News and Perspectives

Hospital-at-Home: New Technology Brings Acute Care to Patients' Homes

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Key Takeaways

- Hospital-at-home programs deliver acute, hospital-level care at home using remote monitoring, wearables, artificial intelligence, and telehealth platforms combined with in-person care.
- Key barriers include the need for payor policy change, data security, interoperability, and scaling reliable digital infrastructure.
- This care model improves patient satisfaction, lowers costs and readmissions, and reduces hospital-related complications.
- Despite strong outcomes, adoption is limited by reimbursement, logistics, and sometimes, hesitance for change by medical staff and patients.

What if requiring acute medical care didn't automatically mean you'd need to be admitted to the hospital?

Clinicians, emergency responders, and family members have seen it time and again: patients reluctant to make an appointment or go to the emergency department, even when symptoms become uncomfortable or dangerous, because they know that the medical care team will want to admit them to the hospital. They may be homebound and struggle to get to an appointment, or they may be unable to or uncomfortable about leaving home, pets, children, or work behind while they're in hospital.

Hospital-at-home (HaH) programs have taken off in recent years due to hospital overcrowding, advances in remote and portable medical technology, and the broader acceptance of telehealth care brought about by the COVID-19 pandemic [1]. These programs combine remote monitoring and in-person clinician visits to provide acute-level care from the comfort of the patient's home.

While there are logistical and financial hurdles, the results are largely positive: patients report improved satisfaction with care, costs and readmission rates drop, iatrogenic complications are minimized, and more beds become available at the hospital for those who need them most [2,3]. HaH programs may represent a key solution to easing our overburdened health system.

A Brief History of Care at Home

Prior to the era of modern medicine, care at home was the norm. From the late 19th to early 20th century, increased urbanization, improved technology and treatments, and the newly discovered germ theory of disease led to the centralization of medical care within hospital walls [4].

In the modern medical landscape, very little care occurs in the home. From birth to death, it has become our cultural expectation that acute medical care is conducted at the hospital, though growing evidence suggests that HaH models can achieve similar or better outcomes for appropriately selected patients compared with inpatient care [1,5]. Modern technology now allows clinicians to safely monitor complex patients outside the hospital.

Defining "Hospital-at-Home"

HaH programs differ from routine telehealth because they deliver hospital-level care for acute conditions, rather than simple outpatient management.

Typical components include [1]:

- *Remote physiologic monitoring*, such as vital signs and heart rhythm via wearable sensors.
- *Digital communication with the care team*, including telehealth visits via hospital-supplied devices.
- *Frequent in-person visits and 24/7 response*. Nurse and/or physician visits occur daily or multiple times per day. The care team is available 24/7, and systems are in place to escalate care when necessary.
- *Multidisciplinary care*. Physicians, nurses, pharmacists, therapists, social workers, and more may be involved, just as they would be in the hospital.
- *Home-based interventions*. At-home care includes, but is not limited to, medication administration; oxygen therapy; diagnostic imaging; lab testing; physical, occupational, or speech therapy; and assistance with personal care.
- *A robust logistics set-up*. Patients receive transport to and from the hospital for additional treatment and meal and/or medication delivery in addition to care coordination.

Care often focuses on elderly patients who are most at risk for negative outcomes due to inpatient hospitalization. Common diagnoses include chronic obstructive pulmonary disease, congestive heart failure, pneumonia, postsurgical care, and infections requiring intravenous antibiotic treatment [1].

Admission begins in the outpatient setting, with the emergency or ambulatory care physician determining whether a patient's clinical picture is suitable for HaH treatment. The patient's home environment is then assessed for safety; if criteria are met, the patient is transported home and care begins immediately [1].

Pioneering the Hospital-at-Home Concept in the United States

In 1994, the primary technologies that Johns Hopkins geriatrician Bruce Leff, MD, MBA, MPH [6], had available to him were a pager and a bulky portable phone housed in a backpack. Yet, he and his colleagues were determined to help high-risk patients avoid hospitalization altogether and instead provided acute care within the patient's home. They believed this would be a safer and more cost-conscious method of care for specific patient populations [7,8].

They soon proved their theory: total costs, length of admission, and cases of acute delirium in elderly patients dropped, while patients and caregivers enrolled in the newly established HaH program reported less stress and an overall positive opinion of the care they received [1].

"We've come a long way," Dr Leff recalls. "I would say over the last 10 to 15 years, health-based technologies that did not exist 30 years ago are pretty routine now in hospital-at-home."

Today, Dr Leff leads the Hospital at Home Users Group, which aims to foster collaboration and define best practices as health systems worldwide harness today's technology to offer at-risk patients hospital-level care from the safety of their own homes [9].

Evidence for Operational Benefits

In addition to clinical benefits for patients, HaH programs offer robust operational benefits to health systems already overwhelmed by an increasingly sick and aging population and rising health care costs.

Length of stay and overall spending is reduced, and remote monitoring and hybrid staffing models may help address workforce shortages and support hospital capacity management [10]. These programs also offer significant cost savings by helping to avoid the need for construction of additional physical hospital space [10].

Today's technologies—such as large language models for monitoring and predictive analytics, remote monitoring via digital sensors, expanding options for portable diagnostic testing, telehealth infrastructure, automated medication administration, and even drone delivery of supplies—make this model of care increasingly feasible [10].

Implementation Challenges

Perhaps the largest hurdle facing health systems that wish to establish a HaH program is payor reimbursement. In his work with the Hospital at Home Users Group, Dr Leff notes that "...payment and culture change are the two biggest pieces of this whole thing."

Data security, quality, and analytics also remain a significant hurdle, though recent improvements in artificial intelligence now offer a way to streamline virtual medical decision-making. Medical staff and patients sometimes express concerns over safety and quality of care outcomes when care is provided in the home rather than in a hospital. The logistics of staffing, scheduling, supply chain management, care coordination, and remote monitoring also present challenges [10].

The Future of Hospital-at-Home Care

HaH models continue to gain traction given their distinct patient and operational benefits and the increasing availability of technologies that support acute care at home.

Dr Leff looks forward to what he calls a "home-based care ecosystem," in which many medical disciplines work as one to provide hospital-level care from home, leveraging both remote technology and in-person care.

"The hospital of the future is ER, OR, and ICUs," Dr Leff predicts. "...Most of the other stuff will move out."

Given the rapid advancement in medical technology and proven advantages to this mode of care, this possibility is becoming an increasingly appealing answer to many of the challenges facing our current health care systems.

Keywords: telemedicine; hospital at home; remote sensing technology; delivery of health care; artificial intelligence; health services accessibility; patient safety

Conflicts of Interest

None declared.

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