

Design With Care

Designing
People-Centred
Healthcare





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Designing
People-Centred
Healthcare

Community
System Innovation
Point of Care

Tan Tock Seng Hospital National Healthcare Group Singapore

Design With Care

Designing
People-Centred
Healthcare



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Foreword

On our way to a childcare centre situated in the hospital, my young daughter once asked why an ambulance is white in colour. She observed that the patients arriving by ambulance often look sad, and perhaps a rainbow-coloured vehicle would cheer them up.

A colleague overseeing the hospital's infrastructure development once interviewed a next of kin who was waiting at the atrium while his wife underwent surgery. When the husband broke down and shared his anxiety and fear, it changed how my colleague saw the role of common spaces. Instead of simply providing function, they needed to offer moments of comfort and peace to anxious next of kin too.

In healthcare, we often take a left-brain approach to solving problems. But many issues require us to go beyond logic and take an empathetic approach as well. We need to observe and speak to our patients, caregivers and fellow colleagues in order to understand their different challenges, needs and aspirations. These are often unspoken, but very important. They help us forge a mutual understanding of what others are experiencing and come to more user-centred solutions. This is the power of design.

Design in healthcare complements the existing repertoire of improvement and innovation tools and methodologies. Be it a process, experience or product, using design pushes us to understand the underlying and complex issues behind a problem, and addresses the elephant in the room. It also helps to create a better experience through collective wisdom and creativity.

This design playbook chronicles such a journey in seven healthcare design projects. Each pushes the envelope of how we can serve our patients and community better and differently. They are accompanied by guides to seven design tools, which you can take a run at during your next improvement and innovation endeavour. You will experience first-hand how design can bring about radical collaboration, germinate creative ideas and result in sustainable solutions that can solve real issues in our healthcare system today.

May you be inspired! #DesigninHealthcare

Lynette Ong

Transformation Director, TTSH



Transforming Healthcare in Singapore: Designing People-Centred Care

Health systems in the developed world have been adapting to challenges posed by their ageing populations, including that of healthy life expectancy. While more people are living longer today, they are also spending a larger part of their lives in ill health.

Singapore is home to some 440,000 people aged 65 and above—a population which will more than double by 2030. A recent Ministry of Health study comparing the burden of disease in Singapore between 1990 and 2019 found that while the average life span has increased some 9.3 years to 84.9 years in 2019, the healthy life expectancy has not grown as fast.¹

The National Healthcare Group's (NHG) cluster of healthcare institutions serves some 1.4 million residents in Singapore, and 17 per cent are aged over 65 years old, a proportion higher than the national average of 13 per cent. NHG has identified three key drivers of healthcare utilisation and costs as the population continues to age—frailty, the rising prevalence of chronic diseases and the impact of poor lifestyle habits. The COVID-19 pandemic has also compounded the trends of chronic diseases due to sedentary and unhealthy lifestyles, according to the

- 1 "Global Burden of Disease 2019 Study Findings." Ministry of Health. Accessed October 29, 2021. <https://www.moh.gov.sg/news-highlights/details/global-burden-of-disease-2019-study-findings/>
- 2 "National Population Health Survey Findings." Health Promotion Board. 18 November, 2021, <https://www.hpb.gov.sg/community/national-population-health-survey/survey-findings>

National Population Health Survey 2020.² In response, the group has launched various efforts to address this key question: "How might we deliver better care through people-centred designed products, services, systems and messages?"

As part of the NHG cluster, Tan Tock Seng Hospital (TTSH) has embarked on a journey to deliver people-centred healthcare through care and process redesign since 2007, with the inception of the Kaizen Office and introduction of Lean management principles and practice. Today, the office is part of the Transformation Division, supporting large system-level changes and ground-up initiatives to improve care delivery continuously with interdisciplinary care teams. The professional expertise of the team comprises Lean practitioners, Service and Industrial designers, Digital Precision engineers and Organisational Development practitioners. There is also a Living Lab, a maker space based at the Centre of Healthcare Innovation in TTSH, to encourage staff to tinker with their innovation ideas.

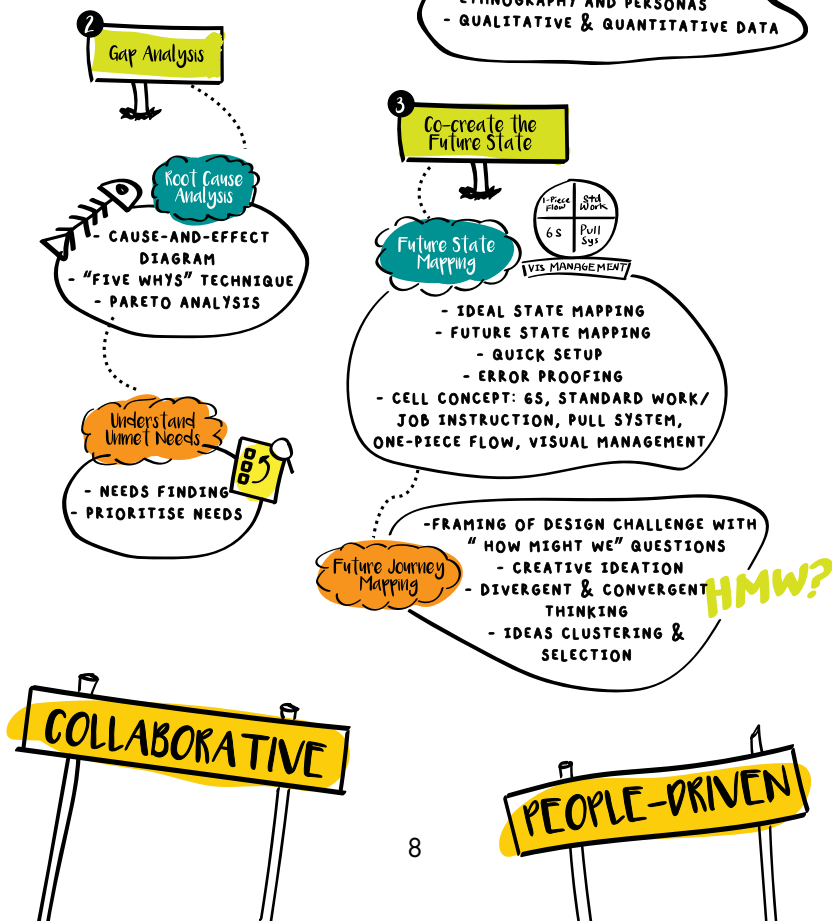
"As we go beyond our hospital into the community, we have to innovate new ways of delivering care, both as a specialist hospital and together with primary care and community partners."

Prof. Eugene Fidelis Soh
Chief Executive Officer, TTSH & Central Health

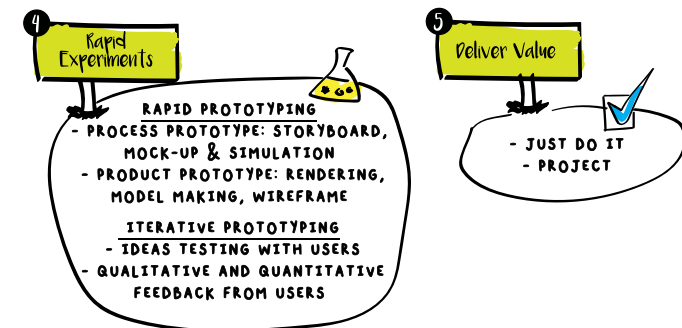
Every care and process redesign effort by the hospital centres around the needs of patients, while also considering that of other stakeholders in the ecosystem such as caregivers and community care partners. We achieve this through a variety of approaches specific to the problem or needs at hand, and they are underpinned by the principles and concepts of Design Thinking, Lean and Organisational Development.



for Empathy and Efficiency based Improvement & Innovation



8



This book showcases seven examples from the spectrum of care and process redesign efforts by the hospital, as told through the healthcare professionals who spearheaded the transformation. Each is an example of not just good design, but what "great design" can achieve.

"Great design isn't measured by desirability, novelty, or awe factor but by its ability to drive meaningful change—advancing agency and equity within communities, and helping people and organizations take bold leaps forward."

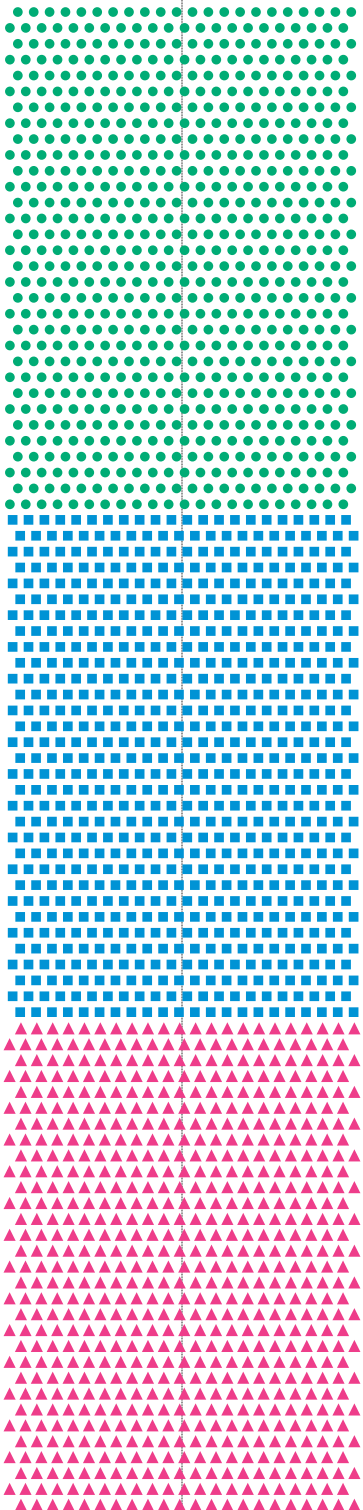
IDEO.ORG—10 Years of Impact

Developing these from ideas to concepts and finally a new product, process or experience brought us great satisfaction. We hope these real-world case studies can inspire other creative problem solvers across the healthcare sector too.



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Projects



Overview of Projects

Community



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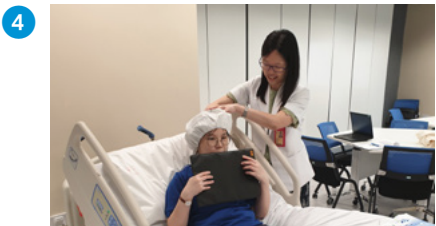


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System Innovation



Care Beyond Boundaries 48



Delivering a Better Pharmacy 60



Empowering the Future Digital Workforce 70

Point of Care



Enabling Independence 80

Seamless Shared Care

Project 01

Enhancing the transfer from acute to community hospitals

CHALLENGE

The average transfer time of a medically stable patient from TTSH to a community hospital was approximately 5.5 days. It delayed patients' entry into rehabilitation and sub-acute care facilities, while their extended stay occupied acute beds that could have been made available for critically ill patients requiring admission.

SOLUTION

The extensive paperwork and clarifications required before transfers was reduced by TTSH and its community hospitals agreeing to access a shared system of medical records. Patients and next-of-kin were encouraged to agree to referrals more readily with new collaterals that raise awareness on the important role of community hospitals. These efforts reduced overall transfer time.

Team



Clockwise, from left:

Kucy Ng

Director, Division of Integrative and Community Care Operations, TTSH

Hayley Chau

Deputy Director, Division of Integrative and Community Care Operations, TTSH

Munawar Kahlik

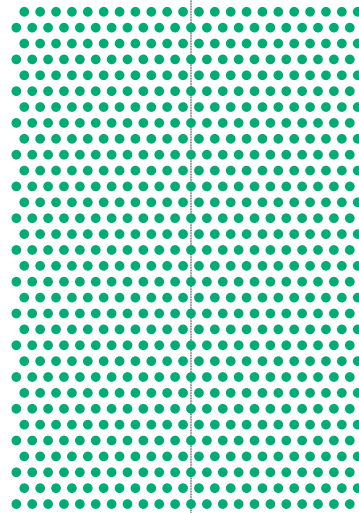
Senior Executive, Division of Integrative and Community Care Operations, TTSH

David Yong

Manager, Referrals & Admissions Office, AMK-THKH

Wang Zhiye

Senior Nurse Manager, Level 10, TTSH



Part of a nurse's job at TTSH is ensuring patients in stable condition are promptly transferred to community hospitals for rehabilitation care. But Sister Wang Zhiye used to have her hands tied. She needed the patient's doctor, therapist, nurses and social worker to each complete their section in the referral report to inform the receiving community hospital. The process could take up to a week, despite daily reminders from the nurses.

“我们只能干着急 (We were anxious but unable to do more),” recalls Sister Zhiye, who is also one of the nursing leads in discharge planning at TTSH.

“But today, we just click a button and the patient can go tomorrow.”

This “button” refers to a fast-track referral process introduced in 2019. Instead of writing up multi-disciplinary team reports, nurses can give a direct notice to TTSH's two nearest community hospital partners, Ang Mo Kio-Thye Hua Kwan Hospital (AMK-THKH) and Ren Ci Community Hospital.

Previously, referral delays kept patients at TTSH, an acute hospital, longer than necessary. It delayed the start of their dedicated rehabilitation care and patients were spending more days in the healthcare system than required to recover. They also occupied beds that could be freed up for the critically ill. The issue was pervasive across all acute hospitals in Singapore, which led the then Health Minister, Mr Gan Kim Yong, to issue the challenge in 2017 of achieving a one-day transfer to community hospitals.

“When our CEO conveyed this to us, I thought it was a very tall challenge,” recalls Ms Hayley Chau, Deputy Director, Division of Integrative and Community Care Operations at TTSH.

While the clinicians of TTSH, AMK-THKH and Ren Ci regularly meet to discuss clinical matters, the staff had seldom collaborated across different departmental roles and ran independent operations. A team of doctors, nurses, therapists and administrators involved in the referral process across all three hospitals were convened to create a seamless experience for patients with the support of the Kaizen Office.

Observing from The Ground

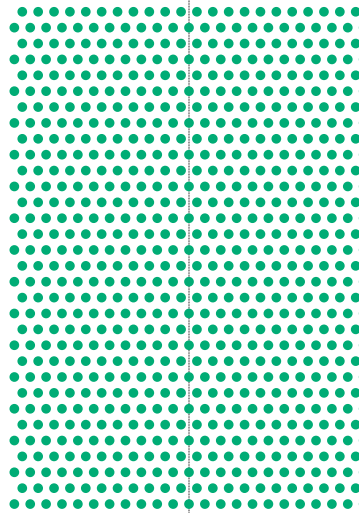
The project team began by conducting observation studies. They visited each of the three hospitals to learn about the administrative processes required for a patient to be referred from an acute hospital to a community hospital. At each of the 28 rounds of observations, the project team consisted of process owners who could explain what was going on and stakeholders who were impacted by it. Someone who was unfamiliar with the process, commonly referred to as a pair of “Fresh Eyes” in the design thinking process, was also present to provide neutral observations.

As the project team retraced the journey, beginning from when a TTSH patient was identified as suitable for transfer, to him or her finally being physically admitted into a community hospital, they witnessed first-hand how onerous it was.

“When we went to see how the community hospitals’ admissions team assess TTSH referrals, we realised there were so many hard copies of paperwork being used,” says Hayley.

Few of the overwhelmed staff had a clear idea of how the transfer process worked in the complex organisations and what was required of the process, adds Mr David Yong, Manager, Referrals & Admissions Office at AMK-THKH.

“Everyone had their own paperwork and did not know what was going on the other side. For example, TTSH’s ward staff might not understand how we determined if a patient was suitable



Observation studies were conducted at the three hospitals to map the processes involved in a patient transfer.

for transfer and there was sometimes a delay because certain information was missing,” he says.

“The observation studies allowed us to see what each other did and get a deeper understanding of why so much time was being consumed in order to transfer a patient. Many of these processes used to be invisible to us.”

Sharing for Better Care

One area of work duplication identified by the project team was how TTSH’s referral reports were largely similar to its internal medical reports. An initial idea was for a new common referral assessment to be shared by all hospitals—but this only added more paperwork. As all three hospitals use the same Electronic Medical Records (EMR) system to store patients’ information, the project team saw an opportunity to share their medical reports instead. TTSH then convinced its management to allow the community hospitals to immediately retrieve the necessary information from its internal medical reports in advance of a patient’s transfer.



TOOL HIGHLIGHT: OBSERVATION STUDY

By going to the ground, the project team saw for themselves the challenges involved in a patient transfer. An observation study can help you empathise with users to uncover hidden needs! ↳ Page 100

“Previously, TTSH’s different family groups had to submit their reports into a portal for the receiving hospital to assess the patient case. We have to give credit to AMK-THKH and Ren Ci because they are willing to take on the load of now reading the case notes directly from the EMR system,” says Mr Munawar Kahlik, a senior executive at TTSH’s Division of Integrative and Community Care Operations. “Traditionally, we worked in silos and the good thing about this project is that we dropped our boundaries and saw how we can improve as one.”

The new fast-track referral process was successfully piloted in July 2018 and rolled out hospital-wide in October that year. Since then, it has almost halved the average transfer time from 5.5 to 2.9 days. While it can now take as little as a day for straightforward cases, it sometimes takes longer if the patient has complex medical needs such as dialysis, or if there is a lack of matching gender beds at the community hospitals.

The faster process has not only benefitted patients but made life more convenient for the nurses, says Sister Zhiye.

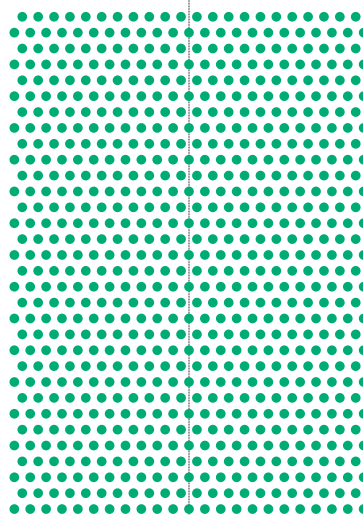
“We used to receive many calls from the community hospitals because they wanted to find out more to ascertain if a patient was indeed ready to be transferred. Now, they can access the information themselves,” she says.

The fast-track referral process became so popular that several TTSH nurses transferred patients ahead of time as they feared there would be no available beds at the community hospitals. There is now a daily status update on vacancies and the hospitals have set guidelines to make it clear when a patient is suitable for transfer.

 **47.2% improvement***

in the average number of days it takes to transfer a patient from TTSH to a community hospital.

* Comparing FY2017 (excluding 95th percentile) to the period between 15 October 2018 and 31 March 2019.



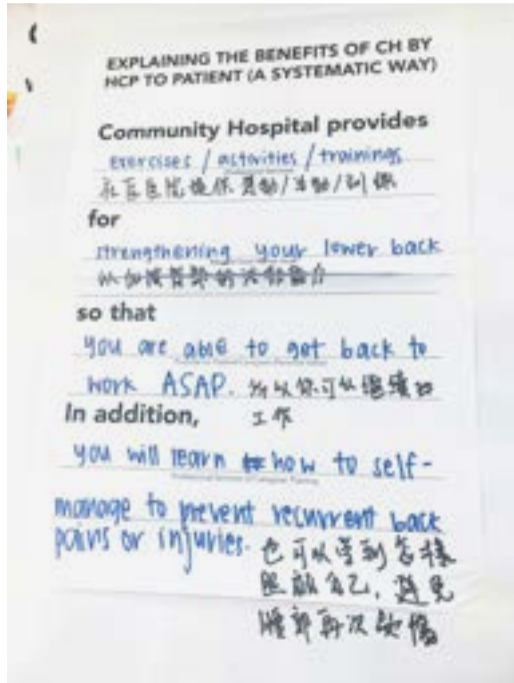
“Instead of having a separate project team come up with solutions, we empowered people on the ground to co-create a solution. Knowing that whatever they came up with will impact the work they do was a great motivation for them.”

Mr Munawar Kahlik

Senior Executive, Division of Integrative and Community Care Operations, TTSH



By mapping out the entire referral process, the project team was able to identify the bottlenecks and come up with solutions to speed up the transfer.

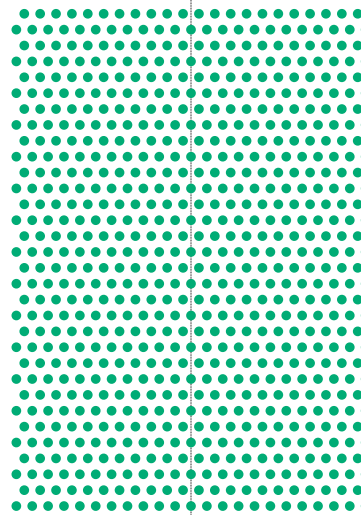


↑ The project team worked with students from Nanyang Polytechnic's School of Design to design collaterals that better communicate to patients and caregivers the important role of community hospitals. The students provided fresh perspectives as they were unfamiliar with the existing process and the medical jargon.

↖ A template used during the workshop to help hospital staff systematically outline the benefits of community hospitals. The process taught them how to explain in a manner that was more convincing and easily understood.

Improving Patient Communications

Besides a duplication of paperwork, the observation studies also revealed that transfers were sometimes delayed by patients or their next of kin who hesitated to move. The project team followed up with user interviews and discovered that there was a poor understanding of the community hospital's role in providing post-treatment and rehabilitative care. Many patients and next



1,686 man-hours* estimated to be saved



annually as doctors, nurses and therapists no longer draft a referral application separately.

* Extrapolated from the period between 15 October 2018 and 31 March 2019.

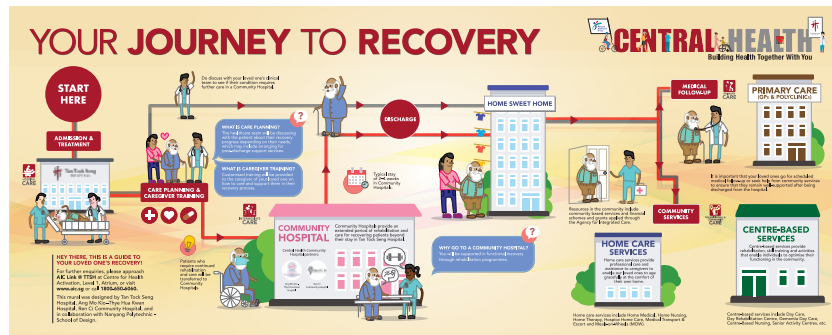
of kin were reluctant to transfer because they thought acute and community hospitals were one and the same.

"They only knew the difference between a hospital and a nursing home and did not understand why they needed to be moved from one hospital to another," says David. "They asked us what's the difference and why ask me to go so far away?"

Together with students from Nanyang Polytechnic's School of Design, the project team created a series of collaterals to explain the role of community hospitals. One of which is a mural illustrating a patient's healthcare journey after a stay in an acute hospital that is now prominently displayed at TTSH's Visitor Registration Counter. Hayley explains that hearing directly from the patients and their next of kin helped the project team realise that public communications about community hospitals had to be improved.

"The design process made us examine the fundamentals and value of community hospitals," she says. "We realised we needed to explain it better if we wanted patients to take up the service, rather than assuming that what we said is enough for their understanding."

David adds that it was immensely helpful to work with the students who were unfamiliar with the healthcare industry.



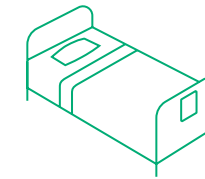
A booklet and a mural explaining the important role of community hospitals was created with the help of design students from Nanyang Polytechnic to better explain their importance.

"The students gave us fresh perspectives on how the public perceives the whole healthcare system. As professionals in the industry, we tend to use jargons that only we understand. We got to see a patient's healthcare journey through the eyes of non-professionals," he says.

Although the project has long been completed, the months-long collaboration has forged a good working relationship among the members of the different hospitals. This was useful during Singapore's COVID-19 outbreak in 2020. When TTSH needed to ramp up bed capacity for patients with the infectious disease, it was able to transfer several of its long-staying patients to the community hospitals on short notice.

"The design process has sharpened our approach to work. We now know who to discuss matters with and we have built up a strong collaborative relationship," says Hayley.

2,007 bed-days avoidance



for the non-critically ill from when the fast-track referral process was introduced in October 2018 to March 2019. It equated to an additional 236 acute admissions within the same period.

"The trust that was fostered has created a virtuous cycle of friendship and support. It wasn't just one improvement project that we did. It has got a ripple effect."

The project team is grateful for the participation of AMK-THKH and Ren Ci, as well as the help of Nanyang Polytechnic's School of Design for improving communications on the role of community hospitals.

Making Better Mobility

Project 02

Improving the experience of
Personal Mobility Aids

CHALLENGE

Personal Mobility Aids (PMAs) help people with disabilities get from place to place and perform their everyday activities. However, the user experience is far from satisfactory due to the lack of customisation in the PMAs, environmental barriers and the social stigma of using them. As a result, PMAs bring about their own challenges.

SOLUTION

Six prototypes for new PMAs and accessories were co-created with users, occupational therapists and other stakeholders. The solutions were developed for five different personas, each of which was created by the project team after their observation studies of PMA users in their daily lives.

Team



Clockwise, from
top left:

Florence Cheong

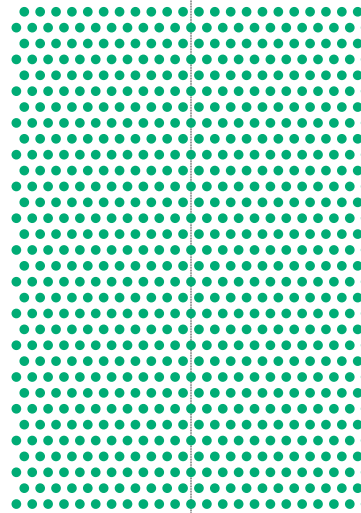
Head of Department,
Occupational Therapy,
TTSH

Lee Hengky

Senior Occupational
Therapist, Community
Health, TTSH

Nani Adilla Zailani

Senior Occupational
Therapist, TTSH



Yung Ma-Mee enjoys having lunch with her colleagues. However, securing a table at a food court during the peak lunch hour is daunting because she requires a table that is wheelchair accessible. Ma-Mee has Systemic Lupus Erythematosus, an autoimmune disease that causes immense pain in the joints. The wheelchair gives her mobility, but it can also dampen her social life.

Even after finding a table, it may be too low for her wheelchair which means she will have to slump forward during her meal. She also needs help bringing her food to the table, because it is tricky to balance a tray with one hand while using the other to control a joystick to navigate her wheelchair. Feeling like a burden to her companions, she decides to bring lunch from home in the future.

Ma-Mee may be a fictional character, but her struggles reflect the realities of many Personal Mobility Aid (PMA) users. These were uncovered by TTSH's Occupational Therapy (OT) department in preparation for its OT Day in 2020. The annual event sees the department's therapists embark on improvement projects. In that year, they worked with the Kaizen Office to organise a makeathon to tackle the mobility experience of PMA users.

Before brainstorming solutions, the therapists were tasked to conduct several rounds of observation studies to witness first-hand how their patients used PMAs in their everyday lives. While home visits are part of the therapists' job, they seldom spent extended periods with their patients.

"On a normal home visit, we are very task focused. We get our assessments done, the forms signed and the funding applications filled. But because we had the luxury of time during the observation studies, we followed them through their daily routine and that gave us the opportunity to see things that we might not usually see," says Ms Nani Adilla Zailani, a Senior Occupational Therapist at the hospital.

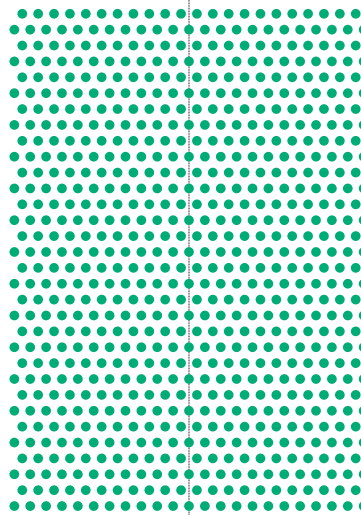
For instance, Nani witnessed how a patient spent almost 10 minutes closing his door at home because he had to negotiate a tight space while on a wheelchair. Although the patient brought this up in earlier interviews, she did not realise how challenging it was. As she followed the patient around his neighbourhood, Nani also noticed how he had to navigate around a street lamp placed



Through an observation study, the project team spent time with different PMA users to see and experience the challenges they encountered in their daily lives.

in the middle of the only wheelchair-accessible pathway to his home—an obstacle he had failed to mention.

“Sometimes the users understate their difficulties because they have been dealing with them for a long time, until they no longer see them as problems. But they exist nonetheless,” she says.



Personifying the Problems

Over one month, the team of 18 therapists and therapy assistants observed nine PMA users of various ages and backgrounds, as well as interviewed them about their challenges. These ranged from the inconvenience of storing items bought during a trip out, to the long waiting time for lifts. Besides physical obstacles, there were also psychological ones, such as a patient feeling stigmatised and even defeated when she couldn't fulfil what she thought were her duties as a mother. The challenges were clustered into themes for developing five fictional personas, each representing the different archetypes of PMA users.

“The personas helped us to take a step back to put ourselves in the users' shoes. Instead of jumping into a solution, we asked ourselves if something could really be a problem for the personas or was it only a problem for us the therapists and vice versa,” says Senior Occupational Therapist Mr Lee Hengky.

The five personas—Anxious Annie, Empowered Emily, Chill Charlie, Pessimistic Peter and Yung Ma-Mee—also captured the behaviours and attitudes of the different types of PMA users. “Pessimistic Peter”, for example, is wary of how members of the public look at him. He avoids taking the lift with others because people have previously expressed displeasure with him taking a longer time to enter and exit. This was a familiar issue to the therapists but not one they would usually focus on as there was no immediate solution, explains Nani.

“After going through all the pain points, we realised that some issues faced by users were outside of their control. For instance, after multiple failed attempts at wanting to integrate, they become pessimistic. It is just as important to look at how the public can help create a better mobility experience for all the ‘Pessimistic Peters’ out there,” she says.

The therapists then organised a two-day makeathon to co-create solutions with the PMA users. They also invited engineering and design students, as well as government and industry representatives involved in the mobility journey. The participants were grouped into six teams of diverse make-up and asked to come up with solutions for an assigned persona.

For instance, participants working with “Anxious Annie” were asked how they might create easy to use navigation controls that help new users overcome their anxieties towards the use of the PMA. It drew a range of ideas, including a back sensor to detect nearby obstacles and a mobile application that displays wheelchair accessible routes.

“If we approached the questions only from a therapist’s perspective, we would focus narrowly on whether the user can get out of the house, go to work or access the toilet,” says Hengky. “The participants came up with a joystick training plate for ‘Anxious Annie’ to better train her in the precise control of a wheelchair, which we had not thought about before. While we had been teaching patients about the different wheelchair functions, we simply assumed they could do it.”

Prototyping Better Solutions

The ideas were developed by the participants into prototypes with cardboard. The affordable and easily available material allowed them to create life-size models to quickly test their assumptions and ideas. The PMA users in the team could also try out the solutions and share their feedback immediately.

“The prototyping process helped the teams see how feasible and practical their solutions were. It was nice to see them helping one another to make something from scratch,” says Hengky.

Of the six prototypes created during the makeathon, three were eventually selected for further development based on their innovativeness and feasibility. They include a PMA with omni-directional wheels to make 360-degree turns in tight spaces;

and **9** **11** organisations
PMA users participated in the
makeathon.




“I’m scared I may run over someone’s foot I do not want to inconvenience those around me.”

ANXIOUS ANNIE

Age	41	House Type	Lives in 3 room flat
Gender	Female	Family	Widowed with 1 child
Experience	Anxious User	Occupation	Stay at home mum

Annie is transitioning into using the PMA as an independent mode of transport, as her function progressively worsens with having muscular dystrophy. Overwhelmed by the PMA controls for navigation, however, she finds it easier to rely on her family members to push her around on a manual wheelchair than using the prescribed PMA. Her fear of inconveniencing the public is her greatest deterrence, hence resorts to using the PMA only when her family members and caregivers are around.



Despite having the PMA for slightly over 1 month, Annie has only used the PMA 3-4 times since. The PMA is still in most condition and was stored in the original plastic sheet. She only uses the PMA when there are family members with her.



Annie is competent in navigating with the PMA when in open spaces. However in narrow spaces or when people walk too near her, she becomes stressed, panics and mis-controls the joystick on the PMA. This has resulted in her crashing into people, walls and doors many times.

KEY INSIGHTS

Easier to depend on others than to use a PMA

Although Anxious Annie is fairly capable in navigating alone, she gets anxious and panics at road junctions and crowded spaces. As such, she has grown accustomed to having her family members with her while using the PMA, or depend on them to push her around with a manual wheelchair.

Fear of the environment

As a considerate individual fearful of troubling others, Anxious Annie often keeps to herself. This leaves her in a vulnerable and stressful environment whereby she takes it upon herself should there be any mishaps that occur while navigating on the PMA.

ATTITUDE TOWARDS HEALTH

Annie has a full understanding of her medical condition and fulfils her medication obligations diligently. Although her progressive weakness means that she is becoming more dependent on PMA, she prefers not to.

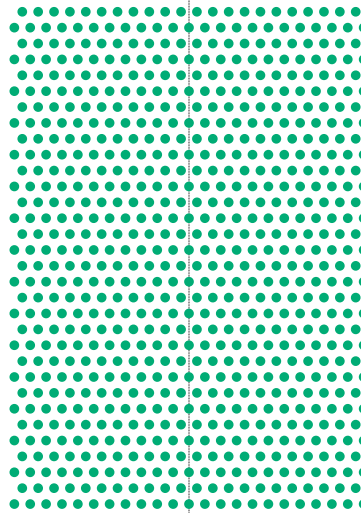
ATTITUDE TOWARDS PMA

Annie’s comfort and ease in having her family members push her around with a manual wheelchair leaves her with limited motivation to consider the use of the PMA as an alternate means for independent transportation. She is focused on maintaining her way of life using familiar products such as the manual wheelchair due to her low confidence level.

“Anxious Annie” is one of five personas created by the project team based on observation studies and user interviews to represent the different types of PMA users. Each listed out a persona’s attitudes, challenges in the mobility journey and opportunities for solutions.



Each team in the makeathon consisted of therapists, PMA users, design students as well as government and industry representatives. It helped them look at the challenges from a range of perspectives.



TOOL HIGHLIGHT: PROTOTYPING

Building cardboard models of their ideas allowed the makeathon participants to test their assumptions and the feasibility of their solutions. Prototyping is a way of getting early feedback from users and improving your ideas! ↳ Page 125



The three prototypes selected for further development. They include (clockwise from left) accessories such as a stow away lunch tray; a PMA with omni-directional wheels so that a user can easily make a turn in tight corners; and a joystick plate for training new users.

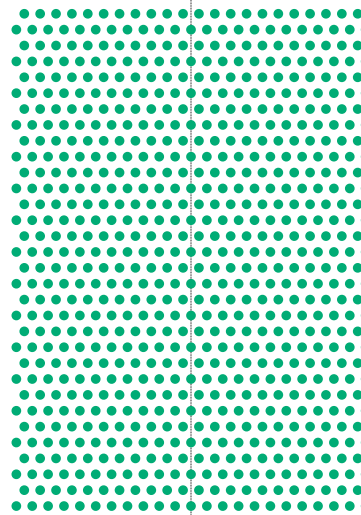
a series of attachments to customise for different scenarios, including a tray table and a retractable rain canopy; and a joystick training plate for new PMA users. These prototypes are being refined so they can be commercialised and made widely available to all PMA users.

"The makeathon not only drew out fresh solutions, but also taught the therapists to re-examine the everyday lives of their patients and their work," says Hengky.

"It has helped me look at things more systematically and question why things are done in a certain way. The design thinking process helps us break away from the norms to make our service and process more efficient."

This "spirit of innovation" is what Nani hopes more of her colleagues can embrace too.

By producing cardboard prototypes of their ideas, the makeathon participants could quickly test the feasibility of their ideas with the PMA users in their team and make immediate refinements.



"Just because two people have the same medical condition doesn't mean that they face the same problems in their daily lives. The design thinking tools help us go beyond our academic knowledge to see their lived experiences."

Ms Nani Adilla Zailani
Senior Occupational Therapist, TTSH

"It's very easy to get sucked into the day-to-day without thinking about how to make the experience better for patients," she says.

"The thing about healthcare is that it's so personal yet some of the problems they face are pervasive. If we can come up with simple design solutions that will benefit a lot more people, then why not?"

The project team is grateful to the following participants in the makeathon: Agis Mobility Pte Ltd, AWWA, Building and Construction Authority, Housing & Development Board, Khoo Teck Puat Hospital, Land Transport Authority, St Luke's ElderCare, United BMEC Pte Ltd and student volunteers from Nanyang Technological University, National University of Singapore and Singapore University of Technology and Design.

Boosting the Road to Recovery

Project 03

Redesigning the rehabilitation journey to increase uptake and completion

CHALLENGE

Less than 50 percent of total referrals to Day Rehabilitation Centres (DRCs) are taken up by patients. Many who undergo rehabilitation also drop out before completion. Despite earlier efforts to speed up the referral process and make rehabilitation more attractive, the uptake has not improved significantly.

SOLUTION

An observation study was conducted to learn why patients and next of kin do not take up rehabilitation or drop out, and what would motivate them to participate. From these insights, eight personas were created to represent the different types of DRC users and their behaviours. They guided the generation of solutions.

Team



Clockwise, from left:

Doreen Yeo

Chairperson, Allied Health, TTSH

A/Prof Ian Leong

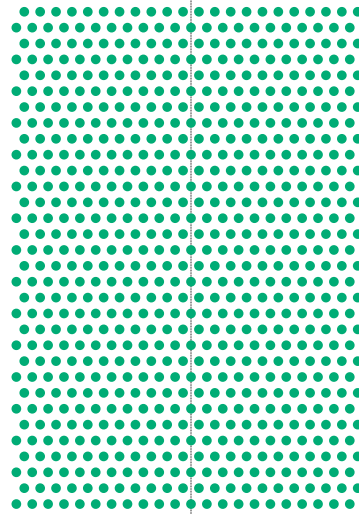
Assistant Chairman Medical Board, Community Care Integration, TTSH

Teo Kaiting

Assistant Director, Allied Health Operations, TTSH

Lim Sing Yong

Deputy Director, Population Health Office, TTSH



A patient's road to recovery does not end after being discharged from the hospital. In Singapore, those suffering from injuries as well as acute and chronic conditions are referred for therapy at one of the many Day Rehabilitation Centres (DRCs) found across the island. They help patients fully recover and reduce their likelihood of being readmitted to hospitals.

Yet less than half of these patients take up their referrals and a significant proportion who do also drop out before completion. This has been a persistent problem for TTSH, says Ms Lim Sing Yong, Deputy Director, Population Health Office.

"Over the years, we have conducted several value stream mappings to find choke points within the flow of patients from acute hospitals to the community," she adds. "We always thought uptake could be improved with a better referral process."

But even after TTSH's administrators addressed the cost of the service, the lack of transport and long waiting times for a placement, the uptake rate did not improve significantly.

"This led us to think if we should look at the problem from a different perspective as we had been assuming a lot of things," Sing Yong says.

Seeing the Problem Anew

In 2020, she and Ms Teo Kaiting, an Assistant Director at TTSH's Allied Health Operations, did just that by initiating an improvement project and enlisting the help of Kaizen Office. Working with administrators and therapists from TTSH, its partner community hospitals and DRCs, the project team conducted an observation study with patients and next of kin to understand their challenges with rehabilitation and what would motivate them to take up the service.

While the study confirmed long assumed supporting factors such as transportation and subsidies that encouraged take up, there were also unexpected discoveries. Some patients rejected rehabilitation because they were contented with their current level of mobility or relying on their caregivers. It challenged the administrators who perceived being more independent as the

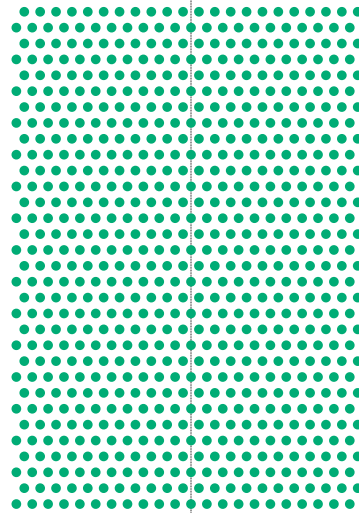


A Kaizen facilitator explaining to the project team how they can derive insights from their personas and journey maps.

goal for all patients. Others declined because they felt the DRCs they were referred to did not meet their needs. Some dropped out after their condition had improved because they preferred to practise the rehabilitative exercises at home instead of travelling to a DRC. Then there were patients who completed their care plan but felt that the DRCs they were referred to were not equipped to meet their needs.

“Patients are more knowledgeable these days. They know what to look out for in their rehabilitation journey and what services the DRCs offer,” says Ms Sandy Tan, a Senior Executive at TTSH’s Physiotherapy Department, who conducted several of the interviews.

Over nine months, the project team spoke to 55 patients and their next of kin from five DRCs, including Ren Ci Hospital, AWWA, St Luke’s Eldercare, Kwong Wai Shiu Hospital and St Hilda’s Community Services. The interviewees were mostly over the age of 60 and included not just patients who rejected rehabilitation or dropped out but also those who completed it. While the COVID-19 pandemic restricted these hour-long sessions to phone calls instead of traditional face-to-face sessions, the project team successfully gathered enough insights for the next phase of creating personas.



TOOL HIGHLIGHT: PERSONA

“Sally the Stretched Caregiver” and “Don’t See a Need Debbie” were some of the personas that helped Sing Yong, Sandy and Sarah understand who they should be redesigning the rehabilitation experience for. ↪ Page 110

Journeying With Patients

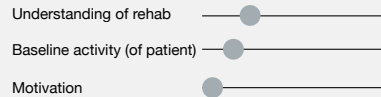
The interview responses across the three different groups of patients and their next of kin were studied for behaviour patterns using the Activities, Attitudes, Aptitudes, Motivations and Skills (AAAMS) tool. Each category of the tool encompassed a variety of values that were assessed on a scale. For example, the interviewee’s attitudes towards familiarity versus being “open to new things”. Or, to what extent the interviewee was self-motivated or needed to be pushed to exercise. By identifying common behaviours across each group of interviewees, the project team could then create personas. Patients who were “content with the current state” also tended to “place low priority in rehabilitation” and “find rehabilitation troublesome”. In contrast, many patients who accepted or completed rehabilitation were discontented with their current state and wanted to be self-sufficient. Hence, they placed a high priority in rehabilitation.

In all, the project team developed eight personas of patients and next of kin. Each was brought to life with a name that encapsulates what the persona values as well as a portrait and details of his or her motivations, goals and frustrations. An example is “Uncle Sim the Stubborn Patient” who is inactive and rejects rehabilitation as he does not enjoy stepping out of his comfort zone. Another is “Dan the Delayed Patient” who is self-motivated and started working out independently as the wait for referral was too long. A third persona was “Sally the Stretched Caregiver”, who did not take up rehabilitation for her mother

Reject Type 2

Sally the Stretched Caregiver

*"Of course the centre is good",
"Not about how good the centre
is", about whether she can afford
to spend the time and money.*

**Context**

Sally is the caregiver of her mother, who is a patient with high and complex needs - dementia/mental disability. She takes care of all her mother's needs while still keeping her own job and personal responsibilities. As such, Sally faces burn out from time to time and is constantly worried about her mother.

Because Sally's mother has many other needs and health issues, she not see DRC as a priority as she has other problems to address. Physical rehab is not her priority. To Sally, her mother's current mobility is acceptable to her even though her level of dependence is high.

Obstacles to overcome

Sally is constantly stretched with having to solve other problems her mother faces and has little time, financial resources and mental capacity to understand/consider DRC.

To her, DRC does not meet her main concern in caring for her mother and would rather take up other care facilities such as dementia and general daycare, which meets her needs of finding respite care and meeting her other primary concerns.

With limited resources (time and money), she prioritises other medical arrangements.

Goals

To address her primary concerns first (respite care etc.).

Opportunities

- Rehab with other complementary services as well - such as dementia care or mental health care.
- Need to understand NOK/pt's fundamental needs first before addressing patient's rehab needs.
- Engage her when she is most receptive to other health options and integrate her choices, connecting rehab to other priorities in life

One of the eight personas created by the project team was "Sally the Stretched Caregiver". She was brought to life with details of her behaviour patterns, pain points and goals which eventually guided the ideation of solutions.

because she had multiple health conditions. This persona made the most impression on the team, says Ms Sarah Tan.

"We always hear about complex care coordination and the need to reconcile different appointments, but it was mostly in the Specialist Outpatient Clinic context," explains the Executive at TTSH's Population Health Office.

"But when we interviewed caregivers like Sally, we realised patients who are referred to DRCs may have mental conditions like dementia and other more pressing issues. So it's understandable if she is frustrated with the system because all the services are at different places."

"The personas opened the participants' eyes to what patients were feeling."

Ms Sarah Tan
Executive, Population Health
Office, TTSH

The persona even sparked a discussion on whether patients with cognitive difficulties should be referred to DRC at all, Sing Yong adds.

"We realised a DRC referral may not be the most appropriate. Regardless, many caregivers just follow our instructions, but I think they are feeling the strain. The persona made us reassess what is of value to patients and their families."

For each persona, the project team also mapped out his or her rehabilitation journey to identify where in the process they experienced frustrations or challenges. While "Carrie the Convincing Caregiver" needed more help during referral to encourage her father to take up rehabilitation, someone like "Derrick the Dissatisfied Patient" required more customised exercises and better communication of their rationale to help him complete it.

"Each persona has a different DRC experience, so it's important to lay out their journeys to find out the point where they dropped out and what contributed to that. This would determine the kind of interventions that would be required," says Sarah. "We would not have been able to understand the frustrations that the personas go through without breaking it down."



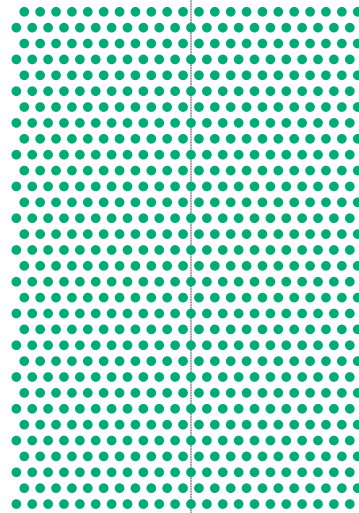
The rehabilitation journey of each persona was mapped out, from referral up to the completion of a DRC rehabilitation. Such journey maps helped the project team understand the persona's thoughts, emotions and challenges at key moments and to identify opportunities.

A More Sustainable Solution

The eight personas and their journey maps were presented at an ideation workshop in April 2021 which had participants from TTSH, DRCs and the Agency for Integrated Care. These stakeholders in the rehabilitation process were invited to form multi-agency teams to tackle the different challenges, and were guided by the personas and journey maps, says Sarah.

"Hearing the personas' journey map and knowing what they had to go through made the experience more personal. A lot of creative ideas spun out from the workshop," she explains.

For instance, one proposal was to list the benefits of rehabilitation exercises, just like how stores selling traditional Chinese soup advertise the health benefits of their offerings. They believed it would excite and challenge patients such as "Don't See a Need Debbie" who dropped out of rehabilitation after she stopped seeing its value.



"So instead of just telling patients to 'go do it', they can build their own therapy. This was a suggestion from a rehabilitation doctor, and it shows how the workshop enabled views from across clinical care providers to improve the value of DRCs," Sarah says.

Besides proposing solutions, the two-day ideation workshop also culminated with the participants envisioning the future of the rehabilitation journey. Some suggestions include improving communications on the important role that DRCs play, keeping patients frequently updated on their progress, and offering maintenance rehabilitation even after a patient's immediate issues are resolved. These have been shared with the Ministry of Health to help in the development of a national One-Rehab framework, which will ensure Singapore's healthcare system can provide timely access to the right level of rehabilitation care.

The team is currently awaiting to pilot the many solutions that came out of the project, but have already gained a new perspective about the problem, says Sing Yong.

"Healthcare providers, for example, should be less medical and prescriptive when approaching patients. They should understand what is of value to patients as the value proposition may not have been adequately understood by families or patients," she says.

"The observation studies and creation of personas were really opportunities for us to dig deeper into what the issues were. It has led us to come up with a more sustainable solution."

The project team appreciates the help of the Agency for Integrated Care and the DRCs that worked on the project, including AWWA, Kwong Wai Shiu Hospital, Ren Ci Hospital, St Hilda's Community Services and St Luke's ElderCare.

Care Beyond Boundaries

Project 04

Expanding healthcare beyond the hospital ward

CHALLENGE

Singapore's steadily ageing population is driving a growing demand for healthcare services amidst declining manpower. The existing healthcare system operates in silos, which results in a clunky experience for patients. It also relies heavily on healthcare personnel—a model which is unsustainable for the future.

SOLUTION

To better connect the entire healthcare experience by leveraging on technology and expanding the journey of care beyond the hospital into the home. By bringing healthcare closer to the patient, enabling anticipative care and empowering patients to be carers, future hospital wards can rely less on manpower yet deliver improved care.

Team



Clockwise, from left:

Dr. Hoi Shu Yin

Chief Nurse, TTSH

Yong Keng Kwang

Group Chief Nurse, NHG

Prof. Bernard Thong

Divisional Chairman,
Medicine, TTSH

Canny Lee

Deputy Director,
Nursing & Critical Care
Operations, TTSH

Instead of rushing to the doctors when feeling unwell, you first consult a chatbot. It guides you to the appropriate healthcare institution, be it a general practitioner, a polyclinic or a hospital. It even books the necessary medical interventions beforehand. During admission, the doctors and nurses are assisted by smart sensors to ensure early medical interventions when necessary. Your rehabilitation continues even after being discharged as you recover in the comfort of home with the virtual guidance of healthcare personnel.

This is a future of healthcare dreamt up by a team from TTSH. Ward without Walls (WoW) envisions a seamless care experience from home to hospital and back to home in response to two upcoming challenges faced by Singapore's healthcare sector as its population continues to age.

"It will be a double whammy with a manpower shortage and an exponential increase in healthcare demand due to growing chronic diseases. So we must figure out how to do things better without using too many resources in order to free up time for our healthcare personnel," says Mr Yong Keng Kwang, the Group Chief Nurse of NHG who led the project until October 2020.

Having previously ran another project to improve hospital ward designs for a better care experience, Keng Kwang and other TTSH nurses started WoW as a second phase of this effort. They assembled a multidisciplinary project team, including doctors, nurses, pharmacists, administrators and facilitators from the Kaizen Office, to reimagine the healthcare experience beyond the hospital ward, specifically pre and post-admission.

"If we can go upstream to manage the demand for acute services, we can better distribute the burden of care so that it is a more sustainable way of managing resources," Keng Kwang explains.

Learning from the Users

The project team began by learning from the recipients of care regarding their experience. Some 16 user interviews were conducted with former and existing patients as well as their caregivers, and what emerged was how "episodic" and "fragmented" the existing situation was. For instance, patients were often asked by different departments in TTSH the same

TOOL HIGHLIGHT: USER INTERVIEW

Speaking directly with patients and caregivers helped the project team to understand first-hand their challenges and feelings of the existing healthcare experience. A user interview assists in coming up with solutions that meet real needs. ↪ Page 105

questions about their health history. Care was also often communicated in a paternalistic manner, and patients were simply expected to comply even though they may not fully understand why.

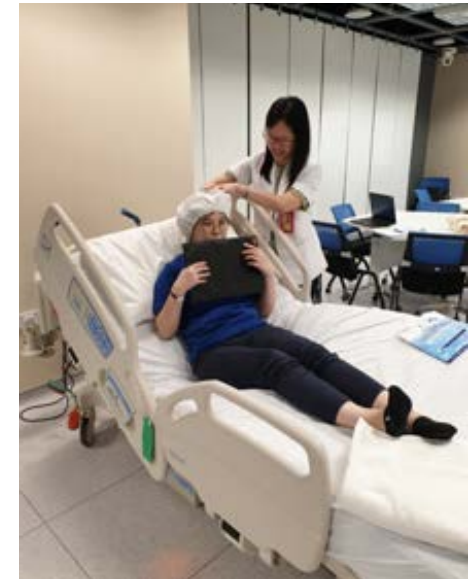
In contrast, patients wanted to be more involved in the care experience, but they were lacking in knowledge and confidence. It presented the project team with an opportunity to introduce a new model of care based on three principles. Firstly, recognising that the care experience is a transition that follows the patients. Secondly, empowering patients to be carers too. Finally, using technology to help healthcare staff better anticipate patients' needs and transform the hospital from a provider to an enabler of care.

"As healthcare professionals, we do know the importance of person-centred care and involving the patients more. However, the competitive demands in a hospital have shaped our priorities," says Dr. Hoi Shu Yin, the Chief Nurse of TTSH who now leads WoW.

"Realistically, it is just not possible to have one nurse follow a patient throughout the care journey. Hence, it became important to leverage on technology and redesign the care environment in order to increase the ability of our staff to provide relationship-based care."

To support their user interviews, the project team also conducted an immersion exercise where they role played as

Amongst various innovations the project team proposed was a self-cleaning shower cap to improve staff productivity. It was put to the test through an immersion exercise, where staff role played as patients (right) to assess (bottom) how it might improve the care experience.



“By taking a journey perspective in assessing healthcare, we could see how care is a transition and who are the pertinent stakeholders we should involve to improve it.”

Mr Yong Keng Kwang
Group Chief Nurse, NHG

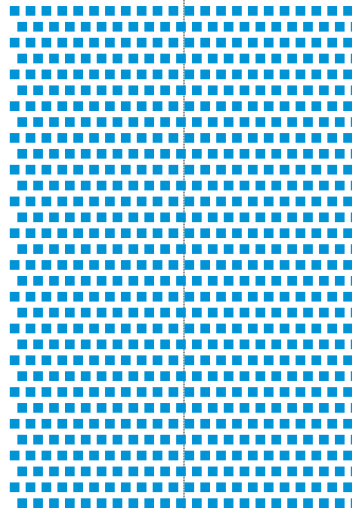
patients to test out various care improvement ideas. It helped the staff to better empathise with their patients, says Kaizen facilitator Mr Mohamed Razeen.

“It was an eye-opening exercise as the staff really experienced what our patients go through in the wards. It made them realise some of the innovations needed to be modified or dropped as they may not resonate well with patients,” he says.

Improving Processes Through Mapping

With a better understanding of the patients' challenges and needs, the project team carried out workshops to imagine what the care experience would look like in 2030. They created three elderly personas to focus their efforts on, including a patient living with her husband; a wheelchair-bound patient who had a caregiver; and one who stayed alone and was financially disadvantaged. Each represented a group of patients who consume healthcare services in TTSH differently.

The future care experience for each persona was mapped out in a storyboard to illustrate what the project team's solutions

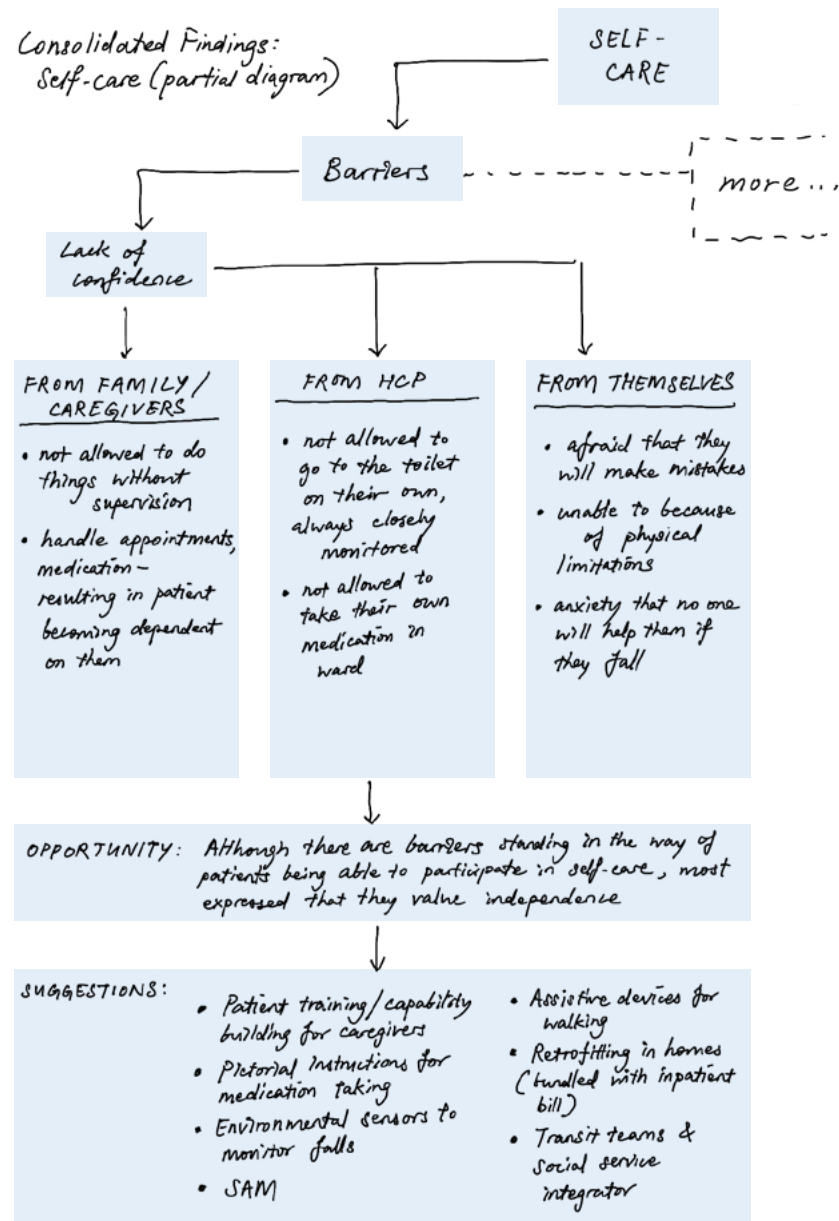


A storyboard for one of three personas created by the project team. It outlines several ideas, including making care more anticipative using smart wearable technology and creating platforms to empower patients to care for themselves.

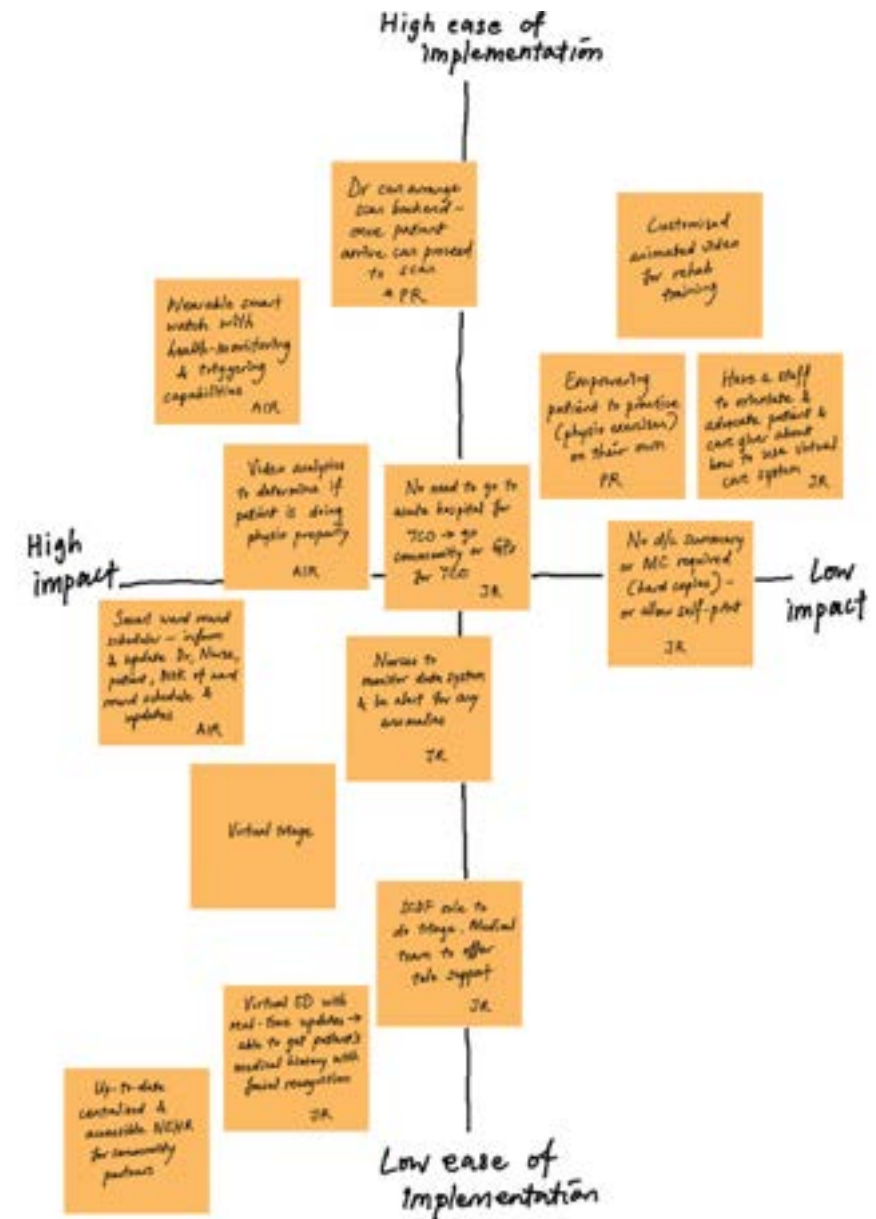
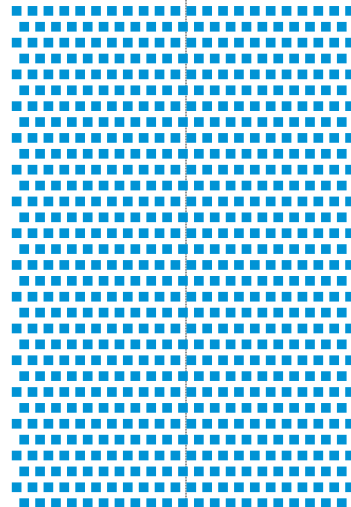
entailed. It allowed each idea to be holistically assessed by identifying existing processes that needed to be redesigned, the potential for automation, as well as how the role of healthcare personnel could evolve. For instance, to help patients better care for themselves in the hospital and at home, they need to be equipped with knowledge about their conditions. This requires the healthcare personnel to take on the role of an educator.

“When we think about innovation, we typically think about technology and the usual game changers. But how we can leverage innovation to redesign our services is to think beyond technology and improve processes instead. That's why the insights from the workshops were very important in helping the team understand the challenges of the future,” says Shu Yin.

She adds that technology is but an enabler.



One barrier to patients caring for themselves was the lack of confidence. From the insights gathered during the user interviews, the project team then identified the opportunity and relevant suggestions.



The ideas from the final workshop were assessed based on their level of impact and ease of implementation.

"If you don't change the way people do things then it is very hard to sustain the change. We need to also think about the role of the staff in the redesigned environment, so that it is fulfilling for them and they can thus add value to the patients too."

Solutions for Patients and Staff

Six of the most impactful and feasible ideas from the workshop were eventually shortlisted for piloting. For example, anticipative care in the form of remote monitoring technologies will enable patients to have uninterrupted rest instead of traveling in and out of the ward frequently for procedures and investigations. A universal digital platform for gathering healthcare data can help the different healthcare personnel share information and analyse big data trends to provide a seamless care experience. Finally, a virtual health service allows patients to learn about their conditions in the hospital and at home, so that they are empowered to care for themselves.

"Many of the ideas are not exactly new, but we are able to finesse them through the design thinking process," says Keng Kwang.

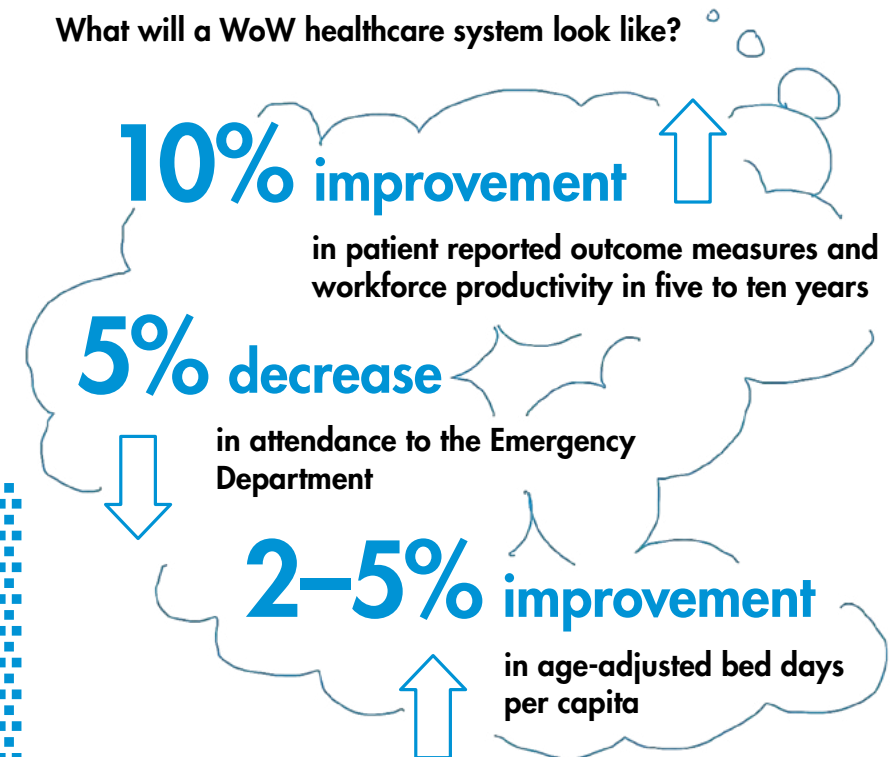
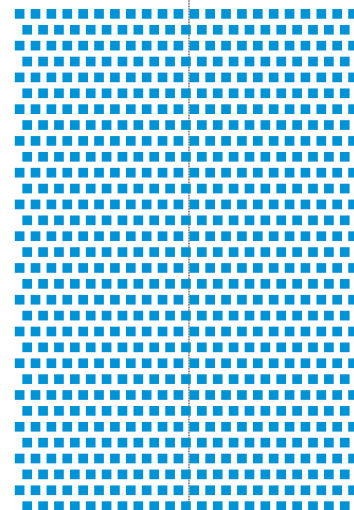
By taking a user-centric perspective, the project team was able to come up with fresh ideas that better aligned the needs of both patients and staff, he adds.

"For instance, learning that patients themselves don't want to be admitted into the acute hospital as far as possible helped us think of ways to refer them directly to the services they need instead of going through the Emergency Department," Keng Kwang says. "The Emergency Department is also happy that they can focus on the patients who need their attention the most."

Since the workshop's completion in August 2019, the project team has been working towards piloting the ideas in two TTSH wards. Some challenges that have to be resolved first include securing the data generated from the various monitoring technologies, as well as integrating the different ideas into a seamless experience.

When WoW is fully realised, Keng Kwang and Shu Yin hope it will improve patients' experience of transiting between care settings, raise their involvement in self-care and ultimately lead

What will a WoW healthcare system look like?



to better medical outcomes. On a systemic level, the project will also help acute hospitals provide more sustainable care by improving workforce productivity and reducing the number of days patients spend in a hospital. As patients are directed to more appropriate support in the community healthcare institutions, there will also be a decrease in admittance to the acute hospital's Emergency Department.

"Every hospital bed involves various medical resources and personnel such as doctors and nurses. If WoW really works, care will be redistributed and patients will not need to come to the hospital unless necessary," says Keng Kwang.

"In this way, patients can age in place. It is also what they truly want."

Delivering a Better Pharmacy

Project 05

A more convenient and
reliable medication delivery
service by design

CHALLENGE

Pharmacy prescription load at TTSH has increased to over 2,000 a day. As a result, patients end up waiting a long time to collect their medication. Although many can take up a medication delivery service that the hospital has had for years, it has not been popular.

SOLUTION

An observation study uncovered six personas representing different patient archetypes and their concerns with the existing medication delivery service. The personas were used in a workshop to guide participants to explore ways to improve the service. The solutions ranged from streamlining the service experience to improving the delivery packaging, amongst others.

Team



Clockwise, from left:

Lim Hong Yee

Pharmacy Director, TTSH

Benedict Lim

Deputy Director,
Pharmacy Operations,
TTSH (Previous)

Lim Woan Chyi

Principal Pharmacist,
TTSH

Chan Su Wei

Senior Pharmacist, TTSH

Lai Ho Yan

Senior Pharmacist, TTSH

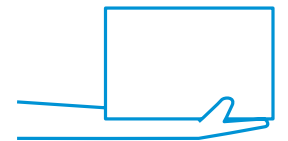
A hospital consultation typically ends with a visit to the pharmacy. But some TTSH patients can now head straight home after seeing the doctor at its Specialist Outpatient Clinics (SOCs). Instead of making another stop at the pharmacy and waiting in line to collect their prescribed medication, it is delivered to their homes or any preferred local address instead.

This is one of the ways TTSH has improved its medication delivery service. Although the service has been around for over a decade, few have taken it up. In 2018, there were just up to 17 orders every day. In contrast, prescription loads at TTSH's pharmacy had grown to over 2,000 orders daily and many patients ended up waiting a long time to collect their medication.

"If we continued our old ways, we would not be able to cope, and our pharmacy counters will have to keep increasing as more patients come to us. We would never have enough space and manpower" says Ms Lim Woan Chyi, Principal Pharmacist, TTSH.

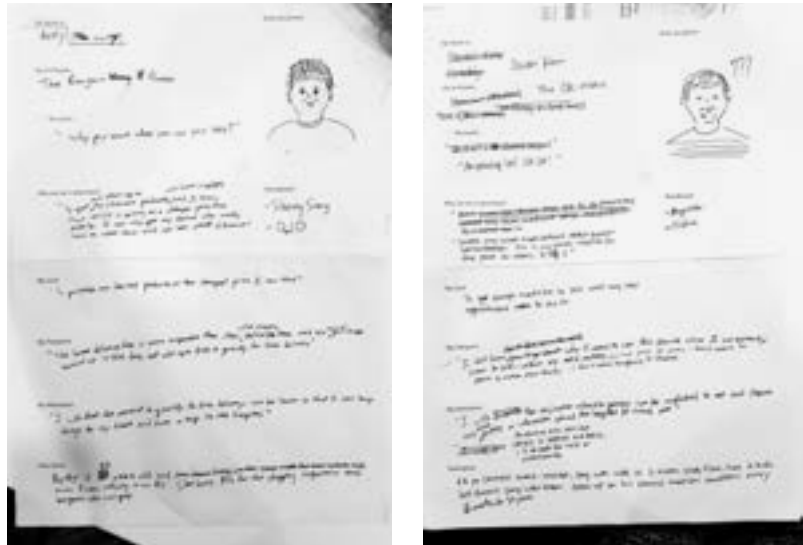
In September 2018, she led a team of pharmacists to explore ways of getting patients to switch to its medication delivery service instead. In collaboration with the Kaizen Office, they first conducted an observation study with patients and their next of kin. Some 13 individuals waiting at the pharmacy were interviewed about their concerns with medical deliveries, which ranged from uncertainty in payment methods to challenges in arranging a delivery date. The interviewees were also quizzed on what would motivate them to use such a service. The various insights were then used to develop personas representing the needs of different users.

From **17** to **90**



daily delivery orders since the improved service was introduced in January 2020.

“While we knew there were patients with different personalities and concerns, we never had the time to sit down and structure them into different personas. Through the exercise, we realised there were very different groups of people whom we could then target solutions for,” says Senior Pharmacist Ms Lai Ho Yan.



A user study conducted by the project team uncovered six different personas who used the pharmacy. The unique behaviour and needs of each guided the solutions proposed by participants during a workshop to formulate solutions.

“Traditionally, we target a problem by focusing on the gaps and root causes. But coming up with ‘How might we’ statements helped us think out of the box and broaden our perspectives.”

Ms Lim Woan Chyi
Principal Pharmacist, TTSH

The team identified six personas and named some of them with colloquial Singlish phrases that distinguished their traits. For instance, “Caleb the Chop Chop Curry Pok” typifies patients who are very eager to get their medications quickly and with little fuss. Another was “Aunty Betty the Bargain Queen” who is highly sensitive of price and value and feels it is not worth paying extra for delivery. The personas were eventually presented to their colleagues in the pharmacy team during an ideation workshop where they were invited to co-create solutions.

Beyond Problem-Solving

Instead of immediately tackling the problems presented by each persona, the workshop participants were asked to first craft ‘How might we’ statements. As suggested by the name of the tool, it requires a collaborative effort to reframe problems as opportunities for improvement and welcomes all sorts of ideas, not just the most feasible ones. For the “Kiasi Karen” persona who worries about the quality and accuracy of medical deliveries—embodying the local term for someone who is overly worried about things—Ms Cheyenne Lee and her team asked:

“How might we assure patients’ confidence in the delivery process?” Such a statement helped them focus on addressing fundamental emotions and needs, says the participant who works in the operations side of the pharmacy.

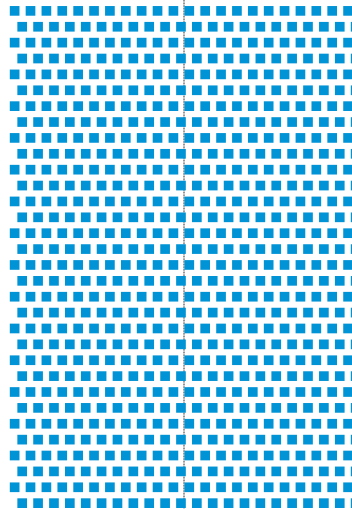
“In the past, we focused on the gaps and came up with ways to close them which is short-term. ‘How might we’ statements encouraged us to think of the ideal situation so that we are more likely to come up with sustainable and long-term solutions,” Cheyenne adds.

Her team initially struggled to craft a statement because they were overly focused on the problem.

“We were stuck at ‘How might we improve the delivery process,’ but the Kaizen facilitator challenged us to think about what we wanted to achieve by doing so. It encouraged us to think of the value we wanted to bring to patients,” she says.

Cheyenne’s team proposed a new packaging design to better assure patients that their medical deliveries were secure. It replaced what was previously just a TTSH-branded plastic bag secured with a cable tie, which sometimes came off and left patients wondering if their medication had been tampered with. Today, the hospital’s medical delivery comes in tamper-proof parcel bags that are labelled with quality assurance messages.

By broadening the challenge from simply increasing the uptake of the medical delivery service, unexpected solutions also emerged.



Two of the six examples of ‘How might we’ statements crafted during the workshop. They helped workshop participants explore a wider range of possible solutions.

The “Money Matters Mandy” persona, for instance, is typical of patients and next-of-kin who make multiple trips to the hospital to collect medication because they cannot afford to pay for it in one go. Thus, workshop participants proposed a programme for TTSH staff to volunteer with medical deliveries. It allows staff to get closer to patients in the community and reduces the hospital’s delivery costs. Since launching Going the Extra Mile (GEM) in December 2019, some 15 deliveries have been made—although this was stopped momentarily because of the COVID-19 pandemic.

The Pharmacy Reimagined

Besides formulating solutions, the project team also improved the medication delivery experience. They conducted an experiential research of popular e-commerce platforms such as Redmart, Lazada and Fairprice Online to identify useful features that can be incorporated into a new secured order form for medical refills. They included offering a selection of delivery dates and allowing patients to upload partial memos of their previous prescription to ensure their orders are correct. The research helped the project team better anticipate patients’ expectations too. For instance, while they may be used to deliveries being left in their corridors

TOOL HIGHLIGHT: HOW MIGHT WE

Instead of tackling the problem directly, workshop participants were asked to reframe them as statements of ideal scenarios. Such ‘How might we’ statements encouraged more innovative solutions. ↪ Page 116

or risers, this was not possible with medication which has specific safety and privacy concerns. It led the project team to educate the delivery vendor and patients on such restrictions.

“We are also aware that our patients are consumers in the market, and they have expectations of deliveries and do comparisons,” says Ho Yan. “We tried to find out what noteworthy traits popular e-commerce sites have and adopted those that were relevant to us.”

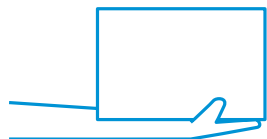
The new and improved delivery service was launched at the end of 2019. Since then, the project team has engaged TTSH's SOC's to recruit eligible patients to take it on as a default option. It has lessened the load at the pharmacy such that pharmacists can better focus on providing quality counselling to those who need it. The improved medication delivery service has also been well-received by patients, and even became essential for them during the COVID-19 pandemic, says Woan Chyi.

“As many could not leave their house to get their medication, they appreciated the service. It was fortunate we started this project before COVID-19, otherwise we would have been frantically trying to figure out how to get medication to our patients,” she says.

While the volume of TTSH's medication delivery service increased dramatically by over 36 times during the pandemic, the project team believes there is room for more growth. They hope the experience will ultimately help patients rethink what the role of a pharmacy is too, says Cheyenne.

Up to 615

delivery orders were made daily in April 2020, when a partial lockdown was started in Singapore because of the COVID-19 pandemic.



A proposal for a new packaging (left) to address patients' concern about the security of their medical deliveries, which used to be sent in plastic bags. It was eventually realised as tamper-proof parcel bags (below) that also come printed with messages for quality assurance.



“Success is when medical delivery becomes the default option,” she says. “When patients think of a pharmacy, they don't think of a physical counter but one that offers delivery and counselling only for those who need it. It will be a total change in the traditional mindset.”

Empowering the Future Digital Workforce

Project 06

Co-creating an employee-centric digital experience to help staff grow on the job

CHALLENGE

To identify and resolve the challenges faced by staff, line managers and human resource staff with the existing Human Resource Information System (HRIS) as part of a transition to a more relationship-based human resource management experience.

SOLUTION

Four service blueprints were co-created with employees for the different stages of human resource experience, including onboarding, daily matters, performance management as well as learning and development. These informed the request for proposals issued to service providers and will guide the development of a new HRIS.

Team



Clockwise, from left:

Koh Teck Chee

Director, Group Human Resource, NHG

Gary Chua

Senior Manager, Group Human Resource, NHG

Ang Shi Teng

Executive, Group Human Resource, NHG

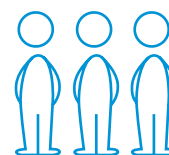
If a Cantonese-speaking patient enters a clinic, a clueless nurse can simply ask around for a colleague who speaks the language. Imagine doing the same at a hospital, where there are thousands of patients and clinicians. The challenge of enlisting the help of personnel with the required expertise—be it a language or critical care skill—could be done in just a matter of clicks with an updated human resource system envisioned by NHG.

The new Human Resource Information System (HRIS) will increase productivity at the group's various healthcare institutions and help NHG gain a comprehensive knowledge of its 20,000-strong workforce. The group can then empower each one of them to grow on the job, moving away from the traditional command-and-control style of management, to one that fosters self-direction and collaboration among employees.

"We need a relationship-based transformation, that is, to be very clear of where the people we recruit come from, what experiences they have, the career pathway they want and then share these talents across institutions," says Mr Koh Teck Chee, Director of Group Human Resource at NHG.

The vision led to plans in 2020 to overhaul the existing HRIS. It was also an opportune time as new technologies had emerged since the last major transformation in 2013. The existing system was based on a conventional model of human resource (HR) management that was designed mainly for administrative purposes such as collecting and storing employees' records, ranging from their qualifications to pay and benefits. Although NHG has updated the system over the years, the current HRIS is nowhere near the user-friendly, data-driven model needed to facilitate deeper employee engagement.

"Our employees' LinkedIn profiles are more comprehensive than



1,726 staff or 5% of the workforce across 10 NHG institutions were engaged for this project.



During workshops to gather feedback about the existing HRIS, employees were asked about the challenges they faced as well as what features and improvements they would like to see.



their HRIS profiles. We don't know what they have accomplished or the courses they have taken outside. The system only captures one-time-data, which is their CV at the point of recruitment, so our understanding of our staff is lacking," Teck Chee explains.

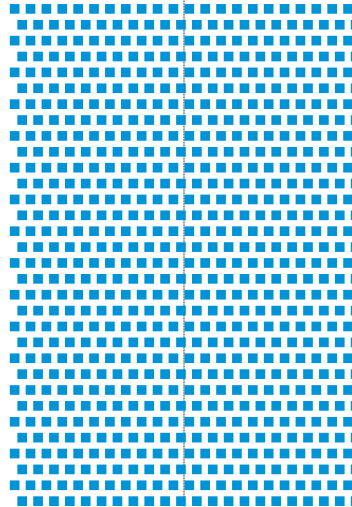
Moreover, employees largely use HRIS today only for transactional purposes, such as submitting claims or applying leave. Such a system sends a wrong signal about the organisation's relationship with its employees, says Mr Gary Chua, a Senior Manager at NHG's Group HR team.

"We want to improve performances by giving developmental feedback, to have regular conversations on growth opportunities. This is not possible with the current system that restricts us to the traditional annual appraisals," he adds. "It doesn't facilitate relationships or communications."

Co-Creating with Employees

While NHG's Group HR team had a vision for the new HRIS, the question was how it would manifest in the different touchpoints and processes. They had also heard complaints about the existing system's shortcomings over the years. But instead of coming up with solutions on their own, they roped in the Kaizen Office to facilitate a co-creation process with NHG's employees to reimagine the future digital human resource experience.

The project team first surveyed over 1,500 staff across NHG's 10 institutions to understand how they felt about the existing HRIS



During the project, Singapore was hit by the COVID-19 pandemic and the typical in-person workshops had to go online to adhere to safe management measures. Although challenging, participants were still able to engage and generate ideas.

and identify their needs and challenges. It was supplemented by deep dives into the issues with some 114 representatives from all the family groups in NHG. These user studies turned up various key insights that confirmed many of the issues the HR team had previously identified.

For example, HRIS does not offer an overview of the skills and certifications that staff have acquired over the years. Thus, line managers find it challenging to maximise their staff's expertise and experience or offer appropriate career advice for advancement. Moreover, the existing system was designed for yearly assessments, which makes it difficult to review any longer-term undertaking during performance appraisals.

"What we needed was to rethink the form and shape in which each of these areas could take. For example, we know there's a need to track performances. The question is how? How do we motivate people? Do we want to wait till the end of the year to do an assessment, or can we have regular conversations about the projects that the staff said they wanted to do, to help improve their performances?" says Mr Matthew Loh, who is a HR Director at TTSH and part of the project team.

Storyboarding the Future

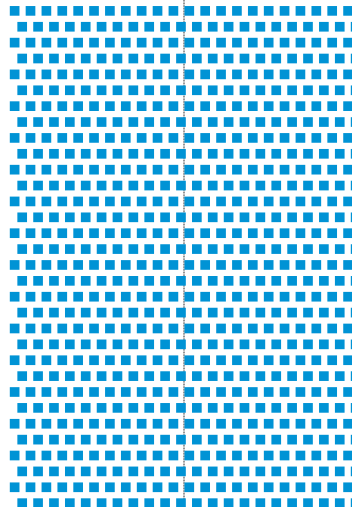
A workshop was also conducted with 26 staff across NHG to envision the future HRIS experience. They were asked to

propose solutions for the four typical HR functions—performance management, learning and development, onboarding, and daily matters such as leave application—based on earlier user insights collected by the project team. For each solution, participants were guided to detail its key features and benefits entailed through the HR journey as well as the technology required to realise it.

Such a process mapping exercise helped them consider the entire experience of what they proposed from the perspective of the user and look out for any flaws and inconsistencies. The solutions were then combined into four service blueprints at the end of the workshop. These came in the form of storyboards to showcase how they would work and to help the project team identify what is required to achieve them.

One example is a performance management app that offers templates for line managers to set goals for each of their staff and give feedback throughout the year. The app also has a dashboard powered by artificial intelligence to analyse staffs' individual strengths, weaknesses and performance to help managers make better decisions about promotions or recommend training to open doors for one.

The service blueprints were then validated and further refined over six sessions with another 58 participants from various family groups and institutions. A final workshop was organised with other HR staff to study the feasibility of the blueprints and identify what was required in the back end to support the experience



TOOL HIGHLIGHT: STORYBOARD

The complexity of an ideal HRIS was made visible through storyboarding. The tool translates ideas into visuals to help users better understand how a new product or solution works and appreciate its value.

↳ Page 120



A storyboard illustrating an ideal performance management app with templates (left) for line managers to set goals for their staff and give feedback throughout the year. The app also has a dashboard (right) powered by artificial intelligence to analyse staffs' individual strengths, weaknesses and performance.

as desired by employees. While gathering feedback to solve problems is nothing new to NHG's Group HR team, the design thinking process helped them see the underlying problems more clearly and make more confident assessments, Gary says.

"It was good to look at the problem from a whole process perspective. The storyboards and journey maps broke down the HR system into processes which helped everyone see the linkages," he adds.

Reframing the issue was helpful in eliciting more insightful responses from the participants too, Matthew says. Otherwise, such discussions sometimes spiral into an unfruitful "complaint session".

"As we started the conversation, it invariably moved into a discussion of what's not right about the system. Here's where the Kaizen facilitators came in and asked, 'How do you think it can be changed?'. I thought that was a nice way to take the participants out of simply lamenting over the problem," he says.

A Continuing Conversation

Having finalised the service blueprints in February 2021, the Group HR team integrated them into their request for proposals. The blueprints will guide the service vendors on what to offer in the new HRIS and how NHG evaluates the proposals.

“Design thinking is that rigorous drilling of an idea so that, at the end of the day, you’ll find something that is tangible. It is not satisfied with people saying, ‘We need to value add’. It probes further and asks ‘How can we do it?’. Having a framework like that forces us to suss out the truth, unpeel and find the core of it all, and not to be fooled into motherhood statements.”

Mr Matthew Loh
Director, Human Resource, TTSH

“In the past, our demands were very piecemeal. A table here and some checkboxes there. We don’t invest the time to ideate and think about the process we want,” says Teck Chee. “The blueprints allow us to look at the workflow from start to end and see how we can merge the ideal HR processes and the



The proposed HRIS can enable smarter and more efficient decision making about staff performance. This storyboard showcases a dashboard offering an overview of individual staff and their performance rating (left), and the use of tools such as GROW coaching to provide feedback.

experience that the staff have asked for. We are very clear of what we want, and which vendor is better for what reasons.”

The new HRIS is scheduled to be launched only in January 2023, but the three-month-long experience of formulating it through design thinking has rejuvenated the Group HR team, Teck Chee adds. The user-centric process helped highlight many unnecessary procedures that administrators too often failed to see, and it also became an opportunity to educate fellow colleagues on why certain HR policies were in place.

“It’s easy for the staff to say the process is lousy and a waste of time. But when you bring them down to co-create the ideal process, they are also able to see the challenges we face,” he says. “During the workshops, we all had to break out from our individual perspectives and see how we are contributing to the success of the organisation.”

Such a holistic view now informs the way the HR team sees their work too, Gary says.

“We can do many things for our staff, but is it beneficial to them or are we creating more problems?” He asks. “The process was a good way to learn the things that really mattered to them. It made us look at HR from the employees’ perspective.”

Enabling Independence

Project 07

Designing a universal adaptive holder for differently-abled people

CHALLENGE

Patients with limited hand functions and upper limb strength are unable to care for themselves by independently performing tasks such as feeding. Existing adaptive devices are not widely available in Singapore, and they also lack flexibility in accommodating different kinds of disabilities and needs.

SOLUTION

A new adaptive device was proposed by a TTSH occupational therapist. The prototype underwent a series of usability tests with patients to ensure that it can accommodate a range of utensils and grooming tools, and work for their identified disabilities. It is currently undergoing further development.

Team



Clockwise, from left:

Tay Ming Min
Senior Occupational
Therapist, TTSH

Chung Kai Siang
Innovation
Technologist, Kaizen
Office, TTSH

Wilson Chin
Innovation
Technologist, Kaizen
Office, TTSH

Reaching out for a spoon, scooping up food and bringing it to the mouth seem to be all that there is to feeding. But the seemingly effortless act for many of us consists of multiple hand motions—shoulder joint movements, forearm pronation and supination, wrist flexion and extension, just to name a few—and losing the ability to do any one step renders a person incapable of eating independently.

Such is the case for many of the patients whom Senior Occupational Therapist Ms Tay Ming Min cares for. They suffer from neurological and orthopaedic conditions such as Parkinson's disease, motor neuron disease, spinal cord injuries and fractures that affect their upper limb strength and motor skills. It makes everyday tasks such as feeding and brushing one's teeth an uphill challenge. Many patients end up depending on their caregivers, but desire to regain some ability to care for themselves, she says.

"They want to be able to do at least one or two things on their own and have full control over how they do it. Although these are simple tasks, being able to carry them out successfully gives patients a sense of control of their daily lives," Ming Min explains.

While adaptive devices exist for those who have lost control of their upper limbs to independently perform some of these daily tasks, they do not always meet a patient's needs. As a result, Ming Min and her colleagues often modify them on a case-by-case basis to cater to different disabilities and various stages of functional recovery.

"We do simple tweaks for different ailments, using Velcro straps, thermoplastics or household items like sponges. The problem is these materials don't last, so we have to keep modifying them. Since it's all by trial and error, it's very time consuming," she says.

Ming Min set out to tackle this problem after returning to Singapore from her further studies in New York City where she saw how occupational therapists and assistive technology practitioners 3D-printed customised solutions for patients. It inspired Ming Min to use the 3D-printers in the Centre for Healthcare Innovation Living Lab (CHILL) and tap on the engineering and design expertise of the Kaizen Office to come up with a more versatile adaptive device for feeding.

She chose to focus on this activity as the requisite motor skills are relatively easier to imitate with hardware, but the choices of such devices are limited in Singapore. Many also work for only one kind of utensil such that patients need to buy separate devices for a fork and a spoon. Ming Min envisioned a device that is compatible not only with various utensils but can also serve patients with different motor difficulties.

Breaking Down the Challenge

Together with Kaizen's Innovation Technologists Mr Chung Kai Siang and Mr Wilson Chin, Ming Min kickstarted the project by understanding the problems her patients had with the existing solutions. They conducted a usability test where they observed the patients using the devices and carried out time-motion studies to pinpoint when they faced the most difficulties.

"To envision what we need to create, we must first identify the problem. From understanding what the existing solutions offered and the limitations they have, we were able to break down the problems into its core pieces and then put the pieces back together in an effective way," says Wilson.

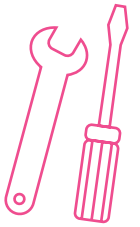
The trio also analysed a box-full of feeding devices—both in the market and modified—that TTSH's team of occupational therapists had amassed over the years. By drawing up a matrix of their features and functions, they obtained an overview of the different approaches to solving the problem and what made a good feeding device. For instance, thicker handles were often created for those with weak grasp while a velcro strap around the palm provided additional support.

"This way we could tap on existing efforts and development in the industry, and avoid having to develop a prototype from scratch. Instead, we spent more effort in refining the design," Kai Siang explains.

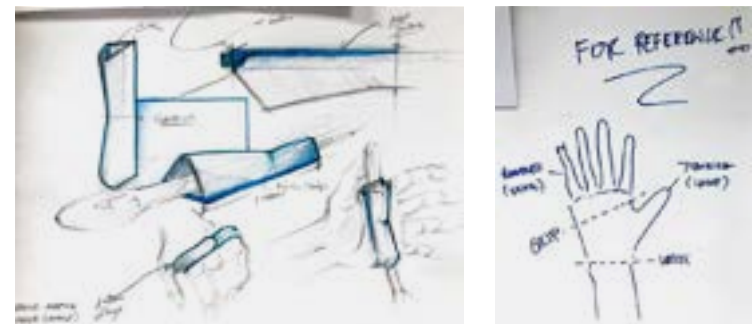
With the necessary insights, the project team began sketching out early ideas to quickly gather feedback from other therapists. Three solutions were then refined and 3D-printed for initial testing by the project team. The best features of each prototype were eventually combined into a single design with

>15 existing devices and modifications

were studied by the project team before they embarked on creating a new device.



The project team tested out various existing tools and modifications to understand the different design approaches used in an adaptive feeding device.



By sketching out their ideas first, the project team was able to quickly test out their assumptions and then pick the appropriate designs to create physical prototypes for.

“The many prototyping sessions and usability testing made me realise how one function of the design can affect another. There are many considerations when coming up with a design, but as long as we are willing to try things out, there will be a solution.”

Ms Tay Ming Min
Senior Occupational Therapist, TTSH



TOOL HIGHLIGHT: USABILITY TESTING

By testing out her prototypes with different users, Ming Min could assess her ideas in the real world, refine the design and convince them of its viability. [↳ Page 130](#)

interchangeable parts, including an enlarged handle with an elastic strap and a rotatable hex connector to which different utensil grippers may be attached.

The prototype was put out for another series of usability tests where patients performed a variety of real world tasks with it. They then assessed their experience based on aspects such as the ease of inserting a utensil into the device and the level of comfort after prolonged use based on a Likert scale. An average of 2 out of 3 points for a feature indicated satisfaction, while failure to achieve that suggested a need for improvement. These assessments were supported by user interviews about overall experiences.

Agile Testing and Improving

Over several rounds of iteration and usability tests, the project team further refined their prototype to address various issues raised. For instance, some patients thought the device was too heavy. Others felt the strap was uncomfortable and it lacked support for the wrist. While these were easily resolved with a change of materials, another complaint about the device's inability to handle a wide range of utensils was trickier to tackle. It turned out that there were simply more varieties than the trio had imagined.

“We struggled with the wide range of fork and spoon sizes. The patients were supposed to slot them in from the back, but some were too thick or too wide to even fit in. Others were too small,

so the patients ended up asking for help to secure them onto the prototype,” says Ming Min.

The project team eventually came up with a more accommodating utensil gripper. But not all perceived shortfalls that arose from the usability tests resulted in a change of design because it could compromise other functions of the device.

“We needed to decide between giving patients what they wanted and maintaining the product’s multipurpose usage,” Ming Min explains.

“We came to realise that we can’t have an all-in solution. It’s not possible to make the device usable for every single patient as we cannot speculate all the items they will use. We can only teach them the best way to use it, in order to maximise its benefits.”

Besides learning from the patients’ experience, the usability tests motivated the team too, says Kai Siang.

“One of the most memorable moments was during the mid-development phase, when I saw a patient keenly trying out our prototype even though it did not work so well,” he says. “I could see their desire to feed themselves independently. I imagined if this device were to be developed well, it would be something that might change their lives.”

Beyond a Feeding Tool

Some of the ideas for improving the design also came serendipitously. While the therapists were fiddling with the prototypes during the trials, they realised it could easily accommodate combs and toothbrushes. The project team thus expanded their device to support self-grooming too. On another occasion, Ming Min noticed a ball joint in a product used by a patient to fasten a feeding device onto her prosthetic arm. She figured that the joint would be useful for allowing angle adjustments as some patients cannot rotate their forearms.

The latest prototype by the project team is a kit consisting of an enlarged handle with a strap, a hex connector with a ball-joint and two attachments with varying slot sizes. Patients may



Patients who tested this early prototype (left) feedbacked that the adapter could accept only a limited range of utensils. It spurred the project team to refine the design.



The latest design comes in two options. The standard kit (left) is for users with some level of grip strength and require less assistance. The advanced kit (right) offers a range of attachments for different tools and addresses the needs of those who have limited movements in their forearm and wrist.



The advanced kit consists of four modules to address a variety of uses. The enlarged handle with a Velcro strap helps those with a weak grip, while a hex connector supports users who have limited range of motion. Two adapters allow for a variety of utensils and grooming tools to be easily attached.



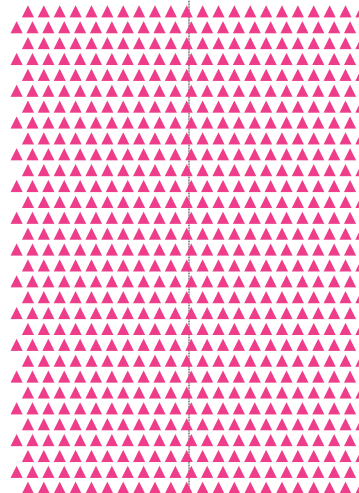
(Left to right) The evolution of the adapter for utensils as it was improved for better grip and stability, as well as to fit a wider variety of designs.

choose the attachment that best suits their utensils or other self-care tools and fix it onto the handle via the connector. As the design has interchangeable parts to address a variety of challenges, therapists can readily offer it to their patients.

In July 2021, the project team received a grant from the Centre for Allied Health and Pharmacy Excellence (CAPE) to further develop the working prototype. Besides conducting more usability tests to refine the design, they will attempt to incorporate a popular request for the device to facilitate tasks that require more finger dexterity such as writing. The eventual goal is to commercialise the product so that it can be more widely available.

"It is satisfying to see how far we have come, from the very first prototype that was nothing like what we wanted, to the final one that was well used by patients because it met some of their needs," says Ming Min. "Many users who tested the prototypes gave us many positive feedback and even asked us to work on more devices to help them with their daily tasks!"

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Transforming Healthcare Systems by Design

The first step to improving a system is defining what we wish to transform. However, we frequently do not agree what this may be. Even if we do, we will discover that a system consists of many different parts: its reason to exist; its goals; and its various members. Thus, it is important to arrive at a common understanding through observation and dialogue. We often come to realise that our initial assumptions were but a caricature of a system all along.

Just as important is understanding a system not only from the view of individual operators but as a collective too. By recognising the interdependence that exists amongst different parties, we can begin to question our different roles, be it as an owner, actor or customer. For example, the community hospital is an actor in the healthcare system and also a customer that requires information to carry out its work. It is also an owner of the system as it offers hospital beds as a resource. Similarly, patients are not just customers in the healthcare system but actors who can stall it by delaying their decisions. It is only through dialogue that we can better define the needs and responsibilities of the different roles in a system, which in turn help each of us perform them better.

This is the process behind the Seamless Shared Care project (↳ page 14) which rediscovered new ways to facilitate the transfer of patients between the community hospitals and acute hospitals. The project team brought in the perspectives of staff who considered themselves peripheral to it and involved patients

who saw themselves as simply recipients of care, but ironically, not members of the system. The team even invited external parties to offer fresh perspectives of how the who, what and why can be managed.

The discussions led to a reassessment of the multiple paper and electronic processes which were supposed to aid mutual understanding of the patient. By re-engaging the who, reviewing and simplifying the what, as well as reframing and communicating more clearly the why, the team significantly improved the system by speeding up transfers. Even patients who do not utilise it have benefitted because of the freed-up capacity in the acute hospitals.

The project is just one of several in this book that showcases how design thinking can transform systems in healthcare. Perhaps, we will uncover more systems that need to be looked at.

A/Prof Ian Leong

Assistant Chairman Medical Board,
Community Care Integration, TTSH



What Design Thinking Can Bring to Healthcare

Design at its heart is a process of planning and envisioning with the users. Thus, the concept of design thinking would not be unfamiliar to healthcare professionals. We too have been trained to assess our patients through interviews, observations and fact-finding, before “designing” a care plan to meet each of their physiological and psychosocial needs. In the course of caregiving, we often revisit our assumptions, redefine the problems and create solutions—an iterative process to figure out how best to help the patient heal or the family to care for.

Design thinking adds to our repertoire of tools for shaping care delivery, such that each day of work brings meaning and joy. It draws our focus to the experiences of the individuals whom we serve, be it recipients or providers of care. It drives us to experiment and prototype solutions, eventually developing innovative products, services or systems that resonate with what is required on the ground. When applied on a systemic level, it brings about design innovation by giving us a deeper understanding of the people and communities we serve.

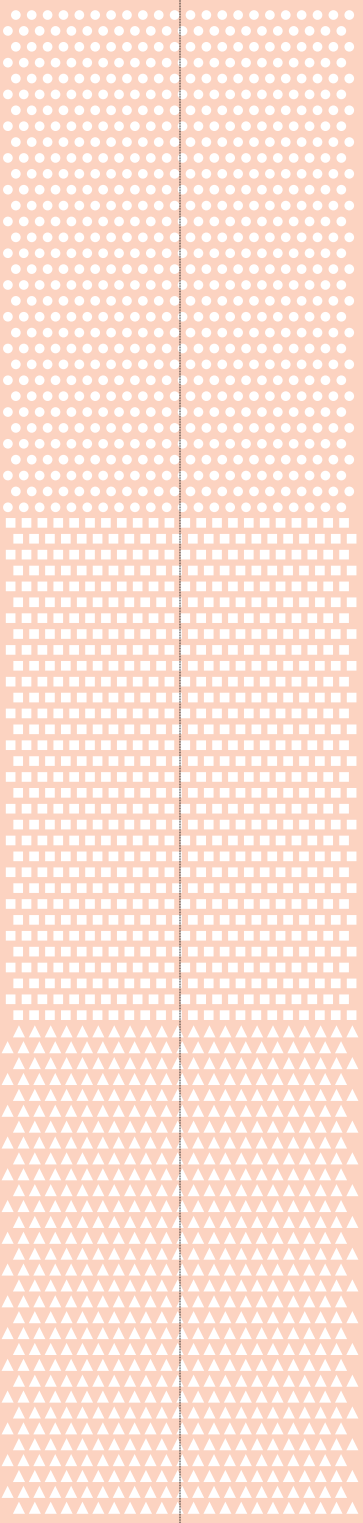
As we continue to navigate the challenges faced by healthcare systems, both the known and unknown, our mission as healthcare professionals remains in doing our best to serve, care and heal. Design innovation provides the opportunity for us to understand our world with a different pair of lens and potentially lead to technological solutions that transcend the current boundaries of care. Our goal is a care experience that contributes towards the building of a happy and healthy population. Nurses too can look forward to “nursing beyond nurses, and nurses beyond nursing” in this transformative journey.

Dr. Hoi Shu Yin

Chief Nurse, TTSH




Tools



Overview of Tools


1



Observation Study

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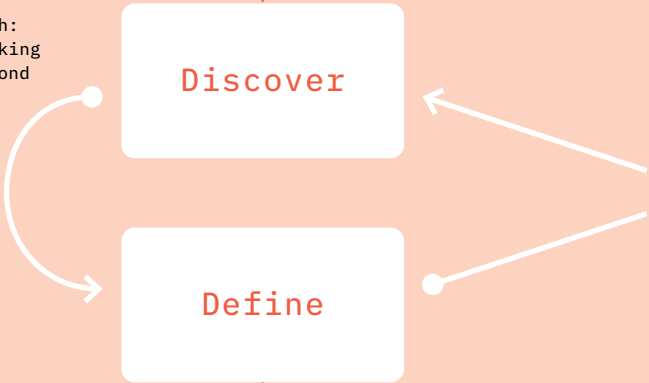
2



User Interview

105

Our Approach:
Design Thinking
Double Diamond
Framework



3



Persona

110


4



'How Might We' Statements

116


5



Storyboard

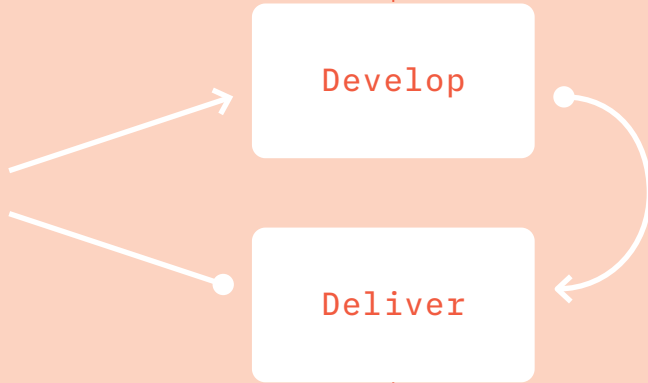
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6




Prototyping

125



7



Usability Testing

130

Observation Study

Tool 01



Empathising with the needs of users is key to better understand their experiences and to uncover hidden needs. An Observation Study is useful for this. It requires a beginner’s mindset: asking a lot of questions and making no predetermined notions as to how things work—just like a child!

Why?

- Observe patients and users in their natural environment.
- Find out what they do as well as fail to do.
- Identify objects, conditions and behaviours that contribute to the problem.
- Gain a better understanding of the design challenge.

How?

1 Plan

What are the objectives and focus of your study? Who and what is to be observed? What do you plan to do with your findings?

2 Identify

Where can the users be found? What process is observed? Define the start and end point of the process you will observe based on your objectives. The following Observation Plan template may be useful:

Key questions:		Example: Transfer of patient from acute to community hospital
AREA	Where is the place of observation?	TTSH In-patient wards.
PROCESS	What process is being observed?	Obtaining patient consent for transfer to community hospital.
NO. OF CASES	How many cases are being observed?	2 General (1 Surgical 1 Medical) and 1 Renal
START	When does the process begin?	Patient is identified as suitable for transfer to community hospital.

END	When does the process conclude?	Patient makes decision on transfer.
REMARKS	Anything else to look out for?	May need ground staff to assist mapping as process takes a few days.
TEAM	Who is observing?	Process Owners: Doctor, Pharmacist Stakeholders: Nurse, Admin Managers Fresh Eyes: Physiotherapist Admin Leader: Executive

3 Assemble

Gather a team of observers and include at least one from each of the following categories:

Process owners: People who are involved in the process in question. They will provide context and insights into the observations.

Stakeholders: People who share a relationship with the user and are impacted by the process. They can influence the outcomes you hope to achieve.

Fresh eyes: People who are not familiar with the process and do not have any preconception of it. Hence, their observations are neutral.

Admin leaders: People who manage the planning and implementation of the observation study.

4 Observe

Begin observing the users with the “What, How, Why” technique. It helps you move from concrete observations of a particular situation to identifying unseen emotions and motives. Divide your observation notes into the following:

	Key questions:	Example: Patient's interaction with medication
OBSERVATION	What does the situation look like? Describe only what you see.	Patient took medication out of the plastic bag, lifted the package to eye level and returned it untouched.
UNDERSTANDING	How is the user doing it? Describe tangible actions, such as facial expression or body language, to identify the emotional impact of performing the task.	Patient is frowning while trying to read the labels and looks confused.
INTERPRETATION	Why is the user doing it this way? Infer the reasons behind what you are observing.	Patient doesn't understand the instructions that are written in English.

5 Analyse

Discuss the findings with the team of observers. It will help you uncover alternative perspectives and reach more holistic observations.

Materials

- Pen and notebook for notes
- Recording device, e.g. voice recorder or camera
- Written consent and/or confidentiality agreement

Duration

Depending on the scale of the study, the duration for each stage ranges from:

- Just-in-Time Training and Planning: 0.5 hours to 2 weeks
- Observation: 1 hour to 4 weeks
- Interpretation: 0.5 hours to 2 weeks

Tips!

- Train observers to differentiate between observations and interpretations.
- During observations:
 - Hold your urge to ask questions because it may disrupt the user's actions.
 - Note down quantifiable information. For example, how long it takes to complete certain tasks. Such information may be visualised with charts and graphs.
 - Look out for the "Observer Effect" (also known as Hawthorne Effect), when people change their behaviour because they know they are being studied.

TOOL-IN-ACTION



"When we went to see how the community hospitals' admissions team assess TTSH referrals, we realised there were so many hard copies of paperwork being used."

An Observation Study helped Ms Hayley Chau, Deputy Director, Division of Integrative and Community Care Operations, and her project team uncover what held up the transfer of patients from acute to community hospitals. ↳ Page 14

User Interview

Tool 02



It is important to get to the bottom of the problem before seeking a solution. A User Interview allows you to spend time with the users and listen to their experiences so that your design will meet their needs.

Why?

- See from the users' points of view.
- Gain insights into users' emotions and motivations to understand their choices and behaviours.
- Countercheck previously held assumptions.

How?

1 Plan

Before

Spontaneous conversations can be insightful but planning questions ahead of time helps you to stay focused on the purpose of the interview.

- Set a goal on what you want to learn from the user.
- List potential questions that will help you achieve your goal.
- Organise your questions into common themes so that the interview flows smoothly. For example, group all questions about a user's experience, separate from those regarding their goals and wishes.
- Prepare open-ended questions to elicit longer and more revealing responses. For example, "Walk me through your experience during your stay in TTSH."
- Prepare the documents for obtaining the required permissions. For example, consent to audio record or use personal data.

During

Carry out interviews in pairs so that one person takes notes while the other pays full attention to the interviewee. Observe the interviewee's body language and clarify anything that is inconsistent to what they say. An interview usually flows like this:

2 Interview

Objectives:

- Introduce yourself
- State the purpose of your interview
- Seek permission to interview

Example: Interview patients on hospital experience

Hello [interviewee's name], I am [name] and [name] from [organisation]. Can we ask you a few questions on how we can improve your experience in the ward? It will take about 15 minutes.

- Explain how the interview will be used
- Sign the consent forms

Your responses will be kept confidential... OR
Your responses will be published in the next issue of our in-house magazine. If you agree, could you please sign this consent form?

- Make the interviewee feel comfortable
- Ask warm up questions

- Can you tell me about yourself?
- What do you do for a living?
- How are you feeling now?

- Seek stories
- Draw out concrete examples

- Are there any areas you find inconvenient during your stay here?
- How often do the doctors/nurses attend to you?

- Ask follow-up questions to clarify response
- Use the T.E.D.W method

- **Tell** me more about the ward rounds.
- **Explain** what the nurses usually come to you for.
- **Describe** what they do.
- **Walk** me through the whole process.

- Ask interviewee how he or she feels about the process being described

- How do you feel when you are being pushed out of the ward for procedures like X-ray and CT-scan?
- How was your experience of the automated bed turner?

- Wrap up the session

Is there anything you would like to add?

- Thank the interviewee

Thank you for your time. Wish you a speedy recovery.

3 Analyse

After

Group similar information such as pain points and positive moments across interviewees.

Create insights by identifying how different data might relate to one another, as well as the underlying reasons behind certain behaviours or comments.

Materials

- Pen and notebook
- Voice Recorder

Duration

30 to 60 minutes

Tips!

- Have no more than three members at an interview. Otherwise, the interviewee may be too intimidated to speak his or her mind.
- Remember that the interviewee is the expert:
 - Be patient and don't be afraid of silence. Give the interviewee time to reflect and let him or her do most of the talking.
 - Avoid leading questions like, "Tell me about your frustrations..."
 - Ask "why" even when you think you know the answer.
- Demonstrating how something is done or sketching may help the interviewee better explain an idea.
- Audio record the interview with permission in case you miss anything out.

TOOL-IN-ACTION



"Many a times we base our ideas on assumptions and past experiences. But by interviewing users, we can hear from their perspective and validate our assumptions."

Sister Lim Mei Ling and her project team could hear first-hand the challenges patients and their next of kin face in the healthcare system through User Interviews. It also helped the team propose ideas that truly served the users' needs and desires. ↪ Page 48

Persona

Tool 03



Who do you design for? Personas help vividly represent the potential types of users of your solution. These fictional characters based on insights from Observation Studies and User Interviews go beyond segmenting the users by demographics. They identify patterns of behaviour and motivations that can guide the creation of more user-centric solutions.

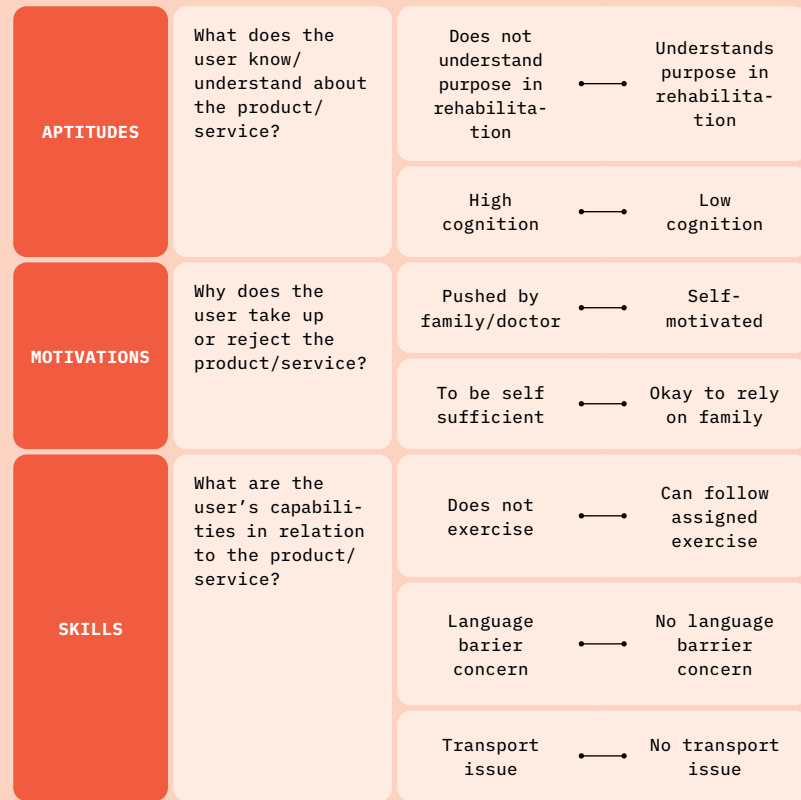
Why?

- Identify non-stereotypical archetypes of users by highlighting motivations, frustrations, behaviour patterns, goals and needs.
- Develop solutions for one or several types of users, rather than an average user.
- Create designs that empathise and identify with the needs of users.
- Align everyone in the project team to what users value.

How?

- 1 **Observe**
Find out how users interact with the product or service through Observation Studies (↳ Page 100) and/or User Interviews (↳ Page 105).
- 2 **Analyse**
Categorise the data collected using the Activities, Attitudes, Aptitudes, Motivations, Skills (AAAMS) tool to identify behavioural attributes. Each category may either present a spectrum of behaviour (e.g. active to sedentary) or discrete opposites (e.g. working versus retired):

	Key questions:	Example: Existing users of Day Rehabilitation Centre (DRC)
ACTIVITIES	What is the user's lifestyle?	Working — Retired
		Active — Sedentary
		Independent — Reliant on caregiver
ATTITUDES	What does the user perceive about the product/service? (i.e. a set of beliefs, emotions and behaviours)	Sees no value in rehabilitation — Values rehabilitation
		Poor impression of DRCs — Good impression of DRCs



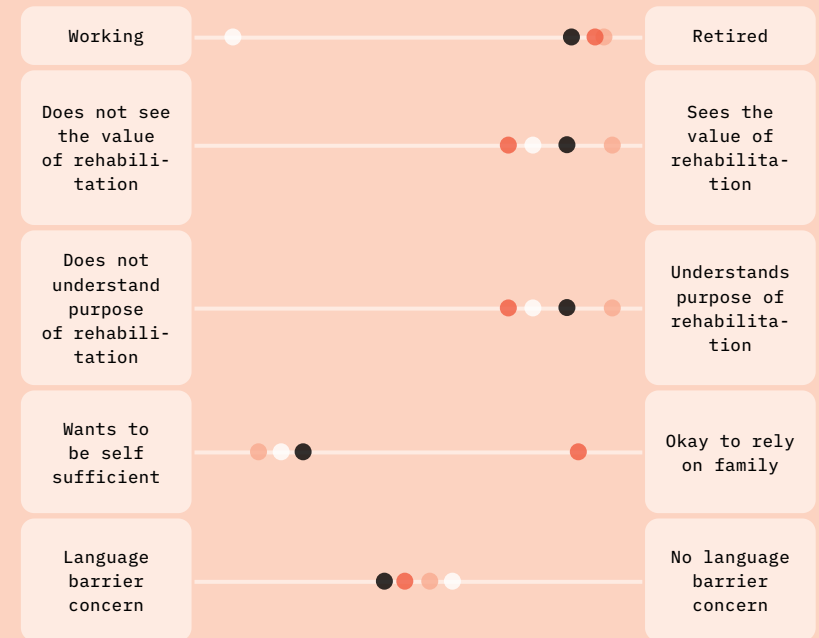
3 Map

Plot your users (represented by coloured dots) against each behavioural attribute. Identify their positions relative to one another rather than mapping them to a precise point:



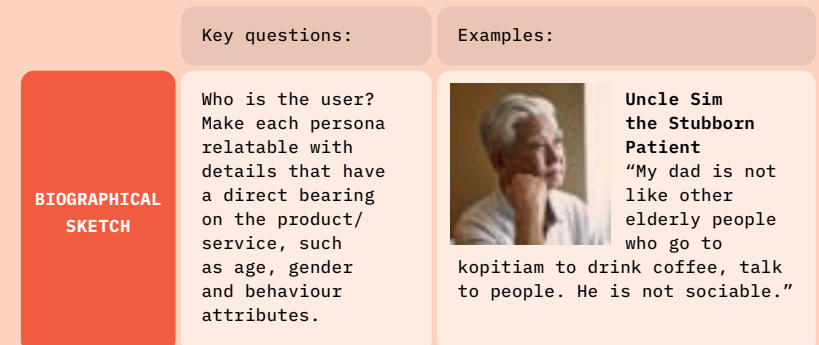
4 Develop

Identify behaviour patterns, motivations and needs that occur across clusters of interviewees to form a persona. For example, users who reject attending the DRC share the following attributes:



5 Refine

With the behaviour patterns, observations and interview, further develop the personas' narrative. The following Persona template may be useful:



more on the next page ↗

BEHAVIOUR PATTERNS	Where, why and how does the user engage with a product/service?	Uncle Sim prefers to keep to himself and can be stubborn. He recognises his medical issue but does not want to address it nor trouble his family to bring him to the DRC. He also dislikes trying new things. Uncle Sim's son takes good care of him, but cannot convince his father because he does not understand the value and purpose of rehabilitation and DRCs.
NEEDS / PAIN POINTS	What issues and challenges does the user face?	<p>Understanding of rehabilitation</p> <p>Baseline activity (of patient)</p> <p>Motivation</p>
GOALS	What does the user want to achieve?	Uncle Sim wishes to maintain his current lifestyle; and only address his condition when in pain. His son wants the best for him but does not want to push him too hard.
MOTIVATION	What does the user value?	He wishes people will understand his preferences and can tailor the treatment to his lifestyle.
OPPORTUNITY	What opportunities exist? Refer to 'How Might We' Statements (> Page 116) on how to develop them.	How might we help clients who need encouragement ease into doing rehab at DRC and contextualise their treatment so that they will be more open to attending DRC?

Materials

- Pen and paper
- Photos from Observation Studies
- Persona template

Duration

20 to 40 minutes to create a persona, excluding Observation Studies or User Interviews.

Tips!

- Develop 3-5 personas and their identified characteristics. Prioritise those who should be the primary design target.
- Logical personas are more realistic. Avoid forming personas based on random correlations.
- Have fun naming your persona! Choose one that is easy to remember, relatable to the type of user and your solution.
- Keep personas easy to understand with relevant details from Observation Studies and User Interviews.
- Revisit your persona to check whether your proposed solutions fulfil their needs and goals.

TOOL-IN-ACTION



“The user interviews and creation of personas were really opportunities for us to dig deeper into the issues behind the problems.”

Uncovering personas that represented Day Rehabilitation Centres helped Ms Lim Sing Yong, Deputy Director, Population Health Office, understand the users' challenges and validate her team's proposed solutions. ↪ Page 38

'How Might We' Statements

Tool 04



While it is tempting to immediately solve the problem at hand, it often leads to only incremental improvements. Crafting 'How might we' statements helps you explore a broader range of innovative solutions. The word "how" reframes the problem as an opportunity, while "might" suggests that all ideas are welcome regardless of their feasibility. Finally, "we" emphasises teamwork. Together, the phrase encourages a diverse and experimental approach to tackling challenges.

Why?

- Turn a challenge into an opportunity.
- Define the scope of problem solving.
- Elicit a wide range of solutions that are user-centric.
- Lower the barrier to action.
- Encourage collaboration in problem solving.

How?

1 Identify

Reflect on the needs and challenges identified in the early stage of the project. Refer to the Persona(s) (↳ Page 110) if you have created them.

2 Develop

Come up with several 'How might we' statements that address them. Follow this structure:

How might we [intended action to solve a problem] for [user] so that [desired outcome]?

Phrase the statement positively. Use "promote", "strengthen" and "improve" rather than "prevent", "reduce" and "remove".

3 Check

Read the statement aloud. Does it inspire many solutions? If not, the question may be too narrow. Or it could be too broad if you don't know where to start. Find the sweet spot with the following:

Problem: Tackling communication issues during the COVID-19 pandemic			
Examples	"How might we help people who are worried about COVID-19?"	"How might we rapidly inform and empower the elderly to stay safe and healthy during the outbreak?"	"How might we create an app that gives directions on how to take care of your health during COVID-19?"
Evaluation	Too broad	Just right	Too narrow
Explanation	Hard to find somewhere to start.	It has a target audience, a desired outcome and does not suggest a solution.	Missing a target audience. The statement also should not suggest a solution.

Materials

- Pen and paper, or a whiteboard so that everybody can see the statement being formulated.

Duration

No longer than 15 minutes for each statement.

Tips!

- Don't limit yourself to one perfect statement. There are no right or wrong ones! Develop several before narrowing them down.
- Reflect on the needs and challenges faced by users to keep in mind who you are creating solutions for.
- Allow enough time for discussion to formulate a good statement, but do not let it go on for too long.

TOOL-IN-ACTION



"Traditionally, we target a problem by focusing on the gaps and root causes. But coming up with 'How might we' statements helped us think out of the box and broadened our perspective."

Principal Pharmacist Ms Lim Woan Chyi and her team turned challenges into opportunities by using 'How might we' statements to prompt new solutions to improve the uptake of TTSH's medication delivery service. ↪ Page 60

Storyboard

Tool 05



Traditionally used in creating films and comics, this tool shows how a story unfolds through a sequence of images. In the context of design, storyboarding can be used to visualise the users' experience frame-by-frame to identify the challenges they face in a process or proposed solution.

Why?

Storyboarding is useful across different stages of the Design Thinking Double Diamond Framework:

- **Discover:** Summarises the experience of a service or product from a single point of view, typically that of a user.
- **Define:** Identifies areas in the user experience to improve on and ensures that everyone in the project team understands the process they are ideating for.
- **Develop:** Showcases where and how a proposed solution will be used in an easy-to-understand format to aid further refinement.
- **Deliver:** Breaks down a solution into its entire process to spot inconsistencies and flaws and prompt discussions on ways to improve.

How?

1 Plan

Determine the problem or solution you want to illustrate using a storyboard.

2 Identify

Who is the main character? What is the setting and plot? The main character is usually the person facing the problem and will benefit from the solution. It could also be a Persona (↳ Page 110) that you created. The setting is where and when the character will likely encounter the problem or solution. The plot shows the experience from the character's point of view.

3 Illustrate

Draw out your story like a comic strip by using speech and thought bubbles, action bursts, captions and narrations. Each scene should fit a sticky note and only convey one or two ideas. Add details relevant to the plot. Here is an example:

Context

Solution:

Character:

Plot and Setting:

Smart Total Performance (TPM) and Key Achievement Area (KAA)Template
Reporting Officer (RO)
Annual Total Performance Management Review


Idea

Storyboard

Details

1


Assisting staff to create meaningful goals through smart TPM/KAA template



RO communicates KAA expectations with staff via mobile app.

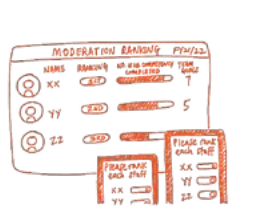
2

Artificial Intelligence (AI)-driven performance management to enable smart and efficient decision making



RO sees a quick overview of appraised staff's strengths and weaknesses based on their TPM submission.


3



RO sees an overview of individual staff and their performance rating that is auto-populated for the system.

4

Anytime feedback & documentation for impactful performance management

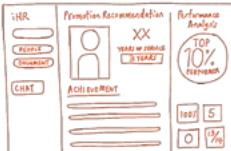


RO gives feedback to the appraised staff anywhere and anytime.

more on the next page ↗

5


Smart alerts and tracker



RO receives prompts from the system when a staff is ready for promotion.

6

AI-facilitated conversation for development



Staff receives feedback and acknowledges the action plan. RO gives feedback and recommends an action plan.

- 4

Perform

Read or even act out your storyboard. Even if you don't have an audience to provide feedback, this will help you spot any inconsistencies or gaps in the story.
- 5

Apply

Apply your storyboard in Usability Testing (↪ Page 130) to assess your ideas.

- Materials
- Pen and/or markers
 - Post-its and/or a whiteboard
 - Storyboard templates, typically pages with grids

Time

1 to 2 hours, depending on the length of your story.

Tips!

- Don't worry about creating beautiful drawings! Stick figures are fine as it is more important to think through your ideas.
- Don't feel pressured to draw your storyboard chronologically. If you are stuck, draw the first and last scenes and then work from there.
- Stay focused on your main character.
- Complement the storyboard with photos from your Observation Study (↳ Page 100).
- Add humour to your story!

TOOL-IN-ACTION



"It was a good way of looking at the problem from a whole process perspective. The storyboards and journey maps broke down the HR system into processes and phases which helped everyone see the linkages."

Mr Gary Chua, Senior Manager of Group Human Resource at NHG, and his project team used storyboarding to illustrate their ideas for a new Human Resource Information System (HRIS). ↳ Page 70

Prototyping

Tool 06



It is costly for a solution to fail. Building and testing a prototype of your idea will help to prevent that. Prototypes can take many forms, from physical models to sketches of digital interfaces, or even role plays of a process or service. Whatever it is, prototyping should be done in the early phase of design thinking to avoid wasting resources.

Why?

- Bring clarity to the design by visualising how the idea might work.
- Gather early feedback from users.
- Validate and refine new ideas and assumptions quickly with little effort and investment.

How?

1 Define

Before

Why design the solution? For whom is it intended? What are you testing for? Refer to your Observation Studies (↳ Page 100) or User Interviews (↳ Page 105) to define your intent of prototyping.

Should the prototype be a Proof of Concept or Proof of Value? This determines the degree of exactness to the actual solution, also known as “fidelity”.

- **Proof of Concept (PoC)** aims to verify that an idea is technically feasible, will function as envisioned and is desired by the intended users. The prototype may be of a lower fidelity.
- **Proof of Value (PoV)** aims to ascertain that an idea is indeed useful for the intended users in the real world in varying contexts and conditions. It requires a higher fidelity prototype.

2 Identify

What is the nature of the idea? Is it a digital application, a physical product or a process experience? This determines the method and materials needed for prototyping. For example, building a cardboard product prototype or role-playing a process experience.

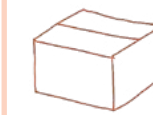
Method of Prototyping

PHYSICAL

2D/3D
sketch



paper /
cardboard
mock-up



3D-print in
small scale /
actual scale



hand-made or
hand-finished
unique in
actual
material



DIGITAL

idea
sketch



wireframes
(paper
prototypes)



interactive
click-model
on device
using proto-
typing tools



functional
prototype
in actual
environment



EXPERIENCES / PROCESSES

sketch



storyboard &
storytelling



investigative
role play



technical role
play in actual
environment



PoC



PoV

3 Test	During Build the prototype to required fidelity. Get feedback from users through Usability Testing (↳ Page 130).
4 Evaluate	After Assess the feedback. If needed, re-visit Step 2 to explore other forms of prototyping that better suit the current stage of the project.
5 Refine	Improve the prototype by repeating Steps 1 to 4 until it fulfils the intent or when the feedback received has no significance for the next refinement.

Materials

Depends on the project and the level of fidelity required. For instance, pen, paper and cardboard if you are building a product prototype.

Duration

Prototyping is an iterative process, so plan for several iterations with each taking 2 to 4 weeks.

Tips!

- Prototyping for just one part of a solution is fine. For example, a proposed grip handle for a wheelchair.
- Having the right audience in mind will help you to achieve your intent faster.
- Always build low fidelity prototypes before moving on to high fidelity ones.
- Don't be too concerned about creating the perfect prototype, just build it! The focus is to rapidly improve your ideas.

TOOL-IN-ACTION



“The prototyping process helped the teams see how feasible and practical their solutions were.”

Creating cardboard models of Personal Mobility Aids helped participants quickly test their solutions during a makeathon organised by Senior Occupational Therapist Mr Lee Hengky and his colleagues. ↳ Page 26

Usability Testing

Tool 07



A product will ultimately be judged for its usefulness, so why not get it tested before it hits the market? Usability Testing is a great way to find out the flaws—and the potential—in a prototype from those who will be using it. The feedback can be used to improve the final design and ensure that it benefits the intended users.

Why?

- Gain a better and deeper understanding of the problems with existing solutions.
- Learn more about the users.
- Check if prototype works and meets needs of potential users.
- Identify new opportunities for improvement or new ideas for the design.

How?

Before

1 Plan

What is the goal of the prototype? What are the test objectives? What tasks should they be tested for? Who are suitable participants? The following Usability Test Plan template may be useful:

	Key questions:	Example: Test for adaptive feeding device prototype
PRODUCT	What is being tested? What are the product goals?	Adaptive feeding device for patients with upper limbs impairments; To aid rehabilitation and improve patients' independence.
BUSINESS CASE	Why are we testing?	To test functionality and identify user desirability.
TEST OBJECTIVES	What are the goals of testing?	To identify areas of improvement and gauge patients' acceptance of the aid.
PARTICIPANTS	Who are the right participants for usability testing and how many?	11 patients with upper limb impairment.

more on the next page ↗

TASK SCENARIOS	What features are important to test?	<ul style="list-style-type: none">Wearing the device.Attaching utensils to the device.Using device to feed themselves.
ROLES	Who is involved in the test and what are their roles?	Occupational therapists will moderate the test, observe and conduct the post-test survey.

During

2 Introduce

Welcome participants and explain the prototype, objectives and tasks. Obtain their declaration of consent. Instruct participants to verbalise their thoughts while performing the tasks so that you will know what they are thinking.

3 Observe

Take notes of how participants interact with the prototype, the challenges they may face, and how they feel about the experience. The following Note-Taking template may be useful:

Task Scenario: Using adaptive feeding device at home when no one is around to help		
Participant 1		
	TASK	SCORE (highlight one)
Key questions	<ul style="list-style-type: none">What is an important product feature?What might users have the most difficulty with?	<ul style="list-style-type: none">How do you measure success?Is it simply about completion of the task or a more specific benchmark? A Likert Scale can help nudge users when measuring success.
		NOTES
	<ul style="list-style-type: none">How did the participant complete or struggle with the task?	

Examples	Wearing the device on the hand.	<ol style="list-style-type: none">1 Not completed2 Completed with difficulty or help3 Easily completed	User slipped on the handle easily.
	Attaching a utensil to the device.	<ol style="list-style-type: none">1 Not completed2 Completed with difficulty or help3 Easily Completed	User took a few times to slot in successfully.
	Using device to feed themselves.	<ol style="list-style-type: none">1 Not completed2 Completed with difficulty or help3 Easily Completed	User struggled to achieve an angle that can hold the food well before feeding into the mouth.

4 Survey

Conduct a post-test survey and/or interview to understand how participants felt about using the prototype. Seek out both qualitative and quantitative responses:

Post-Test Survey / Interview	
	QUANTITATIVE
Examples	What is your comfort level after wearing the adaptive feeding device? Please rate on a scale: 0 Uncomfortable 1 Slightly uncomfortable 2 Comfortable
	How is the experience of using the device? What are some challenges and improvements?

5 Evaluate

After

Analyse the findings to improve your design. The following Usability Testing Report template may be useful:

	Key questions:	Example: Adaptive feeding device	
GOALS	What are your test objectives?	<ul style="list-style-type: none">Is the device ergonomic for users?Is the device suitable for feeding when attached with utensils?	
FINDINGS	<p>Which product features achieved the goal?</p> <p>Which need to be relooked at?</p> <p>Of those that needs to be relooked at, what are some problems and how will they be tackled?</p>	<p>What worked:</p> <ul style="list-style-type: none">Prototype stays on the hand during use.Spoon stays attached to device during the test. <p>To be improved:</p> <ul style="list-style-type: none">Accommodate other items of daily living, such as a toothbrush, comb, etc.Adjustable strap to secure fingers/grasp.	
	Problem	Issue	Recommendation
	Use and ergonomics of handle	Handle is not friendly for left handers and does not fit well to the user's hand	Redesign the handle for either hand; Add contours that fit the palm.

6 Refine

Improve prototype and conduct another usability test by repeating Steps 1 to 4. Testing ends when the users' needs have been met, or when new insights do not add any significance for the next refinement.

Materials

- Prototype
- Camera for video recording
- Script for moderator to explain the project, objectives and tasks
- Declaration of consent
- Survey forms

Duration

Depending on the complexity of the prototype and tasks, the time spent can range from 40 to 90 minutes.

Tips!

- Create test scenarios based on real-world tasks to help users engage them more naturally.
- Draw up a score criterion for easier evaluation of success and failure. For example, a Likert Scale offers 3, 4, 5 and 7 point intervals for measurement. Choose an appropriate one for your survey.
- During the test:
 - Don't just survey your users, observe them too.
 - Don't help participants when they get stuck. Ask them what they think should happen next.
 - Avoid leading questions that may influence participants' expectations.
- Avoid adding new features to the product, focus on improving existing ones.

TOOL-IN-ACTION



“Many users who tested the prototypes gave us many positive feedback and even asked us to work on more devices to help them with their daily tasks!”

Usability Testing helped Ms Tay Ming Min, Senior Occupational Therapist, identify how to improve her adaptive feeding device and uncover opportunities to cater to more types of tools. ↪ Page 80

Further Reading

Information about each of the design thinking tools featured in this book was referenced from various existing sources. You may refer to them to learn more.

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Our TTSH Journey in Innovation and Improvement

I am heartened by the projects featured in this book. They reflect a culture of continuous improvement and innovation that is part of our TTSH DNA today. I always remember the words of our Group CEO, Prof. Philip Choo, that every staff has two jobs. The first is to do our job well and the second is to do it better. I often wonder what keeps our staff passionate about innovation and always raring to go after the next S-curve improvement leap, despite the daily hustle and bustle. I strongly believe that it stems from us wanting to care better for our patients and their caregivers.

Over the years, TTSH has improved itself by developing new capabilities in innovation and transformation. We began early on with the MyCare programme where we embarked on value stream mapping to reduce waste and streamline care. It has helped us to deliver true value to our patients, caregivers, staff and the overall healthcare system as well as laid a strong foundation in innovation. In recent years, we have incorporated the tool of Design Thinking which adds the voices and perspectives of our patients and caregivers. It is absolutely essential as they are in the centre of all our innovation initiatives and must be part of the efforts in co-creating solutions be it in care, processes, products or roles.

Besides being blessed with visionary leaders, we are supported with enablers and platforms for innovation too. They include the Centre for Healthcare Innovation (CHI), Centre for Allied Health and Pharmacy Excellence (CAPE), Centre for Asian Nursing Studies (CANS), Centre for Medical Technologies & Innovations

(CMTi), Kaizen Office, CHI Living Lab and the Ng Teng Fong Healthcare Innovation Programme—just to name a few. Most recently, the Digital Transformation Council was set up in TTSH too. It integrates our talents and efforts in incorporating digital solutions to transform the institution into a “Hospital without Walls”. We are moving beyond delivering good hospital care to good population health, such that care follows our patients and residents wherever they are.

In healthcare, we will never consider ourselves as having “arrived”. There is no end point as the needs of our patients and residents continually evolve. As long as we understand the “why” of our mission, we will keep striving to be better. I am excited for what lies ahead. As healthcare workers, we will have ample opportunities to develop ourselves to be relevant to the needs of the population that we care for. For patients and residents in the Central Health network, we welcome you as partners in co-creating a healthcare system that is more robust and agile.

Truly, we will be stronger together.

— —
Doreen Yeo

Chairperson of Allied Health, TTSH



Acknowledgements

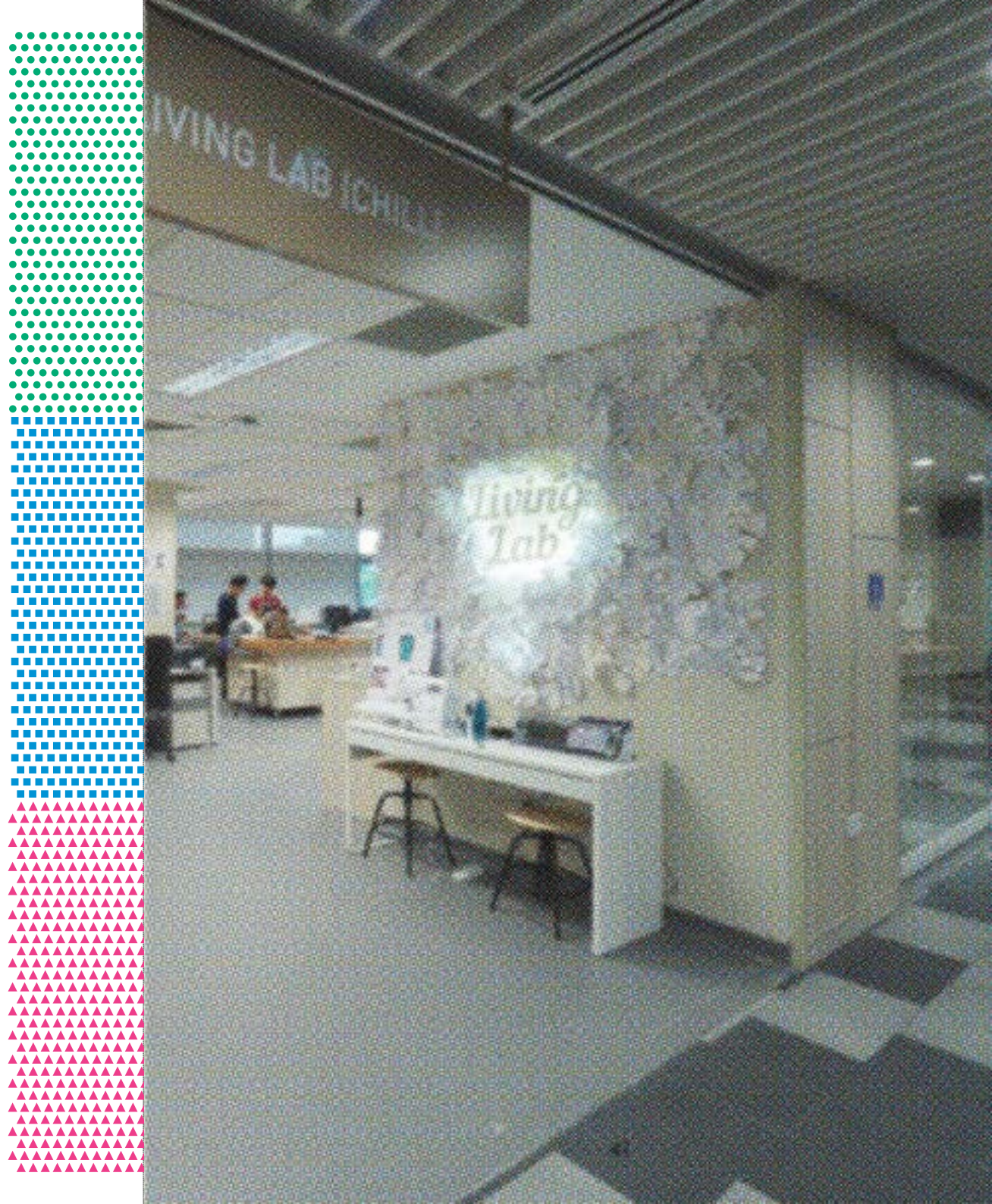
We would like to express our thanks and appreciation to all who were involved in the projects featured in this book.

Community, institutional and industry partners as well as volunteers who participated in our projects:

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Ang Mo Kio-Thye Hua Kwan Hospital
AWWA
Building and Construction Authority
Housing & Development Board
Institute of Mental Health
Land Transport Authority
Khoo Teck Puat Hospital
Kwong Wai Shiu Hospital
National Healthcare Group
National Healthcare Group Diagnostics
National Healthcare Group Pharmacy
National Healthcare Group Polyclinics
National Skin Centre
Nanyang Polytechnic
Nanyang Technological University
National University of Singapore
Ren Ci Community Hospital
Singapore University of Technology and Design
St Hilda's Community Services
St Luke's ElderCare
United BMEC Pte Ltd
Woodland Health Campus

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Design With Care: Designing People-Centered Healthcare © 2021

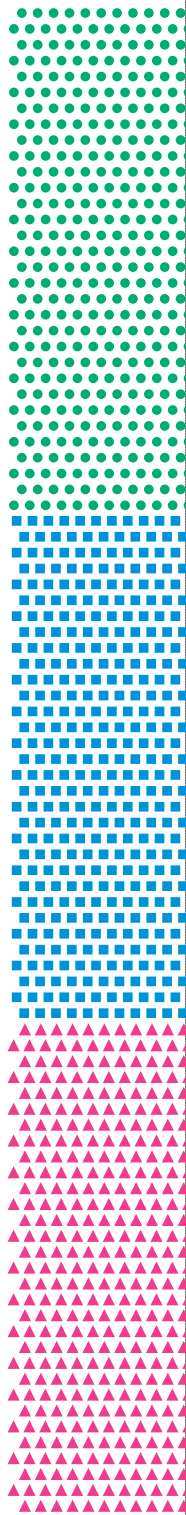
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Efforts to improve health systems often focus on the functional aspects of processes and care, but may unintentionally neglect the patients and users involved. *Design With Care: Designing People-Centred Healthcare* showcases how the National Healthcare Group and Tan Tock Seng Hospital in Singapore have used design to create better and more seamless care by putting people at the centre of focus.

It features various case studies by healthcare professionals who used Design Thinking with Lean and Organisational Development principles and concepts. Through their stories, insights and tips, this folio offers an instructive and inspiring take on the power of good design to create better care experiences for people.