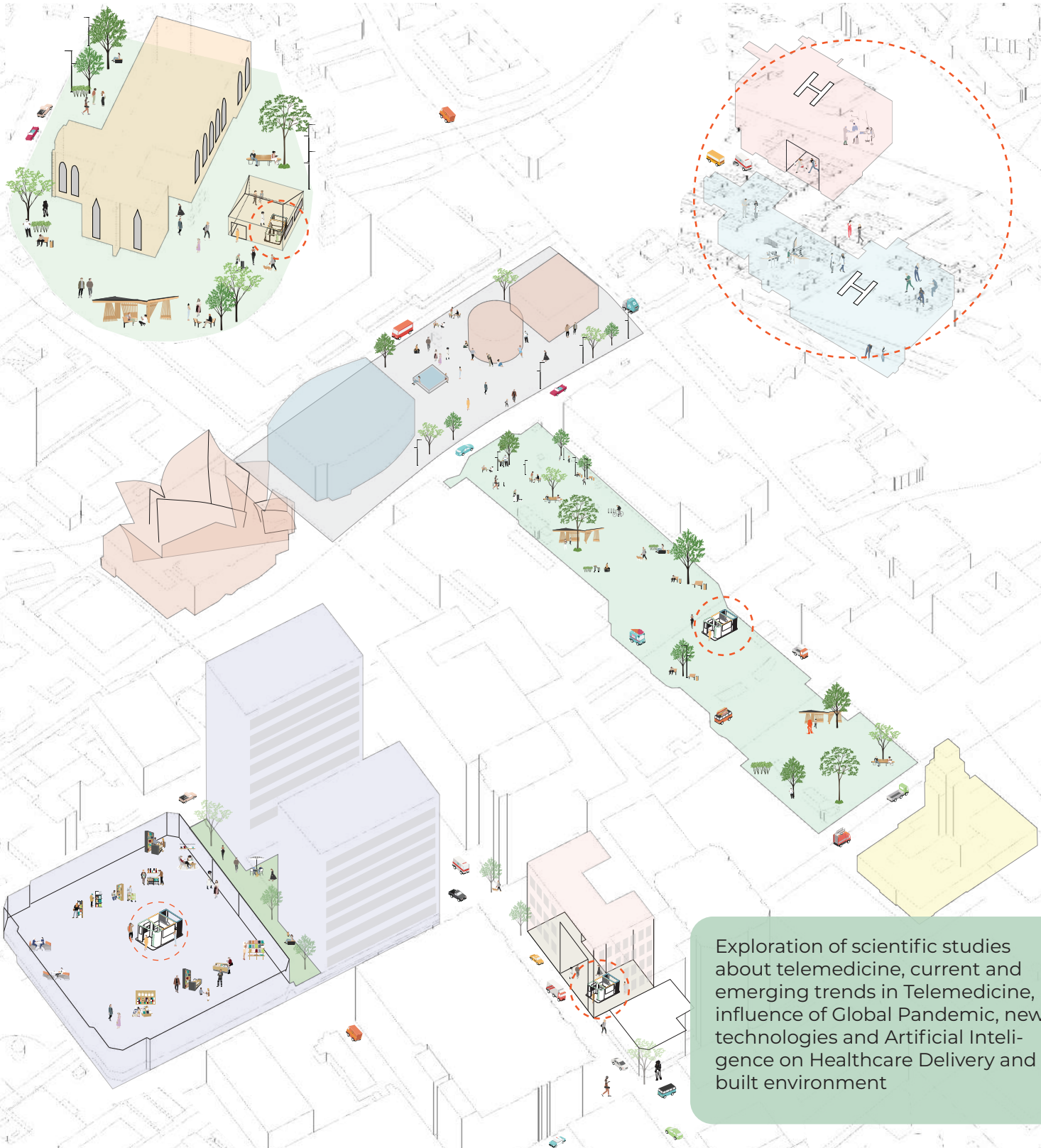




JOURNEY IN TELEMEDICINE

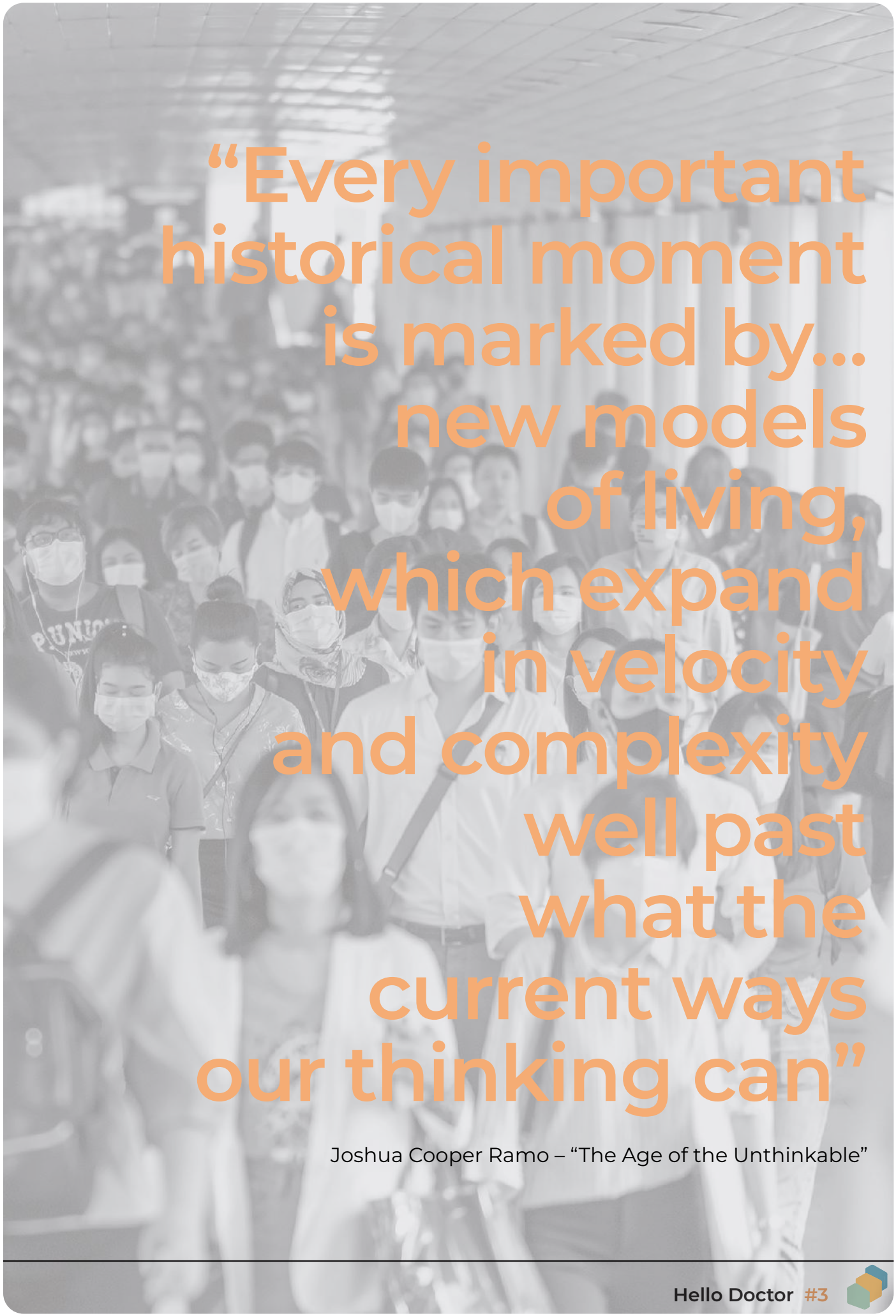
HELLO DOCTOR



Exploration of scientific studies about telemedicine, current and emerging trends in Telemedicine, influence of Global Pandemic, new technologies and Artificial Intelligence on Healthcare Delivery and built environment

STUDY CONTENTS

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“Every important historical moment is marked by... new models of living, which expand in velocity and complexity well past what the current ways our thinking can”

Joshua Cooper Ramo – “The Age of the Unthinkable”

01. intro

SYNOPSIS

Telemedicine has been around for over 50 years. It was started in the late 1960s by NASA and Nebraska Psychology Institute. Due to multiple barriers, its adoption was slow until the Global Pandemic shook the world. Suddenly Telemedicine was no longer one of the options; it was the default for patients and physicians to continue the care.

The rise of Telemedicine during the Pandemic proved that a new care model was an unstoppable force in Healthcare; most providers were quick to adapt, but the system should have been more prepared.

The surge of Telemedicine during the Pandemic generated extensive research and data that deserves examination to understand Telemedicine's evolution, its effect on the built environment, and how a strategy can be developed for its future.

Innovations and solutions are needed to provide comprehensive medical care experience that is on par or surpasses physical encounters and considers the lessons learned during the

unprecedented sudden rise of Telemedicine.

In this study, we look at how Telemedicine or rather "connected healthcare" not only continued healthcare delivery for global populations but also changed the perception of Healthcare.

The study attempts to identify benefits, short-comings, and recommendations for the future of connected Healthcare, and find solutions to some of its flaws through the investigation of existing and new technologies that can assist in pushing a new model of care forward.

Equipped with findings from literature review and interviews with physicians, the team created Telemedicine Journey Map from both the patient and the provider perspective. This exercise provided the team an opportunity to see where telehealth could be improved and where it fits in the current and future urban fabric.

The Team also researched the latest technological advancements, wearable technologies, and digital examination tools that could provide a platform where a comprehensive model of care can be delivered through telehealth

...Telemedicine was no longer one of the options, It was the default for patients and physicians to continue the care...

hypothesis

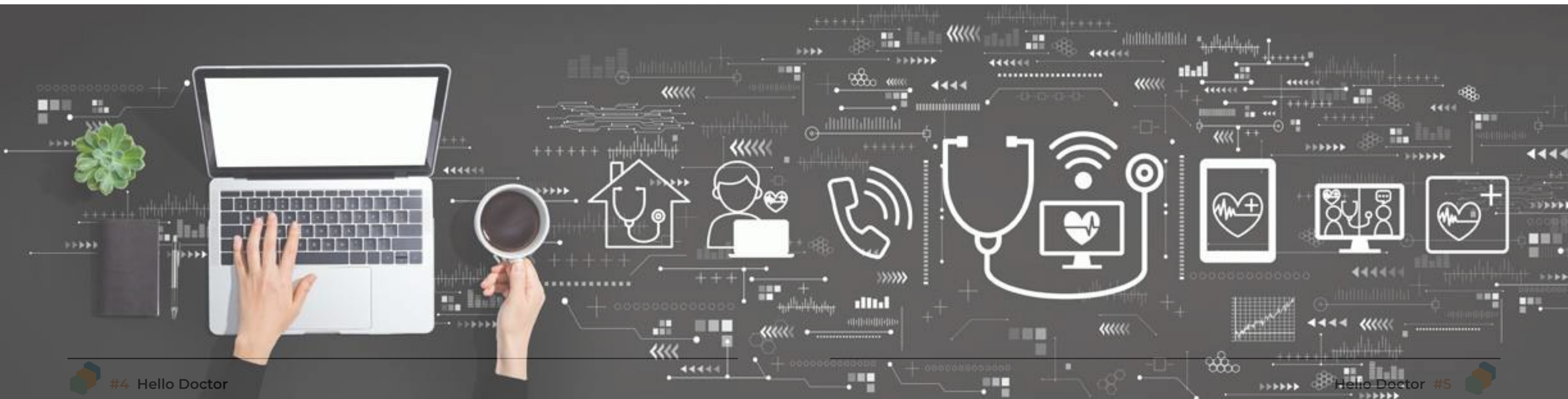
Telehealth became a default Model of Care. With the latest Tele-connected examination and diagnostic tools, telehealth will become on par with the physical examination.

It can happen anywhere utilizing Artificial Intelligence, self-administered diagnostic and exam tools connected to a healthcare provider in real-time. Artificial Intelligence is already in use in Healthcare and our lives. Wearables, in-home diagnostics, intelligent mirrors, toilets, etc., all form a multichoice health eco-system around each individual.

Healthcare is becoming more and more preventative, people have more choices where and how to prevent illnesses, but the key is convenience. The convenience of immediate results will push the industry to innovate and adopt a built environment.

Self-administered micro health units equipped with Tele-exam capabilities could live in retail centers, schools, offices, commercial properties, and more, where they can deliver fully comprehensive medical services.

A I, Telehealth, Convenience -Ultimate Healthcare Influencers



02. TELEHEALTH STATISTICS

To better understand how Americans are adapting to virtual health visits, SingleCare conducted a telehealth survey of 1,700 adults in January 2021.

KEY FINDINGS:

Item A

43% of respondents don't know if telehealth services were offered by their healthcare providers pre-pandemic.



Item D

68% of respondents would prefer in-person visits over telehealth visits after the pandemic.



Item G

For **60%** of respondents Insurance or Medicare completely covered telehealth services



Item B

58% of respondents have Telehealth services offered by their healthcare providers.



Item E

Only **5%** of respondents had used a telehealth service prior to the pandemic (2019 or earlier).



Item H

62% of respondents pay an average of \$0 to \$30 per telehealth visit.



Item C

74% of respondents are open to using telehealth services.



Item F

78% of those who have used telehealth services, were satisfied with their experience.



2/3 of respondents are willing to use telehealth services for common illnesses and follow-up visits.



Saving time, not having to travel, and appointment availability are the most appealing aspects of telehealth.



Diagnosis errors, exam challenges, and quality of care are the most common concerns of telehealth.

HEALTH EQUITY AND TELEHEALTH

"Americans aged 65 and older (**18 percent of the population**) are most likely to have a chronic disease, but almost half (**40 to 45 percent**) do not own a smartphone or have broadband Internet access.

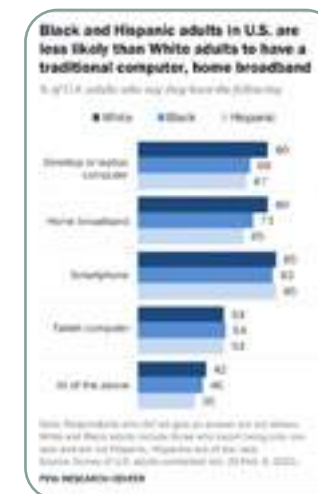
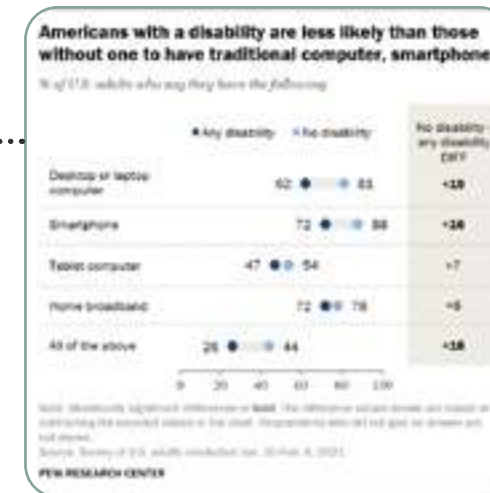
People experiencing poverty report lower rates of smartphone ownership (**71 percent**), broadband Internet access (**59 percent**), and digital literacy (**53 percent**) compared to the general population.

People who are Black or Hispanic report having lower computer ownership (**Black: 58 percent; Hispanic: 57 percent**) or home broadband Internet access (**Black: 66 percent; Hispanic: 61 percent**) than White respondents (**82 and 79 percent, respectively**), although smartphone access is nearly equal (**Black: 80 percent; Hispanic: 79 percent; White: 82 percent**)."

CONCLUSION:

Due to these limitations, some clients may not benefit from telehealth.

Reference: SAMHSA Substance Abuse and Mental Health Service Administration



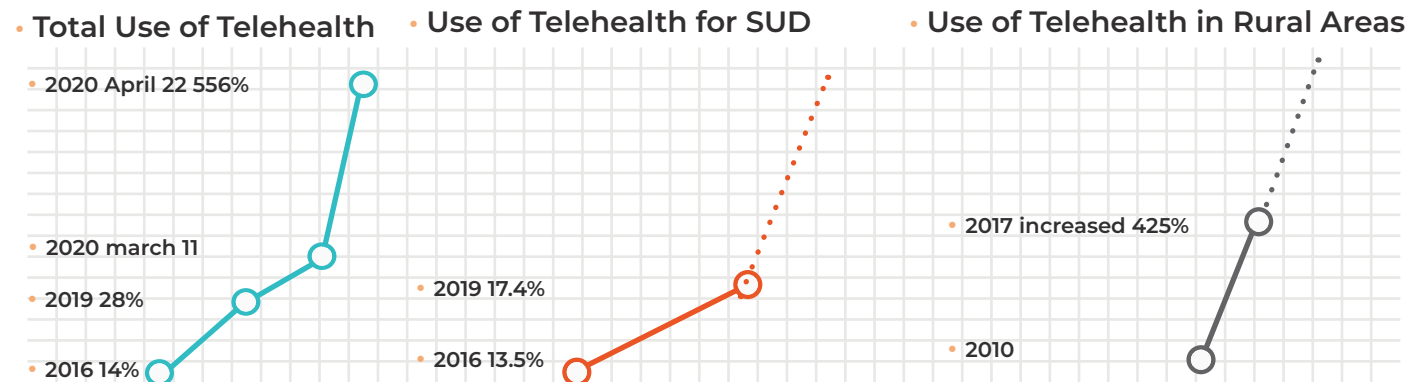
MENTAL HEALTH AND TELEHEALTH

"Implementation and use of telehealth as a mode of service delivery has been increasing in recent years. Between **2016 and 2019, use of telehealth doubled from 14 to 28 percent**. This trend continued between 2019 and 2020, due in large part to the COVID-19 pandemic. Telehealth visits for mental health **increased by 556 percent between March 11 and April 22, 2020**.

The use of telehealth was steadily increasing prior to the COVID-19 pandemic. **Between 2016 and 2019, SUD treatment offered through telehealth increased from 13.5 to 17.4 percent**. Greater adoption of telehealth was associated with rural locations, as well as those that provided multiple treatment settings, offered pharmacotherapy, and served both adult and pediatric populations.

Telehealth visits increased among rural Medicare beneficiaries, including a **425 percent increase for mental health appointments between 2010 and 2017**. Among these beneficiaries, people living with schizophrenia or bipolar disorder in rural areas were more likely to use telehealth for mental health care than those with any other mental illness or those living in urban areas."

Reference: Telehealth for the Treatment of Serious Mental Illness and Substance Use Disorders Issue Brief. SAMHSA Substance Abuse and Mental Health Service Administration



03. Literature REVIEW

As Telemedicine emerged over the years, it also generated extensive data that industry experts studied. COVID accelerated the interest and necessity to learn its total capacity even more.

During our research, we started to study the vast data available on Telemedicine and important drivers that shape and influence Telemedicine and the healthcare model of care as a whole. The review included scientific articles, press articles, white papers, and more, healthcare system recommendations and Clinical Guidelines, and recommendations from FGI and other governing agencies. In this process, we started to organize our findings in a few categories:

- Current State,
- Challenges,
- Recommendations,
- Available technology,
- Future advancements that will affect Telemedicine and Healthcare in general.

Organizing this literature allowed us to identify common threads or unique aspects that influenced our design explorations during this study.

Below are the excerpts from the reviewed literature that we think will be significant drivers for the future of Telemedicine and subsequently affected outcomes of our study:

01 Current State of Telemedicine

“Patients rapidly embraced virtual care as a means of access to healthcare in response to COVID-19. This created new avenues for healthcare organizations to engage both new and existing Patients. Patients’ experiences with virtual care were overwhelmingly positive, but healthcare organizations can provide more seamless, closed-loop experiences. Virtual care is now an expectation and healthcare organizations will need to enhance their offerings to capture growing demand.”

REF: Kyruus, Patient Perspectives on Virtual Care Insights from a survey of 1,000 patients about their virtual care experiences during the COVID-19 pandemic
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survey conducted by Wakefield Research, on behalf of Kyruus in May 2020

“-The internet continues to reign supreme for consumers looking for care, but how they approach their searches is changing

-Consumers are still seeking routine care and are placing a growing emphasis on the ability to do so virtually
-There’s a considerable opportunity to be easier to transact with, not only online, but also over the phone.
-Virtual care and online scheduling emerge as important new factors in provider selection.”

REF: Kyruus, 2020 Patient Access Journey Report, Insights from Kyruus’ Annual Survey conducted by Wakefield Research on behalf of Kyruus in August 2020 of 1,000 Healthcare Consumers regarding imaging the patient journey to access care:

“It is universally understood that telehealth is a necessary form of care delivery to address the supply-and-demand challenges that healthcare faces in the U.S., and to achieve the Triple Aim of improving quality of care, reducing health-care costs, and enhancing population health. As telehealth services expand and mature, they will continue to advance in efficiency, productivity, quality, and financial sustainability. Interoperability is the key to making that happen. And it has impacts for all stakeholders—providers, payers, and patients/plan members, as well as the telehealth vendors who support them.

Interoperability allows telehealth practices and payers to share data across the same systems used for in-person encounters, and interoperable telehealth systems are being successfully deployed, particularly in large health networks.”

REF: ATA, white paper, Telehealth Interoperability, Driving Choice, Continuity, and Scale, ATA - All Rights Reserved | April 2019. AMERICAN TELEMEDICINE ASSOCIATION
901 N GLEBE ROAD | STE 850, ARLINGTON, VA 22203, 703-373-9600,
INFO@AMERICANTELEMED.ORG

“As patients with suspected COVID-19 could present with acute stroke, a telestroke unit was initially established at Utah USA, to enable remote evaluation. Training and access to technology platforms was provided. The telestroke unit was subsequently expanded to include virtual evaluation of seizures, multiple sclerosis and other conditions. The impact of telemedicine is unlikely to recede. Telemedicine capabilities are likely to be embedded within normal operations, scalable, interoperable and built on a strong, reliable infrastructure, so that it is useful even after the acute COVID-19 crisis resolves. The global pandemic will have a lasting effect. With possible reduction in face-to-face consultations, remote evaluation may become mainstream. Webinars will play an increasing role. CME’s and resident training will become more and more digital. The world will never be the same again. It is imperative that we accept and start deploying the “New Normal”.”

REF: Telemedicine and Neurological Practice in the Covid 19 Era, Neurology India, 2020, Volume 68, Issue 3, Krshnan Ganapathy, Dept of Telemedicine, Apollo Telemedicine Networking Foundation, Chennai, Tamil Nadu, India.

02 Challenges

In the course of healthcare digitization, the roles of therapists and patients are likely to change.

“A phenomenological view on digitally enhanced healthcare inspires a reflective discussion about essential constructs of technology use, such as embodiment or presence in the context of telemedicine systems, and their importance for practical implementation.”
“As an important insight of the conducted interviews and a result of our secondary analysis, therapists mentioned the importance of a bodily presence of the patient to guarantee therapeutic success”

REF: Michael Knop, Marius Mueller, Henrik Freude and Caroline Reßing of Universität Siegen, | Conference paper “Perceived Limitations of Telemedicine from a Phenomenological Perspective” | DOI: 10.18690/978-961-286-362-3.9, June 2020

As Covid forced to move healthcare in Digital Realm, most vulnerable population was left without care. People who dependent on Emergency Department services no longer had access to care, while they also did not had access to Telehealth technologies.

“COVID-19 has changed non-emergent healthcare delivery In such a rapid and rampant way and rightfully so, as curbing the pandemic is of utmost priority. But truly curbing a pan-demic requires an equitable approach.”

“As healthcare professionals, it is imperative that we unite not only in the fight against COVID-19, but also against inequity. We must ensure fruitful outcomes for all strata of Americans.”

REF: “Preparing Telemedicine for the Frontlines of Healthcare Equity”
Lala Tanmoy Das, M.S. and Christopher J.Gonzalez, M.D.
JGenInternMed35(8):2443-4
DOI:10.1007/s11606-020-05941-9
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Language and cultural barriers are still present in current healthcare in general, often times patients who face those challenges are not able to share their health concerns or be honest. And same might be an issue from the physician’s side who cannot understand certain cultural intricacies.

“In a globalized world, patients might require interpretation services. Currently, this is not available directly within some telemedicine platforms such as EPIC. However, institutions should strive to contract a “language line” telephone service or other options to facilitate translation services.” As identified in “Telemedicine and Smart working: recommendations of the European association on Urology”

Ref: Telemedicine and Smart Working: Recommendations of the European Association of Urology
Moises Rodriguez Socarrá s a, Stacy Loeb b, Jeremy Yuen-Chun Teoh c, Maria J. Ribal d, Jarka Bloemberg e, James Catto f, James N’Dow g, Hendrik Van Poppel h, Juan Go mez Rivas ij,*
Platinum Priority – Review – Education Editorial by Roman Sosnowski, Hubert Karnecki, Steven Joniau, Jochen Walz, Zachary Klaassen, and Joan Palou on pp. 820–821 of this issue.

Working Practices still need to be reevaluated in telemedicine, digital divide cannot become a barrier for its success.

As authors argue in their publication” Opportunities and Challenges for telehealth within, and beyond, a pandemic”:

“.....telehealth is not just about technology; –delivery of telehealth also requires changes in working practices and curating data. Previous barriers to telehealth have included the need to change work processes. A key

reason that telehealth solutions have been adopted during the pandemic has been to enable work without physical presence at the workplace to protect patients and health-care professionals.⁵

Telehealth can have a positive effect on patient safety and outcomes.⁶ Nevertheless, telehealth comes with risks including exacerbating the digital divide, poor software engineering, and security breaches. Future telehealth platforms must be secure, reliable, and flexible enough to accommodate regulatory, professional, and health-care organizations’ requirements. These platforms should all be updated regularly.⁶”

ref: Opportunities and challenges for telehealth within, and beyond, a pandemic
Ann Blandford, Janet Wesson, René Amalberti, Raed AlHazme, Ragad Allwihan
a.blandford@ucl.ac.uk

⁵ Fagherazzi G, Goetzinger C, Rashid MA, Aguayo GA, Huiart L. Digital health strategies to fight COVID-19 worldwide: challenges, recommendations, and a call for papers. J Med Internet Res 2020; 22: e19284.

⁶ Agboola S, Kvedar J, Target S. Telemedicine and patient safety. AHRQ patient safety network. Sept 1, 2016. <https://psnet.ahrq.gov/perspective/telemedicine-and-patient-safety> [accessed July 22, 2020].

Legal and privacy barriers in most part are still unresolved and need more focused attention, COVID-19 eased up many regulatory barriers due to immediate urgency, but when pandemic and urgency will pass, new regulations need to be developed to address current issues. In the recent article” Trends and Challenges of Telehealth in an Academic Institution: The Unforeseen benefits of the COVID-19 global Pandemic”

Authors identified number of challenges:

- “....Although many regulatory agencies are working to develop best practice guidelines for the use of these services, the legal system currently lags behind the available technology.¹⁰”

–Legal Challenges:“ Similar to in-person care, malpractice claims can be brought against a physician for a telehealth encounter.Telehealth, however, may expand the possible states in which a case may be tried.¹¹ Because the statute of limitations or cap on non-economic damages may differ by state, this may result in “forum shopping” on the patient’s part.”

- Privacy and security: “There is a lack of control over the collection, utilization, and sharing of data collected by telehealth systems. For example, smartphone apps tracking medical history and personal health measures have been found to share in-formation with third parties.¹³

- Physician- Patient Relationship: “Maintaining professional integrity when providing video conferencing, especially when the physician is home, is important. Boundaries can be crossed, for example, when the patient or physician is able to view the other party at home in non-formal attire. Background noise from other family members or television on a physician’s video feed can instill privacy concerns for the patient.²⁷”

Ref: Trends and Challenges of Telehealth in an Academic Institution: The Unforeseen Benefits of the COVID-19 Global Pandemic
Christine E. Wamsley, BA; Alan Kramer, MPH; Jeffrey M. Kenkel, MD, FACS; and Bardia Amirlak, MD, FACS

Editorial Decision date: July 14, 2020; online publish-ahead-of-print July 22, 2020
Aesthetic Surgery Journal 2021, Vol 41(1) 109–118

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DOI: 10.1093/asj/sjaa212 www.aestheticsurgeryjournal.com
Oxford University Press

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13. Minen MT, Sieglitz EJ, Scortino R, Torous J. Privacy issues in smartphone applications: an analysis of headache/migraine applications. Headache. 2018;58(7):1014–1022.

27. Nahai F. Aesthetic telemedicine: designing the patient ex-perience. Aesthet Surg J. 2020;40(9):1037–1039.



03 Recommendations

Within a short period, healthcare industry experts accumulated and analyzed enough evidence to formulate recommendations on operating in the digital, virtual era of Telemedicine.

Recommendations range from an operational, clinical perspective to the built environment, acoustics, lighting, or privacy perspectives. Short excerpts below provide some of the key recommendations that could benefit the healthcare paradigm of today.

European Association of Urology identifies essential points that can aid the process:

-“Many patients will need requisitions for laboratory or imaging tests, some of them with relative urgency. It is important to be able to send files safely, through secure e-mails on a regular basis.”

-“A platform that integrates secure data management and access into electronic records, as well as the ability to allow video visits in an integrated way, is desirable.”

-“A limitation of televisits is that a conventional physical examination cannot be performed. A self-examination directed by the physician may be a reasonable option, especially in video visits. In addition, separate ancillary tests must be conducted separately (such as urine dipstick, postvoid residual urine measurement, and laboratory testing)”

-“During video visits, they recommend having a quiet and private environment for both doctor and patient. Preferably the patient should be alone or with a relative who may help with technical issues. Laptops and desktop computers are preferable to cell phones. Ensure a quiet, nondistracting background and adequate lighting with good audio. The camera should be placed at the eye level. Patients body language to be analyzed. For patients who cannot establish a video visit for technical reasons, a phone call may be an alternative.”

REF: Telemedicine and Smart Working: Recommendations of the European Association of Urology, 78 (2020) 812-819

Moises Rodríguez Socarrá's, Stacy Loeb, Jeremy Yuen-Chun Teoh, Maria J. Ribal, Jarka Bloemberg, James Catto, James N'Dow, Hendrik Van Poppel, Juan Gómez Rivas

Some of the Specialties have particular benefits specific to the area of practice, and Orthopedics is one of them. In the literature review, some of the recommendations are specific to Design.

“Telemedicine can benefit from its intersections with various areas of Design, as design for health^[23] and design thinking methodologies^[24]. There is a need for user-friendly graphic interfaces, which can be coupled with methodologies of interaction design^[25] and UX (user experience)^[26], going through stages of research, information architecture, prototyping, and user tests. Interdisciplinary collaboration designing journey maps and generating artifacts to communicate telemedicine pathways to patients and users are opportunities to be developed^[27]. Fatehi et al.^[28] described that the development of telemedicine interventions can be done using design methods and a patient-centered approach.”

REF: Telemedicine: Is It a Tool for Orthopedics? EMERGING TRENDS IN DESIGN FOR MUSCULOSKELETAL MEDICINE, Published online: 29 October 2020

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27. Reay SD, Collier G, Douglas R, Hayes N, Nakarada-Kordic I, Nair A, et al. Prototyping collaborative relationships between design and healthcare experts: mapping the patient journey. Des Heal. 2017;1:65-79.

28. Fatehi F, Smith AC, Maeder A, Wade V, Gray LC. How to form a later research questions and design studies: forte health assessment and evaluation. J Telemed Telecare. 2017;23:759-63.

Behavioral Health presents another unique opportunity to use various technological advancements such as Virtual Reality in conjunction with Telemedicine that could potentially revolutionize psychiatry treatment methods. Article selected for this topic is a literature review on its own that highlights current challenges, but, most importantly, provides recommendations on how to integrate Virtual Reality in Cognitive Rehabilitation.

As summarized by authors, “Tele-health approaches were demonstrated to be feasible, well-accepted, and effective in providing rehabilitation to chronic neurological patients, increasing participation, and allowing the continuity of care in an ecologic environment..... Over recent years, researchers and clinicians proposed VR as a new technology to implement innovative treatments in a broad range of clinical areas, including mental health disorders”

Article further investigates findings and states and proposes roadmap to address existing issues:

“•First, evidence supporting telerehabilitation and VR for cognitive rehabilitation is still preliminary, and a larger number of studies focusing on the validity, reliability, effectiveness, and efficiency of these techniques and approaches are needed.”⁽⁷⁴⁾

•Second, the high cost of the hardware and software required for these techniques is still a bottleneck that impedes their wide application outside the experimental setting

•Third, a high-speed Internet connection is of paramount importance to improve telerehabilitation and remote monitoring from the therapist, but in some areas, it may not be available

•Fourth, the digital divide in some countries/regions, in older adults, and in some classes of people might reduce the wide application of cognitive telerehabilitation.

Addressing these points requires the involvement of a number of stakeholders, including patient associations, health, informatics, and scientific societies, but may result in a consistent improvement in cognitive rehabilitation strategies in that carrying out interventions at home is even more important because the generalization of the results to daily life activities is one of the most critical elements for the success of the intervention. “

Ref: Telemedicine and Virtual Reality for Cognitive Rehabilitation: A Roadmap for the COVID-19 Pandemic

Elisa Mantovani 1†, Chiara Zucchella 2†, Sara Bottiroli 3,4, Angela Federico 1, Rosalba Giugno 5, Giorgio Sandrini 4,6, Cristiano Chiamulera 7† and Stefano Tamburin 1*†§

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Published: Frontiers in Neurology | www.frontiersin.org September 2020 | Volume 11 | Article 926

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74. Mishkind MC, Norr AM, Katz AC, Reger GM. Review of virtual reality treatment in psychiatry: evidence versus current diffusion and use. Curr Psychiatry Rep. (2017) 19:80. doi: 10.1007/s11920-017-0836-0

03 Recommendations

The Office of the National Coordinator for Health Information Technology (ONC) commissioned Design Session with over 30 stakeholders on Consumer-Centered Telehealth. Some of the Key findings included the following:

- Solutions must be easy for patients to use;
- Team-based care must include smart triggers; the online world and “real” world are converging as mobile technology becomes increasingly pervasive in our lives.
- The next generation of telehealth solutions would be consumer-centered by perfecting this balance;
- Consumer-centered telehealth solutions must leverage smart algorithms and preference-sensitive alerts to cut this data down to size and reduce user fatigue;
- Consumers are the hubs of their own healthcare data;
- A recurring theme across designs was to combat the fragmentation of data across sites and modes of care;
- increase the ability to gather additional contextual information about the patient through mobile technology;
- The groups' consumer designs implied the need to integrate technology and humans intelligently; Increase focus on patient data security.

“Innovators from a range of industries and disciplines are creating new ways to access care, leveraging an increasingly interconnected set of mobile devices and services. Federal agencies such as the ONC are taking increasing interest in understanding how the industry is evolving. Major consumer industry players, such as Walgreens, UnitedHealthcare, Aetna, and others, are making these services available to their customers at scale. “

“The continuous advances in technology are expected to create new and, as of yet, unimagined ways for consumers to interact with each other, access clinical professionals, and direct more of their own care.”

“Currently an impedance to innovation and safety combined, health data must flow around the consumer. Data that exists at the core of the PCP-patient relationship must be available outside of the core in order to expand the overall diameter of cohesive continuity of care and prevent diffusion and fracturing. Patient data must be available wherever the consumer clinically needs it and whoever is acting on their behalf at their direction.”

REF: White paper on Designing The Consumer-Centered Telehealth & eVisit Experience, Considerations for the Future of Consumer Healthcare, Kyra Bobinet, MD MPH and John Petito, MS for The Office of National Coordinator for Health Information Technology, U.S. Department of Health & Human Services
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Amongst many studies Elsevier published a guide that provides step by step instructions of conducting telehealth examination that may inform how to prepare before examination and how to conduct the exam session. Authors identify that “patients respond positively to these maneuvers. Thus, performance of a telehealth physical examination may be considered as an essential element in the context of post pandemic payment policies for telehealth visits.”

Based on their experience Physicians need to prepare ahead of exam and follow certain steps:

Authors identify ten steps to conduct the exam. Below is a short summary of those steps:

Step 1: Vital Signs. We recommend that patients use a validated, digital, upper-arm blood pressure (BP) cuff to measure their BP and heart rate and an electronic scale for measuring daily body weight.

Step 2: Skin. Instruct patients to perform a self-assessment and identify any new bruises, rashes, lacerations, psoriasis plaques (look on elbows, knees especially), or swelling. use Video Clues

Step 3: Head, Eyes, Ears, Nose, and Throat

Ask about hearing to be sure the patient hears you! Are they wearing their hearing aids? Ask if vision or sense of smell is acceptable or has changed, including anosmia, which can be caused by COVID-19

Step 5: Lungs. Ask patients to deeply inhale and exhale through an open mouth.

Step 6: Heart. Ask if the patient or caregiver can take the pulse at the wrist. Have them count out the beats they feel.

Step 7: Abdomen. Ask patients if their abdomen is soft, nontender, and normal in size.

Step 8: Extremities. Ask if patients' hands or feet are colder than usual, or just the fingertips and toes. If cold distally, ask questions about cold sensitivity and color changes to diagnose Raynaud's phenomenon.

Step 9: Neurological. Ask patients to hold their arms out with elbows straight, spread their fingers, and turn their hands up as if catching rain.

Step 10: Social Determinants of Health. Inquire about issues regarding changes in diet, physical activity, sleep, stress, and social support.

Future Direction:

Important issues to be studied include: 1) adapting telehealth visits to different populations, including the elderly, individuals with cognitive impairment, or individuals with low health technology literacy; 2) rates of feasibility, acceptability, and fidelity of patient-assisted virtual examinations; 3) integration of virtual examinations with interpreters; 4) meeting patients' psychosocial needs; and 5) gaining and maintaining trust through a virtual interface.

Ref:The Telehealth Ten: A Guide for a Patient-Assisted Virtual Physical Examination
Catherine P. Benziger, MD, MPH, Mark D. Huffman, MD, MPH, Ranya N. Sweis, MD, MS, and Neil J. Stone, MD

Essentia Health Heart and Vascular Center, Duluth, Minn Northwestern University Feinberg School of Medicine, Chicago, Ill Requests for reprints should be addressed to Catherine Benziger, MD, MPH, Department of Cardiology, Essentia Health – St. Mary's Medical Center, 407 East Third Street Duluth, MN 55805. Copyright © 2020 Elsevier Inc. All rights reserved.

Am J Med. 2021 Jan; 134(1): 48–51. Published online 2020 Jul 18. doi:10.1016/j.amjmed.2020.06.015, PMID: PMC7368154, PMID: 32687813



03 Recommendations

In September of 2020, Facilities Guidelines Institute with the Center of Health Design provided an updated issue brief to address new findings since the start of the global Pandemic. They specifically focused on more than just technology advancements and had more specific considerations for the social and physical impact of the process.

“...Telemedicine happens within a built environment, and designing telemedicine spaces involves more than the selection of technology and an understanding of regulatory compliance. Design should address space requirements for the diagnosis and treatment being offered, acoustics, lighting, gaze angle, interior surfaces, site identification, and necessary considerations to support the use of equipment (e.g., storage, adequate ventilation.)” Authors stated

Guidelines provide minimum required standards that provide a roadmap to re-imagine physical built environment around Telemedicine.

“Telepresence is a synthesis of technology, environment, and human factors that encompasses the demeanor of the patient and provider along with quality of the encounter, including the ambient environment—lighting, sound/noise, and room appearance (Krupinski & Leistner, 2017).”

Recommendations were categorized in the following order:

Space Needs

- *“According to the FGI Guidelines, where telemedicine is used for patient examination, the space must be sized so an exam table can be situated within view of the camera and the following can be accommodated: fixed or mobile telemedicine equipment, peripheral devices, an on-site caregiver or patient presenter, a hand-washing station where hands-on exams are provided, and a documentation area (Facility Guidelines Institute, 2018b).”*

- *“The camera and exam table should be positioned so a presenter using and manipulating telemedicine peripherals can see both the patient and the monitor with images being transmitted to the remote clinician’s site (CTEConline, 2011).”*

- *“The telemedicine room should be large enough for the patient and a patient presenter to move around comfortably for the clinical service being provided”*

Privacy

- *“Telemedicine spaces should be designed with speech and visual privacy based on the room’s clinical function (Belz et al., 2009; Krupinski, 2014).”*

- *“Doors can be both a distraction and a privacy concern and should be out of view of the main camera to avoid perceptions that someone might “walk in” (Major, 2005; PHSA, 2013)*

Acoustics

- *“Telemedicine rooms must have an acoustic environment that facilitates speech intelligibility and communication (Facility Guidelines Institute, 2018b).*

- *“Additionally, a telemedicine room also must be designed for the sound isolation rating appropriate for its clinical function”*

Lighting

- *“lighting is more than “looks,” and proper lighting should ensure natural color rendition as well as even illumination levels.*

- *“All spaces intended for telemedicine services must allow direct frontal lighting (Major, 2005; Raymond et al., 2016).*

Gaze Angle and Camera Distance

- *“Eye contact is an important aspect of visual communication, but when using a webcam, perceptions of eye contact are affected by the location of the camera (Chen, 2002).*

- *“some specialties, such as dermatology, there may be a need for close-up and wider views for context (ATA Teledermatology Guidelines Work Group & ATA Practice Guidelines Committee, 2016).”*

Interior Surfaces

- *“The finishes and colors selected for a telemedicine space must be able to support the natural rendition of color and pattern. (Belz et al., 2009; CTEConline, 2011; Krupinski, 2014; Major, 2005; PHSA, 2013)”*

- *“The FGI Guidelines require the backdrop wall color to have a light reflectance value of 30-40%. To avoid glare and reflections, a surface finish rating of level 1 or 2 (flat finish) is recommended rather than a gloss rating of level 5 (semi-gloss) or 6 (gloss finish).*

Site Identification

- *“Facility identification must be provided at the telemedicine site so it appears in the transmitted image unless such identification is embedded in the electronic telemedicine platform”*

Equipment Associated Issues

- *“Secure storage is required for telemedicine spaces where portable equipment and peripheral devices (e.g., digital cameras, task lighting, EKG devices, etc.) are used (Krupinski et al., 2007; PHSA, 2013).”*

What to Avoid

- *Avoid Telemedicine room locations near: Open Office Areas, Busy Corridors, Stairwells, Parking Lots, Waiting Rooms/areas. HVAC Systems, Toilet Rooms*

Goal

- *“Designing spaces used for telemedicine communications should always strive to maintain the level of safety, privacy, quality of care, and patient experience that would be expected for that same communication when it takes place in person.”*

Ref: “Virtual Care: Guidance for Healthcare Settings” An Issue Brief on Designing for Telemedicine. September 2020 Author: Ellen Taylor PhD, AIA, MBA, EDAC, Vice President for Research. Center for Health Design in conjunction with work developed on behalf of the Facilities Guidelines Institute (FGI)

03 Recommendations

As various Health institutions are transitioning to the Tele-examination model, many of them developed step-by-step guides on how to conduct examinations either for a general exam or focusing on specific specialties. In reviewing exam process guidelines for musculoskeletal examination developed by Mayo Clinic, it was evident that Physical space of a patient and its surroundings were critical aspects in conducting a successful examination process.

The article identifies general considerations as well as specific details in this process:

General Considerations

- *The examiner will look at the video image of the patient, but also should occasionally look directly at the camera as that is the equivalent of looking the patient in the eyes.*

- *The examiner should tell the patient that at times the examiner may need to look away to take notes or view various computer screens.*

- *There may be an audio lag, so try to give the patient 2 seconds or so after he or she stops speaking before talking.*

- *The uniform history taking and examination sequence promotes efficiency and avoids errors of omission.*

- *The patient is requested to use 1 finger to point to the maximal area of pain and to delineate any radiating pain. Consider demonstrating the examination maneuver for the patient, as appropriate*

Patient Considerations:

- *Adequate room to perform full range of motion of the joints in all planes, gait, and sit to stand transitions.*

- *The room should be as free of distractions as possible, with uncluttered background and adequate lighting.*

- *If possible, an additional person can be used to adjust the camera to accommodate different patient positions (ie, standing, lying, full-body view, etc).*

- *If this is an examination of a small child, toys that the child will reach for and manipulate and/or hold for comfort should be used.*

To summarize considerations in various examination settings following stays consistent:

- *Examination can be started with the patient standing comfortably but able to transition from the standing to seated position; the patient should also be able to fully move arms in all directions, and the examiner should be fully able to assess upper back and shoulders as well as front.*

- *In the telemedicine paradigm, the patient can be guided by videos to facilitate specific spine examination techniques*

- *Inquire about the type of electronic device. If a laptop, tablet, or smart phone is used, it is easier to move the device to complete parts of the examination.*

- *To assist with a portion of the examination that requires moving; to assist with safety and special tests and camera control*

- *An assistant may help in raising the shirt to permit viewing of the lumbar spine region*

- *There should be enough room to permit a full-body view of walking both toward and away from the camera. A second person to control camera placement and*

view is recommended.

- *An assistant may be present for this part of the examination if there are concerns about significant unsteadiness.*

- *Because the examiner is trying to assess whether the patient is a fall risk, an assistant needs to stand close to catch the patient if he or she starts to fall*

- *A bath towel or similar long length towel can be used to provide assistance for some of the stretches and range of motion assessments during the hip examination.*

- *If this is an examination of a small child, a flat surface where the child can lie down, such as the floor, table, couch, or bed, will be needed.*

In Conclusion:

Considerations for Patient Movement and positioning, either laying down, seating or walking, raising arms, or rotating, should be considered when accommodating physical space. And space should be large enough so assistant/ family member can be present if needed. the examiner needs to maintain eye contact with the patient.

Ref: “The Telemedicine Musculoskeletal Examination” Mayo Clinic Proceedings Edward R. Laskowski, MD; Shelby E. Johnson, MD; Randy A. Shelerud, MD; Jason A. Lee, DO; Amy E. Rabatin, MD; Sherilyn W. Driscoll, MD; Brittany J. Moore, MD; Michael C. Wainberg, MD; and Carmen M. Terzic, MD, PhD Mayo Clin Proc. n August 2020;95(8):1715-1731 n <https://doi.org/10.1016/j.mayocp.2020.05.026> www.mayoclinicproceedings.org n © 2020 Mayo Foundation for Medical Education and Research

04 Current Technologies

5.Exam tools and ancillary services

How telemedicine is integrating entire Healthcare ecosystem and where we can see innovation?

white paper by Kaiser Permanente summarizes several factors in their White paper issued in 2020:

•“ Virtual care has the potential to improve the patient experience by improving continuity of care, connectivity of modalities, coordination of care, the care continuum.”

•“An example of improved results through virtual care is Hinge Health, the provider that has demonstrated better outcomes from applying virtual care. These improvements include a significant decline in pain symptoms and avoided surgeries. These improvements yielded significant medical savings to the participants.”

•“Ancillary services are developing in a variety of ways to support virtual care, depending on the nature of the service”

•“In pharmacy services, some providers are forming partnerships with logistics companies to improve medication delivery”

•“Improvements in lab services that support virtual care include more satellite labs in convenient locations, as well as an expansion of at-home test kits and mobile labs.”

•“In imaging ultrasound, which is relatively easy to use and has become progressively smaller and more Affordable”

•“From the provider’s perspective, data capture from the customer’s technology has the potential to streamline the decision-making process for physicians, and face recognition technologies that detect emotions and symptoms can be useful aids in diagnosis.”

•“Virtual care has the potential to improve the patient experience by improving continuity of care, connectivity of modalities, coordination of care, and following the care continuum. Because of these benefits and the convenience and flexibility it provides to both customers and providers, it is predicted to become the main mode of care in the future.”

REF: Virtual Care A Research-Based Initiative for Kaiser Permanente December 31, 2020 © 2021 Kaiser Permanente

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Sadden acceleration of tech advancements created the possibility to fully re-imagined healthcare.

Analyzing and categorizing possibilities can paint a clear picture how to design for healthcare today.

Dr. Ilona Hale starts her article “Our new virtual reality” with the quote:

“We can do a lot more virtually than I had previously thought possible” (Wong S. Quick COVID-19 Primary Care Survey of Clinicians: Summary of the first weekly pan-Canadian survey of frontline primary care clinicians’ experience with COVID-19. 2020.)

In her article she explores reality of Primary care and what we need to focus on after COVID has passed:

“Family physicians are ideally positioned to embrace this opportunity - not just during the pandemic but afterwards. High-quality, comprehensive, patient-centered care will always include in-person visits but much of what we do is through listening, reflecting and sharing information, all of which are conducive to a virtual environment..... We are learning many things during the pandemic - about viral transmission, human behavior and the incredible fragility of a global economic system crippled by a microscopic pathogen but the potential to revolutionize primary care practice and emerge with a new model that recognizes and respects patient preferences for delivery of care may be one of the most enduring and important outcomes for primary care. I now wonder why it took us so long to get here.”

REF: “OUR NEW VIRTUAL REALITY”

Dr. Ilona Hale is a Clinical Assistant Professor in the Department of Family Medicine at the University of British Columbia.
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What are the Innovations that are already changing telemedicine? Over last two years there was a significant shift in Healthcare investment market, specifically in Healthcare Tech:

The video conferencing market is projected to reach \$7.76B by 2022. (Credence Research Report, March 2016)

The global telemedicine market generated \$21.5B revenue in 2017 and is predicted to increase by a CAGR of 14.8% from 2018 – 2023. (Prescient and Strategic Intelligence, Telemedicine Market by Type, June 2018)

The US telemedicine market is expected to grow to \$35B by 2025 and video communication is a key enabler. (Statista, Global Telemedicine Market Size, April 26, 2019)

1. Cloud Based Video Conferencing

“Telemedicine delivered over secure cloud-based video conferencing services will help shape the future of the healthcare industry. Patient information will be automatically captured using telemedicine devices like apps and sensors. Patients will continue to self-monitor their health and send results electronically. Doctors will be able to react to data without the need to always see patients during office visits. Patients will be seen using video communications from the comfort of their homes.”

“With medical costs skyrocketing there must be a better approach. Telehealth over two-way video can reduce travel costs, reduce time in waiting rooms, improve patient throughput and care outcomes, and reduce overall healthcare costs, all while keeping the face-to-face interactions that are so valuable to patients”

REF: Transforming Healthcare with Video Communications

By: S. Ann Earon, Ph.D., President Telemanagement Resources International Inc. (TRI) www.bluejeans.com/trial

S. Ann Earon, Ph.D. is president of Telemanagement Resources International Inc. (TRI) and Founding Chairperson of IMCCA, the non-profit industry association for conferencing, collaboration, and unified communications. She can be reached via email at AnnEaron@aol.com.

04 Current Technologies

2. Cloud Based referral Platform

In the Study “Implementation of a cloud- based referral platform in ophthalmology: making telemedicine services a reality in eye care” Authors highlight how cloud-based referral system can support model of care in UK “It has been shown that artificial intelligence can be used to develop algorithms that automatically detect retinal diseases, for example, AMD and DR. (Matsuba S, Tabuchi H, Ohsugi H, et al. Accuracy of ultra- wide- field fundus ophthalmoscopy- assisted deep learning, a machine- learning technology, for detecting age- related macular degeneration. Int Ophthalmol 2019;39:1269-75.)

The first algorithm to classify severity of DR received Federal Drug Administration (FDA) approval in the USA in 2018. (Office of the Commissioner. Press Announcements - FDA permits marketing of artificial intelligence- based device to detect certain diabetes- related eye problems. Available: https://www.fda.gov/newsevents/newsroom/pressannouncements/ucm604357.htm [Accessed 1 Nov 2018])

Tools for automatic OCT pattern recognition and referral decision- making have already been published and could be integrated into a cloud- based referral platform. (De Fauw J, Ledsam JR, Romera- Paredes B, et al. Clinically applicable deep learning for diagnosis and referral in retinal disease. Nat Med 2018;24:1342-50.)

“This progress in medicine might simplify the widespread use of cloud- based teleophthalmology platforms in the future.”

“the first results of using a cloud- based referral platform within the UK and demonstrated that 54% of referrals to the HES could have been avoided. As the NHS faces increasing demand for service provision, innovations that enhance the digital maturity of secondary service healthcare professionals can further optimise the performance from limited resources.

REF: Implementation of a cloud- based referral platform in ophthalmology: making telemedicine services a reality in eye care
Christoph Kern ,1,2 Dun Jack Fu,1 Karsten Kortuem ,1,2 Josef Huemer,1,3 David Barker,4 Alison Davis,1 Konstantinos Balaskas,1 Pearce A Keane,1,5,6 Tom McKinnon,7 Dawn A Sim1,5,6
1Moorfields Eye Hospital, London, United Kingdom
2Department of Ophthalmology, University Eye Hospital, LMU, Munich, Germany
3Eye Departement, Tauernklinikum, Zell am See, Austria
4Rawlings Opticians, Purley, UK
5NIHR Biomedical Research Centre Biomedical Centre, Moorfields Eye Hospital NHS Foundation Trust and UCL Institute of Ophthalmology, London, UK
6Institute of Ophthalmology, University College of London, London, United Kingdom
7Big Picture Medical, London, United Kingdom

3.Virtual Reality

VR Technology allows to bring Telehealth based Mental Health treatment to a whole new level.

Per Clinical guide from Virtual reality platform PSIOUS, which specializes in Virtual Reality in psychotherapy: “In psychotherapy, virtual environments allow us not only to reproduce relevant stimulation configurations for mental health intervention, but also the possibility of manipulating certain variables in order to control and adapt the intervention to our patient’s characteristics. Therefore, this technology allows us on certain occasions to work in a way which cannot be reproduced in the real situation; it provides us with the option of evaluating and intervening with the patient “within” a specific situation (for example, in the subway) without the need to leave the consultation; it allows us to repeat certain conditions (for example, a takeoff) as many times as necessary to work on a therapeutic goal (habituation, reciprocal inhibition of an anxious response, relaxation...), and it helps us to plan in a personalized way, manipulating configuration variables and the moments at which certain events are

initialized, the intervention’s stages, etc.

As in many other areas, new technologies give us the possibility to facilitate certain processes. In the case of psychotherapy, they allow us to control the therapeutic process, that is, they allow us to personalize the psychological interventions in accordance with the patient’s characteristics and needs. For example, in the case of fear of flying, they allow you to land before taking off, and you can also do it as many times as necessary.”

REF: Clinical Guide, www.psious.com, Related/recommended bibliography
Boettcher, J., Åström, V., Pahlsson, D., Schenström, O., Andersson, G. & Carlbring, P. (2014). Internet-Based Mindfulness Treatment for Anxiety Disorders: A Randomized Controlled Trial. Behavior Therapy, 45(2), 241-253. doi:10.1016/j.beth.2013.11.003
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4. Smartphone Enabled Exam Tools

During COVID Outbreak, tech companies quickly adopted Smartphones as Medical examination tools. Including Smartphone enabled Otoscope:

Per “Smartphone-enabled wireless otoscope-assisted online telemedicine during the COVID-19 outbreak” article by Am J Otolaryngol

“With the increased popularity of smartphones, the smartphone application is increasing in otolaryngology clinical practice [10]. The smartphone-enabled otoscope (SEO) is emerging a new electronic device in recent years. Using this device with a dedicated application, doctors can quickly investigate the patient’s external auditory canal and tympanic membrane. Previous studies have shown the value of the portable devices not only as a convenient diagnostic aid but also as a teaching adjunct for the pre-clinical medical students [11,12]. However, smartphone-enabled wireless otoscope-assisted online tele-medicine (SEWOAOT) has not been explored during the COVID-19 outbreak. To contain an epidemic, most people like to stay at home and try to minimize going out. Also, a proportion of people have quarantined in an isolation center or their home for medical observation. In these situations, SEWOAOT can provide an excellent solution, delivering online otolaryngology services.”

REF: Smartphone-enabled wireless otoscope-assisted online telemedicine during the COVID-19 outbreak”, Am J Otolaryngol, Xiangming Meng, , Zhiyong Dai, Chao Hang, Yangyang Wang
Department of Otolaryngology, Wuxi Huishan District People’s Hospital, 2 Zhanqian North Rd, Luoshe Town, Huishan District, Wuxi 214187, PR China
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journal homepage: www.elsevier.com/locate/amjoto,
https://doi.org/10.1016/j.amjoto.2020.102476, Received 31 March 2020
0196-0709/ © 2020 Elsevier Inc. All rights reserved.

[10] Tabanfar R, Chan HHL, Lin V, Le T, Irish JC. Development and face validation of a Virtual Reality Epley Maneuver System (VREMS) for home Epley treatment of benign paroxysmal positional vertigo: a randomized, controlled trial. Am J Otolaryngol 2018;39:184–91. https://doi.org/10.1016/j.amjoto.2017.11.006.

[11] Mandavia R, Lapa T, Smith M, Bhutta MF. A cross-sectional evaluation of the validity of a smartphone otoscopy device in screening for ear disease in Nepal. Clin Otolaryngol 2018;43:31–8. https://doi.org/10.1111/coa.12898.

[12] Hakimi AA, Lalehzarian AS, Lalehzarian SP, Azhdam AM, Nedjat-Haiem S, BoodaieBD. Utility of a smartphone-enabled otoscope in the instruction of otoscopy and middle ear anatomy. Eur Arch Otorhinolaryngol 2019;276:2953–6. https://doi.org/10.1007/s00405-019-05559-6.



Tele-presence

1.Video otoscopy solutions allow for the tele transmission of images compatible with a high-quality diagnosis, either by connecting via internet to a tele-health platform or using a smartphone or a tablet with an iOS or Android operating system. Using the same telecommunication methods, it is possible to remotely conduct a pure-tone audiometry test in accordance with standard practice, a speech-in-quiet or a speech-in-noise audiometry test, as well as objective measures of hearing.

REF:

Telemedicine in Audiology. Best practice recommendations from the French Society of Audiology (SFA) and the French Society of Otorhinolaryngology-Head and Neck Surgery (SFORL)

H. Thai-Vana,b,c, , D. Bakhosd,e, D. Bouccaraf,g, N. Loundonh,i, M. Marxj,k, T. Mornl,m, I. Mosniern, S. Romano,p, C. Villerabelq,r, C. Vincents, F. Venailq,r
 COVID-19: Preliminary recommendations from the SFOR
<https://doi.org/10.1016/j.anorl.2020.10.007>
 1879-7296/© 2020 Published by Elsevier Masson SAS.

2.EyeRobot, a concept which enables dynamic viewpoints for tele-presence using the intuitive control of the user's head motion. Concept of EyeRobot, a telepresence System with a manually controllable viewpoint and stereo Vision in an AR/VRHMD. A remote expert using EyeRobot gains an in-depth spatial understanding using the two Visual cues motion parallax and stereopsis. Furthermore, the direct translation of the movement of the HMD to the remote camera suggests an intuitive control with a low Learning curve. "We presented the concept of EyeRobot, a telepresence System with a manually controllable view point and stereo Vision in an AR/VRHMD. A remote expert using EyeRobot gains an in-depth spatial understanding using the two visual cues motion parallax and stereopsis. Furthermore, the direct translation of the movement of the HMD to the remote camera suggests an intuitive control with a low learning curve. We believe EyeRobot is a valuable asset to collaborative environments."

REF:

EyeRobot: enabling telemedicine using a robot arm and a head-mounted display
 Kevin Yu*, Thomas Wegele, Daniel Ostler, Dirk Wilhelm and Hubertus Feußner
<https://doi.org/10.1515/cdbme-2020-0019>

Tele-Existence

Telediagnosis system that allows medical staff to examine remote patients through Telexistence robot system with tactile sensor/display. The system consists of three components, an audio-visual Telexistence system for telecommunication, a skin-like tactile display equipped with thermal and heartbeat display devices, and body temperature and heartbeat measurement equipment. In comparison with conventional telephone and videophone, this VR system is expected to allow the medical staff to examine the patient more carefully as if he or she is observing the patient face to face

REF:

Study on Telexistence C: A Telediagnosis Platform based on Telexistence: Investigation of the Roles of Presence and Tactile Information in Telemedicine

Mixed Reality

"Telemedicine includes remote teleradiology..... Mixed reality technology cuts through the boundaries between virtual reality and actual reality, bringing a new method of remote consultation."

" The successful application of MR technology is one of the medical milestones of the telemedicine. It not only makes the real time transmission, visual expression, and accurate understanding of 3D spatial information possible, but also breaks the boundary between the virtual world and the physical real world. At the same time, it breaks through the limitation of the region and truly provides a reliable technical guarantee for the rapid development of remote surgery. It also provides a solid application foundation for the cultivation and rapid growth of medical talent.

REF:

Remote consultation based on mixed reality technology

Jiayao Zhang, Fei Gao, Zhewei Ye
 Department of Orthopedics, Wuhan Union Hospital, Tongji Medical College, HuazhongUniversityofScienceandTechnology,1277Jiefang Avenue, Wuhan 430022, China

<http://dx.doi.org/10.1016/j.glohj.2020.01.001>

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Robotics

"Artificial intelligence assisted telemedicine framework would be indispensable in creating futuristic and resilient health systems that can support communities amidst pandemics."

"AI and robotics could play an important role in providing telemedicine services during an outbreak or public health emergency while limiting exposure to healthcare workers and health systems. An international collaborative effort led by WHO, the current consortium, or similar organizations could pave a way to greater telemedicine penetration, especially to benefit the underprivileged and those living in the low-resourced settings."

workers and health systems. An international collaborative effort led by WHO, the current consortium, or similar organizations could pave a way to greater telemedicine penetration, especially to benefit the underprivileged and those living in the low-resourced settings."

REF:

Designing Futuristic Telemedicine Using Artificial Intelligence an Robotics in the COVID-19 Era

Sonu Bhaskar 1,2*,Sian Bradley 1,3,Sateesh Sakhamuri 1,4,Sebastian Moguilner 1,5, Vijay Kumar Chattu 1,6,Shawna Pandya 1,7,Starr Schroeder 1,8,Daniel Ray 1,9 and Maciej Banach

Frontiers in Public Health | www.frontiersin.org

November 2020 | Volume 8 | Article 556789

Findings:

Literature review reveals that global populations embraced telehealth in the last couple of years, started to use it for their daily healthcare needs, and evidence suggests that it is here to stay.

Various challenges and obstacles hinder its progression and ability from offering fully comprehensive health services.

Available technology can resolve most of those challenges; however, it is too expensive to be distributed amongst the population and utilized in telehealth sessions from their homes. And therefore not feasible for massive adoption of its capacity.

After identifying challenges, recommendations, and advancements in technology, accumulated information and lessons learned need to inform Built Environment around Telemedicine.

Significant gaps in healthcare access, socio-economics, and equity in population, as well as geographic location for certain population groups , keep many at a disadvantage.

New solutions have to solve healthcare challenges for every member of society. What is the role of architects and designers in this ecosystem? How can design solve those challenges? High cost of technology or services?

Innovative design solutions can offer an unorthodox way to organize healthcare. Large medical hubs may not be a solution in this scenario, and we can not just rely on home-based care to provide comprehensive services. However, a hybrid decentralized system, equipped with modern cutting edge technology and artificial intelligence, paired with convenience could offer a new paradigm in healthcare delivery.

A decentralized model could still share the cost of service and technology between a large population pool, making it more accessible for all. If conveniently located at a walking distance in small community hubs, in public spaces, at the place of work, schools, etc., this model can offer a solution for the next chapter in telehealth delivery.

04.

INTERVIEWS

The majority of the time, statistical data provides accurate information; however, it often lacks an individual's personal experience. To fully understand the human experience and individuals' behavior in specific settings, the team conducted three interviews with physicians with various specialties: Family Medicine, ENT (Ear, Nose and Throat), and Clinical Researcher. Before the Pandemic, each practiced and conducted in-person meetings with patients and transitioned their practice to remote care. Some continued practice from home and some from the base Clinics, where they always offered the in-person option as well.

01

DR. ALEEN KHODABAKHSHIAN
UCLA / RESEARCH INFECTION DISEASES / CLINICAL TRIALS FOR HIV PATIENTS / EXPERIMENTAL DRUGS

Conducting NIH funded clinical trials on HIV patient. The patients are voluntary, and they are compensated (cash)

The patients find them and then the patients are prescreened. They did not have the option of telehealth before the pandemic. They never closed the clinic during the pandemic. Some patients were not feeling comfortable to come into the clinic, so the remote option was instigated by the clinic. They had to adjust protocols and get approval to be able to do the trials remotely. Zoom is approved by UCLA for patient care or just a telephone. Assessment for clinical trial participants They take medical history List of medication Current illnesses Any ER visits Signs / symptoms The investigator goes thru training to be able to work with a patient in clinical trials. They are trained for the trails, but not for telehealth. They are fully back at the clinic, but the remote option is still available.

Things they resolved:

1. They need the consent form to be wet signed before every visit. Release forms need to be signed before each visit. They mail them, the patient signs it, they show them during the interview then at the next visit they bring the wet signed hardcopy.
2. Medication dispensing. They send pills every few months. Work with pharmacy and FedEx the pills, tracking to make sure the person on the trial is getting the medication.
3. Compensation—give cash in person but now they send a check which takes time. That's why some patients prefer in person since they can get the cash right away.

Things that they could not resolve:

1. Vitals, labs, and physical exam has to be done by the investigate. These cannot be done remotely. The patient cannot go to any lab. It has to be one that is approved for this trial.
2. If vitals are taken by some type of approved device that reports back to a doctor they could be considered valid reporting. but not administered by patients themselves.

Difficulties:

1. Investigators prefer in person since time is lost waiting for the patients to get online and on the appointment.
2. The investigator needs privacy when interviewing the patient which is hard to find in the clinic. Only teams that are part of the trial can be on the call.
3. The remote option was liked by patients, but they also like coming in to get the cash right away.
4. The older patients were not as tech savvy. Getting signatures was more difficult. The investigators preferred avoiding the remote option with the older patients.

02

DR. LINET MIRZAIAN
KAISER PERMANENTE/
FAMILY MEDICINE PHYSICIAN
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Kaiser uses teams for calling and video conferencing. Kaiser Permanente started using telehealth 3 years before Covid

- They had to get patients interested. They did not use it much until Covid. Covid pushed the patient to utilize Telehealth.
- Telephone visits are free. Kaiser does not charge since they cannot get reimbursed from Medicare.
- Kaiser charges for Video calls, and they get reimbursed from Medicare.
- They have been doing Tele and Video 100% for the last year
- They do not have enough doctors for Telehealth.
- Nurses are still doing Covid related items so there is a shortage of nurses as well. 2 doctors are sharing a nurse.
- They just started with in-person visits. They cannot meet the demand since everyone now wants in person.
- Patients are now in the worst condition since some have not seen a physician for the last year.
- Video is not as popular with this population. Patients do not feel comfortable / invasion of their privacy, and they are not tech-savvy.
- Video visits do not provide more info to the physician. The quality of the video is

MAIN TAKEAWAYS

1. Tele visits were very useful for conducting patient history.
2. Tele visits with a physician were used efficiently when the following could occur in advance:
 - a. Vitals, labs, and physical exams had to be done in person but not necessarily by a Physician. They could be done at a nurse clinic.
 - b. Glucose levels were monitored then uploaded to the app before the visit.
 - c. Patients took their own blood pressure and temperature then uploaded to the app before the visit.
 - d. X-rays were performed in lieu of in person visits then the results were provided to the Physician before the tele visit.
3. Patients needed to have a physical visit if any surgery or hazardous medications needed to be prescribed.
4. Physicians required privacy when speaking with a patient.
5. The older patients were not as tech savvy and needed help with the tele visit.
6. Patients did not feel comfortable using the video option since the physicians could see their homes.
7. Video quality was a major concern and not used.
8. there are not enough doctors to respond to patient demands (tele or in person)

03

DR. NOUBAR OUZOUNIAN
KAISER PERMANENTE/ ENT
(EAR, NOSE AND THROAT)
ORANGE COUNTY, CA

Half day work 16 patients in 4 hours—all telephone visits

- Tele visit is useful when there is completed imaging information, CAT scan, Xray, etc.
- Tele visits are very useful to conduct history research questionnaire.
- For at least 1 in 5 patients tele visit makes a difference and saves time to go to hospital.
- In case patient has Lump it always needs to be done in person.

- Video calls are not very successful as video quality and WiFi connection is not always good on Patient side, also , they are not comfortable turning their cameras on when they are in their homes.
- Most patients prefer telephone conversation.

- Tele visits work very well for Psychiatrists and for Diabetic treatments in Dermatology.
- Experience from last year: In March Xrays and tests increased, in October it became more balanced.
- Doctors were working at least 1 day per week in office.
- Younger patients prefer Telemedicine.
- Older patients prefer telephone. Doctors prefer to have in office visits due to difficul-

ties, but still uncertain.

Doctor can conduct work either from Home or from Office.

They spend 15 minutes per patient. Telemedicine has been in practice for last 3 years, but even then he was very selective on who could use tele visit and who needs to come to the office. Nurse would vet them ahead of time before directing either way.

Currently demand is so big they don't have capacity to vet patients ahead of time and they allow them to choose visit type.

Normally they examine 26-27 patients per day. Conducts visits from home only for follow-ups or new patients Last year is a reduction of in person physical visits.

05. CHALLENGES

Reviewed Literature, and the latest statistics proved that the telehealth-based form of patient/doctor interaction became an essential part of the healthcare model. Despite all the progress in this form of care, several critical issues stay present and hinder its future integration in Healthcare on a much larger scale:



ACCESS TO TELEHEALTH is not equally available for all. Social disparities do not always allow access to technologies or providers that equally accept or access this form of communication



DURING THE TELE-VISITS, the patient usually requires an assistant/family member to help with positioning the camera or sound.



A DISENFRANCHISED POPULATION that relies upon ER services are left without access during the surges such as epidemic or disasters as they do not have access to smart technology or health providers.



LANGUAGE BARRIERS In globalized world not all platforms are offering language interpretation services, which is a large barrier in the examination process for patients and physicians



THE AGING POPULATION requires additional assistance to navigate new technologies.



PHYSICIANS tend to reject specific telemedicine systems when they think it is limiting the sensory perception.



THE CONCERN OF PHYSICIANS about the absence of physical contact.



INTEROPERABILITY among disparate video solutions.



NEED FOR PERSONAL CONTACT to thoroughly learn the medical history of a patient.



INTEROPERABILITY with diagnostic medical devices and remote monitoring devices.



Current base **VIDEO COMMUNICATIONS** cannot fully render complex physical signs of a patient.



WIDESPREAD INTEROPERABILITY eliminating individual clinical silos and lack of overall integration of enterprise-wide programs.

Interviews with doctors revealed even more specific issues that are not often identified in academic research studies.

1. Patients mostly shy away from turning cameras on as they feel uncomfortable revealing their surroundings.
2. Not all have an environment that allows for privacy
3. Network connections don't always work well.
4. Patients still need to drive to the medical facility for Lab Work, Blood Work, Vitals, Imaging, and more.
5. With a lack of physical examination, there is increased demand for imaging.



06. RECOMMENDATIONS

To summarize examined information, a series of recommendations must be considered to aid the future evolution of Telemedicine. They vary between various aspects of the examination process: operational, clinical interface, legal, regulations, or built environment. While not all could be accomplished in every scenario, some have the potential to be immediately addressed while designing a built environment around healthcare.



REAL-WORLD AND ONLINE WORLD MUST CONVERGE.



WE MUST BE SENSITIVE TO DATA OVERLOAD.



CONSUMERS ARE THE HUBS OF THEIR OWN HEALTH-CARE DATA.



INTEGRATE TECHNOLOGY AND HUMAN INTERACTION IN THE PHYSICAL WORLD.



INCREASE FOCUS ON PATIENT DATA SECURITY..



PROVIDE PATIENTS WITH BASIC TECHNOLOGY REQUIREMENTS (I.E. ADEQUATE INTERNET CONNECTION).



TRAIN SPECIFIC PROFESSIONAL FIGURES (NEUROPSYCHOLOGISTS) TO EDUCATE PATIENTS AND CAREGIVERS ABOUT TECHNOLOGY.



PROVIDE A SECURE LINE FOR FILE SHARING (TEST RESULTS, ETC.)



PROVIDE SECURE DATA MANAGEMENT (ELECTRONIC RECORDS).



DIRECT SELF-EXAMINATION AND SEPARATE ANCILLARY TESTS AHEAD OF TIME.



CONDUCT SESSIONS IN A QUIET AND PRIVATE ENVIRONMENT.



USER-FRIENDLY GRAPHIC INTERFACES CAN BE COUPLED WITH INTERACTION DESIGN AND UX EXPERIENCE METHODOLOGIES.



DESIGNING JOURNEY MAPS AND GENERATING ARTIFACTS TO COMMUNICATE TELEMEDICINE PATHWAYS TO PATIENTS AND USERS



ACCOMMODATE EQUIPMENT FOR VALIDATED VITAL SIGNS.



WALK PATIENTS THROUGH VARIOUS SELF-ASSESSMENTS AND USE VIDEO CLUES.



FOLLOW SPECIFIC TELE-MEDICINE EXAM INSTRUCTIONS PER HEALTHCARE INSTITUTIONS.



ADAPTING TELEHEALTH VISITS TO DIFFERENT POPULATIONS, THE ELDERLY, INDIVIDUALS WITH COGNITIVE IMPAIRMENT, OR WITH LOW HEALTH TECHNOLOGY LITERACY.



INTEGRATION OF VIRTUAL EXAMINATIONS WITH INTERPRETERS.



MEETING PATIENTS' PSYCHOSOCIAL NEEDS;



GAINING AND MAINTAINING TRUST THROUGH A VIRTUAL INTERFACE.



FOLLOW SPACE ACCOMMODATION RECOMMENDATIONS PER FGI GUIDELINES. INCLUDING SIZE, PRIVACY, ACOUSTICS, LIGHTING, CAMERA LOCATION, SURFACES, SIGNAGE, AND EQUIPMENT.



ENSURE SAFETY, PRIVACY, QUALITY OF CARE, AND HIGH QUALITY OF CARE.



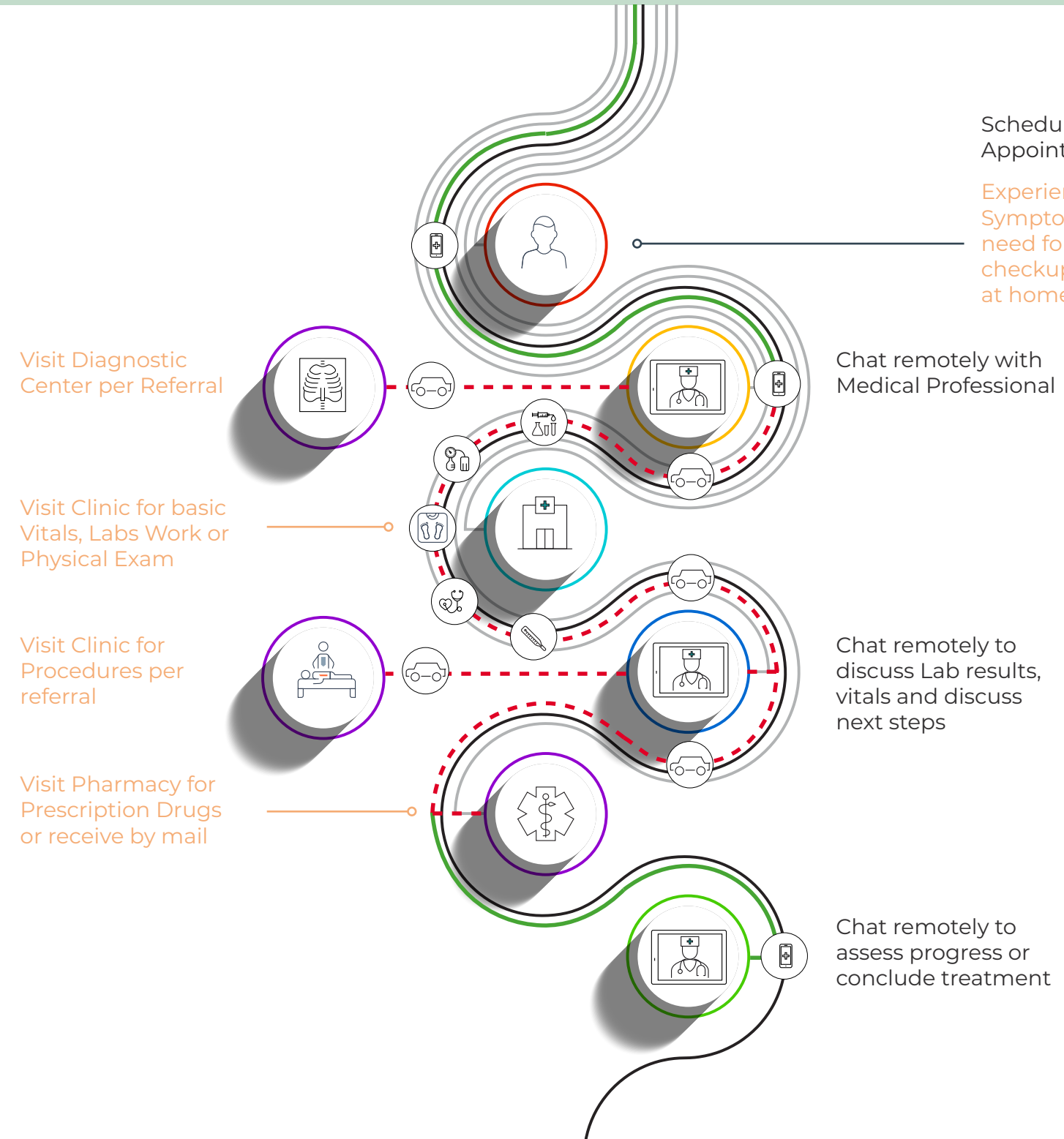
CONSIDERATIONS TO BE TAKEN FOR PATIENT MOVEMENT AND POSITIONING, WHEN ACCOMMODATING PHYSICAL SPACE AND TO ACCOMODATE ASSISTANT IF NEEDED



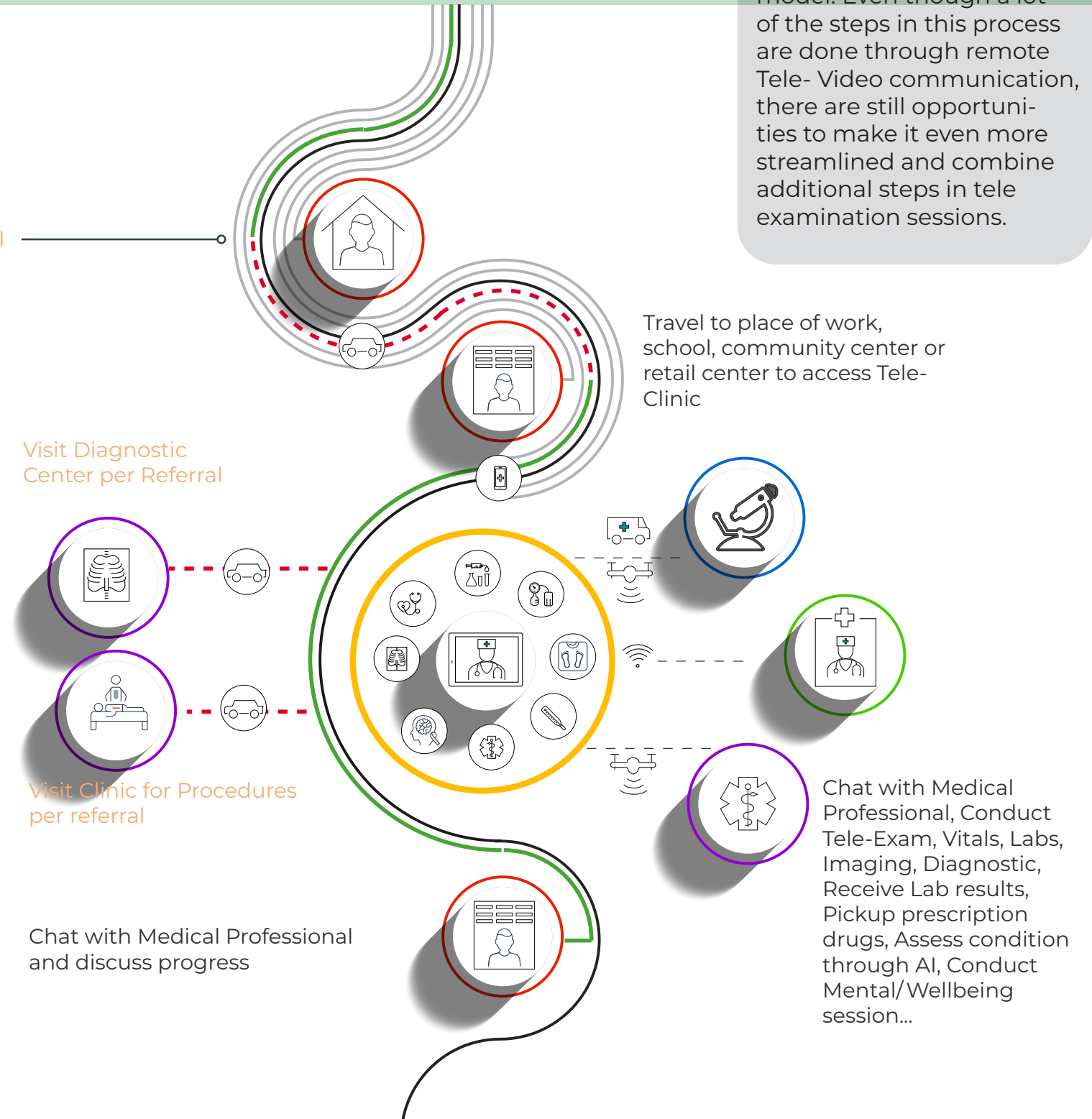
THE EXAMINER NEEDS TO MAINTAIN EYE CONTACT WITH THE PATIENT.

07.PATIENT EXPERIENCE JOURNEY MAP

Exploration of Patient Tele visit Journey opens the window into the process and truly identifies each step of the Telemedicine care model. Even though a lot of the steps in this process are done through remote Tele- Video communication, there are still opportunities to make it even more streamlined and combine additional steps in tele examination sessions.



Today

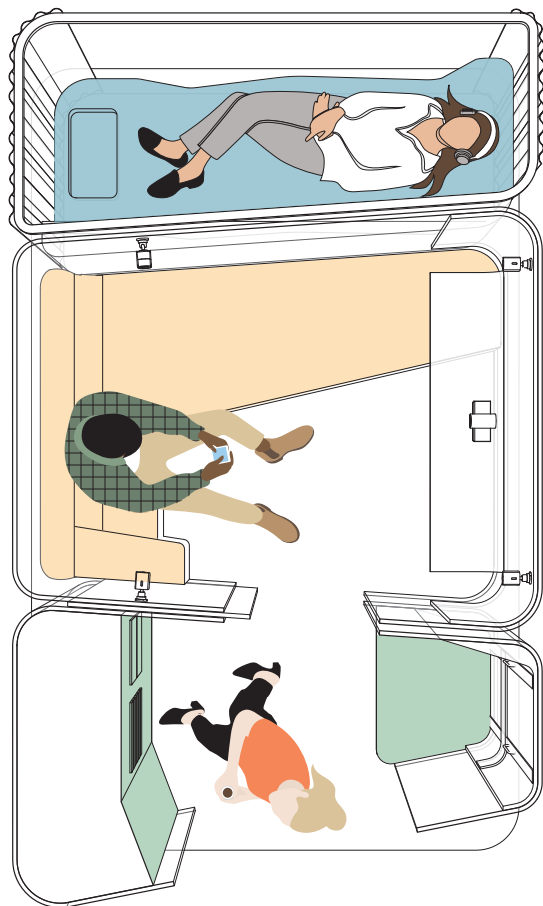


Tomorrow

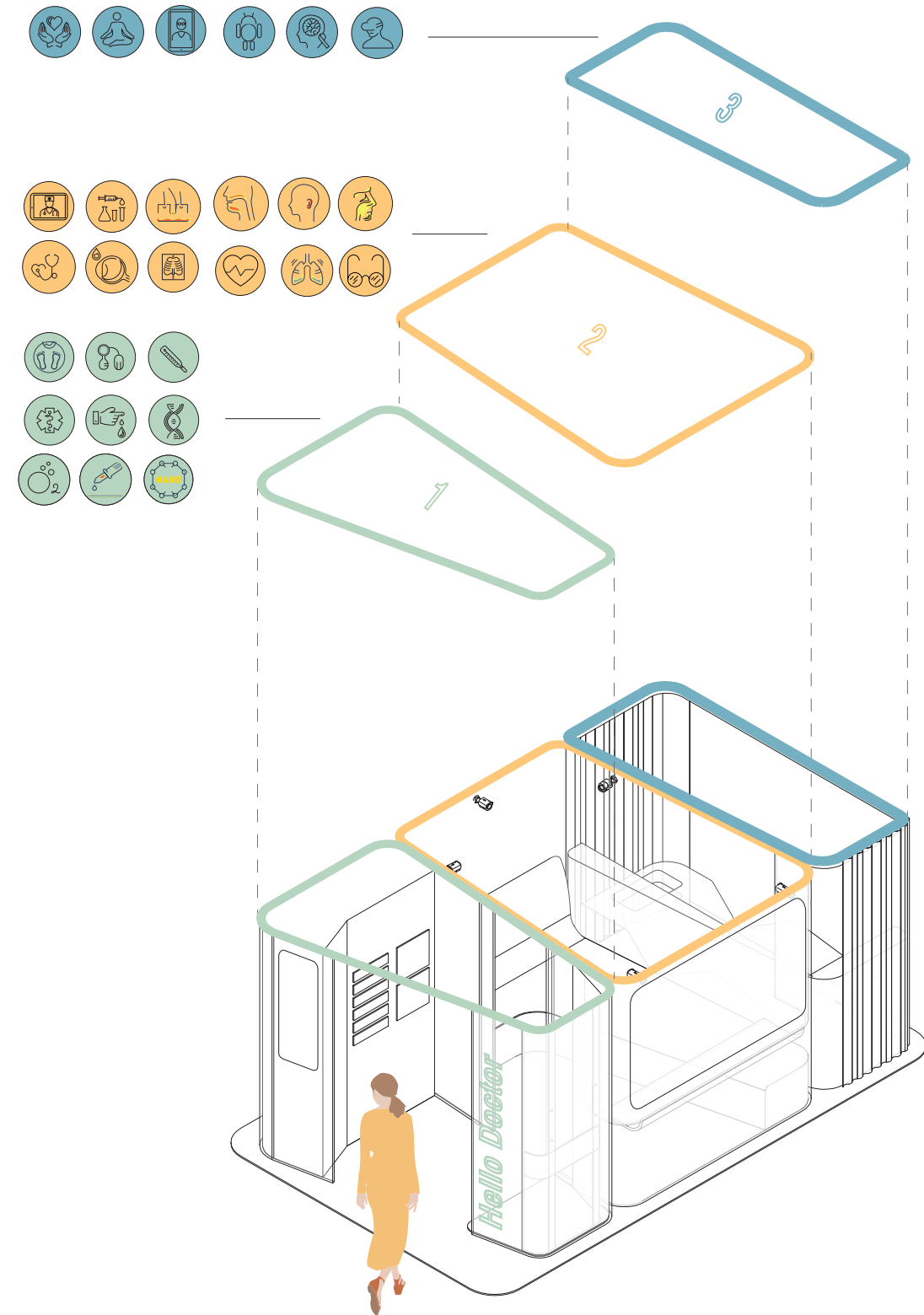
08. CASE STUDY TELE-CLINIC

Thanks to emerging technologies and Artificial Intelligence, several examination process steps could be added to the remote visit scenario. AI, Robotics, and Remote exam tools could make this a reality.

All of those tools are costly, and no individual will start purchasing them for single visit use. Studies and surveys suggest that there is a need for a new kind of model, where users could access microsatellite clinics equipped with the latest tools.

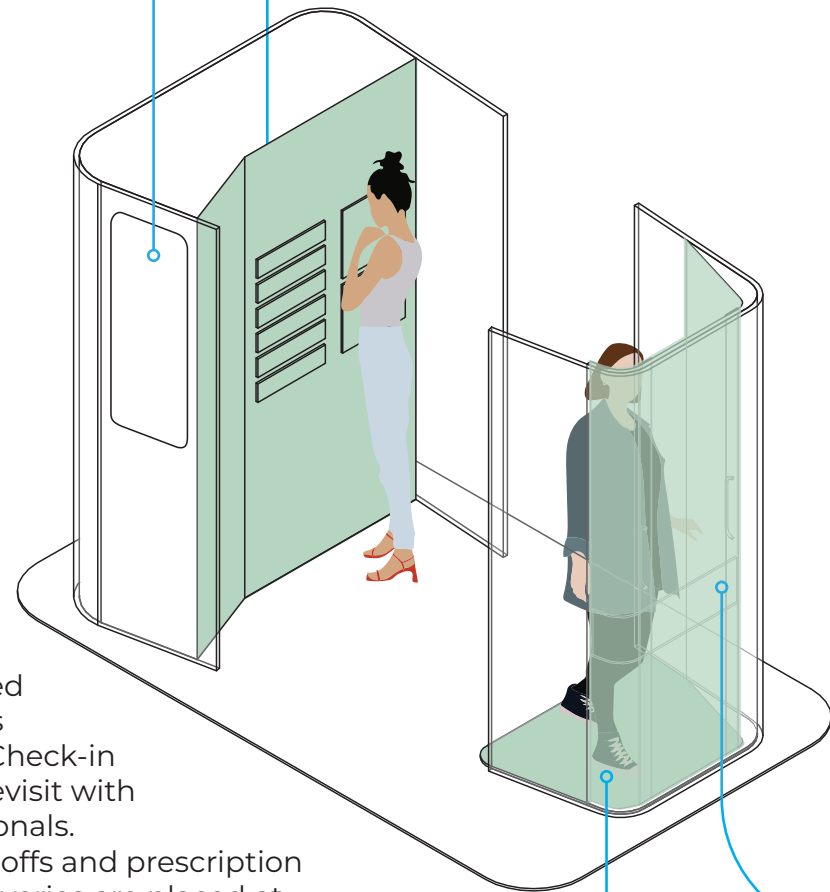


The proposed case study explores merging the latest technologies with physical space and accommodating tele-medicine for various settings. The proposed “Tele-Clinic” is made up of three components where each could function independently or combined.





interactive digital signage with information board



UNIT 1
Stand-Up Clinic is intended for quick access services and a Check-in step for the Televisit with Health Professionals. Lab Work drop-offs and prescription medication deliveries are placed at "Amazon Locker" type boxes while the latest UPS/Drone service or conventional carrier services could perform deliveries. Vitals Kiosk with weight/blood pressure measuring abilities could prepare for exam sessions and the DNA Nanopore device to provide a real-time assessment. Digital signage board to provide occupancy info or health and wellness information.

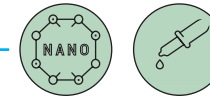
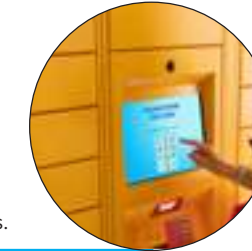


EVERLYWELL has modernized lab testing by bringing access to credible, validated laboratory tests that are initiated and collected by individuals in the comfort and convenience of their home. Everlywell aims to empower individuals to be proactive about their health, and our commitment to quality and accuracy is the same that it is expected from doctor's office. Through the combination of best-in-class science, physician oversight, and rigorously validated collection methods and service, Everlywell ensure the best quality testing by working with labs that meet the following standards:



UPS and **CVS** are teaming up to deliver prescription medicine via drone to residents of The Villages retirement community in Florida. The service, which will use Matternet's M2 drones, is being conducted with authorization from the Federal Aviation Administration. The drone deliveries will begin in early May. The first flights will be less than half a mile and will be delivered to a pickup location near the retirement community. Initially, a UPS ground vehicle will complete the delivery to the resident's door. The prescriptions will be delivered from one CVS store, with two additional stores joining at a later date.

DROP OFF/PICKUP MAIL BOXES accommodate pharmacy and lab deliveries.



FLONGLE FROM NANOPORE enables direct, real-time DNA sequencing, or cDNA sequencing on smaller, single-use flow cells. The sensing platform has the potential to be adapted for the analysis of other types of molecules, for example proteins.



Self-Service Health Kiosk for healthcare; **LABH GROUP HEALTH KIOSK**, **POC HEALTH KIOSK**, Lifestyle Checkpoint Health and Wellbeing Kiosks that measure: Blood Pressure, Pulse, Height & Weight, Body Mass Index, Visceral Fat, Total Body Fat, Blood Oxygen Saturation Levels, Hydration Levels, Body Temperature, Muscle Weight, Bone Mass, Basal Metabolism, Risk Assessment and Management, Workplace Stress Assessment, QRisk2 - Heart Age and Cardiovascular Disease Risk Assessment, Glucose, Uric acid



unit 1

Stand-Up Clinic

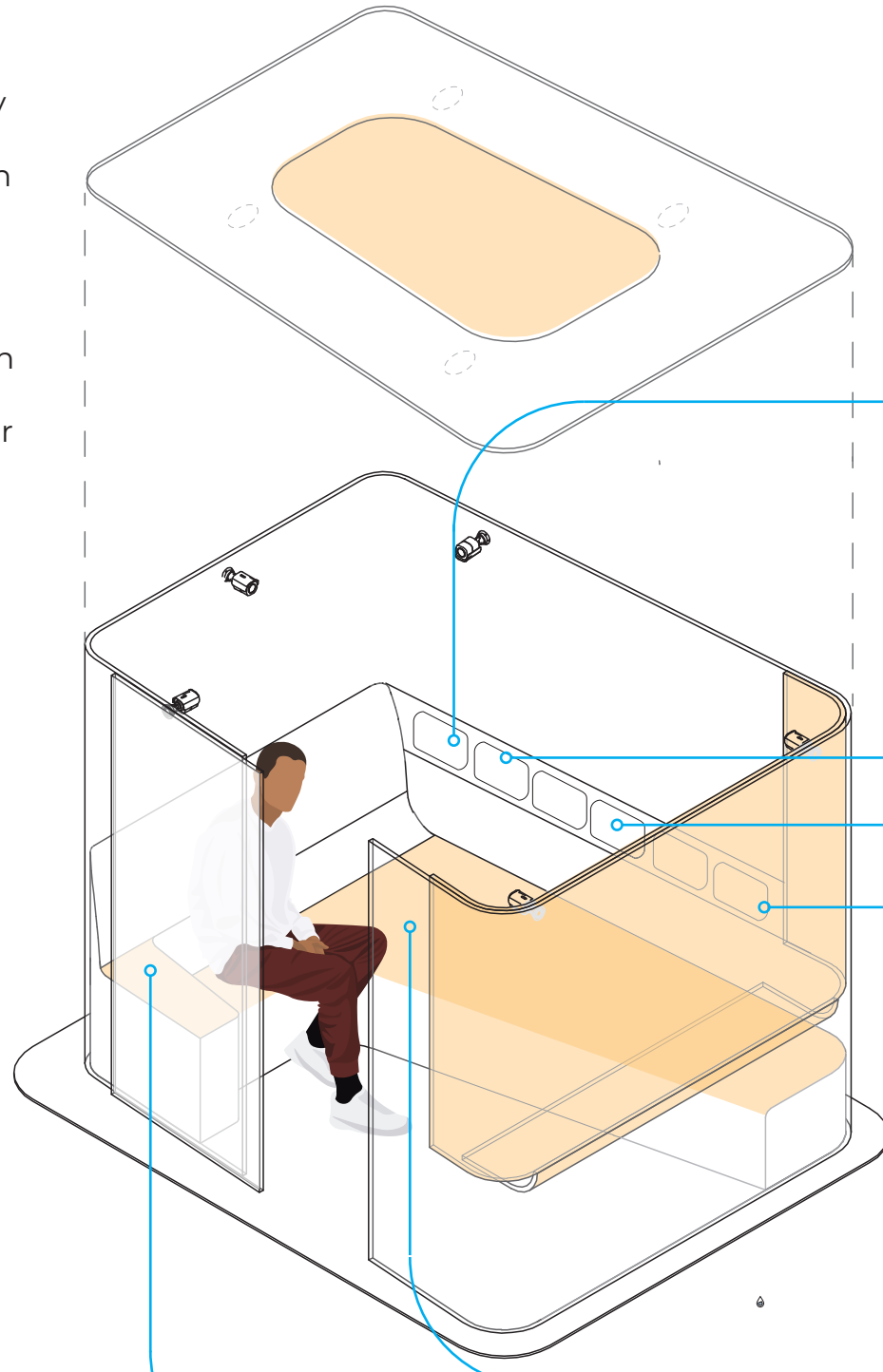
UNIT 2

Exam Clinic is intended to accommodate comprehensive exam sessions.

Patients establish contact with their preferred Health System by docking personal smartphones and activating their select health system application.

Exam tool panel located on the side allows patients to use Tele-exam tools following instructions provided by a Health professional.

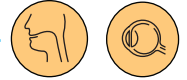
The Side Arm of the patient chair accommodates an AI-powered Blood draw machine.



World's first fully automated self-guided refraction technology from **SMART VISION LABS**. The voice-guided software helps consumers go through the refraction test in a fully automatic fashion. The connected software sends refraction data and the consumer's personal information to a secure HIPAA-compliant cloud. Vision care professionals can provide follow-on service if needed by evaluating the data at any location.



GLOBALMED TOTAL-EXAM2 Examination Camera with S-Video TotalExam is designed to be easy-to-use and easy-to-hold enabling you to acquire clear digital video. TotalExam allows you to view high quality freeze-frame images as well as live video at 30fps. Freeze-framing images during an exam or teleconference is a one-step process. The camera has three different light temperature settings, allowing you to easily select among the varying levels of natural white.



TYTOCARE MEDICAL EXAM KIT
The kit includes TytoCare Device with Exam Camera and Thermometer, Otoscope adaptor for examining the ears, Stethoscope adaptor for heart and lung sounds, and Tongue depressor adaptor for the throat & lung. The patient can perform an exam on your TytoCare device and then email the results to their own doctor for diagnosis.



BUTTERFLY Enterprise all-in-one ultrasound solution. A single probe, whole body ultrasound solution designed with ease of mind. Scan, document, upload, review, and bill with seamless all in one software solution.



The **EARLYSENSE** Vitals Surveillance system gives clinicians immediate access to the patient vitals and motion information they need to detect and respond to early patient deterioration, falls and pressure ulcers. Trended patient vitals including heart rate, respiratory rate and motion Monitor vitals without ever touching the patient—no leads or cuffs required.



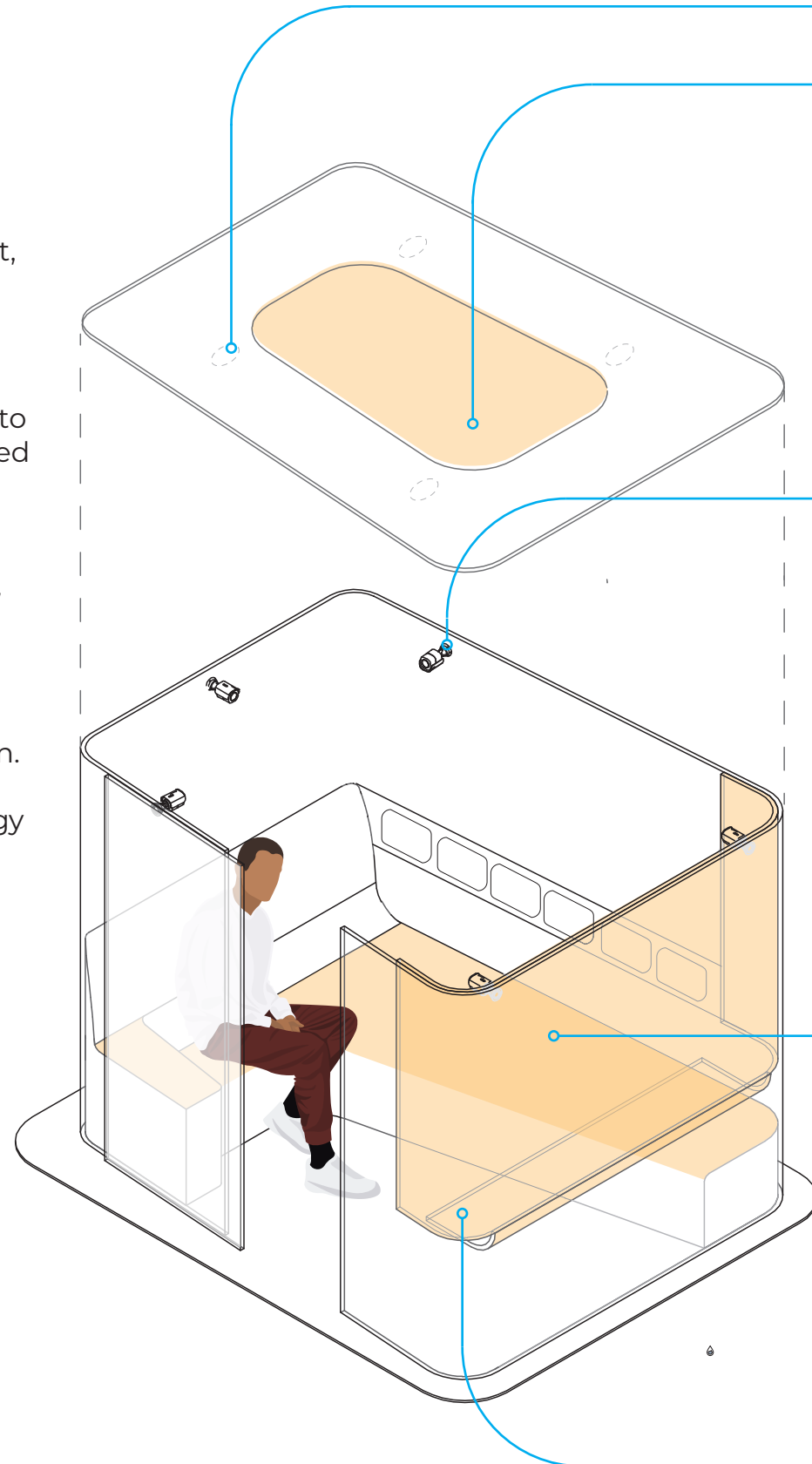
RUTGERS ENGINEERS created a device that uses AI and imaging to draw blood and insert catheters. The robotic device can accurately steer needles and catheters into tiny blood vessels with minimal supervision. It combines artificial intelligence with near-infrared and ultrasound imaging to perform complex visual tasks, including identifying the blood vessels from the surrounding tissue, classifying them and estimating their depth, followed by motion tracking.



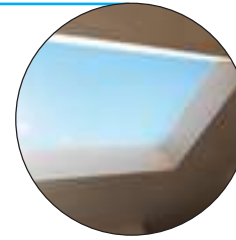
unit 2 Exam Clinic

UNIT 2

The unit is equipped with a large Screen Monitor to allow a realistic “in-person” experience. Size and placement allow eye-level alignment with the patient, seated on exam chair/Lounge equipped with Vitals sensor technologies transcribed to Health professional. The exam chair also has a storage drawer to store disposable linens as needed and a disposal container. Four ceiling-mounted cameras and one front camera allow medical professionals to switch, rotate, and zoom the camera to provide a complete 360° observation of the patient. Simulated Daylight fixture provides exam-level illumination. The unit is equipped with ultraviolet disinfection technology activated after each use.



COELUX is an optical system based on nano technology to artificially reproduce the natural light and visual appearance of the sun and sky. CoeLux offers a breakthrough opportunity for indoor architecture by creating the sensation of infinite space.



A **CE-CERTIFIED COMMERCIAL UVC DISINFECTION FIXTURE** with patented Care222 technology. Christie CounterAct™ commercial UVC disinfection fixtures contain patented Care222® technology that emits filtered far-UVC 222nm light while meeting established safety guidelines, designed to neutralize pathogens with people present.



ENTERPRISE-CLASS USB 3.0 FULL HD PTZ telemedicine video camera for conferencing has positioning for middle and large room video communication. It supports far end camera control with a smooth pan/tilt rotation, fast accurate focus capability and a 12x optical zoom.



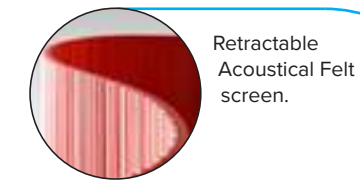
LG'S CURVABLE OPEN FRAME OLEDs provides the flexibility to create amazing digital displays. Supporting concave and convex curvatures in portrait and landscape orientations.



SMART PHONE DOCKING STATION activates and pairs with AV devices.



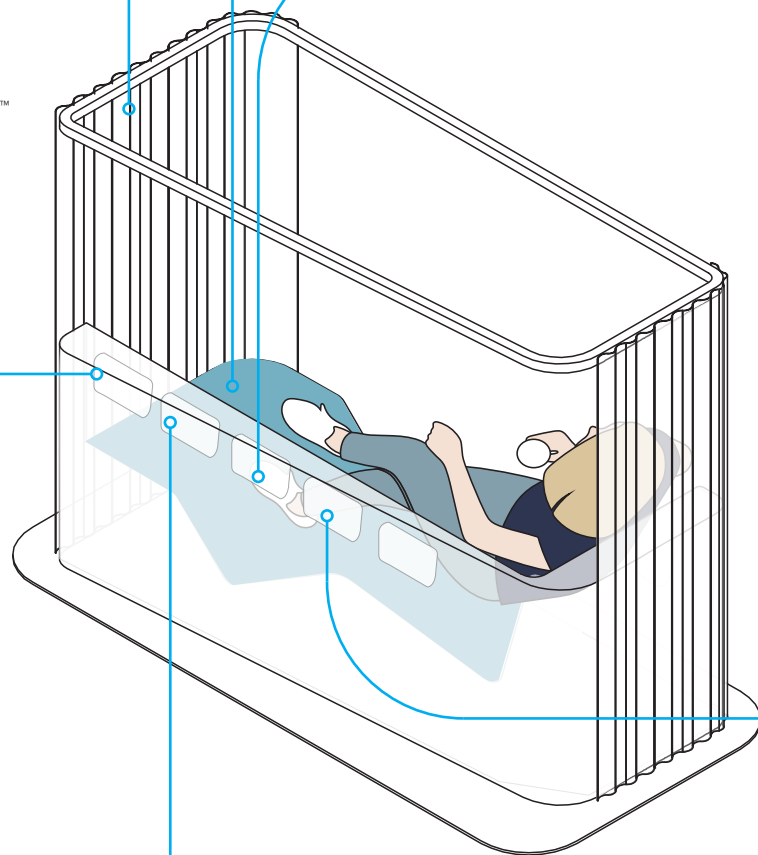
unit 2 Exam Clinic



Retractable Acoustical Felt screen.



A CE-certified commercial UVC disinfection fixture with patented Care222 technology. Christie CounterAct™ commercial UVC disinfection fixtures contain patented Care222® technology that emits filtered far-UVC 222nm light while meeting established safety guidelines, designed to neutralize pathogens with people present.



The wellness unit is designed to accommodate mental health and wellness needs. Intended as a booth with acoustic privacy, Equipped with AI-powered mental health-focused tools and applications: Robotic Emotional support tools such as Tombot and Robin and the ability to connect and perform treatment sessions using VR technologies. Mediation and self-affirmation tools are currently emerging in the healthcare market.

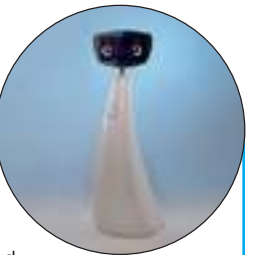
TOMBOT

Tombot Puppies help individuals, families, and communities cope with health adversities. Millions of people facing health adversities cannot safely or practically care for a live animal companion. That's why Tombot was launched. Touch sensors all over the Puppy's body allows her to react to you based on how and where she is being touched. Voice activation software enables your Tombot Puppy to react to your commands. Recordings from a 12 week-old Labrador puppy make your Tombot Puppy sound like the real deal! Tombot comes with a free smartphone app that allows you to name your Puppy, customize its functionality, and track user interactions on a day-to-day basis.



ROBIN THE ROBOT

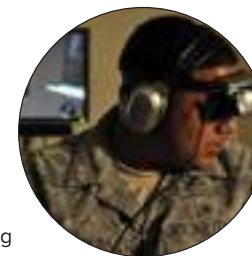
Robin is a product of vision to help children overcome medical stress backed with long-term psychological research done by experts in field. Robin's software algorithm allows it to perform a real-time analysis of children's emotions and respond on spot. Its slick design and cheerful voice appeal t children and instantly gain their trust. Robin can be controlled by a member of the medical personnel. Any assigned staff member can communicate with children by using the robot's interface. While in use, Robin collects and analyzes data on the patient's mood and emotional state.



USC INSTITUTE FOR CREATIVE TECHNOLOGIES

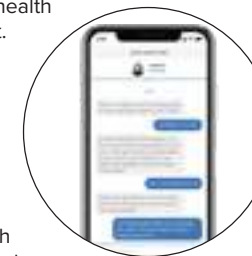
Medical Virtual Reality The ICT MedVR Lab explores and evaluates areas where VR can add value over traditional assessment and intervention approaches. Areas of specialization are in using VR for mental health therapy, motor skills rehabilitation, cognitive assessment and clinical skills training.

(U.S. Air Force photo by Senior Airman Renae Kleckner)(released)



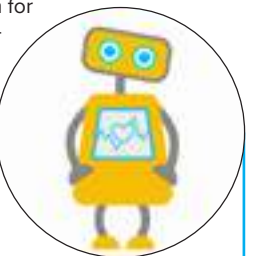
GINGER

On-demand mental health support, day or night. Chat with a trained behavioral health coach within seconds, and meet with a licensed therapist or psychiatrist via video within days. Our behavioral health coaches offer day-to-day support for life's challenges. Want help managing your anxiety or getting better sleep? There's no need to wait for an appointment. Get immediate, real-time support via text with a trained behavioral health coach day or night, 365 days a year.



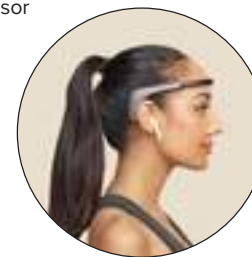
WOEBOT

An advanced system for therapeutic development and delivery. The AI-powered Woebot Health Platform provides the foundation for the discovery, development and delivery of digital therapeutics and clinical tools that span the care continuum. used to develop solutions for behavioral health and digital therapeutics intended for use as medical interventions, and to design a suite of monitoring tools that allow to assess and respond to changes in users' lived experience.



MUSE 2 is a multi-sensor meditation device that provides real-time feedback on your brain activity, heart rate, breathing, and body movements to help you build a consistent meditation practice.

- Real-time brainwave feedback (EEG) teaches you the art of focus.
- Tune into your heart rate to optimize performance.
- Discover how your meditation posture can bring you physical relaxation.
- Learn how to use your breath to find calm and fight stress.



CORE helps develop a consistent meditation habit. It includes Core Meditation Trainer Premium app content—thousands of guided meditation options, breath training, and soundscapes, updated daily. Daily routine trains brain to reach a calm and present state more rapidly, and helps to reduce stress, improve mood, and increases capacity to focus. Core's ECG biosensors measure heart and nervous system. The Core App displays biofeedback and insights to show the impact meditation has on mental and physical wellness.



THE GURUGO mind machine helps you break through fear and doubt, so you can take consistent action toward your dreams. The GuruGo brainwave entrainment device utilizes a combination of 6 most powerful brainwave entrainment modalities to gently, yet automatically guide your brain into optimal states during each session. This premier mind machine makes positive lasting results.



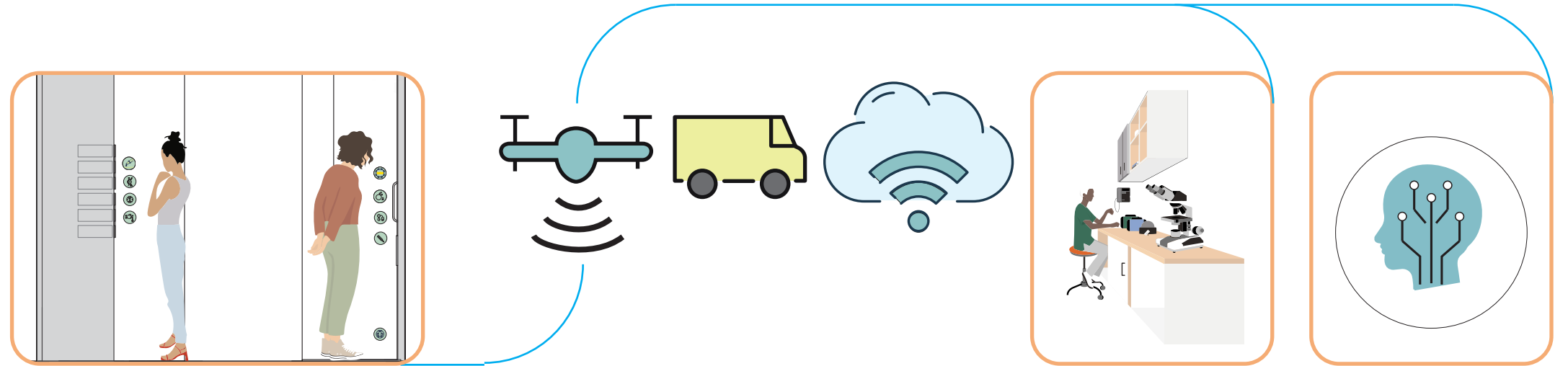
unit 3

B-Well Clinic

09. CASE STUDY NETWORK

The functionality of the entire unit depends on the connectivity to the external service through the various routes.

Unit 1 Locker boxes function based on physical deliveries and pickups by Drone/UPS services, rapid conventional delivery services to and from Pharmacies and labs. At the same time, Vitals stand is powered by AI through Cloud resources.



Unit 2 is mainly designed to establish in-person “calls” with Health professionals on the other side through a high-speed WiFi network.



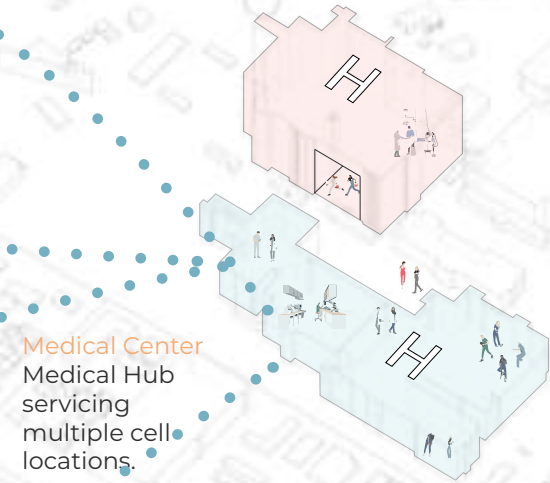
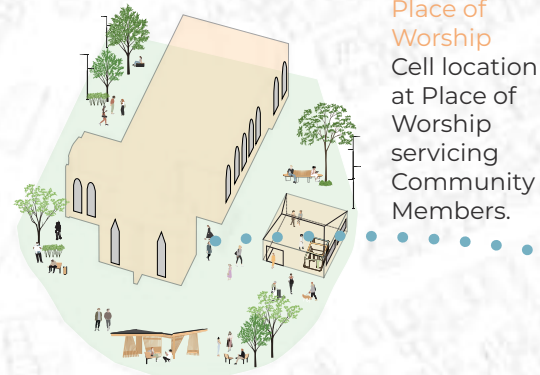
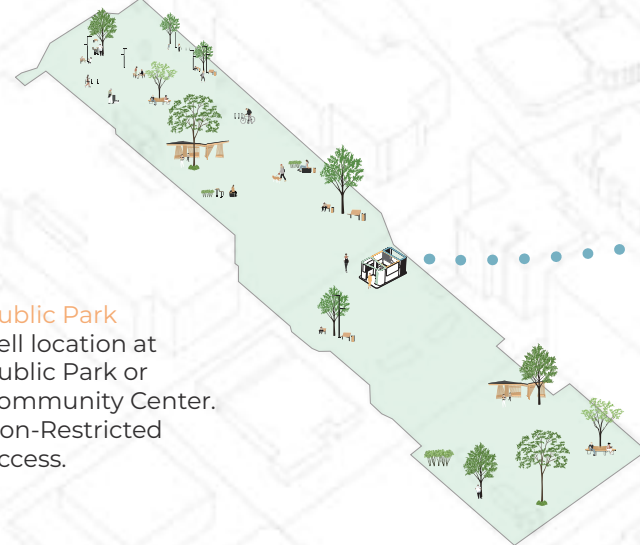
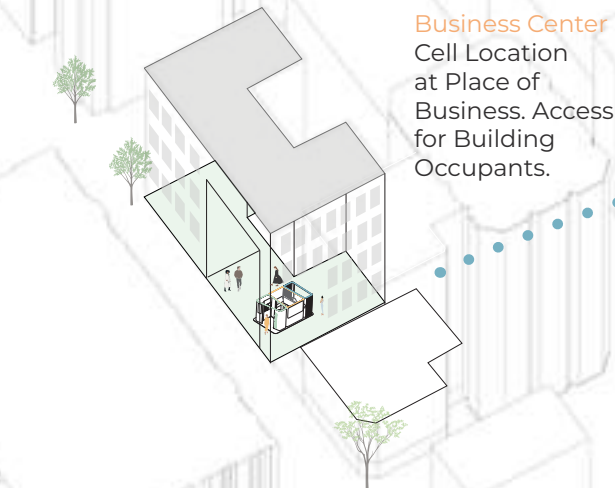
Unit 3 primarily functions based on connection to AI through cloud services, even though it could still link to “real” health providers through personal devices.



10. CASE STUDY

URBAN CONTEXT

Increased density requires increased health and human services, which trigger more robust urban development, construction, carbon footprint, and environmental impact.



Proposed prefabricated Tele Clinics would be located throughout the city within 1 mile of each other and within 15-minute walking distance from someone's work or home. Tele Clinic units can be situated in an existing Office Building, a Mixed-use Development, an Apartment Building, or outside a Community Center or Church. The possibilities are endless. The idea is to decentralize the Primary Care Services. Decentralization provides an opportunity to reduce the need to construct large-scale Medical Office Buildings. As a result, it could minimize the environmental impact caused by significant construction. Decentralization would also eliminate the need to drive back and forth to clinics and, as a result, reduce CO2 emissions. This model has the potential to improve Human Health by accommodating and promoting more healthier habits of walking rather than driving and reducing stress from time spent away from work or home.

11.

CONCLUSION

Exploration of telemedicine, research of Literature, new Technologies, and current shifts in society allowed the team to ideate and imagine how healthcare delivery could look tomorrow.

Global lockdowns demonstrated that society could still function in the remote world, and the world can continue to function behind the screen, but life still demands physical presence and a need for a hybrid form of life.

Healthcare is no exception, and communities around the globe could embrace midpoint destinations between home and Clinic or home and work.

Convenience, combined with a societal shift for carbon footprint reduction, will demand the need for low-impact alternatives in Healthcare access. An increase in Healthcare demand does not necessarily require large-scale construction, rather micro-level injections in already present urban settings.

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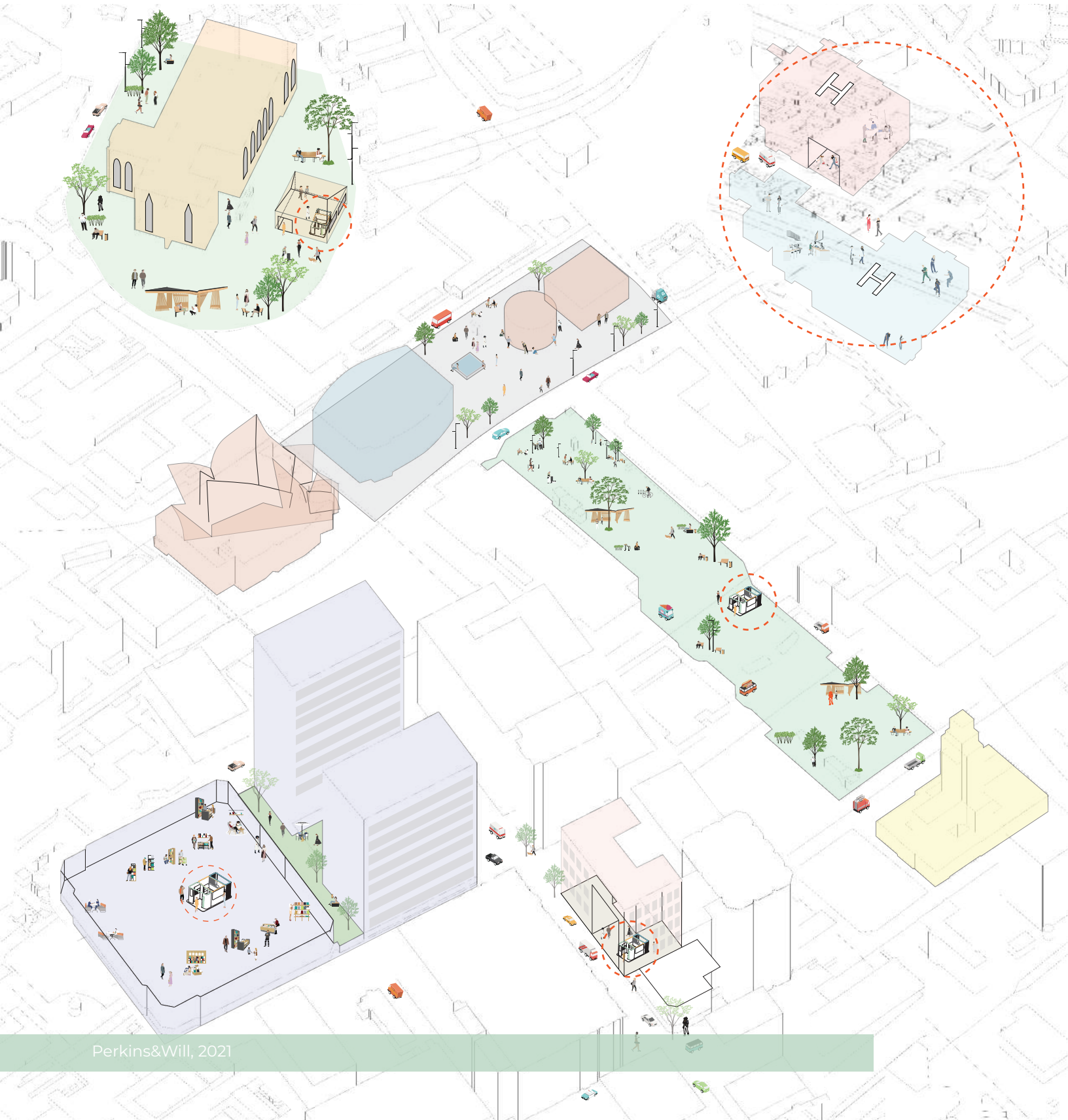
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THANK YOU!



Perkins&Will, 2021

