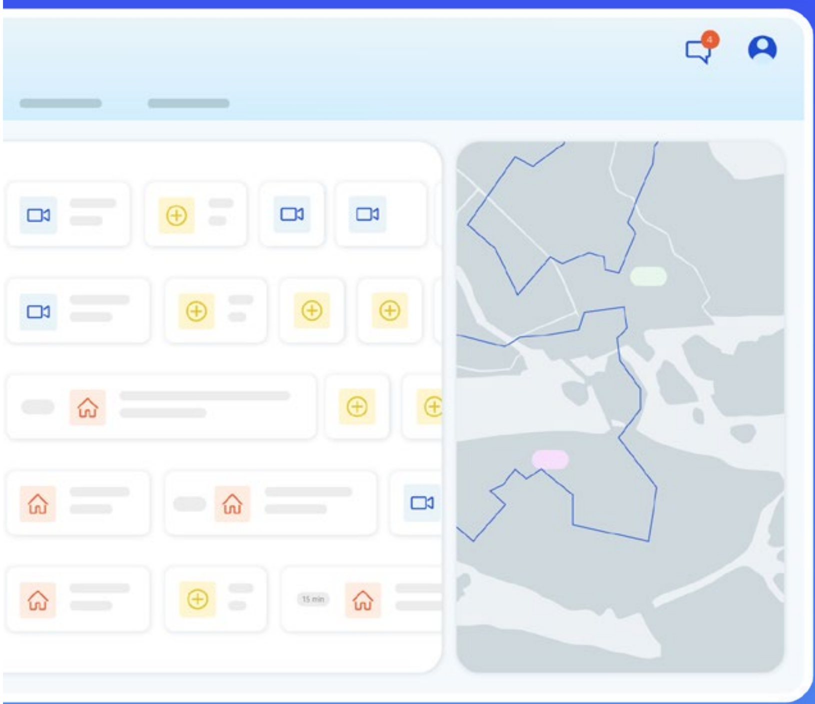
WHITE PAPER

TECHNOLOGY-ENABLED HOSPITAL AT HOME

Scaling Distributed Care Delivery



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EXECUTIVE SUMMARY

Hospital at Home (HaH) is gaining traction as a high-value model for delivering acute care in the patient's home — with demonstrated potential to improve outcomes, reduce hospital congestion, and lower system costs. Yet while the clinical concept is maturing, most HaH programs remain digitally underpowered — constrained by fragmented systems, manual workflows, and limited interoperability, all of which restrict their ability to scale safely and efficiently.

This white paper introduces the emerging concept of a care orchestration platform — a proposed digital framework designed to support the complex coordination needs of distributed care models like HaH. Rather than relying on siloed tools, such a platform aims to unify the oversight and management of people, tasks, and data. Drawing on operational insights from leading HaH programs, the paper outlines core functionalities including intelligent patient identification, smart logistics and real-time visibility, capacity forecasting as well as integration of disparate systems such as EHRs, remote monitoring technologies, and tools for communication. When effectively implemented, a care orchestration platform can serve as the digital backbone of safe, scalable, and responsive home-based acute care.

Building on peer-reviewed research, the paper also explores solutions for complex and resource-intensive challenges such as patient identification, task management, and route optimization. It examines a spectrum of approaches — from rule-based systems like best practice advisories, to AI-driven tools such as machine learning algorithms and multi-agent systems. These approaches serve different user groups and levels of automation, and highlight how technology can augment, rather than replace, human decision-making. The paper also emphasizes the strategic importance of interoperability and user-centered design as foundational pillars for digital maturity.

In conclusion, HaH is advancing from small-scale innovation to a replicable and resilient model for acute care at home. But its success will depend on care being orchestrated through purpose-built, interoperable, and intuitive digital solutions — capable of unifying people, processes, and data in real time.

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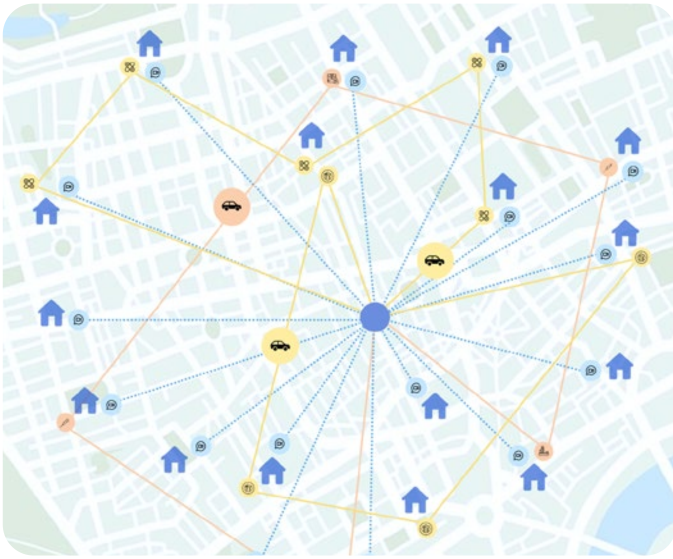
Introduction

SETTING THE STAGE

Why HaH Needs More Than Clinical Innovation

Hospital at Home (HaH) — sometimes referred to as distributed or decentralized acute care, advanced care at home, or home hospital programs — is transforming how acute inpatient care is delivered. By substituting brick-and-mortar hospitalizations with technology-enabled treatment in the patient's home, HaH has been shown to improve patient satisfaction, reduce hospital crowding, and lower costs while maintaining or improving clinical outcomes (1-4). As the number of HaH initiatives continues to grow worldwide, it has become clear that safely and sustainably scaling these programs requires adopting a hybrid care model — one that combines in-person home visits with remote care — and, crucially, a digital infrastructure capable of supporting and integrating both modes of delivery.

While HaH relies on both physical infrastructure — such as medical equipment, connectivity, and in-home monitoring devices — and digital tools, this white paper focuses specifically on the software layer. At the core of this layer is the emerging concept of a care orchestration platform: systems that enable real-time coordination, workflow automation, and intelligent decision-making across a distributed care network.



This paper outlines the key digital capabilities required to deliver safe, scalable, and responsive HaH services. Drawing on peer-reviewed research and real-world insights from leading programs, it explores how an orchestration platform can streamline triage, optimize logistics, integrate data, and enhance clinical oversight. While these functionalities may ultimately converge into a unified platform, the focus here is on what the technology must enable. Despite this potential, most current HaH programs operate well below this digital ideal.

CURRENT CHALLENGES

Fragmentation, Retrofitting, and Digital Gaps

Many HaH programs remain technically underpowered, relying heavily on in-person visits and manual, analog workflows — a combination that severely limits their potential to scale effectively (5, 6) Even those that have begun to digitalize often rely on fragmented tools and repurposed inpatient systems ill-suited for acute, decentralized care (6).

Hospital IT infrastructures were rarely designed with mobile, distributed workflows in mind. As a result, HaH teams often juggle multiple disconnected platforms — one for monitoring, one for telemedicine, one for scheduling, and another for task management. This fragmentation leads to a poor user experience, time-consuming workarounds, and inconsistent documentation — all of which undermine the efficiency, reliability, and safety of care delivery. Such disjointed workflows also contribute to a poor working environment, as highlighted in the qualitative study by Isakov et al, where several interviewees expressed a desire for more integrated systems that could support information sharing and coordination within the care team (6).

A central issue behind this fragmentation is limited interoperability. Many existing care technologies — including electronic health records (EHRs), task management tools and RPM platforms — were not built with open integration in mind. As a result, data must often be manually transferred or accessed through indirect workarounds. For a care orchestration platform to deliver its full value, it must be highly interoperable: able to seamlessly ingest and act on data from a wide array of clinical systems, devices, and documentation tools. This requires not only architectural flexibility on the orchestration side, but also that EHR and RPM vendors support open, well-documented APIs. Without this bidirectional openness, organizations risk vendor lock-in, reduced automation, and missed opportunities to deliver timely, informed care.

Another overlooked challenge is interface usability. Even the most capable systems will fail if clinicians, patients, or caregivers find them confusing or burdensome to use. Platforms must adapt to users' needs and abilities — not the other way around. If interfaces are unintuitive, they simply won't be used, and care coordination will break down. User-centered design is therefore not optional — it's mission-critical.

EMERGING POTENTIAL

Adaptive Orchestration and the Role of AI

As HaH programs expand in scale and complexity, so do the demands placed on the systems that coordinate them. Meeting these demands requires more than manual oversight and siloed workflows — it calls for adaptive orchestration: intelligent systems capable of processing real-time data, responding to changing conditions, and supporting informed decision-making across distributed care environments. Recent advances in Artificial Intelligence (AI) make this increasingly possible.

Different branches of AI offer complementary capabilities within a care orchestration platform. Machine learning (ML) algorithms can be applied in predictive models for patient identification, risk stratification, and capacity forecasting — enabling smarter, faster decisions about who receives care and when. Large language models (LLMs), when securely integrated with EHRs, can extract and summarize unstructured clinical information, supporting more efficient documentation, communication, and insight generation.

Multi-agent systems (MAS) present a promising architectural model for managing the complexity of distributed care. In such framework, autonomous software agents, each responsible for specific functions, could operate in parallel while coordinating toward shared goals. For HaH, MAS could support dynamic task allocation, adaptive logistics, and continuous prioritization of high-acuity patients. By simulating the behavior of coordinated teams, MAS offers a vision for how future orchestration platforms might enable flexible, self-organizing, and robust care delivery at scale.

These technologies collectively support more responsive, scalable, and resource-aware care. Yet their application introduces significant challenges. Today's LLMs, for example, can still generate incorrect or misleading outputs — a problem known as "hallucination." Machine learning models may inadvertently amplify biases present in historical data, and poorly designed systems may encourage over-reliance on automated recommendations. In the context of HaH — where decisions can affect patient safety in high-stakes, fast-moving environments — such risks must be taken seriously.

To mitigate these concerns, AI in HaH should be deployed through a model of augmented intelligence, where technology enhances — but never replaces — human clinical and operational judgment. Systems must be transparent and auditable, with explainable outputs that users can interrogate and trust. Successful implementation also requires strong governance, continuous performance monitoring, and feedback mechanisms that allow the system to learn and adapt in real-world settings.

As AI technologies mature, their role in distributed care orchestration is expected to grow — from supporting predictions and summarizations to autonomously optimizing resource allocation and coordinating care delivery. The potential is clear: a more resilient, adaptive, and scalable care model. But realizing this vision demands thoughtful design, robust safeguards, and an unwavering focus on user trust, ethical governance, and patient safety.

THE DIGITAL FOUNDATION

Four Domains for Scalable HaH Delivery

Recent research identifies four essential domains for digital transformation in HaH care (6):

HEALTH INFORMATION EXCHANGE

Seamless sharing of patient data across systems and services, including referrals, clinical documentation, and cross-provider communication.

HAH CARE MANAGEMENT

Oversight and coordination of care delivery from a leadership and organizational perspective. This includes AI-supported clinical decision tools, digital workforce planning, performance tracking, and systems for collecting and acting on patient feedback. It addresses the who, when, and why of care delivery.

HAH CARE DELIVERY

Real-time coordination of mobile operations such as routing, visit scheduling, location tracking, and safe access to the home environment. This domain focuses on the how and where — ensuring physical care tasks are executed efficiently and safely using digital tools like smart locks, drones, and connected infusion pumps.

DIGITAL HEALTH INTERVENTIONS

Use of telemedicine, remote patient monitoring (RPM), patient-reported outcomes, and digital communication to substitute or supplement in-person care.

Each of these domains must be supported by cohesive, interoperable technology to ensure that HaH care is not only clinically safe, but also operationally scalable and economically viable. Translating these domains into practice requires smart, purpose-built functionalities for patient identification, communication, logistics, real-time visibility, capacity forecasting, and remote monitoring.

02

The Orchestration Platform

Building on the digital foundations outlined in the previous chapter, the next step is to define the core functions that make scalable, high-performing HaH care possible. This chapter explores the essential capabilities a care orchestration platform must support — including intelligent patient identification, integrated communication, smart logistics and real-time visibility, adaptive capacity forecasting, and remote patient monitoring.

PATIENT IDENTIFICATION

From Manual Screening to Intelligent Triage

Traditionally, HaH enrollment relies on manual screening — clinicians reviewing hospital admissions or ED patients to identify candidates. This is a cumbersome and resource consuming task and known pain point for all HaH programs, hence this approach is not scalable. In response, tools based on algorithmic triage and suitability scoring based on clinical and social factors have been developed and successfully demonstrated to increase referral rates and consistency while reducing missed opportunities.

This is elegantly demonstrated in a real-world setting at Mayo Clinic's Advanced Home Care program through a two-phased approach. First, best practice advisories embedded in the EHR notify inpatient providers when a patient may be suitable for HaH, based on predefined criteria such as diagnosis, location, and age (7). This push mechanism is designed to surface candidates early and prompt a provider-initiated consult. Second, ML-based eligibility scores serves as a pull mechanism for the HaH team — automatically screening incoming patients and ranking them by predicted suitability (8). This model incorporates a broader set of variables, including comorbidities, readmission risk, and social determinants of health. Rather than alerting clinicians directly, it supports the HaH team by streamlining patient review and enhancing triage consistency — substantially reducing manual screening burden and missed opportunities.

Together, these tools illustrate the value of layered decision support — with complementary designs tailored to different user groups — in improving referral quality and frequency, reducing variability, and enabling the sustainable scaling of HaH services.

COMMUNICATION

From Fragmented Channels to Integrated Tools

Effective communication is a foundational element of safe, scalable HaH operations — yet in many programs, it remains fragmented and analog. Phone calls are often the primary means of contact within the HaH unit: between the command center and field staff, between referring units and the coordination hub, and between healthcare professionals and patients. While such methods may suffice on a small scale, they introduce significant operational risk and data loss as programs grow.

Relying on phone-based communication limits traceability and scalability. It creates bottlenecks at the command center, where time-sensitive calls — including those related to patient enrollment or clinical deterioration — may be delayed due to line congestion. In worst-case scenarios, this can lead to missed admissions or compromised patient safety. Moreover, critical information exchanged by phone is rarely documented systematically, resulting in the loss of valuable contextual data that could inform business intelligence tools, quality monitoring, or self-learning AI models embedded in the care orchestration platform.

A structured, platform-based chat function offers several advantages. Unlike voice calls, chat supports asynchronous communication with multiple users, lowers the threshold for contacting the command center at all hours, and enables clear documentation of all interactions. Message status indicators (e.g., delivered, read, unread) improve transparency and accountability, while automatic logging eliminates ambiguity around what was said, by whom, and when. Integrated messaging not only improves efficiency — it also strengthens safety and supports system-wide learning by ensuring that communication becomes structured data.

In parallel, video communication plays an increasingly central role in HaH delivery. Video calls can enable virtual patient visits, minimizing the need for physical travel and supporting more flexible care models. They allow remote rounds with patients and caregivers, connect field staff with command center clinicians, and make it easier to include specialists or consulting physicians located elsewhere. For mobile staff, video serves as a critical bridge to on-call expertise — reducing perceived distance and enabling just-in-time support during home visits. When integrated into the orchestration platform, video consultations become an extension of the clinical workflow — enhancing collaboration while contributing to a comprehensive, documented view of patient care.

Together, integrated chat and video tools are not merely conveniences — they are essential enablers of safe, efficient, and learning-oriented HaH care. Their inclusion within a unified orchestration platform ensures that communication is not lost, delayed, or siloed — but instead captured, shared, and used to continuously improve both operations and outcomes.

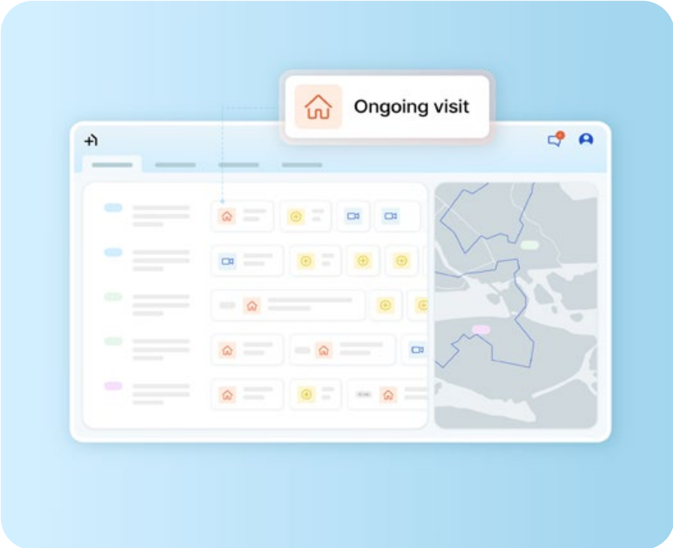
SMART LOGISTICS

Task Allocation, Routing, and Real-Time Visibility

HaH delivery is not only clinical — it is logistical. It involves the continuous coordination of people, places, and resources: knowing who needs to be where, when, and with what — from clinical equipment to essential patient information. Just as crucial is keeping all stakeholders — patients, caregivers, mobile clinicians, supply chain personnel, and command center staff — updated in real time. This includes task status, availability, location tracking, and communication indicators. Scaling HaH requires moving from manual coordination to digital orchestration. Platforms that provide smart logistics, such as automatic task allocation, route optimization, and live operational oversight can streamline daily operations, reduce travel, balance workloads, and improve responsiveness. Centralized dashboards, in turn, give a system-wide view of team activities and care demands, enabling safer and more efficient management of distributed services.

Smart logistics offers several clear advantages — the most immediate being operational efficiency. Intelligent systems allow care teams to focus more on patient needs rather than logistics. A recent systematic review highlights growing interest in these approaches, particularly through simulation studies (9). These studies demonstrate that route optimization can improve timeliness and planning accuracy while maintaining equitable distribution of visits, even under complex and fluctuating conditions. Although real-world evaluations are still limited, the results point to strong potential for smart logistics to drive more resource-aware and scalable HaH models.

Beyond efficiency, smart logistics also contribute significantly to safety and resilience. In HaH, where care is delivered across diverse and dispersed



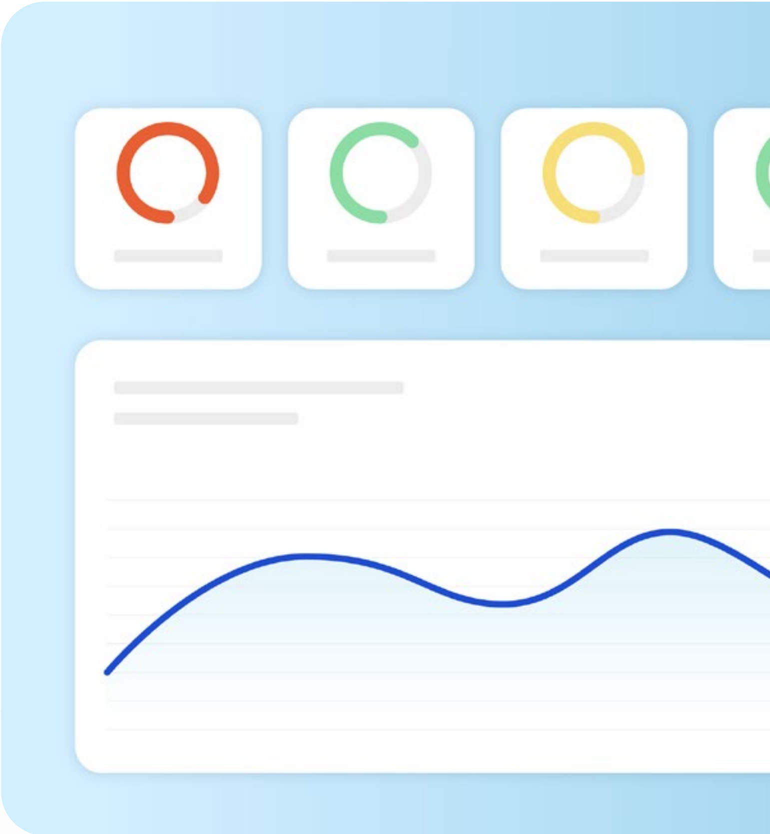
environments, maintaining continuity during disruptions is critical. This was illustrated during the Paris 2024 Olympics, when Greater Paris University Hospitals — one of Europe's largest hospital systems — successfully maintained home-based cancer care for over 500 patients despite extensive disruptions to urban mobility (10). This was possible thanks to proactive planning and robust logistical coordination. However, not all disruptions are predictable. In emergencies such as natural disasters, traditional planning falls short. Smart logistics systems must therefore be capable of responding instantly — generating alternative routes, reallocating resources, and dynamically adjusting schedules in real time. This capacity for rapid reconfiguration under pressure is essential not only for preserving patient safety, but also for building the operational resilience required to sustain HaH at scale.

CAPACITY FORECASTING

From Bed Counts to Complexity-Driven Planning

In traditional hospitals, capacity is measured in beds. But in distributed care models like HaH, capacity is shaped by the complexity and resource demands of each individual patient. A high-acuity patient or one with limited support at home may require significantly more clinical time, visits, and logistical coordination than others. This means that overall capacity is defined not by a fixed bed count, but by the combined intensity of the existing patient case mix.

To manage this complexity, HaH programs need dynamic capacity forecasting tools that analyze patient characteristics and real-time program load. AI-powered systems can estimate the expected resource consumption of each incoming candidate — based on clinical factors, geography, support needs, and workforce availability — enabling smarter intake decisions, more accurate scheduling, and fewer care disruptions.



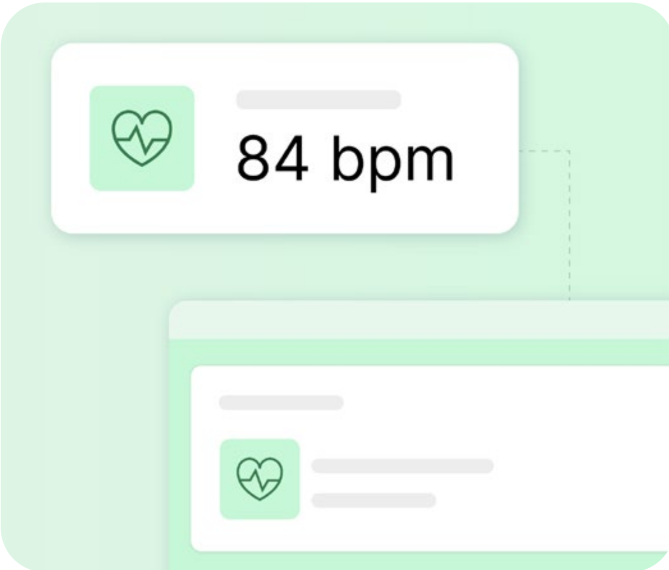
By linking defined care activities to required skill sets, such systems also enable precision scheduling — matching the right competency to the right task at the right time. This improves safety, reduces inefficiency, and ensures appropriate use of clinical skills. Over time, the data generated through this process can also guide organizational development by offering insights into what care is delivered, by whom, and how resource allocation strategies can be improved.

REMOTE PATIENT MONITORING

A Digital Safety Net for Scalable HaH

RPM enables care providers to deliver hospital-grade surveillance beyond the physical ward. It involves the capture of biometric data — such as vital signs, mobility, or cardiac rythm — through intermittent methods (e.g., patient-reported values or Bluetooth-enabled devices) or continuous monitoring (e.g., single-lead ECGs, fall detection, or over-the-air sensors). These data streams feed into clinical dashboards configured with personalized thresholds and automated escalation paths, often supported by bi-directional communication with patients and caregivers.

While the use of RPM is well established in managing stable chronic conditions, its role in high-acuity advanced home care remains an area of active exploration. A recent article proposes that RPM can enhance HaH across several key domains (11). It increases patient eligibility, by allowing moderate to high-acuity patients — who would otherwise require inpatient monitoring — to be safely managed at home. This includes conditions like COPD, pneumonia, and arrythmias who frequently require continuous respiratory and cardiac monitoring. It also drives operational efficiency by



reducing unnecessary home visits and enabling virtual supervision. Additionally, AI-powered early warning systems layered onto RPM data can predict deterioration before symptoms appear, supporting earlier intervention and safer admissions.

In conclusion, when thoughtfully integrated into a care orchestration platform and applied selectively within intelligent workflows, RPM becomes a powerful enabler of scalable, efficient, and proactive home-based care.

03

Conclusion

STRATEGIC OUTLOOK

Coordinating Care at Scale with Digital Intelligence

HaH is more than a clinical innovation — it marks a fundamental shift in how acute care is organized and delivered. Providing hospital-level treatment in the home requires rethinking traditional systems for monitoring, staffing, logistics, and digital coordination.

Scaling such programs safely and sustainably demands more than individual tools — it calls for an integrated orchestration platform that supports efficiency, responsiveness, and continuous learning across distributed environments.

The opportunity is clear: improved outcomes for patients, expanded capacity for providers, and greater resilience for healthcare systems. But success hinges on purpose-built technology — solutions that understand the nuances of HaH delivery, close the gaps of fragmentation, and enable intelligent triage, adaptive logistics, and human-centered AI.

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CHECKLIST

Ten Must-Haves for Scaling Hospital at Home

Use this checklist to evaluate the readiness of your HaH program for scalable, safe, and digitally enabled care delivery:

- **Care Orchestration Platform**
  A unified digital layer that coordinates people, tasks, and data across clinical, logistical, and operational workflows in real time.

- **Intelligent Patient Identification**
  Embedded tools — such as BPAs and ML-driven triage scores — that automatically flag and prioritize eligible patients based on clinical and contextual data.

- **Interoperability by Design**
  Seamless exchange of information across EHRs, RPM tools, communication platforms, and task systems through open APIs and vendor-neutral architecture.

- **Smart Logistics Management**
  Automated task allocation, real-time location tracking, and route optimization that adapts to geography, acuity, and resource availability.

- **Dynamic Capacity Forecasting**
  Systems that analyze current patient mix and care intensity to inform real-time decisions on admissions, staffing, and resource distribution.

- **Remote Monitoring Integration**
  Scalable RPM capabilities — with configurable alerts, continuous or intermittent data capture, and built-in escalation workflows — integrated into clinical operations.

- **Embedded Communication Tools**
  Platform-native chat and video that ensure all interactions are traceable, asynchronous where needed, and embedded within the clinical workflow.

- **User-Adaptive Interfaces**
  Interfaces that respond to the needs of different users — clinicians, caregivers, and patients — minimizing cognitive load and enabling adoption without intensive training.

- **AI-Supported, Human-Centered Decisions**
  AI systems that augment (not replace) clinical and operational judgment, with transparent outputs, built-in bias mitigation, and explainability.

- **Governance and Continuous Learning**
  Structures for oversight, data privacy, performance monitoring, and iterative improvement — ensuring trust, safety, and adaptability at scale.

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