INNOVATION CENTRE DENMARK



HOSPITAL-AT-HOME: NEW MODELS OF CARE IN CLINICAL INNOVATION

INNOVATION CENTRE DENMARK

2025

TABLE OF CONTENTS

00 EXECUTIVE SUMMARY 03

01 INTRODUCTION 04

Challenges in our Healthcare System
Identifying the real problem
The Solution: Embracing new models of care

02 HOSPITAL AT HOME - A PARADIGM SHIFT 07

Introducing the Concept

03 IMPLEMENTING HOSPITAL-AT-HOME MODELS 11

Why should we implement Hospital-at-Home models?
Challenges and Solutions
Getting a HaH Program off the ground

04 CASE STUDIES: IMPLEMENTING HOSPITAL AT HOME IN THE US AND DENMARK 17



CLINICAL INNOVATION OUTLOOK

Foreword

Over the past several years, Innovation Centre Denmark Boston has had a strategic focus on clinical innovation and through various projects and ongoing discussions, collected insights from leading hospitals on the US East Coast. This outlook explores the potential of the hospital-at-home model and its implications for the global healthcare industry. Our goal is to share insights gathered from interactions with Danish and US hospitals and to lay the groundwork for future initiatives in this area.

Special thanks to our American and Danish stakeholders for their involvement in the annual Clinical Innovation Summit, organised by Innovation Centre Denmark Boston, and to all contributors who have made this exploration of the hospital-at-home sphere possible.

Innovation Centre Denmark Boston is working to increase collaborations between Danish and American healthcare providers to explore the comparative advantages that both sides of the Atlantic Ocean offer in providing healthcare.

All of these efforts in fostering collaboration and innovation in healthcare are aimed at building a stronger, more resilient healthcare system for the future.

We hope you find the insights and chosen cases inspiring, and if you wish to continue conversations within the topics of Hospitals and Clinical Innovation, we encourage you to reach out through us directly or through our annual **ClinicalInnovationSummit.com**

Ann-Christina Petersen Lange
Executive Director & Consul General

Torben Orla Nielsen
Science Attaché



EXECUTIVE SUMMARY

Hospital-at-home (HaH) is a new paradigm in healthcare. The concept ranges from video consultations with a general practitioner (GP) to limiting unnecessary Hospitalisation and managing post-acute care from the comfort of a patient's home. The concept is born from several structural challenges within healthcare systems, including, but not limited to, clinical workforce shortages, financial strain, an ageing population, and an increase in patients with chronic diseases. HaH models address these issues by relieving hospitals of non-essential services and providing more "digital care" for patients. HaH models have significantly lower costs for patients and therefore hospitals. Furthermore there aren't any documented physical or mental downsides from the patient side. Studies even suggest that post-acute HaH care decreases the risk of hospital-borne infections, especially in elderly patients, lowering the risk of further medical complications in patients with a weakened immune system. Both the US and Denmark have experience with HaH models. Denmark has historically been adept at implementing virtual elements in preventive care, like consultations with a GP. In the US, the focus has been on near-acute and post-acute care. This is a consequence of incentive and reimbursement schemes that differ between the regions. The HaH market is expected to grow substantially in the coming decades, and the potential in the market doesn't seem to be fulfilled in the near future. Stakeholders worldwide are investing in HaH-enabling devices, and medtech firms are investing heavily in the technology.

Chapter 1

INTRODUTCION

The COVID-19 pandemic challenged global healthcare systems, revealing both significant disparities and systemic weaknesses. The crisis exposed how ill-prepared many healthcare infrastructures were to handle a surge in demand, leading to widespread disruptions, particularly in underserved populations. However, the COVID-19 pandemic also acted as a catalyst for innovation across the healthcare industry, accelerating the adoption of digital tools and new models of care that were previously considered optional and/or futuristic. As healthcare systems around the world pivoted to manage the crisis, they embraced technologies such as telehealth, remote patient monitoring, and virtual consultations at an unprecedented scale. This rapid transformation not only addressed immediate challenges but also laid the groundwork for a more resilient and patient-centred approach to care. The pandemic proved that traditional, hospital-centric models are no longer the golden standard; instead, there is a need to transition to a more flexible, integrated system that leverages the full spectrum of care settings – including the patient's home.

Challenges in our Healthcare System

The concept of HaH can be perceived as an effective response and solution to the myriad of challenges currently confronting hospitals globally. By adopting HaH models, some of these challenges can be addressed, thereby enabling healthcare providers to maintain the provision of optimal healthcare services. Some of these principal challenges are outlined in the following sections.

Ageing Population

The age of citizens in Western countries is increasing rapidly due to healthier lifestyles and medical advancements. Globally, the number of people aged 80 and above is projected to increase from 150 million to 426 million by 2050[1], a 300% increase in 25 years. With age comes a higher need for medical care, as elderly people typically require more frequent medication and healthcare, consuming more resources than younger populations. Thus, this demographic shift is expected to place growing pressure on healthcare systems in the coming decades.

Chronic Disease Burden

The ageing populations in Western countries are driving a growing prevalence of chronic diseases. In the US, 86% of healthcare costs are directed toward managing patients with chronic conditions[2]. While advancements in treatment have extended life expectancy for many patients, they have also intensified demand on healthcare infrastructure. This dynamic, combined with increased life expectancy, underscores the need for structural reforms to sustain quality care. Although expanding resources for healthcare is an essential response, it remains a complex challenge to implement effectively.

Clinical Workforce Shortage

Healthcare workers in the Westeren world face high demand with insufficient supply. In the US, 40% of physicians are 65 years or older[3], and approaching retirement. Education struggles to meet physician demand as healthcare needs rise. Denmark also faces workforce constraints, with over 40% of nursing positions unfilled in 2022[4]. These challenges are expected to increase in the coming years, as the demand for healthcare continues to increase while the number of trained healthcare workers is expected to remain stable or decline.

Financial Constraints and Challenges

To address the clinical workforce shortage, increasing resources for healthcare is an obvious solution to attract more talent. However, healthcare spending in Western countries has already seen a substantial rise over the past 40 years. This trend is

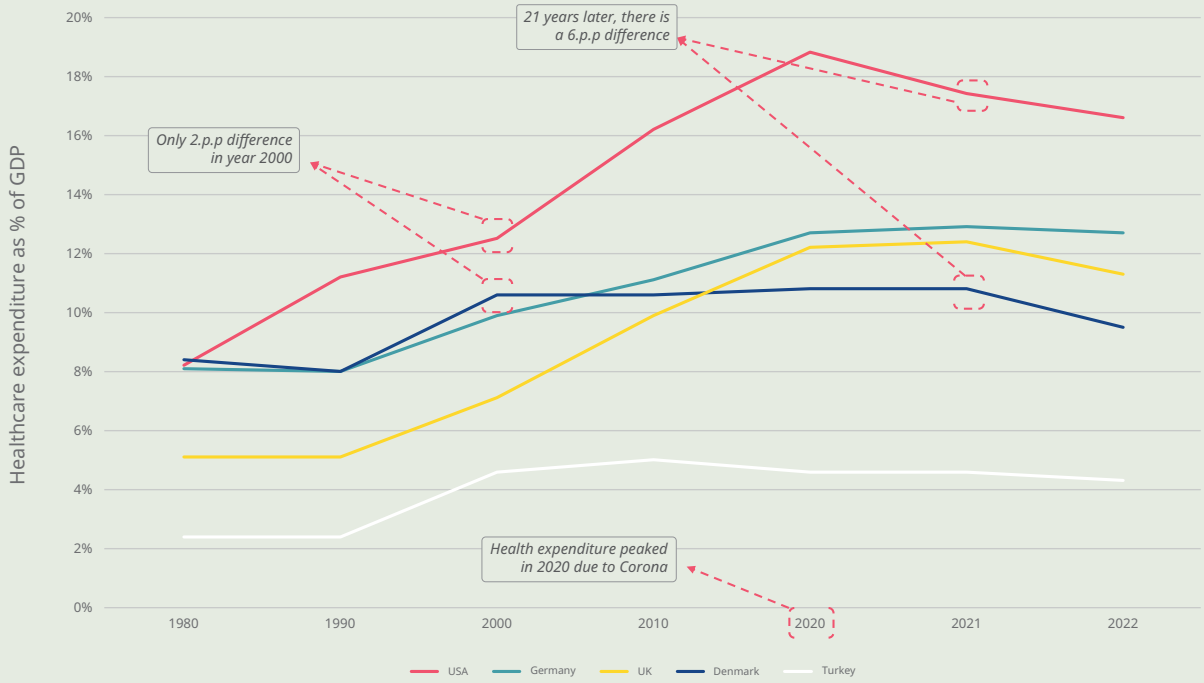
1. Sources: 1. "Ageing," United Nations website, https://www.un.org/en/global-issues/ageing, accessed 10 November 2022. 2. "The Relation of the Chronic Disease Epidemic to the Health Care Crisis," National Library of Medicine website, March 2020

2. "The Relation of the Chronic Disease Epidemic to the Health Care Crisis," National Library of Medicine

3. "The Relation of the Chronic Disease Epidemic to the Health Care Crisis," National Library of Medicine website, March 2020.

4. VIVE, 2024, https://www.vive.dk/da/temaer/mangel-paa-velfaerdsmedarbejdere/

Figure 2.1: Healthcare spending Overview



Annual spend on Healthcare by % of GDP, Source: World Bank Group, United Nations

illustrated in Figure 2.1, which shows the annual healthcare expenditure as a % of GDP, encompassing both private and public spending.

Figure 2.1 shows the financial burden in healthcare. In various Western countries, healthcare costs have increased over the years, consuming a significant portion of the economy, such as 11% of GDP in Denmark. Although more spending is often necessary, economies have limits on healthcare expenditure. Thus, healthcare must operate within financial constraints to remain viable long-term.

These financial strains are even more apparent in the US where they spend over 16% of their GDP on healthcare, almost 6 p.p. more than Denmark.

Identifying the real problem

At first glance, it might seem that the Danish and Western healthcare system is set to fail due to ongoing challenges. However, the high demand for healthcare results from significant clinical advancements that have extended average life spans. Many once-lethal diseases are now treatable, allowing people to live longer. While chronic diseases pose a considerable challenge, they also reflect improved healthcare that enables individuals with such diseases to live longer than what was previously possible.



Figure 2.2: Trends Shaping Healthcare



The success of treatments and advancements in the medical field have led to an increased healthcare spending. This requires a rethinking of how healthcare is delivered, as balancing supply and demand has become the most critical challenge. We need to identify solutions that both reduce the demand for healthcare and increase the supply of healthcare.

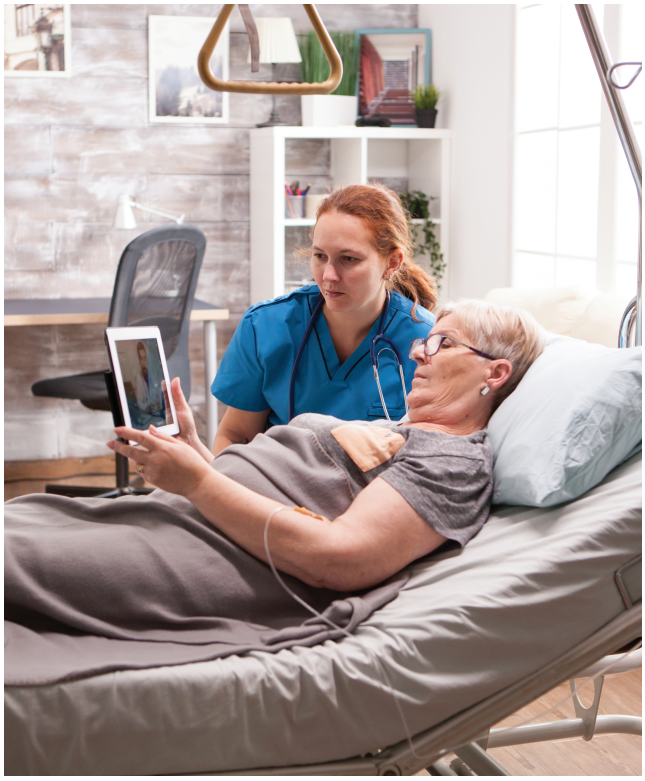
The issues mentioned above are just some of the factors shaping clinical innovation in healthcare. A complete overview of these and other relevant factors is shown in Figure 2.2.

The Solution: Embracing new models of care

To ensure an effective healthcare system in the coming decades, we must rethink and enhance how healthcare is delivered. Healthcare systems need to shift from traditional reactive models to proactive, patient-centred approaches. A key part of this transition includes adopting new technologies and alternative care models, particularly the HaH approach, which reimagines care delivery to better serve a changing population.

The pandemic has demonstrated that virtual care is not just a temporary workaround but a vital component of modern healthcare. The surge in healthcare spending and investment during the pandemic has led to significant advancements in digital innovation, AI, and connectivity. These developments have enabled a more seamless integration of virtual, home-based, and in-person care, allowing health systems to direct patients to the most suitable care settings, improving outcomes while reducing costs.

This outlook explores HaH and related models, offering insights and containing suggestions as to how to implement and further innovate on these topics.



Chapter 2

HOSPITAL AT HOME: A PARADIGM SHIFT

Introducing the Concept

The concept behind the 'hospital at home' initiative is revolutionising healthcare delivery, empowering countless patients who, in the past, routinely travelled to their doctors or hospitals for check-ups, medical prescriptions, post-acute treatment and other essential services. Now, they can conveniently access these services within the comforting boundaries of their own homes. This mirrors a progressive trend familiar to most readers of this perspective, where professionals, across various fields, seamlessly conduct meetings over Zoom, from the comfort of their homes or offices, dramatically reducing the need for physical travel to distant locations. Similarly, students worldwide are embracing virtual classrooms, attending courses and lectures online with just the use of a laptop and a Wi-Fi connection. Remarkably, 97% of Danish households enjoy ready access to the internet[1]. The 'hospital at home' framework effectively extends this digital meeting model to individuals engaged with the healthcare system, specifically benefiting elderly and chronically ill patients. Instead of the traditional method of visiting a doctor in-person to receive prescriptions, this can now be effortlessly accomplished online. If there's a need to monitor blood pressure, it can be done at home, with the data promptly transmitted to the healthcare provider. This approach has not only expanded the scope of available healthcare but, in many instances, also enhanced the quality and personal touch in the care that patients receive.



"One day, hospitals will be just emergency rooms, Operating rooms, and intensive care units. Everything else should get pushed out into the community"

Bruce Leff
Managing Director

Johns Hopkins
University School of Medicine

1. Digitaliserings Styrelsen, Tal og Statistik, 97% of Danes in the age of 15-89 years



Enabling Hospital at Home through Technology

The rapid expansion of the HaH market in the Western healthcare sector is due to technological break- throughs that have made necessary equipment more accessible and easier to use. Traditionally costly and specialised healthcare equipment now often requires less professional operation. Other techno- logical advancements also support this, as shown in Figure 3.1.

Figure 3.1: Technology enabling Hospital-at-Home

Technology	Description	Use Case
Virtual Clinic Exam Room	A web platform that allows doctors to make remote visits and apply the concept of telemedicine	Can enable providers to turn any room into a virtual health suite. HIPPA/HITECH compliant software can be used to securely monitor multiple patients remotely
AI and ML	AI and ML can help physicians identify healthcare needs and solutions faster and more accurately. They can also help doctors customise treatments to individual patients' needs	Data-driven platforms can capture patient data like heart rate, blood pressure, respiration rate and apply advanced AI and ML techniques to flag changes in at-home patient conditions
5G Network	5G support by enabling transfer of large imaging files for specialists to review and advise care, allow the use of AI and Internet of Things (IoT) technology, and remote monitoring of patients	Utilising 5G-based connectivity gateways facilitates the operation of medical devices in delivering a Medical Grade Data-as-a-Service (DaaS) platform. This offers near real-time, encrypted data transmission of vital signs
Voice Activated Devices	Enable users to communicate with patients through speech commands. The device engage patients from telehealth, digital health, to diagnostics and remotely delivered care	Mobile alert solutions that include GPS locating technology, fall-detection capabilities and two-way communication combined in an easy-to-wear pendant
Digital Therapeutics	These solutions combine evidence-based research with digital technologies to provide treatment options for ongoing medical issues that can be addressed in the home	Digital sleep improvement programmes accessible through mobile and web can support patients in management of insomnia disorder

Illustration of key trends that shapes the development of HaH Technology, prepared for ICDK Boston by Ernst and Young (EY)



Hospital at Home Throughout the Healthcare system

HaH models are particularly effective in situations where a doctor or healthcare provider does not need to be physically present. This approach offers significant advantages in preventive care, aligning closely with the core functions of a GP. HaH devices can monitor patients and transmit data to healthcare providers, allowing for timely in-person evaluations when necessary. This stands in contrast to the traditional practice of scheduling biweekly or monthly fixed check-ups, especially beneficial for vulnerable patient groups, including elderly and chronically ill patients.

Acute care, characterised by swift, decisive treatment for patients in dire need, is typically administered in the controlled environment of a hospital. This realm of medicine caters to those with severe or urgent conditions, demanding immediate and expert attention. Here, HaH models meet their limitations, as the tangible presence of medical professionals and the cutting-edge technology available in a hospital setting can be absolutely critical - if not lifesaving. Consequently, when envisioning hospital-at-home concepts, acute care does not typically align within its scope, affirming the indispensable role of traditional acute medical settings.

After an acute episode, patients transition to post-acute care, which includes monitoring and medication management. HaH models offer significant benefits by allowing patients to recover in familiar environ- ments, and avoiding the risk of hospital-borne infections. Additionally, hospitals benefit from reduced bed occupancy and staff time, as monitoring devices notify healthcare workers only when intervention is necessary. These models excel in post-acute care management.

The different implications of HaH models are illustrated in Figure 3.2.

As illustrated in Figure 3.2, Denmark and the US excel in different aspects of the HaH concept. In Denmark, various elements of HaH have been effectively integrated into the preventive function of the healthcare system, such as automatic prescription renewals and virtual consultations with general practitioners. These preventive initiatives align with incentives set by Danish stakeholders within the publicly funded healthcare framework, where reducing costs through preventive measures is a priority. In contrast, the US HaH models predominantly focus on post-acute care, reflecting the incentives of US hospitals, where reimbursement is generally linked to the delivery of treatment rather than preventive measures. In the US, responsibility for preventive healthcare often falls to large health insurance companies rather than hospitals. These differences highlight important lessons that Denmark and the US can learn from each other in the context of their different approaches to the HaH concept.

Hospital at home has the highest potential in preventive & post-acute care

A preventive health effort, like consulting a general practitioner, is very cost-effective under the HaH model. However, the more serious the medical consultation, the less effective the HaH model becomes.

The HaH model is least effective for acute cases, depending on the severity of the medical condition.

For post-acute care and chronic patients, the HaH model is extremely effective, not only as a cost-saving measure but also because it allows patients to remain in familiar surroundings, reducing the risk of transmission of dangerous viruses and bacteria.

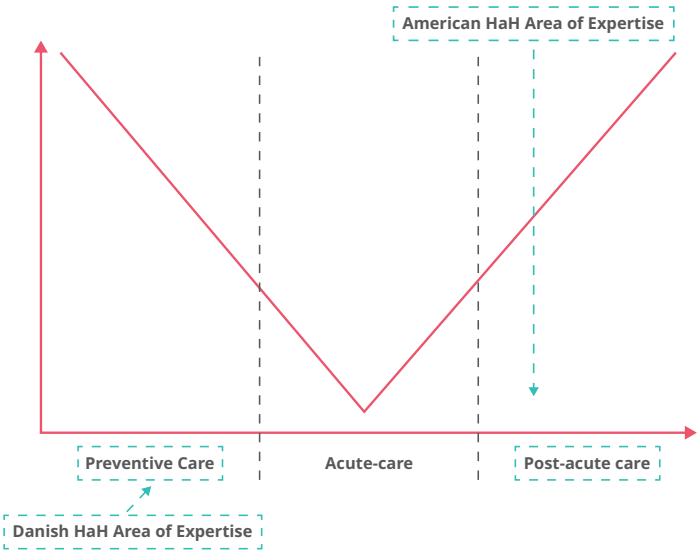


Figure 3.2: The viability of the Hospital-at-Home Model
Graph illustrates differences between the Danish and American HaH market (Prepared by ICDK Boston)



Chapter 3

IMPLEMENTING HOSPITAL-AT-HOME MODELS

Why should we implement Hospital-at-Home models?

Mass General Brigham Hospital, recognised as one of the leading healthcare institutions in the US, conducted a semi-randomised trial involving patients with acute health needs. The cohort receiving care in their homes demonstrated significant cost savings for the institution. Compared to those admitted to conventional hospital settings, patients utilising hospital-at-home services incurred 38% lower costs overall for the hospital[1]. Analysis of post-episode health outcomes found that patients in the HaH group did not experience any decline in health outcomes compared to their in-hospital counterparts. These findings suggest that HaH care can effectively reduce costs while maintaining or potentially enhancing health outcomes.

HaH models, which are particularly beneficial for Denmark's ageing population, provide advantages that go beyond traditional acute inpatient care. A study from New York City of 500 Medicare patients aged 65 and older found that patients in HaH programmes had significantly lower 30-day post-acute costs, saving an average of 5,000 USD, or more than 30,000 DKK.[2]



1."Hospital-Level Care at Home for Acutely Ill Adults", ACP Journals, December 2019.

2. Saenger, P, Ornstein, K, Garrido, M, et al., "Cost of Home Hospitalization vs. Inpatient Hospitalization Inclusive of a 30-Day Post-Acute Period," Journal of the American Geriatrics Society, 25 February 2022.



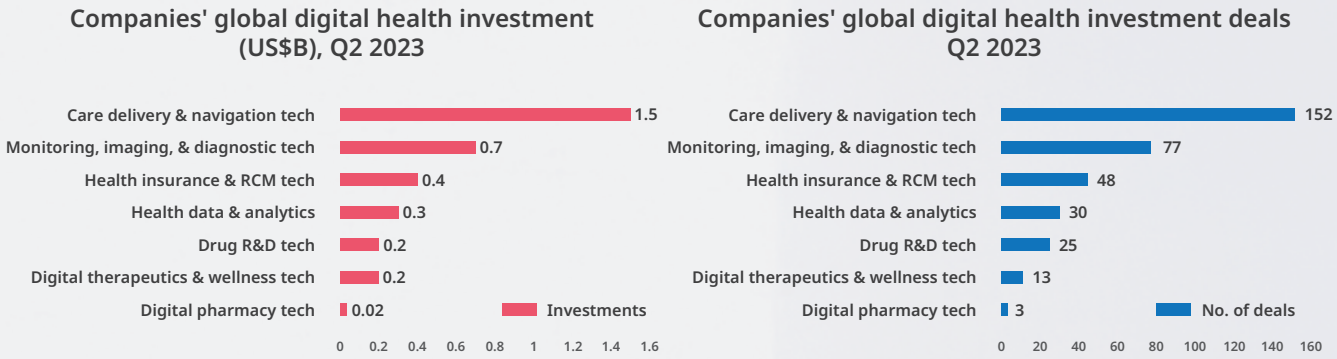
The power of cost saving

The ability of hospitals to maintain high treatment standards while reducing post-acute care costs has driven significant investment in digital health solutions. This trend is illustrated in Figure 4.1, which shows that healthcare sector investments in 2023 have been strongly concentrated in areas like care delivery and diagnostic technology. Digital health solutions are critical to hospital-at-home models, as they enable remote monitoring, diagnostics, and virtual consultations, allowing healthcare providers to deliver quality care directly to patients in their homes.

These investments are likely to continue as the market for HaH services increases worldwide.

It's not only in the US that HaH markets are expanding rapidly. Reports indicate that the HaM market is expected to grow by double digits in the Latin America (LATAM) and the Asia-Pacific (APAC) regions, while western HaH markets are expected to see annual growth of 7.5%. This trend is illustrated in figure 4.2

Figure 4.1: US Investments into Digital Health



Source: "State of Digital Health Q2'23 Report", CB Insights report, July 2023.
10. "Q3 2023 digital health funding: Smaller but mighty", Rock Health report, October 2023

Figure 4.2: Global HaH Market Projections



Source: U.S. Home Healthcare Market Size, Share and Trends Analysis Re- port, 2023 – 2030" Grand View Research report, "Europe Home Care Market Size, Share and Trends Analysis Report, 2020 – 2027" Grand View Research report, "APAC Home Healthcare Market Research Report", Market Data Fore- cast, March 2023, "Latin America Home Healthcare Market Research Report" Market Data Forecast, March 2023

Healthcare stakeholders worldwide are recognising the growing market for HaH solutions, as illustrated in Figures 4.1 and 4.2. This trend is anticipated to drive investments and technological advancements in the HaH market in the coming years. The appeal of HaH lies in its potential to reduce post-acute care and public healthcare costs by up to 30%, all while maintaining high standards and quality of patient care.

Challenges and Solutions

HaH models are appealing not only for their cost-saving potential but also for their ability to address several pressing challenges within the hospital sector. As outlined earlier in this outlook, healthcare systems worldwide face significant issues, including workforce shortages, financial pressures, an ageing population, and a rise in chronic illness—some of which are illustrated in Figure 2.2. By strategically implementing HaH models, healthcare providers can help address these challenges, creating a more sustainable and adaptable healthcare system.

Healthcare for the rural population

Denmark faces significant challenges related to clinical workforce shortages, particularly the need for more healthcare personnel, including nurses and medical specialists, and the need for specialised medical expertise in rural areas, where health inequalities have been increasing for several years[3]. One of Denmark's primary healthcare challenges is attracting professionals, especially doctors, to more rural regions, where healthcare needs are often higher due to the demographic composition, which includes a greater proportion of elderly residents and lower income levels. These factors contribute to a population that is more vulnerable to illness and chronic conditions, which further increases the demand for healthcare services. However, it is challenging to incentivise trained medical professionals to relocate to these remote areas. This issue was a major driver behind Denmark's recent healthcare sector reform, which integrated the capital region with nearby rural areas to improve healthcare accessibility and distribution of resources 4.



Incentives to reduce Hospital stays

Another significant challenge facing Denmark's healthcare system is the high number of hospital admissions, many of which do not require acute care. This puts considerable strain on hospital resources, contributes to overcrowding, and reduces overall efficiency in patient care. HaH initiatives offer a promising solution by enabling precise diagnosis and evaluation to determine if hospitalisation is truly necessary. These models aim to reduce unnecessary admissions while maintaining high standards of care. Paramedics, already skilled healthcare professionals, can leverage HaH technologies to transmit diagnostic data to hospitals, allowing physicians to assess whether a patient requires acute hospital care or can be treated at home.

This approach not only reduces hospital admissions but also makes effective use of the existing workforce by enabling the upskilling of paramedics. Since only minimal training is required to operate HaH devices, implementation costs are kept low while fully utilising the expertise of skilled professionals.

Frequent Flyer Patients

Another common issue, not only in the Danish healthcare system, is the frequent hospitalisation of certain patient groups for various health reasons, observed in both traditional and psychiatric sectors. These patients, often referred to as frequent-flyer patients, are among the most costly for the healthcare system due to their repeated hospital admissions. HaH offers a viable solution by providing care that bridges the gap between hospitalization and no care. For example, psychiatric patients may benefit from regular visits by healthcare workers, while cancer patients can monitor their health metrics at home. While acute care will still be necessary at times, such models can significantly reduce hospital visits and enable continuous health monitoring, automatically alerting healthcare workers if hospitalisation is needed.

Why Healthcare Leaders should embrace HaH Models

In summary, HaH models present opportunities to address several challenges in healthcare. These include reducing costs, improving access to care, minimising inequalities, and avoiding unnecessary hospitalisations for patients who can be treated at home. The specific priorities for healthcare providers may differ based on factors such as geography, patient demographics, available resources, and workforce conditions. The flexibility of HaH models enables their adaptation to different contexts, from preventive care to post-acute care, offering solutions that can be tailored to meet diverse healthcare needs.

Getting a HaH Program off the ground

Despite the many benefits and potential of HaH models, a common question arises: if these models are effective, why hasn't their implementation progressed further? The answer often lies in the challenges associated with execution.

While the advantages are clear, HaH programmes are inherently complex, as there is no one-size-fits-all recipe for success. The approach can vary significantly depending on the healthcare system, the region, and the specific needs of the population. Different organisations may face unique challenges, such as workforce capacity, regulatory constraints, or patient demographics, which influence how the programme is structured and launched. However, despite these variations, there are several key factors to consider that are universally critical to the success of HaH programmes. These include, but are not limited to:

Investing for the long-term outcome

Effective implementation of HaH models requires both financial commitment and long-term investment. This includes ongoing training for personnel, as well as investing in remote monitoring devices that can be deployed to patients' homes. It's essential to have the resources to support these investments, ensuring sustainability and growth.

Assessing the current situation and needs

Assess the organisation's current healthcare delivery challenges. This involves understanding existing gaps in care and identifying whether a preventive or acute HaH model will best address those needs. Tailoring the model to fit the unique needs of the sector or region is crucial for success.

Positioning HaH as a strategic priority

To successfully implement HaH models, HaH should be considered as a strategic priority within an organisation, aligning with broader goals, such as improving patient outcomes, increasing efficiency, or addressing workforce shortages.

Navigating Regulation and Legislation

Regulatory and legislative considerations are critical to implementing HaH. Healthcare is a highly regulated field, and laws can vary widely across sectors and regions. Ensuring that HaH models comply with all necessary regulations and are eligible for reimbursement is essential to avoid costly legal or operational setbacks.

Supporting with Research and Evidence

Research is key to gaining buy-in for **HaH** models. To overcome scepticism, provide robust evidence that HaH is just as effective—or more effective—than traditional hospitalisation. This could include research on patient outcomes, cost-effectiveness, and patient satisfaction to demonstrate the model's value.

In addition to these overarching factors, successful implementation relies on **engaging senior leadership** to secure buy-in and initiate a collaborative conversation. It is essential to address key facility needs such as capacity, nursing shortages, and patient satisfaction. **Communicating with key stakeholders** throughout the process ensures that hospitalists, emergency department staff, primary care physicians, and other referrers understand the programme's goals and patient selection criteria. Finally, **managing the supply chain** is crucial to ensure seamless logistics, such as medication delivery and lab processing, and leveraging local community resources that can support the programme[5].

These factors summarise the essential considerations for implementing HaH models. The following section will provide concrete examples of how HaH models have been implemented in healthcare systems in the US and Denmark.



Chapter 4

CASE STUDIES: IMPLEMENTING HOSPITAL AT HOME IN THE US AND DENMARK

Mass General Brighams's vision for the future of acute care

Mass General Brigham (MGB), a hospital formed by merging Massachusetts General Hospital and Brigham and Women's Hospital, has continued to innovate HaH care by combining and expanding on the existing HaH programmes of both hospitals. Each institution had already developed its own approach to HaH prior to the merger, focusing on acute care for patients who could safely receive hospital-level treatment at home.

With a strategic goal to transition up to 1 in 10 of their patients to HaH care, MGB is at the forefront of redefining how acute care is delivered. Their focus is on providing high-quality care at home, particularly for patients who traditionally would have been admitted to a hospital ward, while more critical care such as ICU services remain hospital-based. The vision is to shift much of the traditional inpatient care into patients' homes, reducing hospital congestion and enhancing patient satisfaction.

The intensive care unit (ICU), defined as potentially life threatening procedures or complications, requirering immediate care and observation. This is the patient who, as an example, has had a traumatic injury following a car crash.

Hospital Ward Care, defined as a place where doctors and nurses provide less critical but essential care to patients admitted.



> *"I see a future where hospitals serve a handful of functions. They'll have emergency departments for rapid assessments, observation periods for brief monitoring, ICUs for critical care, and operating suites. Eventually, much of the floor-based medicine we're used to providing in traditional hospitals will shift into patients' homes."*
>
> **Stephen Dorner, MD, MPH**
> Chief Clinical Officer, Mass General Brigham Healthcare at Home

In the MGB HaH model, patients receive the following services:

Regular visits from a nurse or paramedic

A doctor, nurse practitioner, or a physician assistant sees patients at least once a day, either by video or in person. Physical, occupational, and speech-language therapists are available, as needed.

Diagnostic testing at home and when needed

Portable x-rays, ultrasounds, and blood tests are provided as necessary.

Access to hospital-grade therapeutics

This includes oral and intravenous medications, oxygen therapy, and even food delivery, alongside social work services.

Continuous monitoring of vital signs

Patients are equipped with remote monitoring devices that track vital signs such as temperature, blood pressure, and heart rate—and send this data to the clinical team.

24-hour access to members of a care team

Patients have round-the-clock access to care team members via a tablet, ensuring immediate assistance from paramedics or other clinicians when urgent needs arise. “Current Health”, Best Buy´s Healthcare at home platform, connects patients to nurses, paramedics, advanced practitioners, and paramedics. Emergency response device, can detect falls and enable patients to call for help.

The results of this expanded HaH programme at MGB has shown positive patient outcomes, including reduced infection risks and high patient satisfaction. The model offers patients more independence and increased quality time with family, further demonstrating the potential of HaH to reshape the healthcare landscape.

MGB has successfully applied this model to patients with a range of acute conditions, including:

- Respiratory (lungs)
- Cardiac (heart)
- Endocrine
- Infections
- Gastrointestinal
- Bladder and kidneys
- Liver



Mayo Clinic: Three Years of HaH Success

The Mayo Clinic, a prominent healthcare provider with locations in Minnesota, Arizona, and Florida, has steadily expanded its Hospital-at-Home (HaH) programme over the past three years. Like the programme at Mass General Brigham, Mayo Clinic's HaH model integrates both virtual and in-person care to deliver hospital-level treatment to patients in their homes. Through this programme, patients receive a comprehensive range of services designed to mirror the care they would receive in a traditional hospital setting, tailored to meet their specific needs: 2
All of this is conducted conveniently in the patient's home, further enhancing accessibility and comfort. The following items are offered to Mayo-Clinic's patients:

- A computer tablet for virtual consultations with healthcare providers.
- A direct phone line connecting patients to their dedicated care team.
- A personal emergency response tablet for immediate assistance.
- Vital sign monitoring devices

In addition, specialised equipment like lab tests, ultrasounds and X-rays can be done from the patient's home are conducted conveniently in the patient's home.

Mayo Clinic employs a well-coordinated HaH model where paramedics initiate care by setting up medical equipment and conducting essential preliminary tests in the patient's home. The programme has been a success, with over 2,000 patients receiving post-acute care. From the outset, Mayo Clinic recognised that scalability and timely execution are critical to the success of HaH, focusing on integrating the programme into its broader healthcare delivery system rather than treating it as an isolated initiative.[3]

At its current scale, Mayo Clinic's HaH programme has demonstrated cost-effectiveness and improved patient outcomes compared to traditional hospital stays. The service is offered within a defined radius of the hospital's central command centre and dispatch station, ensuring that in-person visits can be conducted efficiently. This logistical design minimises travel time and maximises the quality of care. However, scaling a HaH programme is not without challenges.

High start-up costs, including investments in equipment and staffing, can make early implementation expensive. These costs are particularly acute when patient volume is low, as they amplify the logistical and operational complexities of delivering care. To address this, Mayo Clinic has invested heavily in remote care technology, such as monitoring devices and centralised systems to manage data from patients' homes, alongside comprehensive training programmes for paramedics, nurses, and physicians.

The key lesson from Mayo Clinic's experience is that achieving cost savings and program sustainability hinges on scaling effectively. By reaching a critical mass of patients, the programme can distribute costs more efficiently, making HaH a viable and transformative alternative to traditional hospital care.

Virtual Healthcare Trends in Denmark

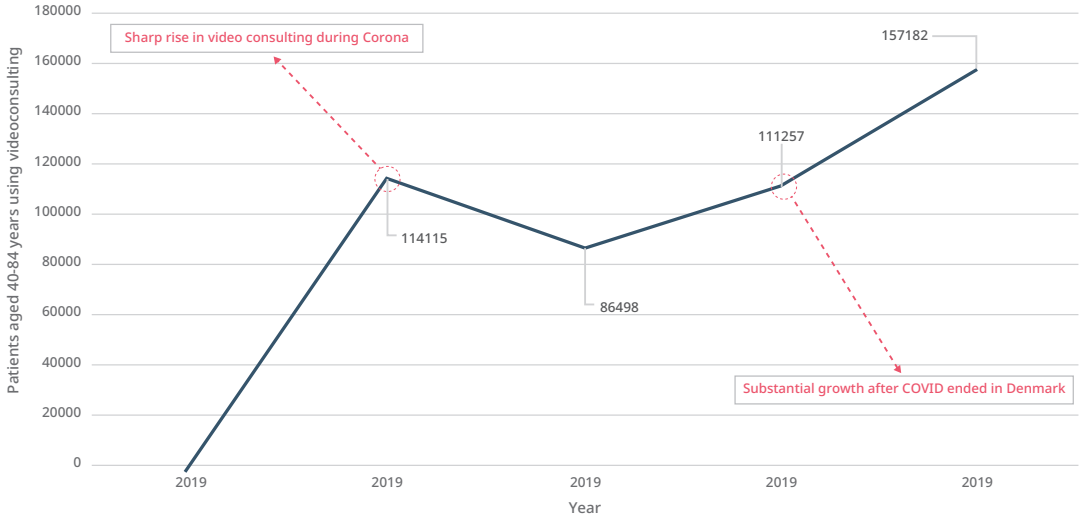
In Denmark, healthcare providers across regions have embraced HaH models to varying degrees, partic- ularly in preventive care. One notable trend has been the significant rise in video consultations with General Practitioners (GPs) over recent years. Figure 5.1 illustrates the annual growth in the number of patients utilising video consultations with their GPs.

In 2020, video consultations were still a relatively novel concept in Danish healthcare. However, the COVID-19 pandemic served as a catalyst, rapidly integrating this practice into the standard repertoire of GPs. While a slight decline occurred after the pandemic's peak in 2021, the use of video consultations has since rebounded and continues to grow. This expansion is driven by the cost-effectiveness of virtual consultations and a growing public acceptance of the practice. For instance, 40% of elderly Danes aged 60–80 express a willingness to engage in video consultations with their GPs[4].

Denmark's robust technological infrastructure significantly supports this transition. The country's centralised health data system ensures seamless access to medical records for GPs across regions and cities, enabling efficient virtual healthcare delivery. With these foundational elements in place, video consulta- tions are poised to become an integral and expanding component of Denmark's healthcare landscape.



Figure 5.1: Growth of virtual healthcare



Y-axis: Patients aged 40-84 year who used video consultancy with a General practitioner (GP) in each recurrent year, **Source: E-Sundhed Database, calculations done internally at ICDK Boston**

Learnings from the HaH Market

The global expansion of the Hospital-at-Home (HaH) market signifies a significant change in healthcare delivery. It involves a shift from conventional hospital-centred models to home-based care. This transition addresses core challenges in the healthcare sector and is more than just a cost-reduction strategy. By incorporating advanced technologies and methods, HaH facilitates advancements that were previously difficult to achieve in traditional healthcare environments.

As exemplified in this outlook, HaH models accommodate acute and post-acute care as well as chronic disease management within the comfort of patients' homes, offering an alternative to conventional inpatient care. Research highlights its advantages: lower costs, increased patient satisfaction, and improved clinical outcomes, particularly for individuals with complex health conditions. For instance, studies reveal that the total cost of an acute episode, including a 30-day post-treatment period, is significantly lower in HaH programmes compared to hospital stays.

Beyond financial and clinical benefits, HaH models address critical systemic challenges. As healthcare systems face workforce shortages and rising burnout rates among clinical staff, HaH offers a strategic solution. By decreasing the demand for hospital beds and enabling more flexible care delivery, these models alleviate pressure on healthcare facilities and providers. Patients also gain significant psychological and emotional benefits. Receiving care in familiar home environments reduces stress and anxiety, promoting better mental health and recovery outcomes. Likewise, healthcare workers operating in less pressured settings often experience greater job satisfaction and improved mental well-being.

While the full potential of HaH models is yet to be realised, their dual promise of high-quality care and cost efficiency signals a transformative direction for the future of healthcare. With patient satisfaction and health outcomes uncompromised, HaH is poised to redefine how we think about care delivery in the years to come.

> *"We save money, we save time, and we save unnecessary congestion of the emergency departments (ED) in urban centres.*
>
> **Dr Jonathan Choy**
> Senior Medical Director of Virtual Care
> Access and Navigation for Alberta Health Services





Written and edited by

Main Authors:
Natasia Lundqvist, Commercial Advisor, Health & Life Scicences,
Innovation Centre Denmark Boston
Oskar Boysen Strandsby, Innovation Associate,
Innovation Centre Denmark Boston

Co-Author:
Casper Grove Pedersen, Senior Innovation Advisor, Health & Life Sciences,
Innovation Centre Denmark Boston

ISBN: 978-87-94128-87-2
Innovation Centre Denmark Boston
50 Milk St, 16th Floor
Boston, MA 02109, USA
Date: November 2024

All rights reserved. No part of this project may be reproduced in any form by any electronic or mechanical means (including photocopying, recording, or information storage and retrieval) without permission in writing from the publisher.