

# Barriers and Facilitators to Scale-Up of Hospital-at-Home: an Observational Cohort Study Protocol

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## Background

Hospital-at-home interventions(1) have been shown to be clinically and cost-effective, and many healthcare systems internationally are investing in scaling-up such interventions. However, most existing studies are focusing on how effective the intervention is, rather than how to successfully scale it up. We report a study protocol for a theory-driven investigation of a hospital-at-home intervention in Singapore, NUHS@Home (2). We propose a novel combination of two established implementation science frameworks – the EPIS framework (3) and the Scale-Up framework (4) – and apply it to a planned scale-up of a hospital-at-home intervention in Singapore.

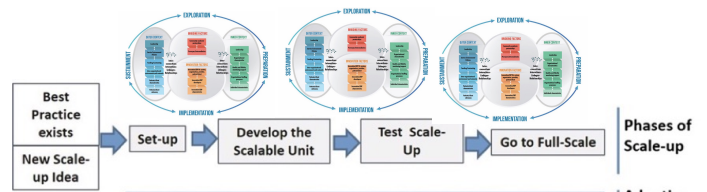
**Table 1: Outcomes and Contexts**

	Measurement (per month)
<b>Implementation Outcomes (IO)</b>	
<b>Penetration</b>	<ul style="list-style-type: none"> <li>Number of patient episodes &amp; bed days</li> <li>Bed capacity and average bed occupancy rate</li> </ul>
<b>Adoption</b>	<ul style="list-style-type: none"> <li>Patients admitted to NUHS@Home per clinical pathway</li> <li>Total patients admitted to affiliated hospital wards for same clinical pathway</li> </ul>
<b>Clinical Outcomes (CO)</b>	
<b>Clinical Outcomes</b>	<ul style="list-style-type: none"> <li>Rate of unplanned return to hospital</li> <li>30-day readmission rate</li> <li>Inpatient mortality rate</li> <li>Rate of patient safety issues</li> </ul>
<b>Outer Context (OC)</b>	
<b>Service Environment</b>	<ul style="list-style-type: none"> <li>Bed occupancy rates of referring hospitals</li> <li>Lodger volume in emergency department of referring hospitals</li> <li>Number of active clinical pathways with NUHS@Home</li> </ul>
<b>Funding</b>	<ul style="list-style-type: none"> <li>Source of service funding used</li> </ul>
<b>Institutional leadership</b>	<ul style="list-style-type: none"> <li>Number of leadership broadcasts (and content)</li> </ul>
<b>External networks</b>	<ul style="list-style-type: none"> <li>Number of engagements with external organisations</li> </ul>
<b>Patient/client characteristics</b>	<ul style="list-style-type: none"> <li>Number of patients referred for each clinical pathway</li> <li>% patients accepted and rejected for each clinical pathway</li> </ul>
<b>Patient/client Advocacy</b>	<ul style="list-style-type: none"> <li>Number of publicity material to patients and doctors</li> </ul>
<b>Inner Context (IC)</b>	
<b>Organisational characteristics</b>	<ul style="list-style-type: none"> <li>Structural changes in the organisation</li> </ul>
<b>Leadership</b>	<ul style="list-style-type: none"> <li>Components of leadership team</li> </ul>
<b>Quality and fidelity of monitoring/support</b>	<ul style="list-style-type: none"> <li>Processes for safety review and data tracking</li> <li>New policies/guidelines/clinical standard /quality indicators</li> <li>Technology systems used</li> <li>Volume of home visits, during and after office hours</li> </ul>
<b>Organisational Staffing processes</b>	<ul style="list-style-type: none"> <li>Volume of staff on service, in total, who left</li> <li>Training programmes for staff in existence</li> <li>Referral hours (office hours, after hours, weekends)</li> </ul>
<b>Individual characteristics</b>	<ul style="list-style-type: none"> <li>% staff that are permanent or rotated</li> <li>Demographics, training, experience of each staff</li> </ul>
<b>Infrastructure</b>	<ul style="list-style-type: none"> <li>Structure of clinical command centre, pharmacy, diagnostic, lab</li> <li># of vendors, types, issues/challenges, volume of services</li> </ul>
<b>Patient/Client Advocacy</b>	<ul style="list-style-type: none"> <li>Average patient satisfaction scores</li> <li>% of patients who returned to hospital due to changing their mind</li> </ul>

## Methods

EPIS offers a useful macro-framework by identifying contextual influences across the phases of Exploration, Preparation, Implementation, and Sustainment. The macro approach of EPIS needs to be further supported by an action-orientated framework of the scale-up process. The Scale-Up framework breaks down scaling-up into 4 phases: set-up, develop the scalable unit, test of scale-up, and go to full-scale (Fig 1).

We will conduct an observational cohort study across 24 months (May 2022 to April 2024) to evaluate the association of outer and inner contextual factors on key implementation outcomes – the volume of patients admitted, operational efficiency and levels of adoption (Table 1). Statistical process control graphs will be used to examine variation in the implementation outcomes over time. Linear regression will be applied to assess associations of outcomes with contextual factors that are continuous variables; logistic regression will be applied to assess the associations of outcomes with binary/descriptive contextual factors. To supplement these, qualitative methods will be applied using a content analysis of monthly meeting minutes and focus groups of the implementation team to understand and explain the outcomes of the observational cohort study.



	Set-Up	Develop the Scalable Unit	Test of Scale-Up	Go to Full-Scale
<b>Timeline</b>	2020-2022	2022-2024	2024-2025	2025-2030
<b>Bed capacity</b>	3 beds	25 beds	50-100 beds	300 beds

**Fig 1. Application of EPIS and Scale-Up Framework to NUHS@Home**

## Conclusions

This study protocol applies implementation frameworks to systematically evaluate the scale-up process and identifying barriers and facilitators towards going to full scale.

**References**

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