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## Mission of the *Academy Journal*

As the official journal of the AIA Academy of Architecture for Health (AAH), this publication explores subjects of interest to AAH members and others involved in the fields of health care architecture, planning, design, and construction. The goal is to promote awareness, educational exchange, and advancement of the overall project delivery process, building products, and medical progress that affect all involved in those fields.

## About AAH

AAH is one of 21 member communities of The American Institute of Architects (AIA). AAH is unique in the depth of its collaboration with professionals from all sectors of the health care community, including physicians, nurses, hospital administrators, facility planners, engineers, managers, health care educators, industry and government representatives, product manufacturers, health care contractors, specialty subcontractors, allied design professionals, and health care consultants.

AAH currently consists of approximately 7,000 members. Its mission is to provide knowledge that supports the design of healthy environments by creating education and networking opportunities for members of—and those touched by—the health care architectural profession.

Please visit our website at aia.org/aah for more about our activities. Please direct any inquiries to aah@aia.org.



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# The Architect's Role in Telehealth Care

Ellie Hayati
2022 Candidate for Master of Architecture + Health
Clemson University

Cait Shaw, Associate AIA
Architectural Designer for Healthcare Environments
LS3P

**ABSTRACT**

Home-centric American culture focused on locality and convenience, combined with a public health emergency, COVID-19, has accelerated the transition to telehealth as part of a regular health care delivery practice. Various health systems have been using telehealth to improve health care access and convenience for patients for several years. Telehealth has potential to reduce costs for providers and patients, alleviate wait times and travel distance, and reduce physical and mental stress. Design for optimal telehealth space for provider visits has been explored heavily. The Veterans Affairs (VA) health system as well as the Facility Guidelines Institute (FGI) have published standards for telehealth; however, nationally accepted codified standards are yet to be offered. Furthermore, full analysis of space programming in a health care environment is in its infancy for a telehealth-driven care delivery model. Intimate integration of telehealth and artificial intelligence into health care delivery will continue to evolve and, thus, so will the supporting architecture.

## American culture + health care at home

Pop culture sci-fi movies like *Back to the Future* (1985, 1989) predicted that by 2020 we would travel far and wide in flying cars, but consumer science has instead been largely focused on locality and convenience. Food, medications, entertainment, fashion, and countless other products are ordered online and delivered in days. This cultural shift was accelerated by COVID-19. Western society has placed a huge emphasis on technology that serves individuals at home. Advancements in technology make it possible for health care providers to follow the commercial sector with a similar model of accessibility and accommodation.

While telehealth has been around since Alexander Graham Bell phoned his doctor about an ailment (Gogia, 2021), COVID-19 popularized telehealth as a strategy to serve patients during the public health emergency. Medical professionals claim that "The COVID-19 pandemic has essentially accelerated U.S. digital health by about 10 years" (Marin, p. 1, 2020). A University of Michigan study found that the percent of telehealth visits grew from 4% to 26% from March to June 2020 (Buis & Kullgren, 2020). This care strategy became imperative during the pandemic, offering reduced risk of transmission and inherently following the social distancing guidelines. Telehealth also reduced the stress and physical requirements on an already overburdened health care system and has allowed people in underserved areas to receive care without traveling (Fant et. al., 2021).

The on-demand American lifestyle has compelled artificial intelligence (AI) as a staple home furnishing or personal accessory. "Smart" devices utilize AI to populate a database dedicated to learning consumer preferences and adjust future suggestions accordingly. This feedback loop between humans and machines is called cybernetics (Wiener, 1948). Telehealth is fundamentally a cybernetic health care experience for both provider and patient. Not only does technology enable communication among individuals, but electronic medical records (EMR) build a database of any one patient's health. Individual health databases are often anonymously combined in large numbers to produce statistical analysis and suggested patterns, such as "In the United States, cigarette smoking is linked to about 80% to 90% of lung cancer deaths" (CDC, 2020). An algorithm supplied with multiple health databases allows AI diagnostics to take place. Asynchronous or live-video urgent care often includes symptom questionnaires to narrow down the diagnoses for the health professional before ever speaking to a patient. The software's AI can provide this service because of data on millions of previous successful diagnoses and treatments. This exchange of data in the medical community has been building for decades and lends itself gracefully to telehealth care. Although telehealth can be performed from remote locations, the environment does still matter.

## Defining telehealth in 2021

Vocabulary around telehealth is still evolving. For the purposes of this article, it is important to note that telehealth is an umbrella term that includes many elements, but the authors agree to the following distinctions:

> The World Health Organization calls telehealth "the delivery of healthcare services, where patients and providers are separated by distance" (Gogia, 2021).
>
> Telemedicine includes teleconsultation, telediagnosis, and digital communication between medical providers.
>
> Asynchronous care (eHealth, Digital Health, mHealth) is used when electronics are incorporated for health provision, support, or management not conducted in real time (Gogia, 2021).
>
> Cybernetics refers to the artificial intelligence (AI) feedback loop between human and machine (Conway 2005). Cybernetic care refers to the combination of technology and human response to create patient treatment solutions.

## Telehealth in practice

Though telehealth challenges exist, many health systems are applying telehealth to improve health care access and convenience for patients. The following case studies prove that this type of care is possible to reduce cost, travel distance, and stress for both providers and patients.

### Community Health Center of Central Missouri

Launched in 2019, a mobile telehealth unit in Central Missouri aims to serve a rural community. The vehicle is fully equipped like a typical exam room. According to the Community Health Center of Central Missouri, "Staff will also have the ability to use telehealth technology in the mobile unit to connect patients with other providers. The patient sitting in the mobile unit will be able to see and talk with a physician or other health care providers in one of our clinic sites via a telehealth unit. This connectivity allows us to address many of the patient's needs in one setting without the patient having to travel" (Clevenger, 2019). The mobile unit is focused on providing care to impoverished, homeless, and other vulnerable populations who would otherwise go under- or unserved by traditional health care delivery methods.

### Rutgers University partnered with SmartCareDoc

In 2018, Rutgers University partnered with SmartCareDoc to deliver care in patients' homes. A registered nurse set up telehealth technology for the patient and facilitated the health visit between the patient and provider (Bagchi et al., p. 3, 2018). This was especially helpful in this area, which had high crime rates and low computer literacy. Older adults in the housing development received the benefits of in-home care without the stress of attempting telehealth alone.

### School-based health centers in South Carolina

School-based health centers have emerged as family clinics at public schools. One example is the Medical University of South Carolina (MUSC) outreach to rural and medically underserved communities in the state. MUSC providers team with the public school nurse to provide regular pediatric exams and basic diagnostic and treatment. This program also allows children to get the care they need without missing school and without causing parents to miss work (Mills, 2021).

### OnMed and Texas A&M's Health Science Center medical kiosk

Medical kiosks are another opportunity for health centers to extend their health care reach. OnMed and Texas A&M's Health Science Center developed a self-contained telehealth station located in the Milam County Sheriff's Department building, which is available for public use. The unit can take all basic vitals, can conduct high-definition video calls between the patient and provider, and even serves as a pharmaceutical vending machine for a variety of typical low-dose prescription drugs that the patient can acquire as soon as the doctor submits the prescription.

## Architecture and design for telehealth

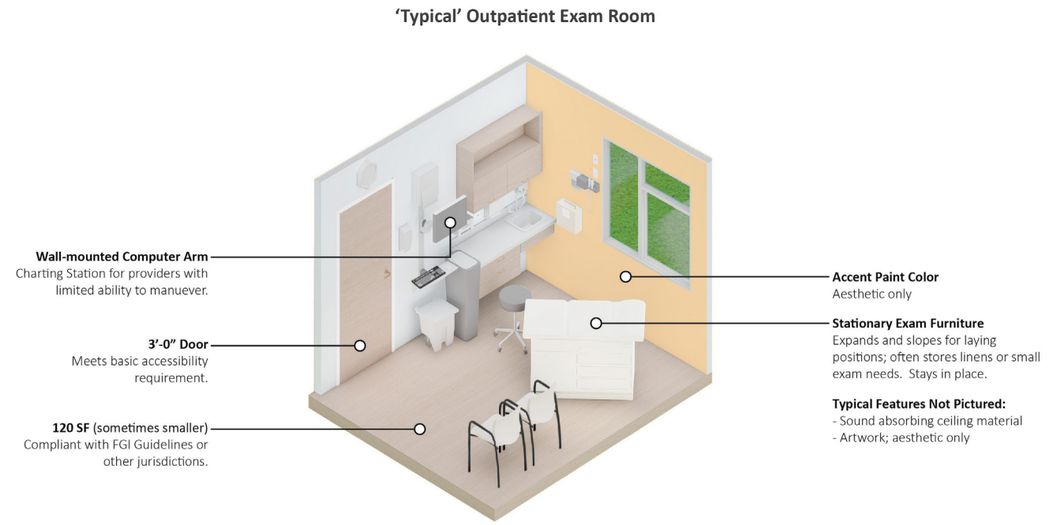



Figure 1

Collaborative spaces that integrate telehealth visits within medical office buildings and clinical spaces are possible, but several environmental factors are key to successful design. The optimal provider space for telehealth is a recording studio—much like YouTube or Instagram professionals use—complete with facial lighting, strategic camera angles, high-resolution equipment, computer workstation, and acoustic isolations in each workspace. The background should be simple and non-distracting. Video filters and special effects are often built into audio-visual communication software to minimize background distractions, but they weigh down bandwidth and potentially increase connection issues. Spaces for telehealth should also have quick access to collaboration space with other members of the health care team. Dictation rooms and private offices are considered antiquated, as technology allows for providers to work anywhere. However, because these kinds of spaces can be retrofitted with necessary equipment, such as sound proofing and monitors, telehealth may reignite their purpose.

Private offices could be upfit for telehealth by extending interior office walls to the structure above, modifying duct penetrations for sound privacy, adding sound-absorbent wall paneling and furnishings, providing proper facial lighting either using natural light or properly mitigating the distraction of natural light, and gaining the ability to personalize a backdrop to complement a provider's skin and hair color. Similarly, dictation areas tended to be rooms subdivided by small workstations that telehealth-style care could use like call centers. Dictation rooms could be upfit with sound-absorbing finish on as many surfaces as possible, noise-cancelling headphones, and customizable facial light, seat, camera, and screen locations for each workstation. Health systems and architects alike should consult acoustic engineers for specific studies on the effectiveness of sound transmission-reducing elements for specific rooms.

In a cybernetic care model, collaboration space is both physical and digital. Many health care systems are using video call software that isn't compatible with their electronic health record (EHR) software (League, 2021). The disconnect between the two platforms requires more time, causes technical difficulty, and increases the risk of poorly documented conversations with patients. Health care systems are faced with expensive infrastructure updates in order to make telehealth visits and EMRs harmonious. IT operations manager for Sentara Health, Mark Crowe, claims that the increased use of telehealth does not only call for IT changes, but requires operational overhaul, stating there is "need for executive organizational support for telehealth as

the strategic business and delivery model." (Crowe, 2021). System-wide, local, and national databases equipped with AI assistance, such as MedShr, a medical case-sharing platform, can help providers narrow diagnosis and potential treatment while having a live conversation. The human provider is responsible for checking the algorithm's decision for each patient's specific case and making corrections and/or treatment plans as necessary.

Best practices for the design of telehealth spaces prioritize flexibility, safety, resolution, and privacy. All rooms in a cybernetic care hospital should be convertible telemedicine rooms. If *telemedicine* is achievable anywhere throughout the hospital, the equipment can be moved rather than the patient. All wires, if needed at all, should be self-retracting from walls or ceilings to avoid trip hazards. Necessary equipment should be easily reached and maneuvered for staff setup. Standard ergonomic concerns such as monitors and microphone height should be observed for each patient. Since skin coloring is often a diagnostic clue, higher Kelvin lighting, light blue accent walls, and matte surfaces to avoid glare are effective strategies for "normalizing" skin tone (Krupinski, 2014). Acoustic privacy is not only a HIPAA concern, but also a patient participation factor. Soft surfaces built into the room's finishes or portable sound batting could reduce sound travel to and from rooms. Overhearing conversations, even indistinguishable murmurs from the next room, can prevent a patient from being fully candid about their own condition. At minimum, patient care rooms (exam, procedure, imaging, etc.) must be designed to adhere to the *FGI Guidelines*' STC requirements for HIPAA compliance. In the most current *FGI Guidelines*, 2.1-3.3, "Accommodations for Telemedicine Services" lists requirements for space, privacy, lighting, and portable imaging and/or monitoring devices. Furthermore, the *FGI* lists minimum design criteria for sound isolation in specific room types from Table 1.2-6.

Finally, examinations done via video communications often require a full-body view. This view is critical not only for orthopedics observations or non-facial skin conditions, but also for psychiatric evaluations, which often rely on body language to determine a patient's general health. A patient unwilling to show their body for a conversation for even a portion of a session may be practicing self-harm that will go undetected (Shaw, 2020).

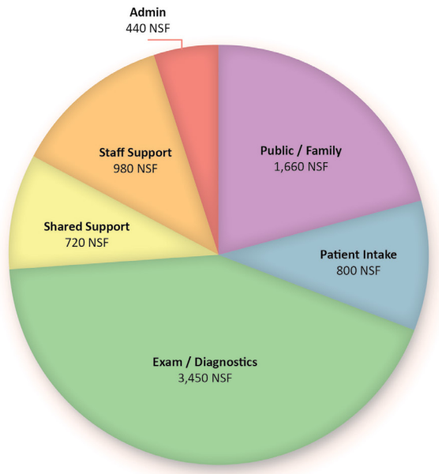
Cybernetic Care Outpatient Room

## The impacts on the brick-and-mortar health care facilities

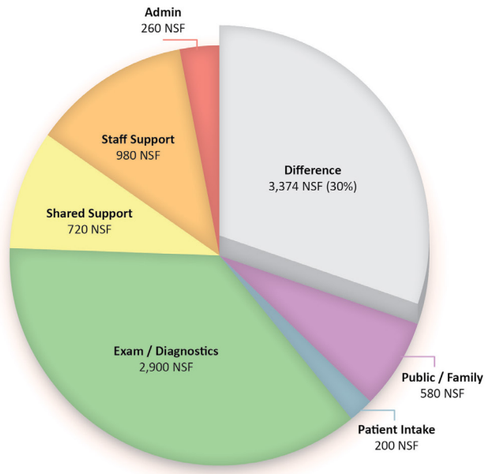
The National Syndromic Surveillance Program (NSSP) reported a 154% increase in emergency telehealth visits in the first quarter of 2020 versus the first quarter of 2019 (Koonin, 2020) due to COVID-19. Many health systems decided to make work-from-home more permanent for administrative employees. Patients began waiting in open air or parking lots and entering the facility only after receiving a text or phone call from their intake nurse. Non-emergent triage started taking place in patient homes. As these trends continue in the post-COVID era, the unused square footage of office spaces, group workspaces, waiting rooms, exam rooms, supply rooms, and parking lots will be quite large. It isn't likely that telehealth will reduce square footage by the full 67%, but it may offer the opportunity for more efficient use of built space.

## Rewriting the space program

Internal Medicine Clinic A




Internal Medicine Clinic A : Telehealth

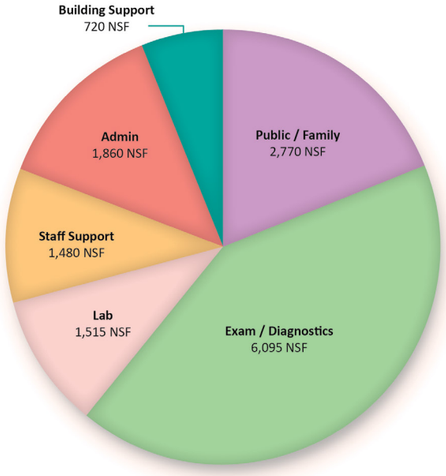



Decades ago, health systems extended their triage and diagnosis reach into suburban communities with medical office buildings (MOBs). Now telehealth connects health systems to any place cell service is available. Medically underserved populations can now benefit from this change in health care reach. Because telehealth reduces in-house triage and diagnosis, the cybernetic outpatient environment could be more procedure focused.

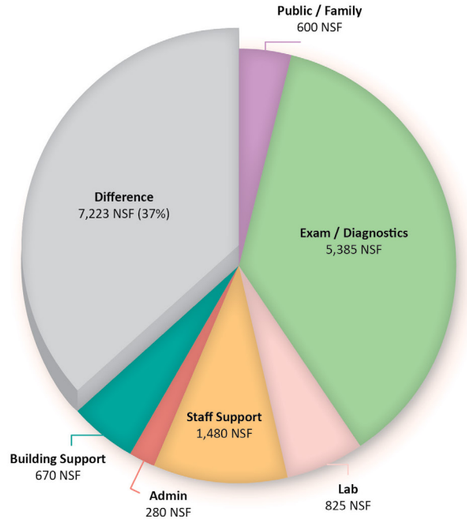
**Before**

**After**

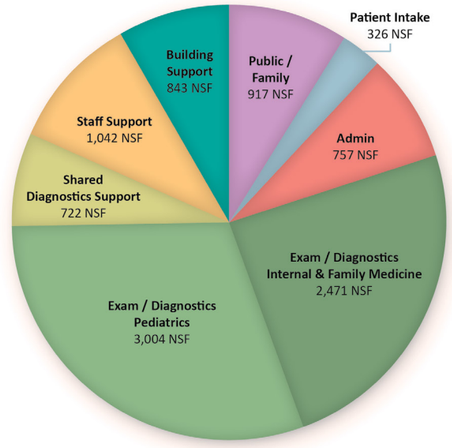
Internal Medicine Clinic B



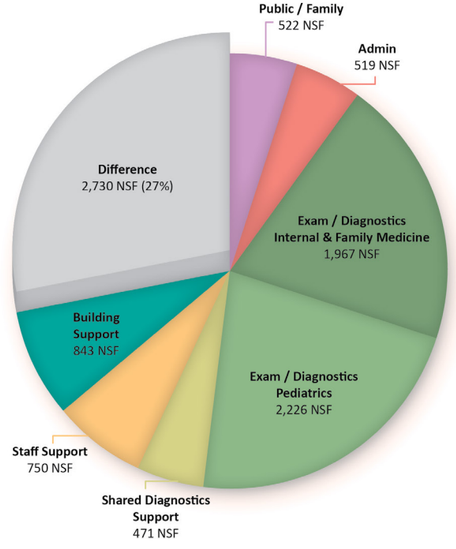

Internal Medicine Clinic B : Telehealth




Internal Medicine Clinic C




Internal Medicine Clinic C : Telehealth




A quick study of space programs for three typical internal medicine clinics demonstrated a reduction ranging from 63% to 73% of the original square footage. For the purposes of this article, a typical internal medicine clinic is classified as a low-acuity environment with mostly exam rooms and few procedure and imaging rooms. As illustrated in Figures 3, 4, and 5, a fully cybernetic outpatient care system could lead to a 30% reduction in square footage or more. Some typically programmed spaces become obsolete, but other spaces could grow. Self-check-in through cell phones, applications, or kiosks allows for alternative waiting scenarios such as parking lot waiting, outdoor waiting, virtual waitlists, and self-rooming—eliminating the need for a large waiting room.

For each space program, the following consistent cuts were made:

1. Waiting was eliminated entirely.
2. Administrative spaces were reduced to clinic offices as scheduling and financial team members would be remote.
3. Exam rooms—originally programmed for 120 square feet in all three clinics—were reduced by half the quantity and increased to 200 square feet each to become multifunctional telemedicine rooms upfit for procedures and portable imaging (“lite” imaging).
4. All procedure rooms are telemedicine rooms, and “lite” imaging rooms were eliminated.

Instead of adding telehealth-specific rooms in addition to exam and procedure rooms, exam rooms could be increased to roughly 200 square feet for multiple functions, such as physical exam, telemedicine, “lite” imaging, blood draw, and minor procedures. Predetermined multifunctional spaces compatible with telemedicine needs may prevent health systems from reverting to private individual offices. The multifunctional nature of the cybernetic exam room is larger but could reduce the amount of total exam rooms needed. Refer to Figure 6 for a proposed room design.

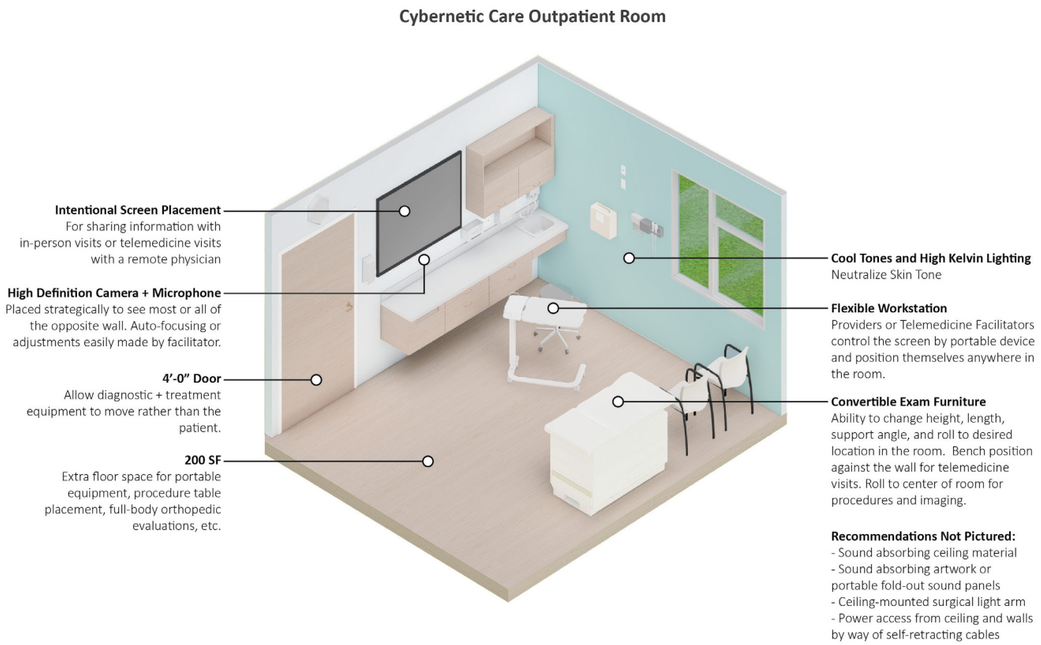



Figure 6

While telehealth is an umbrella term for several different models and methods of care, it consistently matches the American culture of convenience and technology. The case studies shown demonstrate how different systems can be developed for specific community needs. In every type of space, designers must be innovative while considering use of space as well as privacy, comfort, and the necessary telehealth elements discussed. This applies to both multifunctional care rooms with telemedicine capabilities and offices with telehealth capabilities. The recent and extreme increase in telehealth services in the health care landscape provides opportunities for improving efficiency, access, and outcomes. Telehealth expands the reach and convenience of traditional care and continues to advance in capabilities as it remains at the forefront of the industry.



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Online journal of the AIA Academy of Architecture for Health submission deadline: May 27, 2022

You are invited to submit articles, innovative project case studies, completed research projects, and monographs in the field of health care design. In addition to the architectural profession, professionals from all other disciplines involved in health care—doctors, nurses, administrators, etc.—are encouraged to submit.

Articles should be timely; preview new trends; and address industry-wide topics, issues of relevance, and emerging technology in the health care system. No book reviews, please.

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1735 New York Avenue, NW
Washington, DC 20006

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