

Research Assessment Exercise 2020
Impact Case Study

University: The Chinese University of Hong Kong
Unit of Assessment (UoA): 3 (Clinical Medicine)

Title of case study: Transforming Diabetes Care: From Research To Practice To Community

(1) Summary of the impact (indicative maximum 100 words)

The CUHK research-driven quality improvement program (QIP) of using the Hong Kong Diabetes Register (HKDR) to stratify risk, empower patients and individualize care was digitalized in 2007 to become the Joint Asia Diabetes Evaluation (JADE™) Program introduced to 120,000 patients in 11 Asian countries. The HKDR-JADE™ concept provided the template for the territory-wide Diabetes Risk Assessment and Management Program in 2000 which benefited 0.8 million patients in Hong Kong by 2019 with 50-80% decline in death rates. In 2016-2019, the JADE™ Program received international recognition with adoption by payors, policymakers and practitioners for using data to transform diabetes care.

(2) Underpinning research (indicative maximum 500 words)

Based on randomized clinical trials and research-driven QIP, the CUHK Diabetes Care and Research Team first established the HKDR using an inter-disciplinary approach to stratify risk, triage care, empower patients and inform decision-making in 1995. In 2000, the HKDR protocol motivated the Hong Kong Hospital Authority (HA), which provides subsidized healthcare to 90% of people in Hong Kong, to set up multidisciplinary diabetes centres and teams to provide risk assessment and education as a routine service.

In 2007, we established the Asia Diabetes Foundation (www.adf.org.hk) under the CUHK Foundation, as a non-profit research organization, to design the first web-based JADE™ Program in eight languages, complete with care protocol, risk categories, 5-year probabilities of future events, personalized reports, trends/targets of risk factors with individualized decision support. In 2014, using this technologically-assisted care model together with peer support, we confirmed the benefits of this ‘high tech, soft touch’ model in improving multiple risk factors and self-management with reduced hospitalizations (1). Through knowledge transfer using the JADE™ Program, we established a network of 300 sites from 11 Asian countries and registered 120,000 patients to quantify the burden and treatment gaps of young-onset diabetes (2).

In 2007, we established the first CUHK-affiliated, nurse-coordinated, self-funded centre to provide JADE-assisted risk assessment and empowerment program to complement medical care in the community through public-private-partnership (PPP). In 2009, the HA adopted the JADE risk stratification concept and introduced the Risk Assessment and Management Program (RAMP) to 50 public-funded primary care clinics.

Hong Kong has a population of 7.5 million people with 10% having diabetes. Apart from benefiting 0.8 million patients, the HA territory-wide diabetes care program has created a comprehensive diabetes database linked to medication, laboratory, hospitalization and death records. In 2017, using this real-world evidence, we confirmed the improving trends of risk factor control and declining trends of major events in these patients between 2000 and 2013 (3). Independent evaluation of the RAMP in the primary care setting confirmed 50% risk reduction in morbidities, hospitalization and premature mortality compared to usual care and was found to be cost-saving. Supported by a government policy research grant, we confirmed

the benefits of the community-based JADE-assisted care model implemented through PPP reduced cardiovascular-renal-cancer events, hospitalization and death rates by 40-60% irrespective of baseline risk levels compared to usual care (4).

Apart from using data to close care gaps and improve outcomes, the evolution of the HKDR-JADE™-RAMP model since 1995 has created big data for monitoring care quality and detecting emerging trends. In 2019, using this territory-wide diabetes database of 0.4 million people, we reported the excess burden of hospitalization due to mental illness in patients with young-onset diabetes, which affected 17% of the cohort (5). In 2018, we led a meta-analysis of 180,000 patients from different settings, including data from these CUHK-initiated data-driven QIP, and confirmed the benefits of multi-component integrated care in reducing cardiometabolic risk factors, where using team-based care to promote doctor-patient communication and self-management has the greatest effect size (6).

(3) References to the research (indicative maximum of six references) (Authors highlighted in bold are affiliated to CUHK)

1. **Chan JC**, Sui Y, Oldenburg B, **Zhang Y, Chung HH, Goggins W**, Au S, Brown N, **Ozaki R, Wong RY, Ko GT**, Fisher E, for the JADE and PEARL Project Team. Effects of telephone-based peer support in patients with type 2 diabetes mellitus receiving integrated care: A randomized clinical trial. *JAMA Internal Medicine*. 2014;174(6):972-981.
2. **Yeung RO, Zhang Y, Luk A**, Yang W, Sobrepenna L, Yoon KH, Aravind SR, Sheu W, Nguyen TK, **Ozaki R**, Deerochanawong C, Tsang CC, **Chan WB**, Hong EG, Do TQ, Cheung Y, Brown N, Goh SY, **Ma RC**, Mukhopadhyay M, Ojha AK, Chakraborty S, **Kong AP**, Lau W, Jia W, Li W, Guo X, Bian R, Weng J, Ji L, Reyes-dela Rosa M, Toledo RM, Himathongkam T, Yoo SJ, **Chow CC**, Ho LL, Chuang LM, Tutino G, **Tong PC, So WY**, Wolthers T, **Ko G**, Lyubomirsky G and **Chan JC**. Metabolic profiles and treatment gaps in young-onset type 2 diabetes in Asia (the JADE programme): a cross-sectional study of a prospective cohort. *The lancet Diabetes & endocrinology*. 2014;2(12):935-43.
3. **Luk AOY**, Hui EMT, Sin MC, Yeung CY, Chow WS, Ho AYY, Hung HF, Kan E, Ng CM, **So WY**, Yeung CK, Chan KS, Chan KW, Chan PF, Siu SC, Tiu SC, Yeung VTF, **Chan JCN**, Chan FWK, Cheung C, Cheung NT, Ho ST, Lam KSL, Yu LWL, Chao D and Lau IT. Declining Trends of Cardiovascular-Renal Complications and Mortality in Type 2 Diabetes: The Hong Kong Diabetes Database. *Diabetes care*. 2017;40(7):928-935.
4. **Chan JC, Lim L, Luk AO, Ozaki R, Kong AP, Ma RC, So WY** and Lo SV. From Hong Kong Diabetes Register to JADE Program to RAMP-DM for data-driven actions. *Diabetes Care* 2019
5. **Ke C, Lau E**, Shah BR, Stukel TA, **Ma RC, So WY, Kong AP, Chow E**, Clarke P, **Goggins W, Chan JCN and Luk A**. Excess Burden of Mental Illness and Hospitalization in Young-Onset Type 2 Diabetes: A Population-Based Cohort Study. *Annals of internal medicine*. 2019; 170(3):145-154.
6. **Lim LL, Lau ESH, Kong APS**, Davies MJ, Levitt NS, Eliasson B, Aguilar-Salinas CA, Ning G, Seino Y, **So WY**, McGill M, Ogle GD, Orchard TJ, Clarke P, Holman RR, Gregg EW, Gagliardino JJ and **Chan JCN**. Aspects of Multicomponent Integrated Care Promote Sustained Improvement in Surrogate Clinical Outcomes: A Systematic Review and Meta-analysis. *Diabetes care*. 2018;41(6):1312-1320.

(4) Details of the impact (indicative maximum 750 words)

Over 70% of global deaths are due to non-communicable diseases (NCDs) including diabetes, cancer, cardiovascular disease and respiratory disease. Diabetes increases the risk of cardiovascular-renal-cancer deaths by 1.3 to 3-fold. Since early 1990s, the CUHK has combined research and practice to demonstrate by changing setting, workflow and team

structure to set up the HKDR, we can use data to improve clinical outcomes. In 2007, we established the Asia Diabetes Foundation (<http://www.adf.org.hk/>) to digitalize the care model (JADE™ Technology) and increase its impact. This technologically-assisted, integrated diabetes care reduced morbidities, hospitalization and death rates in both public and private care settings in Hong Kong. Amongst 0.8 million adults with diabetes followed up since 2000, death rates due to cardiovascular disease, cancer and all-events have dropped by 50-80% in Hong Kong (1). The cohorts, databases and biobanks of the HKDR has evolved into the multi-centre Hong Kong Diabetes Biobank and Transcend Consortium in 2014 for the discovery of genetic regulation of diabetes and its complications in pursuit of precision medicine (<http://www.hongkongdiabetesbiobank.org/>)

In 2005, we set up the Hong Kong Institute of Diabetes and Obesity under the CUHK (<http://hkido.cuhk.edu.hk/>). Together with the ADF, these two non-profit organizations run regular professional/postgraduate courses, conferences and workshops to inform thousands of healthcare providers/administrators from China and Asia and industrial leaders regarding the rationale, operation and impacts of the JADE™-assisted care model to save life and costs. In 2015, the ADF™ and JADE™ received trademark registration in Hong Kong and China (3).

While the HKDR-JADE™ concept motivated the HA to reform the public-funded diabetes service (1), the CUHK established the first nurse-led Yao Chung Kit (YCK) Diabetes Centre to provide community-based JADE™-assisted assessment and empowerment program to complement medical care through PPP. In a policy research project, we analysed data of 16,000 patients followed up since 2007 and confirmed that the JADE™-assisted care model implemented through PPP, with more personalized service, regular reminders and continuing care, reduced cardiovascular-renal-cancer events by 40-60% and hospitalization rate by 50% compared to patients in HA who spent 3-7 hospital nights/patient/year. In the report, we advocate the set up of community-based non-physician led assessment and education centres to complement physician care, which was adopted by the Government. This report received widespread news coverage (2) and informed insurers that diabetes is indeed preventable, treatable and insurable if patients are assessed, empowered and engaged. In 2018, AXA, the world-leading insurance company launched the Diabetes and 3-Highs Management Program, powered by the JADE™ Technology (4).

This technologically-assisted integrated care model also motivated academic leaders in China to establish one-stop diabetes risk assessment centres to provide similar care model (5,6). In 2016, the CUHK was invited to lead a Lancet Diabetes Commission. Twenty-seven global experts in epidemiology, public health, clinical care and health economics reviewed current gaps in diabetes care, propose solutions and developed models to estimate the impact of using data-driven, integrated care versus status quo to reduce the burden of diabetes and NCDs (7).

In 2019, at the 79th Annual American Diabetes Association (ADA) Scientific Symposium (San Francisco, USA), the CUHK experience in using research to inform practice and policy was one of three hot topics in a special Diabetes Care symposium. Professor Juliana Chan, who led the team to conceptualize, implement and evaluate this program received the Harold Rifkin's Award for Distinguished International Services for a Cause in Diabetes, one of the highest honors bestowed by ADA, along with broad media coverage (8).

In July 2019, the World Health Organization, convened a meeting to discuss the use of diabetes registers to improve care as a global policy, where the CUHK experience was highlighted (9). At the 2019 European Association for the Study of Diabetes (EASD) meeting held in Barcelona, Spain, the HKDR-JADE™-RAMP experience was highlighted in a European Union Diabetes Forum to motivate policy and system changes for improving care (10).

The ADA (<https://www.diabetes.org/>) and EASD (<https://www.easd.org/>) are leading professional and lay organizations with huge influence on practitioners, policymakers and payers. In the World Diabetes Congress (Busan, Korea, December 2019) organized by the International Diabetes Federation, the global advocacy body for prevention, care and cure of diabetes, Professor Juliana Chan leads the chapter in the Diabetes Atlas on advocating the use of data-driven, integrated care to make diabetes care more accessible, affordable and sustainable for prevention of NCD (<https://diabetesatlas.org/>). She also leads a chapter on team-based care in the KDIGO (Kidney Disease Improvement Global Outcomes) Guidelines for diabetic kidney disease to be published in Kidney International in 2020.

(5) Sources to corroborate the impact (indicative maximum of 10 references)

1. **Wu HJ, Lau ESH, Ma RCW, Kong APS**, Wild SH, Goggins W, **Chow E, So WY, Chan JCN, Luk AOY**. Secular trends in all-cause and cause-specific mortality in people with diabetes in Hong Kong, 2001-2016: A retrospective cohort study, Diabetologia 2019.
2. **Chan JCN**. Designing a Sustainable Public-Private-Partnership Program to Enhance Diabetes Care and Evaluating Its Impact Using an Outcomes Simulation Model - supported by Public Policy Research Funding Scheme.
3. Registration of trademark of JADE™ and ADF™ in China and Hong Kong
4. AXA Hong Kong launches first-in-market ‘AXA Diabetes & Three-Highs Management Programme’ To actively help improve health of customers
5. **Chan JC**, Zhang Y and Ning G. Diabetes in China: a societal solution for a personal challenge. The lancet Diabetes & endocrinology. 2014;2(12):969-979.
6. Zhang Y, Wang W and Ning G. Metabolic Management Center: An innovation project for the management of metabolic diseases and complications in China. Journal of diabetes. 2019;11(1):11-13
7. **Chan JC**, Gregg EW, Sargent J and Horton R. Reducing global diabetes burden by implementing solutions and identifying gaps: a Lancet Commission. Lancet. 2016;387(10027):1494-1495.
8. Award, press releases and story coverage by American Diabetes Association 2019.
9. World Health Organization Meeting to develop a model diabetes registry (Geneva, Switzerland)
10. **Chan Juliana**. ‘It can be done: a full cycle of care from data, registries to outcomes and cost savings’ in EUDF* Symposium: Excellence, equity and efficiency in diabetes care (17th September 2019, Barcelona)