that impact core operations
- Engage care delivery disruptors to learn about emerging alternative delivery models
- Examine physical system constraints that present challenges to agility including graceful escalation/degradation and changing program functions (flexibility, adaptability, convertibility)

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- Promote staff resiliency by providing physical resources and amenities as well as economic incentives to address work/life balance
- Consider efficiencies in space to reduce movement and streamline processes
- Advocate for changes to architecture education that require a better understanding of population health and hospital internships

SPHERES OF INFLUENCE

The Task Force acknowledged that healthcare is in a state of flux, being influenced by the gravitational pull of three spheres of influence. Market disruptors are new ways to access care that accommodate consumer preferences. The ability to react to changing needs reflects a shift in thinking from healthcare to health and focus on the holistic needs of diverse individuals. Agility of the system reflects resiliency to respond to natural or community health crises and population health response capacity.



SPHERE 1 MARKET DISRUPTORS

As healthcare spun into the digital age, it has pushed forward with iterative digital technologies mostly advancing traditional methods of medicine. These include diagnostics (digital imaging), treatment (catheterization labs), or documentation (the electronic medical record). Although more advanced, it seems similar to architecture moving from drafting on paper to three-dimensional computer aided drawing. These advancements replace older methods of the same function in many instances and are not true healthcare industry disruptors because they are not fundamentally changing access to or delivery of care.

There are real socioeconomic forces at play along with technological advances that will dramatically impact the healthcare industry from the outside. This disruptor will look past all of the imposed limitations in healthcare and respond to patient demands and expectations for an experience that is safe, meets privacy laws, data/evidence driven, convenient, speedy, accessible, and high touch.¹ Industry disruptors tend to be outsider entrepreneurs or startups rather than innovation coming from existing market leading companies. However, in the digital innovation space we see leading companies (Amazon, Google, Apple, Netflix, Microsoft,

¹ Mayo Clinic selects Google as strategic partner for health care innovation, cloud computing. (2019, September 10). [Https://Newsnetwork.Mayoclinic.Org/](https://Newsnetwork.Mayoclinic.Org/). <https://newsnetwork.mayoclinic.org/discussion/mayo-clinic-selects-google-as-strategic-partner-for-health-care-innovation-cloud-computing/>

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Facebook, Alibaba, and Tencent, among others) create an effect which pushes corporate giants to reform or risk an industry takeover before knowing how to respond. Examples include Amazon transforming warehouse and delivery industries ransacking the book and clothing markets. The result was ghost towns emerging from shopping malls and Netflix streaming shifting the movie industry experience.

Rather than face the Amazon effect of being bulldozed by a disruptor, the Mayo Clinic in 2019 decided to embark on a 10-year strategic partnership with Google ([watch video](#)) to explore this new digital horizon. *“Mayo will use advanced cloud computing, data analytics, machine learning and artificial intelligence (AI) to redefine health care delivery, bringing together global providers and consumers to make health care better.”* To establish a close working relationship Google has opened a regional office near the Mayo Clinic in Rochester, Minnesota where engineers from both organizations will collaborate with researchers, physicians, information technology staff and data scientists, to apply advanced computing techniques to advance health care problems solving methods.²

This disruptive force was a catalyst for at least one institution to experiment with change. We foresee additional partnerships like this as well as internal shifts to incorporate dynamic technology that changes the patient experience such as the work that Houston Methodist is doing. They have created a tech hub that is a living laboratory for a variety of healthcare spaces. They use it as a staging ground for technology prototypes that focus on providing greater patient/family engagement in care and positively transform delivery. This approach uses virtual reality, augmented reality, and mixed reality to provide a constant feedback loop for collaborative care. By creating this laboratory, real time investigations of what patients want, and need can be explored in a way that previously was not possible.

HEALTH LITERACY FOR DIGITAL TECHNOLOGY

As digital technologies evolve within healthcare settings, it is important to recognize the need for establishing how the public will seek and utilize health information. This in turn will impact the built environment. To reduce barriers for access to all health services, the field of public health continually seeks to establish, evaluate, and advance health literacy. Definitions of health literacy included in the US Government's Healthy People 2030 initiative are:

- **Personal health literacy** is the degree to which individuals have the ability to find, understand, and use information and services to inform health-related decisions and actions for themselves and others.
- **Organizational health literacy** is the degree to which organizations equitably enable individuals to find, understand, and use information and services to inform health-related decisions and actions for themselves and others.

Additionally, as more information is obtained through web sources an additional terminology of health literacy is emerging entitled:

- **eHealth Literacy** is the ability to seek, find, understand, and appraise health information from



PERSONAL HEALTH LITERACY

I have my health information and know how to use it to make health decisions



ORGANIZATIONAL HEALTH LITERACY

I can access information I need from my health system



eHEALTH LITERACY

I know how to look for health resources online and apply them to what I know about my own health

² Kocher, C. (2018, March, 13), 7 Industries about to be Amazoned, *LinkedIn Article*, Retrieved 07-26-2021 from: <https://www.linkedin.com/pulse/7-industries-amazoned-you-one-them-chris-kocher/>

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electronic sources and apply the knowledge gained to addressing or solving a health problem³.

As design professionals with high levels of education, we should not assume our health literacy is the same as all patient populations. In the US and Canada, 40% of adults have low literacy levels in which it makes it difficult to navigate information in a civil society. Even among North American adolescents with the highest internet user population on the world, teenagers reported an inability to navigate health resources online. During this pandemic, senior adult expressed frustration with access to online vaccine appointment schedulers since many of these households did not even have internet access⁴.

eHealth Literacy skills include six domains:

Traditional Literacy and Numeracy: ability to read and understand basic mathematical functions.

Media Literacy: ability to interpret media messages implicit or explicit and knowledge of bias or perspective.

Information Literacy: how knowledge is organized, where to find knowledge, searching library information, and sources on information (e.g., books, pamphlets, videos, websites)

Computer/Device Literacy: how to use an electronic device including keyboard, mouse, email, search engines, and the like.

Science Literacy: familiarity of basic scientific terms, process, discovery, evidence, and data.

Health Literacy: ability to follow simple self-care directions, prescriptions, and basic health terminology.

HOW CAN HEALTH LITERACY BE ESTABLISHED AND UTILIZED IN A HEALTHCARE SETTING?

[Apple Healthcare](#) is working with healthcare providers to integrate information and technology devices for both the healthcare clinicians and patient access to care information.

View digital health information videos examples on [Apple Healthcare](#):

Geisinger

Ochsner – physician and staff access

UVA – NICU and migrating home

Duke Health, Johns Hopkins – medical research and [Apple Research Kit](#)

<https://www.apple.com/healthcare/>

SELF CARE

Another disruptor is the trend towards self-care. With access to online health sites and the ability to self-diagnose, there is an interest, especially among younger generations, to manage their health independently for less serious illness. Consumer intelligence agency Mintel identified both physical and mental self-care at home as a major consumer priority in 2021. Top areas of focus were at-home care rituals tailored to an individual's health priorities, illness prevention strategies, or structured ways to take breaks throughout the day. Personalized health tools can tie health goals to wellness products and services. This consumer preference can be leveraged by health systems to reduce the number of

³Norman, Cameron D, & Skinner, Harvey A. (2006). eHealth literacy: Essential skills for consumer health in a networked world. *Journal of Medical Internet Research*, 8(2), E9.

⁴ Centers for Disease Control and Prevention (2021, May, 19), What is Health Literacy, *CDC Health Literacy-Health Literacy Basics*, Retrieved: 07/26/2021 from: <https://www.cdc.gov/healthliteracy/learn/index.html>

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emergency department or clinic visits. It will involve creating different kinds of eHealth access portals that will collect basic diagnostic data such as blood pressure, pulse oxygenation, and temperature. A higher focus on health dashboards and integration with exercise or food shopping regimens will leverage partnerships in retail services or allow health systems to diversify their offerings⁵.

Mobile and pop-up care options will become more prevalent because they offer convenient access and on-demand care. As reimbursement strategies continue to emphasize value, wellness, and outcomes, pushing care out to patients rather than waiting for them to seek access will become more important. Pop up clinics in retail, civic or educational settings, and mobile health venues will help close the healthcare gap.

A final result of a shift towards self-directed care is the unchaining of health events. The traditional sequence of seeking care, getting referrals, follow up scheduling of procedures or testing will be dissolved as on-demand access and greater transparency in the process will allow consumers to mix and match the health resources they seek out. Health systems can facilitate this desire for independence while also providing helpful guidance and oversight to help self-directed patients to stay on track. While at first this might seem like a liability, the self-directed patient is more proactive and better informed, and providing them with the desired health resources will improve their outcomes.

⁵ Wroble, A. (2021, July 21). *Wellness trends to watch in 2021*. Mintel. <https://www.mintel.com/blog/personal-care-market-news/wellness-trends-to-watch-in-2021>

SPHERE 2 ABILITY TO REACT TO NEEDS

Over the past 20 years US Healthcare providers have embraced the concept of patient centered care delivery model. The Institute of Medicine has defined patient-centered care (PCC) as care that is “respectful and responsive to individual patient preferences, needs, and values.” The PCC model in its early stages focused primarily on clinical outcomes with dependencies concerning improving the patient’s relationship with her/his clinical care team⁶. Patients who have reported strong clinical care relationships have reduced diagnostic testing, more understanding of clinical errors within a compassionate environment, and less legal claims. PCC has also broadened the use of a variety of clinical care settings beyond the hospital environment to include outpatient care, medical offices, urgent care settings, and multi-specialty group practices⁷. Greene, Tuzzio and Cherkin 2012 define PCC with three dimensions and nine attributes including:

- Interpersonal (relationship)
 - Communication
 - Knowing the patient
 - Importance of teams
- Clinical (provision of care)
 - Clinical decision support
 - Coordination and continuity
 - Types of encounters
- Structure (system features)
 - Built environment
 - Access to care
 - Information technology

PCC was a change from “traditional, paternalistic, provider-driven, disease-focused” care toward a model where patients’ experiences require engagement at every part of the health and healing process⁸.

WHOLE HEALTH MODEL OF CARE

As a part of this PCC transformation, the US Veterans Administration (VA) in 2011 developed and hired the founding director for the VA Office of Patient Centered Care and Health System Transformation. The goal over an extended strategic plan initiative is to shift the language of patient driven care to describing veterans as human beings living in society as whole persons and remove the descriptor of seeing themselves solely as patients. The veteran should not be a passive recipient of treatment but rather an active self-aware person. The veteran needs motivation to set a series of personal goals that motivate action for positive health outcomes. The VA acknowledges this is not a quick fix and cannot be viewed as a short-term initiative to be dismissed after an annual attempt (i.e., flavor of the month/year syndrome). They recognized this requires a system level transformation. New measurements are required for veteran outcomes, clinician well-being, and an overall mentality of moving

⁶ Gaudet, Tracy, & Kligler, Benjamin. (2019). Whole Health in the Whole System of the Veterans Administration: How Will We Know We Have Reached This Future State? *The Journal of Alternative and Complementary Medicine* (New York, N.Y.), 25(S1), S7-S11.

⁷ Greene, Sarah M, Tuzzio, Leah, & Cherkin, Dan. (2012). A framework for making patient-centered care front and center. *Permanente Journal*, 16(3), 49-53.

⁸ Bokhour, Barbara G, Fix, Gemmae M, Mueller, Nora M, Barker, Anna M, Lavela, Sherri L, Hill, Jennifer N, . . . Lukas, Carol VanDeusen. (2018). How can healthcare organizations implement patient-centered care? Examining a large-scale cultural transformation. *BMC Health Services Research*, 18(1), 168.

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away from medicine outcomes as a measurement of deficits, rather than well-being and positive outcomes.

This total rewiring of health care delivery model is called [Whole Health in the Whole System of the Veterans Administration](#). The Department of Veterans Affairs serves 9 million veterans annually of the 19.5 million veterans in the US. The annual budget for the VA is approximately \$200 billion with service delivery occurring in 18 geographic networks. The VA Whole Health for Life initiative was piloted starting in 2019 across all 18 networks. This model of care includes both realms of public and medical health to embrace prevention & treatment as well as conventional & complementary care approaches.

Although the US VA is one of the largest healthcare providers in the world, these similar whole health models of care are being promoted in academic medicine at prominent institutions like Mayo Clinic, Duke Health⁹, and University of California San Francisco¹⁰.

The built environment is understood as a key element within providing the person at the center of this whole health experience with safe and supportive physical and emotional surroundings. Some of the detailed attributes that define a supportive environment are:

- Physical
 - provide calm and welcoming space
 - accommodating patient, clinical and family needs
 - easy wayfinding and navigation through the system
- Access to care
 - easy appointment making process
 - minimize clinical wait times
 - payment systems accommodating all patient circumstances
- Information technology
 - supports patients and clinicians before, during and after care encounters
 - tracks patient preferences, values and needs dynamically
 - provides self-management tools and information

PROVIDE FOR A RANGE OF PATIENT NEEDS

Achieving the best patient environment is always a goal of architects, designers, and the healthcare centers themselves. It is shortsighted to simply see a healthcare environment as a setting to diagnose or treat. Each patient is unique and has a range of needs that must be addressed in order for care to be as effective as possible.

SPACES TO RESTORE HEALTH

One cannot assume that a healthcare environment is “homelike”, but the goal is to make the area as stress-free and trouble-free as possible. Evidence based design has helped with improving the environment of both outpatients and inpatients. By considering needs from the point of view of multiple end users (i.e., patient, staff, physician, service individuals, etc.). needs can be addressed comprehensively and targeted to each population. Not only should the spaces be conceptualized but other factors such as natural light, exterior view, and finishes must be considered. The overall environment should merge mind, body, and

⁹ Duke Health (2020, Sept 21). Integrative Medicine: Customize Care for your mind, body, spirit and emotional health. *Duke Health/Duke Integrative Medicine Center*. Retrieved: 04/21/2021 from: <https://www.dukehealth.org/treatments/integrative-medicine>

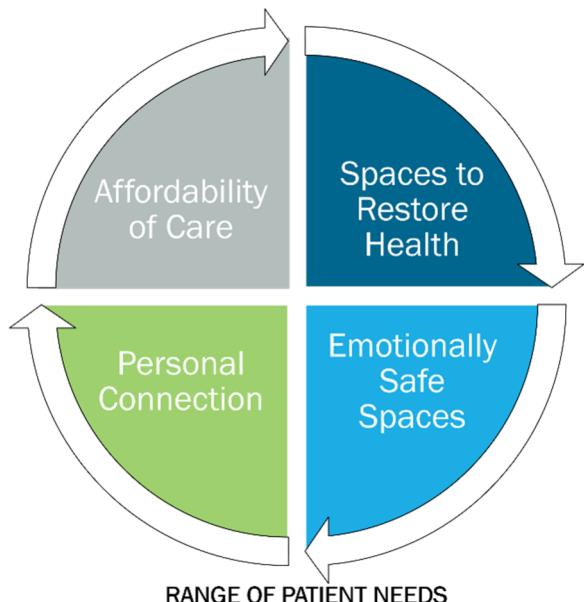
¹⁰ University of California San Francisco (2021). The Transformative Power of Lifestyle Medicine, Medical Grand Rounds with Dean Ornish, MD, UCSF Department of Medicine. Retrieved: 07/21/2021 from: <https://medicine.ucsf.edu/events/medicine-grand-rounds-dean-ornish-md>

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spirit.¹¹ Research has shown that appropriate design and amenities have resulted in greater patient satisfaction. Also, research has shown that thought in the overall environment has resulted in therapeutic benefits, shorter patient stays, reduced infections, and reduced pain.^{12 13}

EMOTIONALLY SAFE SPACES

Concerns about well-being often arise when a person is presented with some type of crisis. While physical safety is easy to see and understand, emotional safety requires trust that those we interact with will treat us with sensitivity, respect, and care. This is important, because when people do not feel emotionally safe, they are less likely to engage with care or feel connected. Their stress levels are heightened which makes it more difficult to listen, understand, empathize or be innovative. Emotional safety can be cued through physical attributes. Arranging seating to promote prospect and refuge by providing defensible spaces and vantage points can put patients at ease. Providing opportunities for choice in level of socialization in public spaces or waiting rooms can also empower patients emotionally. Allowing staff to feel safe in the environment also lowers their stress levels which allows them to provide more engaged and empathetic care. Techniques like asking permission, providing step by step information, and asking the patient if there are any questions also help to humanize the care experience¹⁴.



PERSONAL CONNECTION

When a true relationship can be established between patients and clinicians or among patients, there is accountability to comply with care. This results in better outcomes because the patient feels supported and naturally wants to meet the expectations established through these types of relationships. Stronger relationships between patients and clinicians have been shown to have a correlation to improved outcomes. The relationship is most effective when it provides opportunities for collaborative decision making and the patient sees themselves as a care partner. For example, dissolving the "us vs. them" hierarchy between clinicians and patients can be facilitated by comfortable, face to face seating, movable furniture, and communication tools such as white boards or screens and handouts. This

¹¹ DuBose J, MacAllister L, Hadi K, Sakallaris B. Exploring the Concept of Healing Spaces. HERD: Health Environments Research & Design Journal. 2018;11(1):43-56. doi:10.1177/1937586716680567

¹² Measuring Costs and Outcomes in Healthcare. A collaboration of the editors of *Harvard Business Review* and the *New England Journal of Medicine*, exploring cutting-edge ways to improve quality and reduce waste.

¹³ Better Healing from Better Hospital Design hbr.org, 2015/10, better-healing-from better-hospital...by Yuhgo Yamaguchi, Oct 5, 2015

¹⁴ Johnson, K. (2016, May 18). *Four Ways to Make Patients Feel Safe*. BH365. <https://www.thenationalcouncil.org/BH365/2016/05/18/4-ways-make-patients-traumatic-histories-feel-safe-primary-care/>

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relationship will become increasingly important as care becomes more personalized and patients expect and seek out relationships with providers¹⁵.

AFFORDABILITY OF CARE

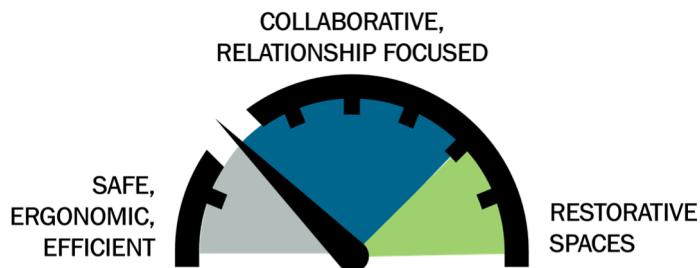
Patients will avoid care that seems as if it will financially deplete them. Inadequate insurance coverage is a significant obstacle in accessing care. Visits won't be scheduled; prescriptions will go unfilled. However, affordability goes deeper than the cost of care. Other important considerations are transportation costs, and long wait times resulting in extra time off work for appointments, resulting in a higher incidence in rescheduled or missed appointments. This has a disproportionate effect on vulnerable populations and minorities. Building health services along walkable routes that are also well served by public transit can alleviate this, as well as co-locating services so patients can access multiple appointments in a single visit. Use maps with public health information to determine the area that most need access to care. Design universal clinics that can serve a range of specialties. Provide telehealth capabilities for same day consults¹⁶.

¹⁵ Johnson, T. (2019, March 11). *The Importance of Physician-Patient Relationships Communication and Trust in Health Care*. Duke Personalized Health Care. <https://dukepersonalizedhealth.org/2019/03/the-importance-of-physician-patient-relationships-communication-and-trust-in-health-care/>

¹⁶ University of California San Francisco (2021). The Transformative Power of Lifestyle Medicine, Medical Grand Rounds with Dean Ornish, MD, UCSF Department of Medicine. Retrieved: 07/21/2021 from: <https://medicine.ucsf.edu/events/medicine-grand-rounds-dean-ornish-md>

STAFF RESILIENCY

The task force sees two current trends that will reshape the healthcare work force: working at top of license, and healthcare workers leaving the profession. In this highly stressful climate, staff can easily feel that they are constantly having to do more with less resources. Therefore, it is critical to focus design efforts on providing supportive environments that allow them to restore between cases¹⁷. The endemic burnout in healthcare environments is due not only to higher levels of stress, but an inability to restore oneself and a feeling of hopelessness that the situation will improve¹⁸.



STAFF RESILIENCY

There are three main areas that must be considered to promote resiliency. While many facilities focus on providing safe, ergonomic and efficient space, the other two areas have greater impact.

Important considerations are as follows:

WORK ENVIRONMENTS THAT SUPPORT THE TASKS PERFORMED

These environments must be ergonomic, promote safety and situational awareness, provide ability to meaningfully interact with co-workers and be customizable to suit patient care needs. Additionally, a careful study of what should be centralized vs. decentralized should be performed to make sure that the space reduced time spent traveling among destinations so more time can be concentrated on patient care.

COLLABORATION AND LEARNING

Staff need the support of one another. This includes social support and the ability to collaborate with one another on patient care. The clinical environment must be constructed to provide opportunities for one-on-one collaboration, group collaboration and departmental meetings. Supporting the work process communicates to staff that their well-being is important

RESPITE ENVIRONMENTS.

This is one of the most lacking spaces in healthcare, but perhaps one of the most important ways for staff to reset after a particularly difficult patient, to take a break or just rest. Respite environments include outdoor garden spaces that feature shade and seating as well as multisensory experiences of plants, textures, visual elements. Quiet rooms with the opportunity to rest and listen to soothing music, adjust lighting preferences. Quality break spaces with natural light and views that do not double as locker or conference space.

¹⁷ Willard-Grace R, Knox M, Huang B, Hammer H, Kivlahan C, Grumbach K (2019). Burnout and Health Care Workforce Turnover *The Annals of Family Medicine* Jan 2019, 17 (1) 36-41; DOI: 10.1370/afm.2338

¹⁸ Reith T. P. (2018). Burnout in United States Healthcare Professionals: A Narrative Review. *Cureus*, 10(12), e3681. <https://doi.org/10.7759/cureus.3681>

SPHERE 3 AGILITY OF THE SYSTEM

The Hospital is not the sole place of care. What is surfacing now and will become a more dominant factor in the future is that we need to shift focus from healthcare to *health*.

Systems will forge uncommon partnerships within the communities they serve to ensure people have access to the tools and resources they need to live healthy lifestyles and get regular preventative care. It will require healthcare to have more of a push than pull effect and morph sites of care based on what provides the most access. Access will be defined not only by how easily someone can get care, but how dynamically responsive that care can be. In recent years, systems have adjusted to respond to natural disasters and pandemics. The Task Force believes microresponses to population health needs will emerge that focus on areas previously considered outside the purview of healthcare.

EQUITABLE ACCESS TO CARE

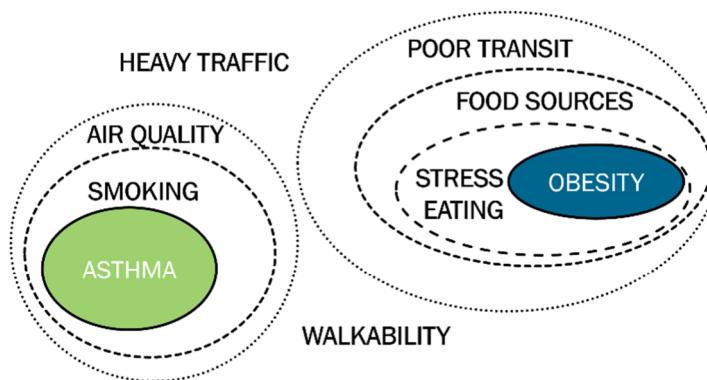
Equitable care refers to our ability to provide affordable, high quality, culturally appropriate service in a timely manner. As demographics of our population change, demands for care will change and as clinical means of service evolve, how we provide medical support and the settings in which we provide them will change.

Availability of mobile and pop-up clinics that can turn into semi-permanent facilities; buildings that can focus on and develop into single or multi-purpose treatment entities; new uses that can be put to the myriad of rural and inner city hospital closures that are occurring or will be abandoned in the future (due to the lack of funds or populations to support them); needs of the baby boomer populace or children requiring timely services that exist outside of the urban centers – will affect how providers respond to the need for new or altered structures and programs to meet individual needs.

With changes in how payment for service are made, how access will need to change to meet millennials desire for selfcare; where the number of baby boomers, who are relatively well, will need chronic care support; and where preventative care initiatives will begin to minimize the need for emergency rooms, urgent care centers, physician office interaction (because of telehealth/virtual care options), will all create new pressures on those designing facilities to create new approaches to delivery of care.

FLEXIBILITY OF FACILITIES WITHIN AND BEYOND BUILDING WALLS

As we look to the future provision of medical and health care services, we need to be able to respond to client needs creating new purposeful uses of their present facilities; expansion of activity into non-traditional settings; and growth in provision of ambulatory/patient self-care locations that will meet individual needs.



MICRORESPONSES

Building health in the future will be tied to how well systems can respond to the dynamic needs of the communities they serve. Many of these needs are tangential to treatment and require uncommon partnerships.

RESOURCE

Access to Health Services

Office of Disease Prevention and Health Promotions
US Department of Health and Human Services

<https://health.gov/healthypeople>

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The ability to be able to change purposes and functions of facilities; modify practice within them and the ability to scale them for use; move them into new settings and markets in response to community needs and demands; and the ability to extend out their life cycles for response to changing “missions” of clients – will require a futuristic approach on the part of architects and designers to develop flexible infrastructure that can accommodate new needs and the way people want to be culturally treated.¹⁹

IT'S NOT ALWAYS ABOUT THE BUILDING

Traditional healthcare solutions have always resulted in new construction but in today's cost constrained environment, new construction may not be possible. Programming new functions into existing healthcare structures can be more cost effective and environmentally friendly. New functions in existing structures may involve reuse or renovation with no new construction. The product must be efficient and work well for all end-users without a resulting new building.



WHAT ELSE CAN IT BE?

Decentralizing health services and providing access to underutilized space during parts of the day can impact outcomes.

Architects must use their abilities to assist a healthcare client to provide more efficiencies by establishing functional relationships. The result may be a strong architect and client relationship to further maximize efficiencies in existing structures while following all regulatory building codes. Repurposing space has become a facility strategy for healthcare systems expanding or shifting services away from their hospitals since less capital investment is required.²⁰ Repurposed space can be made operational more quickly than new construction. Most of the inventory of existing buildings were built for retail, office, and industrial use. These spaces often have many of the characteristics that healthcare organizations desire, including good visibility, abundant parking, and large, open floor plates²¹.

¹⁹ Kendall, Stephen & Kurmel, Thomas & Dekker, Karel & Becker, John. (2012). *HEALTHCARE FACILITIES DESIGN FOR FLEXIBILITY* Healthcare Facilities Design for Flexibility: A Report on Research for The National Institute of Building Sciences.

²⁰ Burke, P. (2018, November 2). *Resuscitating Buildings for Healthcare with Adaptive Reuse*. Medical Construction and Design. <https://mcdmag.com/2018/10/resuscitating-buildings-for-healthcare-with-adaptive-reuse/>

²¹ Burke, P. (2020, February 24). *Resuscitating Buildings for Healthcare: Adaptive Reuse*. Gresham Smith. <https://www.greshamsmith.com/blog/resuscitating-buildings-for-healthcare-adaptive-reuse/>

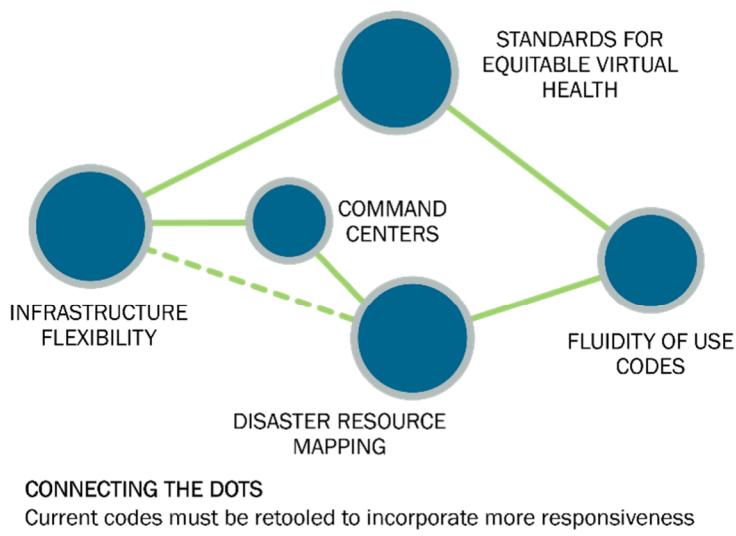
TAKING ACTION

DIVERSIFICATION OF HEALTHCARE INFRASTRUCTURE

Our current code system does not support fluidity of use. Ways to be more flexible yet maintain patient and staff safety must be considered to facilitate care that is responsive and located where it needs to be to serve a population in need at any given time.

RESILIENCY AND DISASTER

While not a new issue or planning requirement, disaster preparedness is usually thought of as an episodic need. It's typically addressed in design by providing the ability for overflow spaces or the conversion of existing space resources to fill a temporary need. Examples would include the ER1 Study done circa 2005 with Washington Hospital Center to allow them to be the primary mass casualty center for the Washington DC area and to create a model for how to respond to large scale mass casualty disasters. More recent examples would include the many large scale COVID treatment and vaccination facilities utilizing sports arena venues.^{22 23}



CONNECTING THE DOTS

Current codes must be retooled to incorporate more responsiveness instead of reaction into the way we design, build and operate facilities.

Emergency preparedness has been elevated as a major focus by the Joint Commission. Having a robust system to handle mass casualties and related events ties directly into federal reimbursements. Historically hospitals have been the center where individuals go in the event of an emergency. They have become safe havens and keeping the environment safe is paramount. The CMS accreditation requirement of being free-standing for 96 hours must be met and there must be a process in place to sustain the facility for longer if needed. A process of assessment, planning, mitigation, implementation, evaluation, response, and recovery must be in place and remain ongoing. Part of this evaluation is an annual hazard vulnerability analysis which evaluates the threat and probability of natural and man-made disasters. The all-hazards approach establishes a framework to prepare for disasters and mass casualty events. The medical center must be able to effectively integrate communications efforts across all agencies including public health, county fire and rescue, state agencies and service providers. Events in the recent past have shown successes and

²² Drenkard K, Rigotti G, Hanfling D, Fahlgren TL, LaFrancois G. Healthcare system disaster preparedness, part 1: readiness planning. *J Nurs Adm.* 2002 Sep;32(9):461-9. doi: 10.1097/00005110-200209000-00008. PMID: 12360118.

²³ Fahlgren TL, Drenkard KN. Healthcare system disaster preparedness, part 2: nursing executive role in leadership. *The Journal of Nursing Administration.* 2002 Oct;32(10):531-537. DOI: 10.1097/00005110-200210000-00008. PMID: 12394598.

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failures in disaster preparedness. Location of facility services must be considered during the ongoing evaluation²⁴.

COMMAND CENTERS

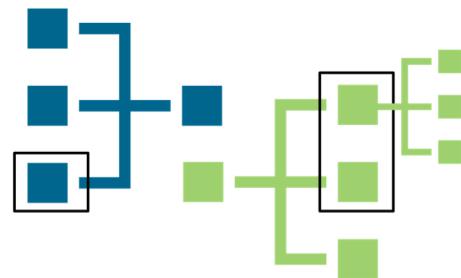
Taking a cue from lean initiatives, co-locating cross functional teams to facilitate communication and decision making in a “Big Room” has been successfully used both with design and construction teams. Some healthcare systems extended this idea in creating more open administrative staff work areas to meet day to day needs and still act as command centers when needed by providing temporary work areas for specific staff needed for the immediate need.

CORE TENANTS OF NON-HEALTHCARE BUILDINGS REUSED

ADAPTIVELY

Adaptive reuse of other building stock for health purposes is a great way to leverage existing infrastructure. When utilization rates for many building types such as offices or schools are considered, there are many hours of the day where these resources are vacant or underutilized. As part of a strategy to push healthcare and other health resources out into communities, health systems should investigate community partnerships that will increase access to and compliance with care. Municipalities should consider retooling zoning laws to allow more flexibility in supporting a variety of uses within a single building.

Speed to market to respond organically to community health needs will become a consumer expectation. Portable and modular elements that allow rapid fit out, expansion or contraction will be needed to address this demand.



ON DEMAND CUSTOMIZATION

It will be increasingly important to provide infrastructure platforms to accommodate a variety of modalities or departments that the health system can designate on an as needed basis.

VIRTUAL SPACE

As telehealth grows acceptance and more widespread use, there needs to be a standardization in care to make sure that diagnostics are accurate and that patients can access technology equitably. Telehealth cannot rely on the stability or availability of an internet connection, or the quality of the device used. It cannot rely on audio quality or the lighting available to the patient.

Consider building telehealth centers with vitals pods located within storefronts or schools. Several of these can be staffed by a medical assistant or tech and members of a community who might not otherwise be easily able to access care can conduct a high-level virtual visit. This can be useful in urban areas, rural communities, even nursing homes.

Virtual space also extends to family or caregiver interaction with health providers. Someone helping care for an elderly parent might be living across the country and need to be able to participate virtually in physician visits, inpatient stays and be able to review vitals data collected in real time.

²⁴ Safety Institute. (2021, May 26). *Emergency preparedness for healthcare* | - Safety Resources and Tools to Promote a Safe Healthcare Delivery Environment for Patients, Workers, and Their Communities. <https://www.premiersafetyinstitute.org/safety-topics-az/emergency-preparedness/emergency-preparedness/>

UNDERSERVED POPULATIONS

So often new projects attempt to serve various versions of a “typical” patient. The future of healthcare must be inclusive and address the needs of people who aren’t usually considered in the design process. This includes the elderly, LGBTQIA+ community, mentally ill, those who have survived trauma and rural populations.

REACHING THOSE IN NEED

In the broader view of society, there is a quiet and often completely voiceless need of access to care by medically underserved areas or populations, or MUA/P’s, as known to the US government. These are areas or populations designated by Health Resources and Services Administration (HRSA), as having too few primary care providers, high infant mortality, high poverty or a high elderly population.²⁵

A recent analysis by Pittsburgh Post-Gazette/Milwaukee Journal reported that people in low-income urban communities are less healthy than those in more affluent suburban neighborhoods that have greater access to hospitals and physicians.²⁶ High rates of chronic disease, disabilities and premature death are well-documented in communities with high incidence of poverty.

Historically, many hospitals around America began in the past century as charitable faith-based organizations dedicated to helping the poor and needy. Hospitals located in rural areas have provided much of the care for people in non-urbanized America. In the past three years there has been a growing trend of closures of rural hospitals. According to a research study by the University of North Carolina, over 50 such hospitals across the US have closed in the past four years (2017-2020). Numerous contributing factors are cited for the closures including the financial impacts of the 2008-2009 recession, demographic and market trends, and decreased demand for inpatient services. Some closed hospitals depended heavily on Medicare for reimbursements and for those within states that chose not to expand the program within the Affordable Care Act, the operational model became unsustainable.

In fact, hospital closures have been occurring for decades, and not just in rural areas. With the advent of health insurance in the 1940’s, hospitals became more focused on paying patients. In the 1960’s, the U.S. Government entered the insurance market with Medicare and Medicaid. By the 1980’s, Medicare switched to paying hospitals for specific services (fee-or-service model). In more recent years, as the government shifted to a value-based reimbursement system many hospitals continued to close or merge with other systems leaving a deficiency of care in rural as well as large inner-city areas.

	ELDERLY	LGBTQIA+	TRAUMA	MENTAL ILLNESS
URBAN				
RURAL				
MENTAL ILLNESS				
TRAUMA				
LGBTQIA+				
ELDERLY				

UNDERSERVED POPULATIONS

These populations are not monolithic- their needs across multiple dimensions must be considered.

²⁵ The Health Resources and Services Administration (HRSA), an agency of the U.S. Department of Health and Human Services, is the primary Federal agency for improving access to health care services for people who are uninsured, isolated or medically vulnerable. Comprising six bureaus and 12 offices, HRSA provides leadership and financial support to health care providers in every state and U.S. territory. HRSA grantees provide health care to uninsured people, people living with HIV/AIDS, and pregnant women, mothers and children.

²⁶ Thomas, L. (n.d.). *Poor Health: Barriers to Health Care for Low Income America*. Pittsburgh Post Gazette. <https://newsinteractive.post-gazette.com/longform/stories/poorhealth>

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These dramatic shifts in how care is paid for has had the greatest impact on people of low-income especially those statistically considered living in poverty. In the US, during the period between 2015 and 2019, the overall poverty rate was 13.4%.²⁷ As of the time of this writing (2021) projections for the poverty rate will rise to a level such one in seven Americans are projected to have resources below the poverty level, but with non-Hispanic Black people and Hispanic people experiencing poverty at about twice the rate of white people.²⁸

In addition, other demographic segments of society that have become fragmented from mainstream healthcare include:

- Elder persons without the network of family or friends to assist them with transitions through life with dementia.
- Persons identifying as LGBTQ and not comfortable with traditional healthcare systems where there might be a perceived stigma within the community to receive specialized care.
- Persons living in prisons
- Homelessness persons
- migratory and seasonal agricultural workers
- Indigenous people living in or near reservations
- Persons needing vaccinations due to pandemic conditions and without access to traditional providers

A SHIFT TOWARDS MORE TARGETED AND STRATIFIED CARE

Indeed, a fundamental shift to where care is given seems inevitable. Particularly with delivery of outpatient services, the unceasing demand for care in MUA/P's will likely be provided by smaller not-for-profit organizations largely funded by HRSA grants operating small clinics, Health Centers, and Critical Access Hospital (CAH's). Some health centers receive funding to focus on special populations. In 2021, HRSA is awarding over \$6 billion to support 1,376 health centers.²⁹

Care by HRSA-funded "Health-Centers" is often delivered within facilities that are eligible to receive federal loan guarantees for capital improvements. According to HRSA, some health centers receive funding to focus on special populations.³⁰

Some non-profit organizations such as Florida-based CAN Community, specialize in outpatient care and education for persons living with HIV/AIDS and have no healthcare insurance or lack

²⁷ US Census Bureau. (2020, December 10). Census Bureau Releases New American Community Survey 5-Year Estimates. The United States Census Bureau. <https://www.census.gov/newsroom/press-releases/2020/acs-5-year.html>

²⁸ Giannarelli, L., Wheaton, L., & Shantz, K. (2021, February 1). 2021 Poverty Projections. Urban Institute. <https://www.urban.org/sites/default/files/publication/103656/2021-poverty-projections.pdf>

²⁹ American Rescue Plan Act Awards. (n.d.). Bureau of Primary Health Care. Retrieved July 28, 2021, from <https://bphc.hrsa.gov/program-opportunities/american-rescue-plan/awards>

³⁰ *Rural Hospital Closures*. (2021, July 9). Sheps Center. <https://www.shepscenter.unc.edu/programs-projects/rural-health/rural-hospital-closures/>

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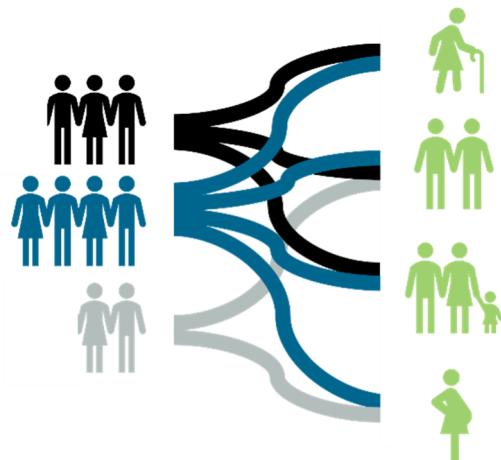
financial resources. Organizations such as these receive federal funds through the Ryan White program, state funding through Medicaid, and local philanthropic contributions. Revenue funds are used to operate and develop new medical clinics that may also integrate pharmacies and dental facilities in underserved communities. Partnership with a community center allows the clinic to be located in the spaces where this community is already gathering. Programmatic elements such as this can have an impact.

Large retailers are also finding opportunities to expand care beyond “mini-clinics” administering simple vaccines to full-service health centers offering primary care, dental, basic radiology, basic diagnostic lab testing, audiology, and optometry. In 2019, Walmart opened its first Walmart Health Center as part of a new SuperCenter in Georgia. More Walmart health centers are being planned and constructed in Arkansas and Florida.

To provide rapid response to rapidly evolving or changing healthcare needs, some government and nonprofit healthcare organization have sought to deploy mini clinics with the use of modular mobile units. Kansas-based Clinic in a Can (clinicinacan.org) is a non-profit company that builds and delivers prefabricated medical units beginning with refurbished shipping containers. The final CIAC products include climate-controlled exam rooms, surgical units, labs, and radiology units that can be assembled, scaled, and configured to meet the need of the site situation. Units can come completely outfitted with major medical equipment and, as an option, be solar powered.

SHARED RESOURCES MODEL

Adaptable and flexible space to allow a diverse group of clinicians and wraparound service providers to gather in a common location. For underserved populations, the fix is not always about Brick and Mortar. In recent years, there has been a lot of attention to the concept of Population Health. In 2008, the state of Oregon was facing an annual multi-billion-dollar financial deficit due healthcare costs. The initial solution to the problem was spearheaded by three counties around the Metro-Portland area that came together in 2012 to form the state's largest Coordinated Care Organization. Combining the resources of doctors, hospitals, Insurers, and Mental Health professionals, these entities contractually agreed to share Medicaid funds under a new initiative to care for patients under a more holistic paradigm. By including preventative care, early childhood care and meeting individualized social needs, the CCO serving approximately 25% of the population, after six years, was able to save over \$2.2 billion dollars over in federal and state money. Unnecessary visits to the Emergency Departments dropped 30%.³¹



WRAPAROUND SERVICES

In a single visit, patients can access expanded services that address other social determinants to health

³¹ Health Share of Oregon | Oregon Health Plan: Covering Oregon Health Plan Members in Clackamas, Multnomah, or Washington Counties. (n.d.). <https://www.healthshareoregon.org/>. Retrieved July 28, 2021, from <https://www.healthshareoregon.org/>

LEAN APPLICATIONS

The common thread of “flexibility, adaptability, adaptiveness or agile environments” which runs through much of this report really calls for environments that are designed to change. Almost everything can be changed if there is enough budget, time and resources. Lean calls for the ability to accommodate continuous changes to eliminate waste on a daily basis. According to a study done by the Center for Lean Engagement and Research at UC Berkeley, almost 70 percent of healthcare systems have reported using Lean or related Lean plus Six Sigma or Robust Process Improvement approaches³².

HOW TO MAKE HEALTHCARE MORE AGILE

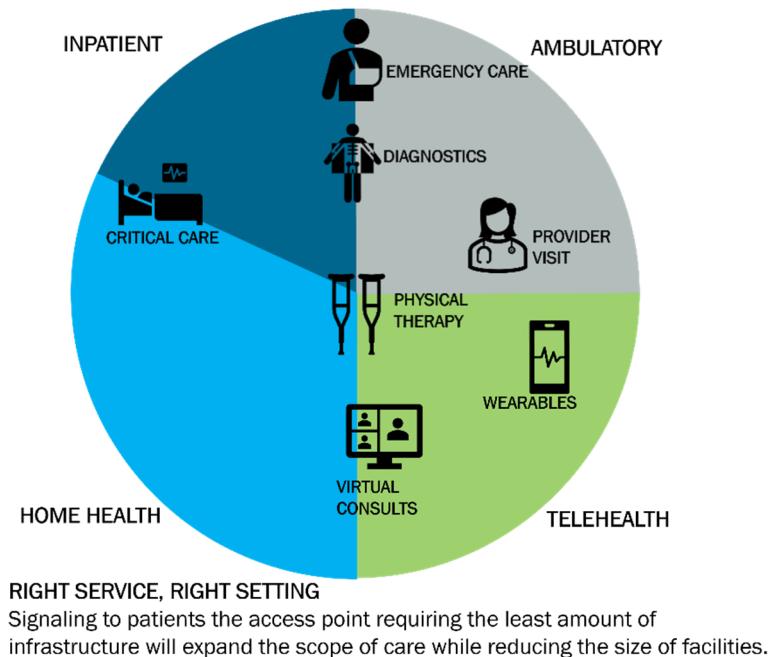
“The **Agile** approach—if embraced by **health care** organizations—will enable new **Agile** health practices, allow care to be **more** adaptive and responsive to new knowledge, improve care processes to deliver **more** value, and **more** effectively adopt new technologies to improve the care of their patients.”

Healthcare like other businesses must keep pace with the ever-changing business environment. Agility – an organization’s ability to adapt quickly with respond to change has become extremely important. Agility has its roots in Continuously Quality Improvement. The background of agility can be found in many manufacturing industries. How to react to a change in the environment and how to deploy processes and capabilities to address changes, challenges, and opportunities is extremely important. Agility is especially relevant to healthcare. The healthcare industry is dealing with items such as the ownership of physician practices by healthcare organizations and the adoption of value-based care arrangements. Patients have increasingly been empowered in making care decisions. Regulatory and financial pressures have grown.

The ever-increasing pace of technological advancements, rising costs, and new entrants into the health care marketplace are part of the challenge healthcare must face today. Healthcare organizations must find effective methods to embrace innovation, which we define as the delivery of new patient and clinician value.³³

LEAN PROCESSES: STREAMLINE METHODS OF PATIENT ARRIVAL TO DISCHARGE (DO YOU EVEN NEED TO BE HERE?)

As health systems look to be more efficient and responsive, they are continuing to be challenged in some very traditional ways. Hospital architects and designers familiar with lean principles can be of help



³² Use of Lean and Related Transformational Performance Improvement Systems in Hospitals in the United States: Results from a National Survey, The Joint Commission Journal on Quality and Patient Safety – Volume 44, Issue 10, October 2018, Pages 574-582.

³³ Berlin, G., de Smet, A., & Sodini, M. (2017, May 15). *Why agility is imperative for healthcare organizations*. McKinsey on Healthcare. <https://healthcare.mckinsey.com/why-agility-imperative-healthcare-organizations/>

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to medical leaders and providers in response to these challenges.

The need for capacity continues to grow because of a baby boomer population in need of critical care services. At the same time, hospitals continue to be pressured to minimize their use of staff and resources at a time when payers are looking to reduce their payments.³⁴ Changes in the use of new and sophisticated technology and the availability of virtual technology are impacting the ability of these facilities to move people effectively through their systems and affect their length of stay. The ability to right size nursing units, ability to improve flexibility and efficiency in the use of ED's to minimize patient stay or use of inpatient facilities; the ease of movement of patients through perioperative services that could otherwise clog the system; and the design of discharge capabilities that could allow the patient and family to move quickly will be important to be looked at in efficient ways.³⁵ Lean activities that can reduce motion, timing, use of resources, etc. and improve the quality and safety of those served will need to be built into facilities of the future.^{36 37}

³⁴ Williams, M., & Mewborn, A. (2013, November). Using Lean in Healthcare Facility Planning & Design. *Asian Hospital and Healthcare Management*, 28. <https://www.asianhhm.com/archives-magazine/21>

³⁵ Hamby, S. (2019, February 14). *Applying Lean Thinking to Healthcare Facility Design: A Before and After Approach*. Gresham Smith. <https://www.greshamsmith.com/blog/applying-lean-thinking-to-healthcare-facility-design-a-before-and-after-approach/>

³⁶ Improving Care Delivery Through Lean: Implementation Case Studies. Content last reviewed November 2014. Agency for Healthcare Research and Quality, Rockville, MD. Publication 13 (15)- 0056. <https://www.ahrq.gov/practiceimprovement/systemdesign/leancasestudies/index.html>

³⁷ Agrawal, S. (2017, March 13). *10 Ways Hospitals Can Reduce Length of Stay for Their Patients*. LinkedIn. <https://www.linkedin.com/pulse/10-ways-hospitals-can-reduce-length-stay-patients-sanjeev-agrawal/>

FLEXIBILITY AND TECH

By facilitating care, technology will replace some of the people and processes involved while including others. It will allow more functionality and efficiency while filling staffing gaps and enabling more personalized and dynamically responsive care. Look for more wearable technologies, and deliveries of samples using drones,

DISSOLVING DEPARTMENTS

Having spaces capable of performing multiple functions will allow healthcare to adapt to census demands. Utilization rates of spaces can be increased by this as-needed approach to care. Silos that create inefficiencies will be eroded as staff are untethered from departmental protocols and are instead assigned to spaces based on their skill sets *and patient needs*. This is different from the “universal inpatient room” concepts of years ago that imagined a mixing of acuity and an almost impossible level of cross training. Instead, patients will be grouped according to treatment needs and the mix of staff from multiple disciplines needed to provide care to that cohort will be assigned to that zone of the facility. Charting will be reimagined to support multidisciplinary teams that include ancillary departments and allow voice activated credentialing and commands as well as AI assist for diagnosis and treatment codes.

Robust telemedicine platforms with expanded networks for increased access will expand home health opportunities, allow more connectivity among caregivers and open up consult opportunities. No longer will patients have to travel to hospitals specializing in their disease, they will be able to have providers from that facility partner with their local caregiver. This will reduce patient costs and level the playing field for who can access world class care.

Within the building, spaces will become more department neutral as prefabricated and modular elements replace built in items to allow easier reconfigurations. Equipment will become smaller and more mobile, allowing it to travel where most needed, reducing patient transport and making care more efficient. Advanced imaging will be simplified with mobile platforms.

Because so much care is being transferred to ambulatory settings, the Task Force advises all inpatient spaces be ICU capable for maximum flexibility and that procedure rooms be designed to support multiple modalities such as Operating room, Interventional Radiology and Endoscopy. Outpatient settings will also have multi-function exam/consult/treatment functions.

ROBOTICS AND DRONES

In the future, healthcare will be highly personalized and customizable based on real time inputs of patient data. More responsive and on demand services to address health issues will be available using robotics and drones,

There are two types of robots, those that are autonomous with a programmed AI protocol and those that require supervisory control. Surgical robots are an example of supervisory control where the robot performs the operations under the step-by-step instruction of the surgeon controlling it. Autonomous robots are currently used in healthcare settings for cleaning and disinfecting spaces, stocking or delivering supplies, drugs or food.

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Patient-facing models can serve as greeters or virtual nurses. As technology improves and becomes more affordable, there will be increasing implementation of this technology. Implications for care mean more just in time delivery. The Institute of Electrical and Electronics Engineers (IEEE) forecasts that robots that provide diagnostics and telemedicine capabilities will be employed in the future during pandemics or to treat infectious disease patients because it reduces the need for Personal Protective Equipment (PPE) and risk to staff. It also reduces transmission because robots are programmed to comply with infection control protocols humans may forgo.³⁸



FUNCTION BASED ROBOTS

Perform specific tasks. These can vary from stocking and delivery to cleaning to specialized functions such as surgery



INTERFACE ROBOTS

Perform a variety of tasks related to patient interaction.



DRONES

Used for pickups and deliveries as well as to survey a setting to understand events and activities on the ground.

³⁸ Hauser, K., & Shaw, R. (2020, May 4). *How Medical Robots Will Help Treat Patients in Future Outbreaks*. IEEE Spectrum. <https://spectrum.ieee.org/automaton/robotics/medical-robots/medical-robots-future-outbreak-response>

CONCLUSION

As we look towards the future of Healthcare in the US and consider the types of places, facilities, and spaces where care can be provided, architects might consider their potential roles in helping communities, to which they belong or share some connection, improve access to care to all persons, regardless of geographic location, age, race, gender identity, or socio-economic status. Many architects and architecture firms believe they have some sense of social responsibility grounded in an innate sense that some buildings and spaces can improve and even transform the quality of life for people. For some architects, it's not always about winning the high-profile, high-profit jobs. There are indeed opportunities to assist healthcare and public health organizations drive towards a more equitable system of care.

The foundation of healthcare architecture has provided the resources and expertise to have the high-level conversations that we have. It also helps us see the next step in our evolution. This fundamental belief about healthcare and who it serves will remain even as we adapt care to new environments. Health will be infused into all segments of society (as we experienced with COVID-19 in 2020 to 2021) and should be available to a larger and wider population base by becoming more diverse as a typology (commercial retail, residential, education). Healthcare must be reexamined and applied as a compilation of its basic components as needed to fit the needs of the community. Expect to see a blending of typologies and experience and intended outcomes based on how user groups inform program. As healthcare becomes more integrated into other building types and settings, the role of the Healthcare Architect will also shift to focus to the critical role of facilitating, envisioning, and designing environments for health.