
Evolution of Hospital in the Home (HiTH) Model and Connectivity Solutions



The Hospitals in the Home (HiTH) care model, established since the 1950s in France and adopted in various countries including Australia, the UK, Canada, Israel, Spain, and the US, aims to alleviate capacity issues in healthcare, enhance efficiencies, cut costs, and improve patient experience by transitioning care from hospitals to homes. In Australia alone, over 595,000 days of hospital-at-home care were provided in 2017 – 2018, comprising over 5% of acute care bed days. Benefits of HiTH include decreased risk of hospital-acquired infections, streamlined triage, and optimal use of limited resources like hospital beds and equipment. Studies show cost savings of 20% – 40% compared to inpatient care due to shorter hospital stays, reduced need for diagnostic tests, and decreased sedative medication usage. Patients under HiTH experience a 26% lower risk of readmission and reduced long-term care admissions, along with lower levels of depression and anxiety and higher satisfaction rates compared to those receiving in-hospital care.

Empowering Underserved Communities: The Potential of the HiTH Care Model

The HiTH model, which combines in-person and remote care facilitated by telehealth technologies, holds great promise for underserved communities such as rural residents, low-income individuals, and the elderly. In the United States, where 80% of rural residents lack adequate medical services, this model offers a solution to deliver high-quality hospital care and reduce complications for older patients. Continuous monitoring by a care team, supported by in-person and video visits, as well as telehealth technologies for biometric monitoring, ensures patients receive timely and comprehensive care. Advancements in technology, including artificial intelligence, digital health platforms, and connected devices, further enhance the feasibility and effectiveness of the HiTH model.

Connectivity Challenges and Solutions in Implementing the HiTH Care Model

For successfully implementing the HiTH (Hospital in the Home) care model, robust connectivity is paramount. While the benefits of this model are evident, several non-medical challenges need to be addressed to ensure its viability. These challenges include patient eligibility criteria, patient education, staff training, and the need for adjustments to home environments to accommodate medical care.

Effective communication serves as a cornerstone in transitioning care from hospitals to homes. Dependable connectivity is crucial for facilitating timely and accurate information exchange among healthcare professionals involved in a patient's care. Access to digital tools and a reliable internet connection are essential prerequisites for delivering high-quality care through the HiTH model.

Different HiTH services require varying levels of connectivity:

- **Telehealth/Telemedicine:** This involves virtual sessions between patients and physicians to review health status, vital signs, diagnostics, etc., in real-time. To ensure high-quality video streams and uninterrupted communication, a reliable, jitter-free internet connection is necessary.
- **Telemetry:** This involves connecting medical devices to monitor and upload patients' vital signs and symptoms in real-time to a central hospital database. Supporting multiple device and sensor connections in a confined space without compromising network performance requires robust connectivity.
- **Testing:** Non-invasive testing procedures, such as endoscopy, require high bandwidth and minimal delay for transmitting high-definition imagery and synchronising user movements with device imagery.
- **Treatment:** Alternate therapies like augmented reality (AR) or virtual reality (VR) for conditions such as chronic pain or anxiety demand high bandwidth and low latency connectivity to ensure seamless delivery and user experience.

To address these connectivity needs effectively, healthcare providers must invest in infrastructure and technologies that support reliable internet connections and data transmission. Additionally, patient education and support in utilising digital tools and understanding the importance of connectivity are vital for the successful adoption of the HiTH model.

Overcoming the Digital Divide: Addressing Connectivity Challenges in HiTH Implementation

The feasibility of the HiTH model could face challenges due to the digital divide, especially for underserved populations like rural communities, low-income individuals, and the elderly, who often lack stable and affordable high-bandwidth connectivity at home. Approximately one in five households in the US lacks internet connectivity, with affordability being a significant barrier. To address this issue, a disruptive communication platform is crucial, enabling seamless wireless connectivity, HD video conferencing, and real-time data exchange. Moreover, such a platform can drive innovation in the HiTH model by facilitating automated treatment responses (e.g., insulin pumps), AI-powered screening for mental illness, and AR/VR-enabled remote procedures performed by paramedics with support from hospital-based physicians.

Advancements in Connectivity: The Evolution of HiTH Network Solutions

Connectivity options are currently limited, but progress is underway. While wireline internet remains the primary method of home broadband, wireless broadband, particularly 5G networks, is becoming increasingly viable. 5G networks offer high download and upload speeds, exceeding 100 Mbps in both urban and rural areas, although they are subject to weather conditions and require a direct line of sight to the tower. Another disruptive technology, Low Earth Orbit (LEO) satellites, is rapidly advancing. Companies like SpaceX are expanding Starlink Internet service, with plans to deploy 42,000 satellites. Starlink offers median download speeds of around 79 Mbps and upload speeds of 10 Mbps, providing a compelling alternative in areas without cable or fibre access networks.

Building a Foundation: Comprehensive Connectivity Solutions for HiTH Implementation

For successful implementation of the HiTH model, adaptable and reliable connectivity solutions are essential. A comprehensive communications platform, ideally provided "as-a-service" by a trusted third party, should integrate various components:

- **Intelligent Home Gateway:** A secure and intelligent system supporting multiple technologies (5G, LTE, -Wi-Fi, LEO) that automatically connects to the best available network for optimal bandwidth. It seamlessly integrates with personal/local area network devices like wearables and bed monitors.
- **Robust and Redundant Network:** This bundles different communication networks (fixed wireless, LEO from multiple operators) to ensure wider coverage and redundancy. It may utilise a Mobile Virtual Network Operator (MVNO) structure for a unified broadband connection.
- **Zero-Trust Network Security:** End-to-end encryption safeguards patient data through various security protocols (e.g., VPNs) and implements strict access controls based on defined permissions.
- **Network Operations Center (NOC):** A state-of-the-art facility providing 24/7 monitoring and troubleshooting to ensure uninterrupted network availability. It offers proactive problem-solving for network and device issues.
- **AI/Machine Learning-Powered Intelligent Network:** This continuously monitors and selects the best available network, dynamically adjusting bandwidth based on application and device needs. It self-corrects for maximum uptime and conducts root-cause analysis for faster issue resolution.
- **Coverage Mapping Tool:** An interactive GIS system offering precise coverage details and available network speeds by provider for any location, aiding in program feasibility assessment.
- **User Interface and API:** A cloud-based platform with an intuitive GUI for management, provisioning, billing, and network monitoring. It also provides APIs for seamless integration with other applications and interfaces for a user-friendly experience.

Addressing the missing link in HiTH connectivity requires a holistic approach encompassing these components to ensure secure, reliable, and scalable connectivity for effective healthcare delivery.

Current Healthcare Connectivity Solutions and Future Possibilities

Currently, there are limited examples of healthcare-focused communications platforms designed to facilitate the transition of hospital care into the home. One notable attempt was Qualcomm's LifeComm, launched around 2005, aimed at establishing a healthcare-focused cellular network service. However, it failed to gain traction due to timing and other factors.

Google Fi, a consumer-focused cellular service from Google, incorporates some elements described for such a platform. It operates as a Mobile Virtual Network Operator (MVNO) with data service based on multiple underlying networks and seamlessly switches connections for optimal connectivity. Google Fi also offers an interactive coverage map and encrypts data using a virtual private network (VPN) when connected to a network.

In the public safety domain, examples like ASTRID's Blue Light Mobile demonstrate the feasibility of MVNOs supporting mission-critical services. Blue Light Mobile leverages multiple commercial networks to ensure optimal coverage for emergency and security services in Belgium and neighbouring countries.

The Hospital in the Home (HiTH) care model offers substantial benefits to healthcare systems by alleviating capacity issues, enhancing efficiencies, and enhancing patient experience. However, its success and expansion hinge on addressing the crucial aspect of connectivity. Technological advancements present an opportunity to develop a dedicated HiTH communications platform, which would not only extend access to underserved populations lacking reliable broadband but also catalyse innovation and further expansion of the HiTH model.

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