

Building a virtual nursing platform to enable nurses to optimise productivity and improve quality and coverage of patient care

A. Problem Statement (Current State)

The COVID-19 pandemic has reshaped how healthcare services are delivered and accessed, helping to overcome behavioural and regulatory barriers that once hindered the adoption of telemedicine. Although COVID-19 may have accelerated the acceptance of telemedicine, the trend long pre-dates it. Governments worldwide have recognised the need to reduce hospitalisations, re-admissions, and length of hospital stays as the populations' age and chronic conditions become more prevalent. To this end, governments and healthcare providers have been exploring and evaluating different virtual care models.¹

Virtual nursing (VN) has emerged as a promising technology in healthcare, offering a solution to the nursing shortage and increasing demand for patient care. By leveraging sensor technology and data analytics, VN can provide real-time monitoring, early detection of patient deterioration, and personalised care. We are exploring this further to address some key challenges:

1. Nursing manpower attrition and shortage

Nursing attrition² and shortage have resulted in expanding nursing-to-patient ratios whereby nurses increasingly need to manage increased patients beyond the recommended ratio. This is compounded by Singapore's rapidly ageing population³. We need to find solutions that can enhance the productivity and workflow of our nurses to alleviate the increase in demand with the manpower that we have.⁴

2. Delayed detection of inpatient deterioration

The current escalation of care triggers relies on point-of-time vital sign measures. It identifies patients who are already unwell but are less effective at identifying patients at risk of deterioration. Several solutions have been deployed to address this, such as contactless continuous respiratory and heart rate monitoring. However, there remains a need for the data to be meaningfully visualised and to generate actionable insights and alarms. Slower response times directly correlate with higher injurious fall rates and lower patient satisfaction

¹ The Telehealth Era Is Just Beginning. Harvard Business Review. May 2022. Available at <https://hbr.org/2022/05/the-telehealth-era-is-just-beginning>

² [MOH Parliamentary address Aug 2022](#)

³ [Population in Brief 2022](#)

⁴ [Closing Speech By Mr Ong Ye Kung, Minister For Health, At The Healthier Sg White Paper Debate 2022, On Wednesday, 5](#)

in acute adult inpatient care settings.⁵ Any means to improve nurses' ability to respond quickly or assist them in promptly identifying high-risk patients and their dispositions may delay patient deterioration.

3. Healthcare Data Fragmentation

Patient data is often spread across different systems and devices, making it difficult to access and analyse as healthcare providers toggle inefficiently between various sources of information. This patient data is stored on multiple platforms. Each data point creates data silos and is fragmented, resulting in views and decisions that are incomplete, less accurate, less up-to-date, ultimately challenging, inefficient, and risky for the provider. This can lead to diagnosis and treatment errors and make it difficult to monitor patient outcomes.

B. Challenge Statement

How might we transform healthcare through virtual nursing, enabling remote nurses to provide personalised, high-quality care while effectively integrating information from a diversity of technologies, and ensuring that data analytics and visualisation tools are in place to efficiently provide proactive care for multiple patients?

C. What are we looking for? (To-be State)

1. There are several phases for the scope of this project. For this challenge, we are looking for a virtual nursing platform that will provide nurses with a unified view of various data points with data insights. The solution should enable them to make timely and effective decisions for inpatients and mobile inpatient care at home (MIC@Home). The longer-term view will include extending this capability to cover outpatient settings. While your proposal should focus on inpatient settings, you may wish to indicate if your solution can cater to outpatient settings or what it may take to do so, if applicable – this will be used for our reference only. More assessment weightage will be placed on covering inpatient settings.
2. Your solution should achieve the following desired outcomes: *
 - a. **Enhance productivity** – aide staff to address nursing manpower shortage challenges and sustainability, improve patient care and outcomes with direct access to a reliable, centralised dashboard for real-time monitoring, early detection of patient deterioration, and provide personalised care.
 - i. Dashboard views allow virtual nurses to continuously monitor patients across different patient populations and/or units, providing situational awareness at-a-glance by identifying patients in most need of immediate intervention – accessible

⁵ Tzeng, H.M., Titler, M.G., Ronis, D.L. et al. The contribution of staff call light response time to fall and injurious fall rates: an exploratory study in four US hospitals using archived hospital data. BMC Health Serv Res 12, 84 (2012)

from anywhere such as virtual hospital, virtual nursing sub-units or the patient's home. Here are some examples of the important view items and essential functions:

1. At-a-glance view of patient status (e.g., 20 patients per page or more)
2. Sorting of patients by:
 - a. Selected care area (e.g., general wards, intensive care unit (ICU), Post Anesthesia Care Unit (PACU), MIC@Home)
 - b. Type of protocol [e.g., Sepsis, acute kidney injury (AKI), etc.]
3. Notification of patients who may require intervention (e.g., colour coding of patient beds). Allowing virtual nurses to triage and proactively engage bedside teams as appropriate or trigger rapid response teams.
4. Dynamic sorting of patient lists based on real-time data
5. Detailed patient view allowing virtual nurses to review:
 - a. Vital signs and lab trends that may indicate sepsis or early deterioration
 - b. Current vital signs
 - c. Vital signs or clinical composite score trends
 - d. Latest lab results
 - e. Protocol status and compliance
6. Checklists for:
 - a. Early Goal Directed Therapy (EGDT) for sepsis
 - b. Infection control indicators such as:
 - i. indwelling catheter duration
 - ii. lines, tubes and drain durations

**Applicants may propose additional or alternative solutions to the above.*

- b. **Data analytics and predictive capability** – generate actionable data insights from aggregated data to identify at risk patients. Provide a clear snapshot of the prioritised alerts/notifications of patients' acuity so users can make timely decisions.
- c. **Transforming nursing practice** – to equip nurses with relevant tools, know-how and structural support to achieve a higher bedside nurse-to-patient ratio. Additionally, to reduce nursing turnover rates, which impacts patient outcomes and extend the career of nurses by bringing back retired nurses into the workforce, further alleviating the nursing manpower shortage.
 - i. Better resource allocation – allowing bed-sides nurses to focus on high-value nursing tasks
 - ii. Improved support for bedside nurses – reducing documentation, assisting with discharge planning, and clinical documentation

- iii. Improved nursing staff retention and job satisfaction – by extending nursing careers for experienced nurses, and attract new staff through more flexible working conditions
 - iv. Improved communication
3. Overall performance requirements:
- a. **Highly customisable, interoperable and integrated:** A device agnostic Internet of Things (IoT) hub with the ability to integrate with relevant current and future hospital applications and systems and agnostically ingest all relevant disparate data types. Additionally, there is a need to sense-make and gain access to reliable, customisable user features (e.g., modular dashboard widgets) to fit their differing needs (i.e., collate various clinical and environment sensors) and settings (i.e., inpatient, operation and outpatient).
 - b. **Intuitive user experience:** All hospital staff must be able to quickly self-help with the digital solution with minimal guidance.
 - c. **Scalable and future-proof:** The proposed solutions must consider the evolution of technologies and be easily scaled across Singapore Healthcare Clusters (hospitals) following successful trials and refinements.
 - d. **Well-secured:** Any recommended solutions must undergo regular risk assessment and adhere to the cybersecurity standards to secure private health data/protected health information.
 - e. **Cost-effective:** The proposed solutions must be cost-effective to support the solution to scale across hospitals.
4. Note: If your proposal is shortlisted, you will be asked to prepare a demo that best represents the desired outcomes to be showcased during the pitch session (i.e., after evaluation and shortlisting of proposals).