**PRESS RELEASE**

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# National Healthcare Innovation and Productivity Awards 2020

## Seven Projects offer Innovative and Value-Driven Solutions to Enhance Care of Patients

**SINGAPORE, 28 July 2020 –** The COVID-19 pandemic has highlighted the value of nurturing a culture of innovation within organisations. The annual National Healthcare Innovation and Productivity (NHIP) Awards inspire and celebrate healthcare professionals who have pushed the boundaries with breakthrough ideas.

Launched in 2016 by the Ministry of Health to foster a more hands-on effort in productivity and innovation, this year's seven winning projects from four healthcare institutions have achieved excellence in three award categories: "Care Redesign", "Automation, IT and Robotics Innovation", and "Workforce Transformation".

### Award Winning Projects

This year, Tan Tock Seng Hospital (TTSH) bagged the Excellence Champion Medal for its "C3 Smart Hospital for the FUTURE" project. Co-developed by TTSH and Integrated Health Information System (IHiS), the 24/7 Command, Control and Communications (C3) smart hospital operating system, can provide real-time visibility of patient flow and resource management on the ground. It has been instrumental in keeping the hospital one step ahead in managing bed capacity, lab testing capability and deployment of manpower resources before and during the COVID-19 peak period.

TTSH also picked up the Workforce Transformation Best Practice Medal by equipping and empowering volunteers to take on para-clinical roles in Total Knee Replacement Rehabilitation. The sustainable programme has proven to improve patients' exercise compliance post-operation and its clinical outcomes.

Ng Teng Feng General Hospital won the Best Practice Medal in the category of Automation, IT, Robotics Innovation by using an automated code blue activation system to reduce the fatality rate in cardiac arrest situations.

The other winners are National University Hospital (NUH) and Singapore General Hospital (SGH) who won Best Practice Medals in Care Redesign. NUH, redesigned its care protocols to empower nurses to risk-screen post-extubated patients for swallowing difficulty, commencement of early resumption of oral intake and decrease re-intubation events and pneumonia rate.

SGH implemented a frailty assessment tool to identify frail elderlies during preoperative assessments and provided pre-habilitation to them resulting in improved postoperative outcomes and cost savings.

The NHIP Medals are sponsored by the Ng Teng Fong Healthcare Innovation Programme (NTF HIP), managed by the Tan Tock Seng Hospital Community Fund and the Centre for Healthcare Innovation.

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## About the Centre for Healthcare Innovation

The Centre for Healthcare Innovation (CHI) Co-Learning Network was launched in October 2016 and currently has 37 local and international partners from Academia, Strategic Agencies, Healthcare, and Industry. Hosted by Tan Tock Seng Hospital and the National Healthcare Group, the network has three strategic thrusts to drive healthcare innovation: Build Thought Leadership, Drive Workforce Transformation, Enable Healthcare Training.

The Network is founded on the concept of Co-Learning – the idea that we learn better together as a Community of Practice. We are an open learning platform, an ecosystem of value-enabling alliances. Through our network, like-minded local and overseas innovation partners will co-learn and collaborate by co-building thought leadership in healthcare innovation, co-transforming the workforce for our future, and co-developing new training and andragogy. We will meet current and future healthcare challenges through innovative and value-driven care delivery to the populations we serve.

The CHI Co-Learning Network is enabled by our financial lever, the $52-million Ng Teng Fong Healthcare Innovation Programme that funds and supports healthcare innovation in collaboration with its partners through three tracks - Training, Innovation and Community Enabling. The programme is managed by the TTSH Community Fund and is the proud sponsor of the National Healthcare Innovation & Productivity (NHIP) Medals.

The Ng Teng Fong Centre for Healthcare Innovation (CHI) is a 9-storey conference, training and innovation building that aims to transform our healthcare workforce to be future-ready. At 25,000 sq m, it is a purpose-built innovation centre with MICE facilities, simulation and innovation labs and engagement spaces.

## ANNEX A: National HIP 2020 Medal Winners Project Synopses

**Excellence Champion Medal**

**Tan Tock Seng Hospital**

Project title: "*C3 Smart Hospital for the FUTURE "*

Introduction:

TTSH Operations Command Centre (OCC), similar to the brain of the hospital, aims to coordinate and provide better care delivery at a systemic level. The Command, Control and Communications (C3) system at TTSH's 24/7 OCC has the ability to communicate and coordinate hospital-wide operations, based on timely data from across multiple systems and the frontline. The conventional ways of facility management are not sustainable. Often, healthcare partners are operating in silos and lack real-time visibility of the ground operations. This delays the efficiency of patient transfers across healthcare providers as any response is lagged or blindsided by bottlenecks within the system.

Team Composition:

C3 Smart Hospital System is developed by TTSH (Resource Management Department and Operations Centre Department), IHiS, ST Engineering and supported by MOH.

Objectives:

With the increasing demand for healthcare, it is no longer sufficient to just look at inventory management. There is a need to look at integration of care, both horizontally and vertically.

Key Features:

The C3 system's primary focus is to coordinate flow, by adopting a more holistic view to the hospital ecosystem and delivers 4 core capabilities –

a) Monitoring and sensing of ground situation
b) Decision Support to provide actionable insights and facilitate informed decision,
c) Flow Optimisation via prescriptive analytics to optimize patient flow
d) Autonomy to self-learn and self-execute standard operating procedures (SOPs) with application of artificial intelligence.

Impact:

- C3 system went live in Dec 2019, and the benefits brought by it was best exemplified during the COVID-19 outbreak. Sensors, analytics and videos have allowed healthcare officials to quickly adapt even at the height of the pandemic.
- Use real-time location sensors to constantly monitor and facilitate load balancing and ensuring staff and patient safety through contact tracing.
- Use data and Artificial Intelligence to predict bottlenecks and trigger for new supplies.
- C3 allowed TTSH management to immediately identify and cope with an escalating situation during the initial weeks of the COVID-19 outbreak. Within 24 hours, TTSH deployed people and equipment to open up five more wards and increase support at the screening centre.
- In the future, the command centre will anticipate workload in other critical parts of the hospital, like the emergency department. C3 will also incorporate machine learning and predictive analytics to enhance proactive actions and forward planning.

## ANNEX A: National HIP 2020 Medal Winners Project Synopses

| **Automation, IT and Robotics Innovation (AIR) Best Practice Medal** |
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| **Ng Teng Fong General Hospital** |
| Project title: "Development of A Real-Time Risk Score to Reduce 30-day Readmission in Singapore" |
| Introduction:<br>At Ng Teng Fong General Hospital (NTFGH), complex underlying medical conditions and complex social issues were two key reasons for readmissions. Unscheduled readmissions pose an additional burden on the healthcare system and are associated with financial and quality-of-care implications. Identifying high-risk patients for proactive interventions during hospitalisation and post-discharge may help reduce these readmissions. NTFGH saw an opportunity to act on patients with high risk for readmission during their index admission before their discharge using data analytics and technology.<br><br>Objective:<br>To reduce readmission rate from 14% to 12% in NTFGH by 2020.<br><br>Team Composition:<br>A multidisciplinary team was assembled in 2017 consisting of Emergency Department (ED) physicians, Inpatient Clinicians, Nurses and Community Leads. The efforts of the group were coordinated by the Quality, Innovation and Improvement (QII) Department.<br><br>Key Features:<br>The team uses real-time patient stratification in Electronic Medical Records (EMR) supported by in-house machine learning models to determine which patients are at higher risk of readmission during day 2 admission. High risk patients are flagged in EMR to frontline staff. The team also used the Quality Improvement framework to identify the problem and formulate bundled interventions for reducing readmissions at several fronts. Risk stratification enabled the teams to better align resources to the higher risk patients and enable sustainability in the long term.<br><br>Impact:<br>The team tracked the crude and risk-adjusted readmission rates for NTFGH as the outcome measures. Crude rate improved significantly from 14.1 percent to 13.0 percent ($p<0.01$) and the risk-adjusted rate improved from 11.4 percent to 10.1 percent ($p<0.01$) between 2017 to 2019. |

## ANNEX A: National HIP 2020 Medal Winners Project Synopses

**Automation, IT and Robotics Innovation (AIR) Best Practice Medal**

**Ng Teng Fong General Hospital**

Project title: *"Technology with Right Activation Parameters and Good Clinical Response: SAVE LIVES"*

Introduction:

Opened in 2015, the Ng Teng Fong General Hospital (NTFGH) has about 100,000 A&E attendances and 40,000 hospital admission annually. In its first year, NTFGH faced an incidence of 1.64 cardiac arrests per 1000 hospital admission.

This led to the birth of the hospital policy "Peri-Arrest Criteria for Code Blue Activation" (PACCA) for recognizing deteriorating patients. However, deteriorating patients who met PACCA criteria were still missed and the Code Blue team was not activated. In 2016, the cardiac arrest rate was 1.2 per 1000 hospital admissions.

Objective:

Reduce cardiac arrest rate in NTFGH by 25%, from 1.2 to <0.9 by 2019.

Team Composition:

Led by the Cardiac Life Support Committee, the project was conducted across all acute wards in the hospital, with support from the Intensive Care Medicine department doctors, respiratory therapist, ward doctors and nurses, medical informatics, facilities and biomedical department.

Key Features:

With a multidisciplinary team of clinical and non-clinical members, the previous manual alert process was enhanced by integrating the existing digitalized activation process with the automation of alerts from the Electronic Medical Record (EMR) system. Peri-cardiac arrest criteria were derived, validated and implemented into the EMR system. When criteria are met, an EMR built-in algorithm triggers an alert to be sent to the automated activation system, which in turn activates all code blue team members simultaneously within 25 seconds. Smart technologies such as bedside monitoring and automated activation system were integrated with the EMR system.

Impact:

Significant reduction in cardiac arrest incidence, with increasing pick-up of patients in Peri-cardiac arrest situation, with survival rate of approximately 70% compared to average 20% in cardiac arrests

- No cardiac arrests in the months of June 2018 and November 2019
- Cardiac arrest dropped from 1.2 to 0.8 per 1000 hospital admissions over a period of 12 months since implementation of "Post-Automation" with only 10% increase in workload

Able to sustain and keep the incidence of cardiac arrest at 0.8 for 1000 hospital admissions from March 2019 to Feb 2020.

## ANNEX A: National HIP 2020 Medal Winners Project Synopses

**Care Redesign (CR) Best Practice Medal**

**National University Hospital**

Project title: "Nurse-Performed Bedside Dysphagia Screening for Post-Extubated Patients in ICUs"

Introduction:

Post-extubation dysphagia (PED) occurs in 62% of intensive care unit (ICU) patients following endotracheal intubation for 48 hours or longer. PED predisposes patients to risk of aspiration, resulting in increased pneumonia, reintubation and prolonged hospitalisation. There is currently no standardised nurse-performed screening (NPS) techniques and high-risk patients are directly referred to speech therapists for formal assessments. By streamlining the NPS PED protocol, it aids nurses in early identification of PED and reduces unintended complications.

Objectives:

This quality improvement initiative aimed to achieve 75% of the nurses trained and competent in performing nurse-performed bedside screening for post-extubated patients within 12 months. It aimed to improve resumption of oral intake within 48 hours post extubation, reduced reintubation events, post-extubation pneumonia rates and length of hospitalisation in post-extubated patients within 12 months.

Team Composition:

The team comprises intensivists, Advanced Practice Nurses (APNs), Speech Therapists (STs), and nurse champions from the five adult intensive care units (ICUs).

Key Features:

1) An NPS PED protocol was designed based on adaptation from Massey Bedside Swallowing Screen, which consisted of theoretical e-learning modules and bedside practical training.
2) Collaborated with the STs to develop a detailed protocol for post-extubated patients, inclusion and exclusion criteria for patient population across medical, surgical, cardiothoracic and coronary care ICUs.
3) Developed a standardised dysphagia screening template on NUH intranet for easy accessibility.
4) Identified ICU nurse champions who underwent practical training and competency assessment by STs; in turn trained and assessed all the RNs.

Impact:

- 100% ICU nurses were trained and competent in nurse-performed bedside dysphagia screening
- Oral intake within 48 hours post extubation increased from 32% to 76%
- Reduction of reintubation events secondary to pneumonia from 71% to 12%
- Reduction of post-extubation pneumonia by 7%
- Median length of hospitalisation was 21 days (pre-implementation) to 14 days (post-implementation)

Empowering nurses in PED screening improves early resumption of oral intake, decreases reintubation events, pneumonia rate and length of hospitalisation. With standardisation of an NPS PED protocol, healthcare professionals were able to screen in a more consistent and timely manner, ensuring safety and care efficiency by adopting a safe oral feeding strategy for post-extubated patients.

## ANNEX A: National HIP 2020 Medal Winners Project Synopses

**Care Redesign (CR) Best Practice Medal**

**Singapore General Hospital**

Project Title: *"PeriopeRativE ProgrAm foR Elderly (PREPARE)"*

Introduction:

Frailty is a state of reduced physiological reserve predisposing one to adverse outcomes when exposed to stressors such as surgery. It is one of the strongest predictors of postoperative complications. This is a great concern in our healthcare system as the currently ageing population means more frail elderlies will be needing surgery. Despite the important association between frailty and postoperative complications, there is no internationally standardised frailty assessment tool for the preoperative settings.

In addition, the current decentralised and unstandardised approach to identify and serve frail elderlies for preoperative optimisation is expensive due to the unnecessary duplication of services, and poor in equitability as many patients are unaware of these beneficial services.

Objectives:

SGH implemented a frailty assessment tool to identify frail elderlies during preoperative assessments. The team also employed a centralised approach to providing in-house prehabilitation to frail patients thereby improving postoperative outcomes and reducing cost.

Team Composition:

The project comprises of a multi-disciplinary team of anaesthetists, physiotherapists, Internal Medicine physicians, nurses, dietitians and administrators at the Singapore General Hospital's Pre-Admission Centre (PAC).

Key Features:

1) Prospective observational study to validate the use of Edmonton Frailty Scale (EFS) for frailty assessment The EFS score was found to be a significant predictor of postoperative complications and longer lengths of stay.

2) Formation of a multi-disciplinary PREPARE team comprising of anaesthetists, nurses, physiotherapists and healthcare administrators to facilitate seamless screening, referral and preoperative optimization. The PREPARE team is embedded at the Singapore General Hospital PAC, a one-stop preoperative care centre providing pre-surgery counselling, risk assessment and health optimization before surgery. Patients undergo a series of preoperative tests at PAC to assess their "fitness" for surgery.

3) Engaged primary surgeons to improve take-up rate of PREPARE. Increasingly, surgeons started referring patients whom were suspected to be frail for earlier review by the PREPARE team, so the team would have a longer period to optimise patients prior to surgery.

Impact:

The outcomes were compared between the post-PREPARE cohort and the pre-PREPARE cohort.

- Reduction in median hospital length of stay in vulnerable-frail patients by 2-3 days
- Average proportion of vulnerable-frail patients with no complications improved by 24%
- Lower average and median bill sizes for patients

Patients were provided with a personalised pre-habilitation strategy, translating into better care delivery for patients.

## ANNEX A: National HIP 2020 Medal Winners Project Synopses

**Workforce Transformation Best Practice Medal**

**Tan Tock Seng Hospital (TTSH)**

Project Title: *"Engaging Volunteers in Performing Para-Clinical Tasks"*

Introduction:

Rehabilitation is strongly recommended after total knee replacement (TKR) to improve knee range-of-motion (ROM), muscle strength and functional mobility. Knee ROM is an important clinical indicator where the success of TKR is often measured based on restoration of knee ROM. Patients with limited knee ROM often have functional limitation and poorer quality of life.

Higher exercise dosage in acute stage (in the ward) translates to better knee ROM after TKR. However, self-exercise compliance remains at the average baseline of 75%. Exercise compliance was poor due to post-op pain and fatigue, lack of motivation, lack of confidence and fear of doing exercises incorrectly. Conventionally, volunteers in healthcare settings are commonly involved in non-clinical tasks.

Objectives:

The objective of the programme was to develop a volunteer transformation programme which aims to equip and empower volunteers to take on para-clinical roles in Total Knee Replacement Rehabilitation to improve patients' exercise compliance and clinical outcomes.

Team Composition:

The project is led by the TTSH Physiotherapy department, together with the Orthopaedic Surgery Department, Ward 85, and the Center for Health Activation (CHA).

Key Features:

Volunteers are upskilled through a structured training curriculum, in which the volunteers can educate the patients on correct knowledge about TKR rehabilitation, as well as, guide and supervise them with their rehabilitative exercises.

Impact:

This is the first workforce transformation programme in Singapore that involved volunteers that are usually present for non-clinical tasks. Through upskilling the informal workforce, it transforms the conventional healthcare delivery model and bridges the current gap in TKS patient's rehabilitation journey. Since the initiation of the volunteer programme, it has benefitted a total of 285 patients from October 2018 to July 2019 with 390 volunteer-guided rehabilitation exercises. This contributed to an increase in the percentage of patients who achieved ROM from baseline of 75% to 7-month average of 83.8%.

This initiative improved patients' health outcomes and enhances their experience. Volunteers are simultaneously empowered to pick up new knowledge and skills that can be applied to their personal lives and the community. Since its inception in October 2018, the programme has proven to enhance patients' clinical outcome and experiences sustainably in the long run.

## ANNEX A: National HIP 2020 Medal Winners Project Synopses

**Workforce Transformation Best Practice Medal**

**Tan Tock Seng Hospital (TTSH)**

Project Title: *"Redesigning call-out system for chest physiotherapy*"

Introduction:

Physiotherapists (PT) working in hospitals are often required to attend to call-outs, defined as undertaking emergency calls and attending to patients after hours. Very often, these call-outs requires chest physiotherapy which utilizes a variety of techniques to loosen secretions and enhance its removal from the airway. Patients who requires emergency chest PT are often critically ill or under respiratory distress. In such situations, the PT has to make prompt and accurate decision. It can be stressful for PTs to be on call-out duty. Even more so for less experienced PTs when faced with inappropriate callouts and to make the judgment call for declining such unnecessary request.

Objectives:

The project aims to redesign the call-out system to better manage inappropriate chest physiotherapy call-out cases and ensuring that staff provides timely, safe and effective management while minimising stress.

Team Composition:

The project team comprises of Physiotherapists (PTs) of varying experiences and specialities.

Key Features:

To redesign the call-out system to better manage inappropriate chest physiotherapy call-out cases, and ensuring staff provides timely, safe and effective management while minimising stress.

1) An algorithm was developed to provide a clear and safe guide, providing a criterion for call-out activation and guidance on patient care. This provides a safe framework for basic practice, enabling PTs to make decision within the scope of knowledge and experience
2) The information was made easily accessible for staff on intranet and in hardcopies.
3) New roster planning pairs less experienced PTs with a consultant PT who specialises in cardiopulmonary physiotherapy, providing an opportunity for the less experienced PTs to be trained.

Impact:

The redesigned call-out system resulted in a significant improvement in the number of inappropriate attended cases by 53%, and $11,360 man-hours and transport costs were saved for the department. Annualised results also showed that PTs are required to come back to attend inappropriate call-out 6 times lesser compared to baseline.

The reduction in number of attended call-outs and support from consultant PT reduced fatigue and stress levels significantly for PTs who are rostered for call-out duties. Altogether, the new call-out system ensured a sustainable delivery of emergency chest PT services to patients without increasing healthcare cost.

## ANNEX A: National HIP 2020 Medal Winners Project Synopses

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