CASE STUDY: MACKAY MEMORIAL HOSPITAL

MacKay Memorial Hospital rolled out its own mHealth programme

How MacKay Memorial Hospital restructured patients' access to mHealth

This Taiwanese hospital believes it is not enough to provide a digital solution in healthcare; the important thing to consider is whether it adds value to users and helps improve their therapeutic outcomes.

Pill organisers and medicine reminder charts had been considered the best memory aides for dosage skippers, up until the development of various mobile health (mHealth) apps. Despite this progress, most mHealth apps in the market seem to work best in English-speaking countries, and fail to boost medication adherence in countries with a different culture and language. Determined to bridge this digitalisation gap, MacKay Memorial Hospital in Taiwan rolled out its own mHealth programme with a Mandarin user interface and a QR scanning option for prescription notes and drug packages, amongst many innovative features.

MacKay Memorial Hospital's move to come up with a Mandarin-based application is also influenced by rising cost pressures amidst an ageing population in Taiwan. The hospital's mHealth app, which is the first of its kind, boasts of a collaborative solution that has helped improve physician-patient interaction and medication knowledge in the country. The app recently bagged Outstanding Innovation award at the Asia Pacific HIMSS-Elsevier Digital Healthcare Award 2017 for being a fast, creative solution in improving processes and driving more effective outcomes for patients.

Dr Shou-Chuan Shih, superintendent, MacKay

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Memorial Hospital and core member of the mHealth programme, said that one of the ways in which patients can contribute to better disease management is through religious adherence to medication regimens.

Tailored for Taiwan
Whilst quality healthcare in Taiwan is considered highly accessible and affordable, Shih noted that non-adherence and knowledge gaps amongst patients often result in unnecessary medical expenditure. In the United States alone, estimates by the Centre for Disease Control and Medication reveal that poor medication adherence contributes to 125,000 deaths and costs up to US$3b every year. According to the World Health Organisation (WHO), only 50% of patients with chronic diseases adhere to long-term therapies. This is especially true considering the number of elderly patients who are hindered to diligently take their dosages because of cognitive decline and polypharmacy. MacKay Memorial Hospital's mHealth programme brings medication adherence and knowledge to a new level, with its patient-centered design concept tailored for Mandarin-speaking users. For the more elderly users, the developers of MacKay's mHealth app included a unique family-friends care circle

feature so patients can have greater accountability in their medication and treatment. In the case of medication tracking and adherence, popular mHealth apps such as MediSafe, DoseCast, and MyMeds have proven effective in reminding patients of their daily dosages. As more apps are released into the market, MacKay Memorial Hospital noted the low adoption rate of these apps in Taiwan and grabbed the opportunity to develop something that would pique the interest of locals. MacKay Memorial Hospital observed that language is the greatest barrier to adoption, thus they pioneered a culture-based app with a Mandarin interface.

MacKay Memorial Hospital also leveraged on the growth of integration in Taiwan's digital landscape by including a QR code system for the prescription process, which addresses a major complication in terms of the digital platform of the app. According to Shih, the initial problem was interoperability between the cloud-based mHealth platform and the hospital information system (HIS). MacKay Memorial Hospital launched the QR code system in response to the challenge of creating an mHealth app based on the existing architecture without causing additional burdens on the HIS, such as transformations on the original framework and additional development costs.

Shih said that the QR code system works by scanning codes on prescription notes and drug packages whilst offline and synchronising the information with the existing HIS once online. Patients can then access personal medication information such as dosage, frequency, drug photos, side effects, and warnings, through the mHealth app, which also automatically notifies users when it's time to take their medicine. Shih noted that the two-step design of the QR code system proves effective as it does not cause additional burdens to the existing HIS infrastructure.

"In addition to facilitating medication compliance through reminder notification in our system, users are encouraged to record their symptoms or discomforts as well as global self-assessment for their treatment period. As a patient-centered design concept, the key features of our mHealth system are to reflect patients' actual medication utilisation status as well as the time and severity of symptoms developed to their healthcare providers so that healthcare teams and patients could function in a collaborative manner," Shih added. Physicians who use

Medication refill with the help of the programme

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the mHealth system are sure to benefit from the patient's medication usage reports, from medication schedule to completion rate to symptoms, in order to improve consultations and follow-ups during return visits. MacKay has taken the collaborative principle further, as users can share the stored information not only with their hospitals and physicians, but also with family and friends for mutual support and improved medication adherence.

Shih said that the family-friends care circle feature was included to particularly help patients with chronic diseases, as they are considered to be in need of an additional tool to solve low medication adherence and polypharmacy. This feature includes an alarm system through which members of the family or friends circles are notified when someone failed to take their medication. On a larger scale, aggregated data from the mHealth app can help administrators better understand medication usage behaviour. Shih said that MacKay Memorial Hospital was able to provide objective measures of population-based medication utilisation, reported for the first time and beneficial to improving the quality of hospital administration.

Tried and tested

MacKay Memorial Hospital utilised several promotion mechanisms in raising awareness about the benefits of the mHealth app, including launching it on the iOs and Google Play platforms. Shih said that to inform their patients and their patients' family and friends, the hospital implemented a widespread publicity campaign through the use of posters, flyers, and videos across the hospital. To further assist users in downloading the app and as way to respond to their questions, the hospital set up a helper desk at several specific locations in the hospital, such as the pharmacy and reception counter, where most of the patients and their loved ones go. Shih added that for patients with specific diseases, the hospital promoted the mHealth programme in consultation rooms and partnered with medical care providers to deploy the app at outpatient clinics in the city. Physicians also involved themselves in the promotion process by encouraging their patients to use the app for better physician-patient interaction. Despite learning about the programme through widespread promotion within the hospital, patients are more

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Promotion campaign during roll-out

convinced to try when their doctors vouch for it. MacKay Memorial Hospital also made sure to provide instruction manuals and pre-discharge consultations to smoothen the transition from in-hospital to out-hospital.

Local users have been receptive of MacKay Memorial Hospital's mHealth app, with a total of 25,909 users recruited, average seven-day active users of 500, and 15.4% (± 3.9) seven-day retention rate during the implementation period. Since the retention rate is quite low, Shih said that the hospital continues to study the critical factors behind the number in order to improve it and make the app more accessible and engaging for the entire Taiwanese population.

Furthermore, Shih added that users preferred to scan the drug packaging rather than the prescription note, with medication information surfing increasing to 3,445 times during the fifth month. This suggested that patients were already familiar with the system as a means to educate themselves. The hospital also noted that in their test, the users who engaged with the app were mostly composed of young adults and males.

At the clinical level, Shih noted that physicians from various specialisations such as cardiology and immunology found the system helpful in caring for patients with complicated medications and those with difficulties managing their medications on their own. Meanwhile, administrators can look at the data from a population lens as the the mHealth app clocked in a total of 25,267 scanning counts including 97 different categories of medications in the implementation period alone.

"We can list the ranking of drugs scanned by the users and track the trends of completion rates of specific medications. These data were the objective measures of patient's medication utilising status at a population level, which would be valuable information for the hospital's administrative quality improvement measures and further policy-making," Shih said. The instant success of MacKay Memorial Hospital's mHealth programme may be seen in the positive online feedback received by the mHealth app regarding the usability of the interface, the availability of drug information, and the quality of reminders and connectivity of family-friends care circles. The app's Google Play rating hit 4.493 points out of 5, with users complimenting how the app helps them record disease

The high attrition rate for mobile app intervention may reflect the user's interest in the novelty of the app but is rapidly declining as the novelty disappears.

symptoms and inquire about drug functions. Other than the symptom record, Shih said that the medication reminder system is one of the first desirable features of the app.

Going forward
Shih further noted that although plenty of users were recruited during the implementation period, the seven-day retention rate is in fact very low. "The high attrition rate for mobile app intervention may reflect the user's interest in the novelty of the app but is rapidly declining as the novelty disappears. It means that the human factor issues play an important role in developing a better patient-centered mHealth app and increasing the retention rate," he added.

MacKay Memorial Hospital expects to work on initial observations for upcoming versions of the app. One of these observations include well-designed versions for elderly users who prefer to use the app on wider and bigger devices, such as seven-inch tablet.

Another observation is the fragmented completion rates of drug usage, indicating that users did not take medications or did not even use the app despite receiving notifications from the system. "The phenomena suggests that making the users continue record their medication utilisation status is the next stage for improving our mHealth system," Shih said.

Whilst technology plays a huge role in determining the success of a digital solution and eventually, better healthcare, MacKay Memorial Hospital remains hinged on the value of placing their patients at the centre. At the end of the day, Shih said that healthcare still revolves around humans: patients, their loved ones, and the hospital's medical staff. As a leader of the hospital, Shih believes that he has a duty to relate not only to his patients, but also to his employees in, order to be more effective in the management of the hospital.

In fact, Shih said that in order to take care of their patients, the hospital has to be able to take care of its employees too. As their mHealth app further develops, Shih said that they believe that the quality and design of their digital health solution for personal medication and health management could be integrated into other hospitals. He added that app may be the foundation that allows healthcare institutions to provide a more versatile and personalised approach toward advanced healthcare.

MacKay Memorial Hospital has been a pioneer in digital solutions in Taiwan, providing other innovative tech-based services such as a Cisco-based Unified Communications (UC) solution comprised of a patient infotainment system and e-whiteboards. The UC system was implemented in response to the challenge of providing real-time care amidst the growing number of patients in the hospital.

Through the system, nurses can access a central patient terminal which allows them to take patients' calls via a wireless phone and respond to needs at the moment they are expressed. The e-whiteboards also provide a common platform for doctors and nurses to access their patients' real-time status, staff assignments, and duty roster, resulting in greater hospital productivity and patient satisfaction.