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Proposing a Framework to Model Hospital in the Home Programs



Abstract: The Australian health system is continuing to face challenges driven by an ageing population, increasing chronic disease burden, health equity, access issues, workforce and infrastructure gaps, and changing consumer expectations. The global pandemic highlighted pressures in the system with many hospitals experiencing considerable bed shortages and challenges to meet demand in the acute hospital setting. Hospital in the Home (HITH) is a solution a number of hospitals have adopted to address this challenge. HITH enables acute admitted care to be delivered to patients in their own home. Care can be provided in person or using digital technology such as telehealth. This study employs a case study method and collects data from six Australian health districts, namely, Western Health, Northern Health, Barwon Health, Alfred Health, Gold Coast Health and Northern Sydney Local Health. The qualitative analysis of the secondary data collected from these cases has informed a new framework for managing HITH initiatives in hospitals. This framework has 5 elements namely, Programs, Governance, Technology, Services, and Referrals. Implications of findings for practitioners are also provided herein.

Keywords: Hospital In The Home, HITH, At Home Programs, Health Sector, Health Districts, Hospital, Tele-Health, Home-based Care.

I. INTRODUCTION

The global healthcare sector has been conceptualizing the notion of a care without walls hospital, where virtual care takes precedence to address the multifaceted needs of an increasingly aging population grappling with an increasing burden of chronic disease. However, this vision has remained largely unrealized within the majority of healthcare services. Where attempts have been made the programs remain small, catering to a niche patient group or confined to pilot phases.

Hospital In The Home (HITH) commonly refers to providing patients with hospital-level care in their own homes [1, 2]. Several past researchers have examined different aspects of HITH, such as the HITH efficacy [3, 4], the experience of patients and caregivers within HITH programs [5, 6], the use of technology [7], ethical issues [8], and HITH clinical models. However, research on providing overall management and governance frameworks or models for HITH programs is quite limited according to Leff, et al. [1]. Clinical models generally concentrate on the actions and methods employed by the HITH to achieve its objectives [1]. Effective clinical care necessitates well-defined lines of responsibility and accountability, which should be clearly communicated to both the patient and caregivers. The clinical governance can be overseen by the admitting clinician, who may for example include a staff specialist, visiting medical officer, GP visiting medical officer, GP with admitting rights to HITH, or nurse practitioner [9]. Leff, et al. [1] emphasize the need for further research to offer improved organisational structure for HITH services. This involves exploring whether HITH should be a part of clinical department within a traditional hospital setting or function separately. Alternatively, it raises the question of whether HITH can effectively function as stand alone

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services without being part of a particular hospital. This calls for exploring and developing new HITH delivery models to match changes in healthcare settings and advancements in medical practice.

Due to the current gap in the literature, through conducting multiple case studies, this study proposes a relatively comprehensive framework for modelling overall HITH programs as a part of the hospital system. The study can provide insights for hospitals that are interested in adopting this model as well as hospitals who are already running at home programs. The research question underlying this paper is:

RQ) What is a framework to model hospital in the home programs?

The literature lacks evidence for overall frameworks or models for HITH programs. Thus, by undertaking this study, the authors aim to suggest a big picture framework that enables a hospital model for HITH initiatives.

Following this initial section, a review of the literature is provided to contextualize the research within the existing body of knowledge. Next, the research methodology employed is outlined. Subsequently, the research findings are presented. Finally, a detailed discussion of the implications of these research findings for practitioners is provided.

II. LITERATURE REVIEW

In 1947, the HITH unit was established at Montefiore Hospital in New York, which was the start of this care model. In Europe, the HITH model commenced at Tenon Hospital in Paris in 1951, where the model was then implemented across the continent [10]. There are difficulties in defining HITH since a precise description of a healthcare service model is not easy [1]. Based on the literature, it can be concluded that HITH involves providing patient with acute hospital-level care in their own homes [2, 11], although some studies refer to this as HaH, which stands for Hospital at Home [1, 12], or as Virtual Hospital [13].

Levine, et al. [14] have highlighted approaches for providing HITH care in rural regions. Due to the lack of training on how to manage risks in home-based care, Lewis and Noyes [15] developed a clinical governance and risk management framework to help nurses in home-based care programs. The way health care services are organized, regulated, and controlled are dictated by their governance structure [16]. To efficiently manage referral pathways, Amantea, et al. [17] suggested a framework for the HITH admission process. Their study conducted in Turin in Italy through real data used a standard language modelling called BPMN to simulate the processes of a hospital admission. Their study aimed to understand how and under what conditions the admission process for HITH programs can work more efficiently. Heller, et al. [18] developed a new at-home care model called Completing Hospitalization at Home (CHaH). In fact, following bed shortages at two hospitals in New York City during the COVID-19 pandemic, and existing payment barriers with the current at-home care model called Home Hospitalization (HaH), the new model could help to success of at-home programs. de Sousa Vale, et al. [10] indicated two models for managing HITH programs. The first model is led by hospital health professionals and the second is GP led. In the first model, patients visit hospitals for advanced diagnostics and care managed by specialists. In the second model, patients receive personalized care from their GP, but have limited access to advanced diagnostics and specialist expertise [17]. Leong, et al. [19] identified two main types of HITH models. Early Supported Discharge (ESD) and Admission Avoidance (AA). ESD aims to accelerate the release of admitted patients from the hospital by providing partial care outside the hospital setting. AA involves admitting patients directly into HaH. This can happen either by referrals from general practitioners to avoid hospital visits or directly from the emergency room without inpatient stays. This study aimed to conduct a systematic review of two HITH models to evaluate the safety and effectiveness of HaH based on different model types [19]. Bryant, et al. [20] discussed the challenges associated with managing HITH programs during the COVID-19 pandemic. The study highlighted how important is it to plan for service operation and clinical care, each involving various essential elements. Table 1 summarises study findings of HITH management models.

Table 1: Overview of the relevant research studies

Author (Name, Year)	Key Findings
Heller, et al. [18]	The new care approach, known as CHaH, significantly increased enrolment in the HaH program by quickly utilizing a previously inaccessible financial framework to enhance insurance participation. During the pandemic's peak, the model increased HaH enrolment,

	made it easier to admit patients after diagnostic procedures, and discharged many patients, potentially reducing future bed surges.
<i>de Sousa Vale, et al. [10]</i>	There are two models to run HITH programs: one led by hospital professionals and another by patients' GPs.
<i>Amantea, et al. [17]</i>	The study aims to improve the understanding and effectiveness in admitting patients to the HITH program in Turin by investigating how the referral process works.
<i>Leong, et al. [19]</i>	Based on the study's findings in implementing HITH programs, AA was preferred over ESD. This preference was based on the potential benefits of AA, such as improved clinical outcomes, cost-effectiveness, and the complete replacement of hospital stays with AA.
<i>Bryant, et al. [20]</i>	Considerations in planning for HITH preparedness: Managing staffing, Managing HITH equipment use and availability, Managing patient workload, Minimising risk of exposure to and transmission of SARS-CoV-2, Communications. Clinical role of HITH for COVID-19: Provision of safe effective HITH care to meet increased hospital demand, Referral of new patients to HITH with COVID-19, Mode of HITH care for patients with COVID-19, Transfer from HITH back to hospital of deteriorating patients with COVID-19

III. METHODOLOGY

This paper adopts an interpretivist research paradigm, which is based on the idea that research questions can be effectively answered through investigating human experiences and the social realities that shape them. Accordingly, a qualitative research approach has been employed. As Merriam and Tisdell (2015) have noted, qualitative research approach utilizes various data sources as instruments to uncover and interpret the underlying or hidden meanings present within a given context. Qualitative research often places human actors at the centre, as the approach is commonly utilized to observe, interview, and analyze the factors influencing human behaviours.

3.1 Research Method and Data Collection

The specific research method applied in this study is the multiple case study approach. This method is suitable for generating in-depth, and multifaceted understandings of complex real-world phenomena. Case study research enables the researcher to explore the key meanings, implications, and characteristics of the case by focusing either on a single case in-depth or multiple cases in order to draw comparative insights across various aspects of the research question (Crowe et al, 2011). Researchers have defined case study in different ways - for instance, Stake (1995, p. 237) defines it as "both the process of learning about the case and the product of our learning", while Miles and Huberman (1994, p. 25) describe it as the uncovering of "a phenomenon of some sort occurring in a bounded context", and Green and Thorogood (2018, p. 284) define it as an "In-depth study undertaken of one particular 'case', which could be a site, individual or policy". Nonetheless, the core idea is to conduct a deep exploration of an event or phenomenon and its impacts on the surrounding environment.

3.2 Cases Under Study

Table 2 shows the cases studied herein. As mentioned, this research employed the case study research method by studying 6 Australian hospitals which have already adopted HITH. These cases include Northern Health, Barwon Health, Alfred Health, Western Health, Gold Coast Health, and Northern Sydney Local Health District. Data collected was secondary data from various verified, reliable and valid sources such as hospital websites, non-profit media, and so on. Table 2 briefly introduces these 6 cases. Each of the 6 cases is explained after Table 2.

Table 2: Cases studied in this research

Case name	Country/State	The highlight of the Case
Western Health	Australia/Victoria	Ten @Home Programs; No independent division for @Home Programs

Northern Health	Australia/Victoria	Twelve @Home programs; An independent division for @Home programs called the Hospital without Walls Program Division; Tyto Care's telehealth device
Barwon Health	Australia/Victoria	Seven @Home programs; No independent division for @Home Programs; Innovative mental health screening by iCOPE
Alfred Health	Australia/Victoria	Eight @Home Programs; HITH unit status undetermined
Gold Coast Health	Australia/Queensland	Six @Home programs; No independent division for @Home Programs
Northern Sydney Local Health	Australia/NSW	Five @Home programs; HITH unit status undetermined

Case study 1: Western Health

As the first case-study, Western Health oversees healthcare services for one of Australia's rapidly expanding and culturally diverse regions. This includes the management of four acute public hospitals: Sunshine Hospital (which includes the Joan Kirner Women's and Children's facility), Footscray Hospital, Williamstown Hospital, and Bacchus Marsh Hospital. In addition to these acute care facilities, Western Health also operates several Community Health Centres across the area it serves. Western Health's main service area is Brimbank, Hobsons Bay, Maribyrnong, and Melton local government areas, along with Hume and Moonee Valley (West), with Wyndham serving as a secondary catchment area. Western Health's @Home programs comprise ten programs, including Neonatal HITH, Maternity @Home, and Residential InReach. Two Types of overseeing is considered for @Home programs. These programs are clinically and operationally overseen by different divisions. For example, Neonatal HITH and Maternity @Home fall under the clinical governance of the Women & Children division. Maternity wards serve as the sole internal referral source for Maternity @Home. For Neonatal HITH, internal referral sources include nursery and wards, the neonatal medical team, and the maternity service team. The Residential InReach program, on the other hand, has both internal and external referral sources and is governed by two divisions: Chronic & Complex Care and Aged Cancer & Continuing Care.

Case study 2: Northern Health

As the second case-study, Northern Health is responsible for providing healthcare services to three of Victoria's rapidly growing areas: Hume, Whittlesea, and Mitchell. Operating across five main campuses - Northern Hospital Epping, Broadmeadows Hospital, Bundoora Centre, Craigieburn Centre, and Kilmore District Hospital - Northern Health offers a range of medical and healthcare services to the residents of these expanding communities. Northern Health's HITH service provides the opportunity for patients to continue their hospital treatment in the comfort of their own home. According to the publicly available information, there are twelve HITH programs covering a wide range of services, with examples including GEM @Home, Neonatal HITH, Northern Oncology and Haematology (NOAH @Home), and Liver at Home program. Each program has its own specific services, operates under the governance (clinical governance and operational governance) of different departments, and has specific (internal and external) pathway sources. For instance, GEM @Home includes nursing services, physiotherapy, occupational therapy, social work, speech pathology, clinical psychology, allied health assistant, dietetics, and geriatrician consultancy. Neonatal HITH includes home phototherapy service (for mother and baby), domiciliary midwives, and home visit after maternity. A department called the Hospital without Walls Program Division is responsible for overseeing the HITH programs. However, various other departments and divisions may be involved in different HITH programs. The Neonatal HITH, is governed by two departments in its operation , the Hospital without Walls Program and the Women's and Children's division. Based on the organizational chart of Northern Health, Neonatal HITH is clinically governed by the Women's and Children's division. The Maternity Wards, Neonatal Unit, and Maternity Service Team are mentioned as three possible referral sources for Neonatal HITH referral pathways. The Northern Health HITH program has been utilizing Tyto Care's telehealth device since April 2023, marking the first implementation of such technology in the country. Tyto Care's device facilitates remote healthcare consultations and diagnostics, assessing fluid on the lungs, which is a common problem that affects patients with heart failure.

Case study 3: Barwon Health

Barwon Health is one of the largest and most comprehensive regional health services in Australia. Serving a geographically dispersed population, Barwon Health operates through two major sites, spanning across Anglesea, Torquay, and Lorne. Barwon Health provides seven @Home programs offering diverse services, such as Transition Care Program (TCP), Paediatric HITH, Postnatal Care @Home, Palliative Care at Home, and Cancer HITH. TCP includes personal and/or nursing care, medical care, meals, transport to/from appointments, speech therapy, podiatry, and dietetics services. Paediatric HITH provides patients with homebirth services, and Postnatal Care @Home includes services like midwife visits and daily visits for babies. According to publicly available data, there is no specific department to govern the @home programs at Barwon Health. Paediatric HITH is operated by a team of experienced midwives from University Hospital Geelong's Special Care Nursery, in cooperation with paediatricians under the clinical governance of Women's and Children's. For Paediatric HITH, there are internal referrals such as the maternity ward and the pregnancy care clinic. For Palliative Care at Home, internal referrals include the Palliative Care Unit and Outpatient Clinics, while external sources like GPs and hospitals are also mentioned. Barwon Health has launched an innovative mental health screening program for new mothers called iCOPE.

Case study 4: Alfred Health

Alfred Health, which was founded in 1871, operates across three sites: Caulfield Hospital, Alfred Hospital, and Sandringham Hospital. Through this network of three hospitals, as well as numerous clinics and community-based services, Alfred Health provides healthcare to the residents of southern and bayside Melbourne. The Alfred offers eight @Home programs such as Better at Home, Cancer @Home program, and Palliative Assessment and Treatment Service (PATS). Better at Home program includes a wide range of services such as rehabilitation, assistance with medication, continence assistance, diabetes management and complex wound management, mobility, personal care, shopping, meals, domestic tasks, and respite. For Better at Home programs there are referral pathways such as external GPs and hospitals. For the Cancer @Home program, the referral pathways are limited only to internal referrals, with two departments overseeing the program: Alfred Cancer and Alfred Health's Hospital in The Home (HITH). Residential aged care facility, PATS clinician, and External GP are some of PATS referral sources.

Case study 5: Gold Coast Health

Gold Coast Health is among Queensland's 16 hospital and health services (HHSs), statutory bodies tasked with providing public health services across different geographical areas of Queensland. It operates through four hospitals: Gold Coast University Hospital, Robina Hospital, Varsity Lakes Day Hospital, and Tugun Satellite Hospital, in addition to 20 facilities. The Gold Coast Health District offers a total of six @Home programs, including the Children's Hospital in The Home (CHITH), Maternity Hospital in the Home (MHITH), and Community Rehabilitation Program (CRP). CRP includes services such as Clinical Psychology, Dietetics, Neuropsychology, Nursing, Occupational Therapy, Pharmacy, Physiotherapy, Rehabilitation Consultant, Social Work, and Speech Pathology. CHITH includes NG feeding support at home, daily IV antibiotics and continuous IV antibiotics, eczema wet wrap support, bowel washout at home, hypospadias repair support, and overnight saturation monitoring for physiotherapy for children with chronic diseases. The CHITH and MHITH are overseen by Women's, Newborn and Children's Services, as there is no specific unit or department specifically for HITH (based on the publicly accessible data). Internal referral pathways to the CHITH program include Children's Short Stay Unit (CSSU), Children's Emergency Unit, and GCUH Paediatric Clinic. For MHITH, they are the Maternity Ward and Emergency Department.

Case study 6: Northern Sydney Local Health District

The Northern Sydney Local Health District (NSLHD) is one of the largest health districts in NSW. Its public hospitals are Royal North Shore, Ryde, Hornsby, Macquarie, Manly, Mona Vale, and Northern Beaches. Royal North Shore Hospital is a referral hospital for Northern Sydney Local Health District which provides a comprehensive range of services to patients from across NSW. Ryde Hospital, Hornsby Ku-ring-gai Hospital, Macquarie Hospital, Mona Vale Hospital, and Northern Beaches Hospital are other sites within NSLHD. NSLHD's @Home programs include five programs such as ComPacks Safe and Supported at Home (SASH), Paediatric Hospital in the Home (HITH), and Northern Sydney Home Nursing Service (NSHNS). The services covered by SASH are catheter care, continence services, occupational therapy, and physiotherapy. To access SASH, NSHNS,

NSLHD Health Contact Centre, and Health Link Electronic Referral are mentioned as referral sources. The services covered by the Paediatric HITH program are clinical progress assessment, education and support, and intravenous medications. This is the only program directly governed by HITHsites, with in-home nursing support provided by HITH nurses. Referral sources for Paediatric HITH include the paediatric ward, emergency department, and Health Link Electronic Referral. For NSHNS, referral sources include GPs, emergency departments, community services, and other healthcare providers.

IV. PROPOSED FRAMEWORK

This section demonstrates the framework developed in the course of studying the 6 cases described above. This model has 5 elements namely, Programs, Governance, Technology, Services, and Referrals.

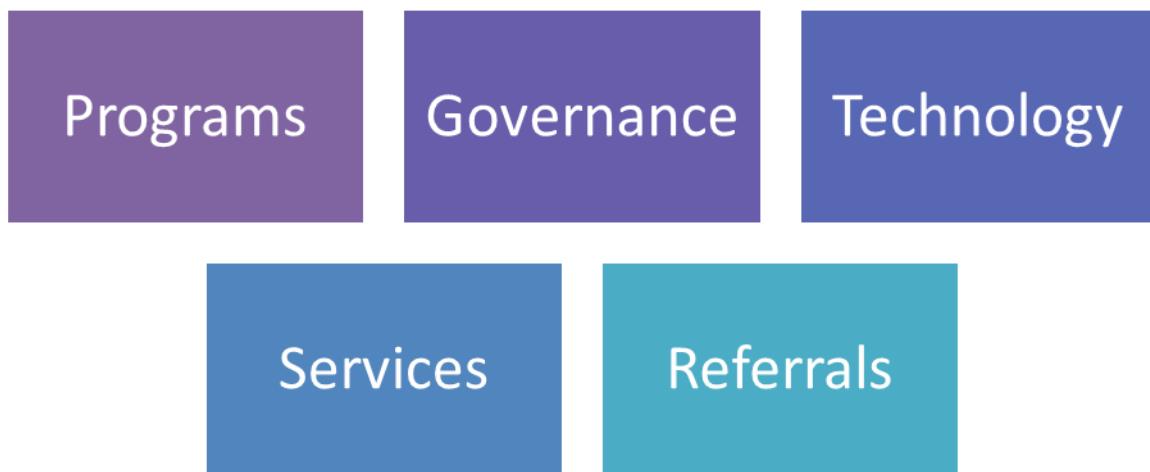


Figure 1. Proposed model for Hospital in the Home programs

4.1 *Programs*

Programs refer to a set of healthcare services provided to patients in their own homes rather than in a regular hospital setting. For instance, GEM @home is a program offered by providers such as Western Health and Northern Health

4.2 *Services*

Services are specialized healthcare offerings and supports given to patients as part of various healthcare programs provided by different healthcare districts. For instance, occupational therapy is one the services provided through the GEM @home program at Northern Health.

4.3 *Governance*

Governance refers to the safe oversight of healthcare programs and services which directs the model of care. . There are two forms of governance: clinical and operational governance. For instance, at Western Health, the Maternity @Home program is governed both clinically and operationally by the Women & Children department.

4.4 *Referrals*

Referrals are defined as the pathways for patients to access certain services. Referrals could be internal or external. For example an internal referral for Neonatal HITH at Western Health could originate from inside the healthcare system, such as nursery and wards or maternity service teams. . Examples of external referral for Residential InReach at Western Health are referrals from general practitioners or community health services.

4.5 *Technology*

Technology refers to the various information and communication technologies employed to assist in providing healthcare services to the patients from their home. That includes any hardware equipment or software technology which is used at patients' homes to improve patient care, diagnosis, and treatment. For instance, iCOPE enables

Barwon Health to support the mental well-being of new and expectant mothers in the Geelong region through the Postnatal Care @ Home program.

V. DISCUSSIONS AND CONCLUSIONS:

For hospitals implementing HITH programs, it is important to consider carefully assessing various patients' needs. Understanding these needs and the existing referral pathways results in developing customized HITH programs that meet the needs of a community. Moreover, the incorporation of advanced technologies like telehealth devices and other novel technologies can improve the delivery of remote healthcare services. And embracing technology can significantly improve the program outcomes. Hospitals that are implementing HITH programs should clearly define referral pathways. For hospitals that have already adopted HITH programs, it may be efficient to pay attention to both internal and external referral pathways. Several referral sources and pathways were indicated across studies reviewed. Governance is another element of the framework which plays a key role in the success of at-home programs. Having clear governance structure is also important for the success of hospitals and health districts at-home programs. For instance, having clear policies outlining clinical and operational responsibilities for each program. Technology is also a crucial part of having successful at-home programs. Technologies that can address the patients' needs in accordance with programs and services and truly support patients that otherwise would be admitted. Good examples of these are cardiac monitoring with rapid response.

One of the limitations of the study was the use of secondary data sources like the website of hospitals and government. Generally, using only secondary data could result in biases or inaccuracies in findings and could decrease reliability of the framework. The specific contexts of the healthcare districts in Australia might have limited the extent of application of the framework to other context outside of Australia, which would affect the generalizability of findings. Providing qualitative data and stakeholder perspectives alongside the secondary data would bring more reliability and validity regarding the findings.

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