



**For information
on 15.12.2022**

HAB-P331

Hospital Authority

Cluster Presentation Programme – Kowloon Central Cluster Experience Sharing of Hospital Command Centre

Advice Sought

Members are invited to note for information the development and key components of the Hospital Command Centre (HCC) in the Queen Elizabeth Hospital (QEH) of the Kowloon Central Cluster (KCC) for improving the efficiency and quality of patient management.

Background

2. QEH is one of the busiest hospitals in Hong Kong, with hundreds of admissions and discharges every day. The turnover of hospital beds and thus bed capacity are severely impacted by the increasing service demand and high patient inflow due to aging population, especially during the winter surge period. Access block at the Accident and Emergency (A&E) Department leading to long waiting time for admission to inpatient wards has also caught public attention.

3. To tackle these long-standing challenges, QEH, being one of the pilot hospitals in the Hospital Authority (HA) to pursue Smart Hospital initiatives, took the lead in establishing HCC in October 2020 under the joint effort of the Cluster Information Technology Division (KCCIT) and the Head Office Information Technology and Health Informatics Division (IT&HID). A co-delivery approach was adopted with the involvement of user departments, Administrative Services, KCCIT and IT&HID to develop the system algorithm for linking the data and embodying features of various corporate systems to facilitate the operation of HCC. Through bringing in advanced technology applications and digital healthcare solutions, HCC serves as an integrated platform for managing patient flow and facilitating patient's access to services across hospitals in KCC by optimising the use of real time bed statistics, clinical information and resources available.

Development of the Hospital Command Centre

Co-development and Co-delivery approach

4. With a view to maximising clinical outcomes, enhancing patient's experience and increasing efficiency, the QEH Command Centre Task Force (CCTF) was established

to lead the development of HCC in three domains, namely Capacity (Bed) Management, Resource (Logistic) Management, and Clinical Management. The Task Force comprises representatives from clinical departments including A&E, Medicine, Neurosurgery, Orthopaedics & Traumatology, Intensive Care Unit, Central Nursing Division (CND), as well as those from non-clinical departments such as the Administrative Services, Supporting Services, KCCIT and IT&HID. Instead of following the conventional top-down approach, HCC adopts a co-development and co-delivery concept in the development process whereby input from frontline users of QEH, KCCIT and IT&HID is solicited to reengineer the operational workflow, as appropriate, for effectiveness and efficiency. From 2020 to 2022, the QEH CCTF and its workgroups held more than 40 meetings to enhance and refine the HCC's features.

5. Under the co-developing product concepts, a special team is also set up to work on Minimum Viable Products (MVP), which are launchable versions consisting of basic features, for obtaining user feedback to support and facilitate the next stage of development.

Components of Hospital Command Centre

6. Key functions of the three components of HCC as mentioned in paragraph 4, are summarised in the ensuing paragraphs.

Capacity (Bed) Command Centre

7. The Capacity (Bed) Command Centre processes all bed-related data for generating real time information in various aspects, such as bed occupancy rates, patients' average length of stay, daily admission and discharge statistics, etc. Such information is useful in optimising bed deployment in a timely manner and enhancing patient flow through arranging transfers to convalescent/rehabilitation (C/R) hospitals and discharging patients as appropriate.

Resource (Logistic) Command Centre

8. The Resource (Logistic) Command Centre provides an overview of the available resources in real time, such as the number of stretchers, porters, and Non-emergency Ambulance Transfer Service (NEATS), through a major module named "Real Time Location System (RTLS)". For instance, Bluetooth beacons are installed in different locations in A&E Department and hospital lift lobbies to indicate real time location of specific labelled items under RTLS. The Centre is instrumental in expediting both intra- and inter-hospital logistical support through flexible and efficient deployment of resources.

9. By consolidating useful information captured in various hospital systems, the NEATS dashboard, the Porter dashboard, and the Resource Communication Panel are made available for different frontline users to timely review cases pending transfer/discharge. For example, the waiting time can be largely reduced by mapping the status of drug readiness and the arrival time of porters to the ward.

Clinical Command Centre

10. The Clinical Command Centre breaks the barriers of information silos for patients by providing smart visualisation of selected clinical data of wards to facilitate management of conditions of individual patients using a data-driven approach. It also incorporates e-vital sign data and provides clinical staff with key information, such as extreme vitals and the Modified Early Warning Score for Clinical Deterioration (MEWS) data, for monitoring patients' conditions and assessing the risks of deterioration of patients. With this consolidated platform, clinical staff, including Chief of Service (COS), Team Heads, Consultants, Nursing Consultants, Department Operations Managers, Ward Managers and CND, could save time and effort in obtaining data from various clinical systems manually which will enable them to monitor patients' conditions on-the-go for promptly identifying risk areas and patients at-risk and prioritising care upon ward rounds, and thus improving efficiency in overseeing ward situations and patient management.

COVID-19 Command Centre Module

11. During the fifth wave of the COVID-19 pandemic, there was an unprecedented influx of confirmed cases to QEH A&E Department leading to serious access block. QEH was converted into a "Designated Hospital" for COVID-19 patients on 9 March 2022 so as to concentrate its expertise and resources on patient management as well as expediting hospital bed turnover.

12. For close monitoring of the bed situation amid the severe epidemic situation, CCTF rapidly developed a COVID-19 Command Centre Module for incorporation into HCC, allowing comprehensive information about confirmed COVID-19 patients, including their journey across different types of wards (Tier 1 / 2 / 3 isolation wards and general wards) based on the change of clinical conditions, at a glance in one integrated dashboard. This enabled clinical staff to instantly view patient distribution and bed occupancy rates and obtain accurate data for resource allocation. In addition, the COVID-19 Command Centre Module improves inter-department communication and coordination, and centralises resources to deal with sudden surge in service demand. In particular, the Module displays bed availability by means of a colour-coded system. Such information facilitates the process of patient transfer among Tier 1, 2 and 3 isolation beds and the downloading of recovered patients to cluster C/R hospitals and Community Isolation Facilities/Community Treatment Facilities for continued patient care.

13. The COVID-19 Command Centre Module has been further developed to display real time patient flow status at hospital, specialty, ward, and patient levels. An advanced Patient Transfer Request System has also been integrated to the Module to facilitate the transfer of COVID-19 patients among various hospital isolation wards. Hospital management and bed coordinators could make use of the real time information to make decisions on resource reallocation, which further expedites the patient flow.

Promulgation of the Hospital Command Centre

14. More than 28 visits to HCC and experience sharing sessions involving over 280 visitors were arranged by KCC for other clusters/hospitals and departments of HA Head Office. On the KCC Smart Hospital Facebook page, QEH had shared with the public six posts and one video for HCC, which attracted coverage on television and in newspapers.

Service Enhancements

15. After the launch of HCC in October 2020, the average processing time of discharge to C/R hospitals has been reduced from 3.5 hours to 2.5 hours, and the number of patients transferred to C/R Hospitals went up from 47% to 55% (i.e. from 5 616 in 2019/20 to 7 676 in 2021/22). We also observed a decrease in administrative and nursing workload, with the daily clinical handover time by nurses shortened roughly by 1 143 minutes (i.e. 381 cases and three minutes each) and an estimated saving of 4 200 minutes (i.e. 2 100 cases and two minutes each) of daily phone time by nurses, ward clerks and NEATS coordinators for making necessary arrangement for discharging patients. RTLS has also helped saving time of porter staff in searching for patients in the A&E Department.

16. Recently, HCC has been enhanced to provide designated users with a specially designed dashboard with smart visualisation of selected business cases (hospital and specialty based) according to the criteria/rules with reference to corporate-wide standard clinical practice, aiming to cater for the specific needs of individual hospitals/specialties. For instance, the dashboard for paediatric department presents Pediatric Early Warning Score instead of MEWS, while that for surgical department highlights patient's intra-operative and post-operative clinical information. HCC also begins to apply artificial intelligence (AI) to predict the trend of patient flow and plan for potential response measures. Through AI-powered cross-system data analysis, HCC can predict the number of A&E attendances and patients' likelihood of discharge in the coming three days so as to give a forecast on the general and C/R bed demand for managing ward capacity and inter-hospital transfer. It can also evaluate various clinical risk factors based on the patient's clinical data (e.g. vital signs / ventilation requirement) and detect deteriorated patients who require early intervention.

Way Forward

17. HCC has improved the quality of care and enhanced patient flow through access to real time consolidated information by clinical staff. As a way forward, more application of AI and rule-based decision engine will be explored to further optimise patient care and workflow, including the prediction of patient's length of stay, bed demand and assignment. Besides, CCTF will steer a new co-development project, kicked off in October 2022, to establish a Cluster Command Centre to improve patient flow between cluster hospitals with reference to features and experience from HCC. HCC will also work with the HA's Emergency Operation Centre to strength its emergency preparedness and

responses through central coordination and deployment of resources across seven clusters. In parallel, HA would explore the opportunity to establish HCC in other clusters as appropriate.

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