Project Title

C3 Smart Hospital for the Future

Project Lead and Members

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Project members: Ms Tan Mingchu, Mr Tan Beng Kiat Albert, Mr William Salim, Mr Ng Jing Cheng, Mr Perry Chia, Mr Muhammad Syafi Salim

Organisation(s) Involved

Tan Tock Seng Hospital

Project Period

Start date: Dec 2018

Completed date: Dec 2019

Aims

The Resource Management department is part of the Operations Family Group, and was set up to optimise hospital's operations, and ensure a smooth patient flow at every touch point.

Similar to an airport control tower, the concept of an Operations Command Centre (OCC) was conceived in as early as 2013 to coordinate and provide better care for patients at a systemic level. There is currently no such command and control centre in any healthcare facility worldwide today. Traditional healthcare Command Centres typically focus on facility management or bed allocation, while recently developed Command Centres are still predominantly inventory-centric and Business Intelligence-driven. Instead, ours would be a first-of-its-kind in healthcare, with the primary focus to coordinate flow, which adopts a more holistic view to the hospital ecosystem.

The project team comprises mainly operations executives, who worked closely with Management and frontline staff to understand current challenges and formulate solutions collaboratively.

Background

TTSH is a busy hospital, with an average midnight bed occupancy rate of 91% in 2018. As a result, the average Bed Waiting Time for admission is 3.9hrs in 2018.

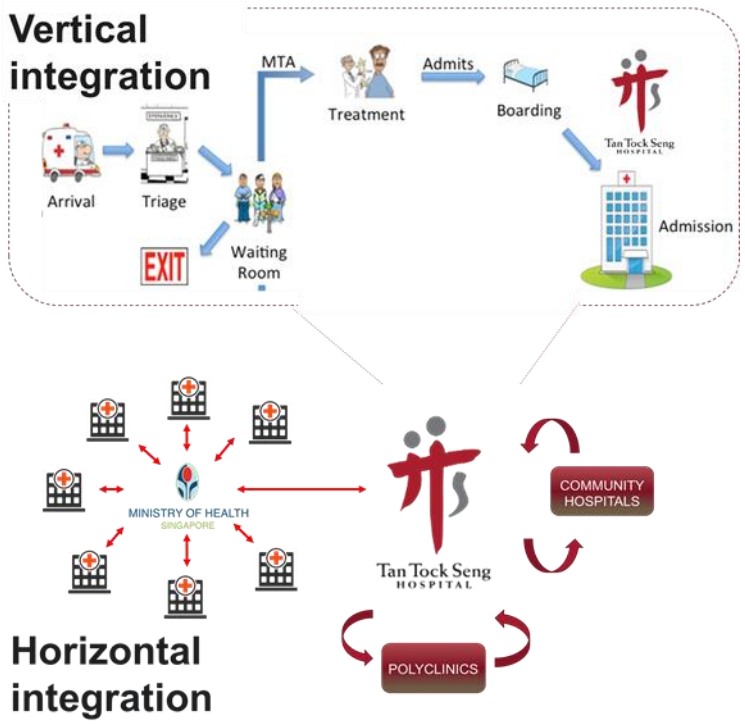
The demand for hospital/tertiary services is high today partly because:

a) Often, healthcare partners are operating in silos and do not have visibility of one another's situation. This delays the efficiency of transfers across healthcare providers.

b) Also, optimisation occurs at a unit-level, and individual providers are not cognizant of the impact of their work on others (e.g. Polyclinics continue to refer patients to a tertiary hospital that is facing full occupancy). The current mindset is predominantly on inventory/stock management and not one of flow management.

c) Within each healthcare operator, management might not have full real-time visibility of the ground operations, and any response is lagged, or blindsided by bottlenecks within the system.

With the increasing demand for healthcare, it was not sustainable to continue the conventional ways of bed management, and there was a need to look at integration of care, both horizontally and vertically.



Vertical integration of care involves optimisation within the hospital's own resources. We need to be able to appreciate and predict patient flow, and quickly identify any chokepoints, ranging from shortage of manpower/supplies to prolonged turnaround time. Sometimes, unnecessary delays could also be due to manual coordination, e.g. in passing of information. Hence, the C3 system also targets to seamlessly trigger appropriate response plans via automated Standard Operating Procedures (SOPs).

Horizontal integration of care involves optimisation beyond the hospital shores, and leveraging on upstream and downstream resources to load balance the workload within the healthcare ecosystem. We need to look more into population health, and right site care where possible. This relies on tapping more on primary care as well as step-down care partners as much as possible, instead of over-relying on tertiary care. Also, because transfers between healthcare operators are critical to achieve this, we need to minimise any unnecessary wait for transfer due to lack of information.

Methods

See attachment

Results

See attachment

Lessons Learnt

There needs to be an alignment of data interpretation. Ground attachment to understand workflows on the ground is necessary in order to understand the data. Because the concept is so new to many stakeholders, it is also important to adopt an agile implementation approach, be inclusive and have regular read-backs, and learn how to fail fast and learn fast.

Conclusion

There is a need to look at optimisation more holistically from a system-level perspective. Only with proper vertical and horizontal integration, can we harness the maximum value of the healthcare ecosystem.

Project Category

Automation, IT & Robotics, Workforce Transformation

Keywords

Automation, IT & Robotics, Workforce Transformation, Quality Improvement, Efficient Care, Tan Tock Seng Hospital, Level Improvement, Workflow Redesign, System Process Improvement, Cost Effectiveness, Productivity, Operations

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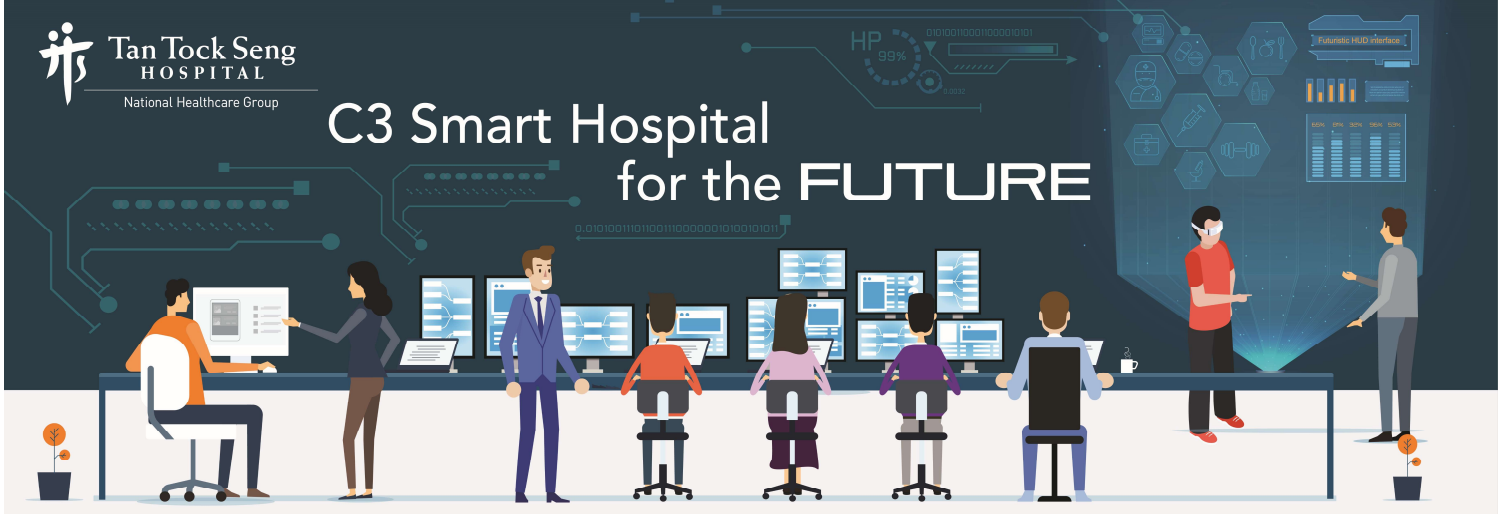
C3 Smart Hospital for the FUTURE



Issue: Operating in silos and lack of real-time visibility of ground operations

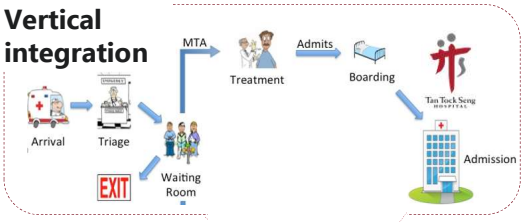
Demand for hospital/ tertiary services is high today partly because:

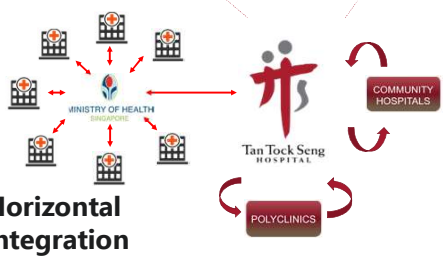
a) Often, healthcare partners are operating in silos and do not have visibility of one another's situation. This delays transfers across providers.
b) Optimisation occurs at a unit level. The current focus is predominantly on inventory/ stock management
c) Each operator might not have full real-time visibility of ground operations, and any response is lagged.

No longer is it sufficient to just look at inventory management, we need to consider vertical and horizontal integration:

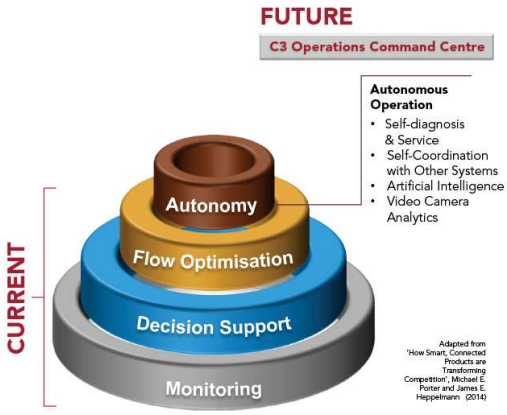
a) Vertical integration of care involves optimisation within TTSH resources, and better appreciation of patient flow, to quickly identify any chokepoints, and seamlessly trigger the appropriate response plan.
b) Horizontal integration of care involves optimisation beyond TTSH shores, and leveraging on both upstream and downstream resources to load balance throughout the healthcare ecosystem.

Vertical integration





Horizontal integration



What is Command, Control & Communications (C3)?

The Operations Command Centre (OCC), similar to an airport control tower, aims to coordinate and provide better care for patients at a systemic level. It is a first of its kind in healthcare, with the primary focus to coordinate flow, by adopting a more holistic view to the hospital ecosystem and deliver 4 core capabilities –

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

Results

The C3 system was developed with constant engagement of clinical and operational leads from key departments, as well as Senior Management, and finally went live in Dec 2019.

Now, TTSH management has a real time sensing of key details such as the Emergency Department situation, Bed Stock availability, and Discharge situation. This is done fully by automated pulling of data, instead of taxing on staff to collate the details.

The benefits brought about by C3 was best exemplified during the COVID-19 outbreak, where the system has greatly reduced the work that would have otherwise been done by calling and collating details from the ground. It has helped the frontline focus their efforts in fighting the COVID-19 war.